The Nautical Almanac 2027



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The Nautical Almanac

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fair winds, clear skies & following seas
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Acknowledgment and Credits

Dr. Enno Rodegerdts

The Nautical Almanac *Daily Pages* and Sun Almanacs found on our site were originally created from PyAlmanac written by the great Norwegian sailor Enno Rodegerdts. PyAlmanac used PyEphem to generate the almanacs and LaTex provided the final formatting. Visit Dr. Rodegerdts site and learn of his voyages at https://sv-inua.net/

Without his work TheNauticalAlmanac.com wouldn't exist

Andrew Bauer

Mr. Bauer has taken the initial work of Dr. Rodegerdts and improved it to the excellence found in the following Daily Pages. Attending foremost to the accuracy of data and then formatting Mr. Bauer created SkyAlmanac which draws from Brandon Rhodes work *Ephem* and *Skyfield* and provides a clear arrangement of figures required for celestial navigation. He has also created the separate *Declination of the Sun and Planets* and *Local Mean Time of Meridian Passage* you'll find near the end of this almanac.

His work was determined, tireless and efficient. In our mutual writing across many lines of longitude he has always been pleasant, friendly and most affable.

As he has said, *"The art of celestial navigation should be promoted, not discouraged, even in the modern day".*

To both of these men we all owe a large debt of gratitude and thanks

Disclaimer and Warning

Prior to use verify the accuracy of The Nautical Almanac or data you download from our site. They SHOULD NOT and MUST NOT be relied upon for celestial navigation work of any sorts or any purpose whatsoever. You use them at your own risk or peril.

Errors & Corrections

Contact us if you find any significant errors and describe the correction that should be made.



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2027

January

wk	Su	M	Tu	W	Th	F	Sa
1						1	2
2	3	4	5	6	7	8	9
3	10	11	12	13	14	15	16
4	17	18	19	20	21	22	23
5	24	25	26	27	28	29	30
6	31						

February

wk	Su	M	Tu	W	Th	F	Sa
6		1	2	3	4	5	6
7	7	8	9	10	11	12	13
8	14	15	16	17	18	19	20
9	21	22	23	24	25	26	27
10	28						

March

wk	Su	M	Tu	W	Th	F	Sa
10		1	2	3	4	5	6
11	7	8	9	10	11	12	13
12	14	15	16	17	18	19	20
13	21	22	23	24	25	26	27
14	28	29	30	31			

April

wk	Su	M	Tu	W	Th	F	Sa
14					1	2	3
15	4	5	6	7	8	9	10
16	11	12	13	14	15	16	17
17	18	19	20	21	22	23	24
18	25	26	27	28	29	30	

May

wk	Su	M	Tu	W	Th	F	Sa
18							1
19	2	3	4	5	6	7	8
20	9	10	11	12	13	14	15
21	16	17	18	19	20	21	22
22	23	24	25	26	27	28	29
23	30	31					

June

wk	Su	M	Tu	W	Th	F	Sa
23			1	2	3	4	5
24	6	7	8	9	10	11	12
25	13	14	15	16	17	18	19
26	20	21	22	23	24	25	26
27	27	28	29	30			

July

wk	Su	M	Tu	W	Th	F	Sa
27					1	2	3
28	4	5	6	7	8	9	10
29	11	12	13	14	15	16	17
30	18	19	20	21	22	23	24
31	25	26	27	28	29	30	31

August

wk	Su	M	Tu	W	Th	F	Sa
31	1	2	3	4	5	6	7
32	8	9	10	11	12	13	14
33	15	16	17	18	19	20	21
34	22	23	24	25	26	27	28
35	29	30	31				

September

wk	Su	M	Tu	W	Th	F	Sa
35				1	2	3	4
36	5	6	7	8	9	10	11
37	12	13	14	15	16	17	18
38	19	20	21	22	23	24	25
39	26	27	28	29	30		

October

wk	Su	M	Tu	W	Th	F	Sa
39						1	2
40	3	4	5	6	7	8	9
41	10	11	12	13	14	15	16
42	17	18	19	20	21	22	23
43	24	25	26	27	28	29	30
44	31						

November

wk	Su	M	Tu	W	Th	F	Sa
44		1	2	3	4	5	6
45	7	8	9	10	11	12	13
46	14	15	16	17	18	19	20
47	21	22	23	24	25	26	27
48	28	29	30				

December

wk	Su	M	Tu	W	Th	F	Sa
48				1	2	3	4
49	5	6	7	8	9	10	11
50	12	13	14	15	16	17	18
51	19	20	21	22	23	24	25
52	26	27	28	29	30	31	

2027

Day of Week, Week Number, Day of Year, Remaining Days of Year

Day of Month	1 January			
	Day of Week	Day of Year	Days remaining	Week number
1	Fri	1	364	
2	Sat	2	363	
3	Sun	3	362	1
4	Mon	4	361	
5	Tue	5	360	
6	Wed	6	359	
7	Thu	7	358	
8	Fri	8	357	
9	Sat	9	356	
10	Sun	10	355	2
11	Mon	11	354	
12	Tue	12	353	
13	Wed	13	352	
14	Thu	14	351	
15	Fri	15	350	
16	Sat	16	349	
17	Sun	17	348	3
18	Mon	18	347	
19	Tue	19	346	
20	Wed	20	345	
21	Thu	21	344	
22	Fri	22	343	
23	Sat	23	342	
24	Sun	24	341	4
25	Mon	25	340	
26	Tue	26	339	
27	Wed	27	338	
28	Thu	28	337	
29	Fri	29	336	
30	Sat	30	335	
31	Sun	31	334	5

Day of Month	2 February			
	Day of Week	Day of Year	Days remaining	Week number
1	Mon	32	333	5
2	Tue	33	332	
3	Wed	34	331	
4	Thu	35	330	
5	Fri	36	329	
6	Sat	37	328	
7	Sun	38	327	6
8	Mon	39	326	
9	Tue	40	325	
10	Wed	41	324	
11	Thu	42	323	
12	Fri	43	322	
13	Sat	44	321	
14	Sun	45	320	7
15	Mon	46	319	
16	Tue	47	318	
17	Wed	48	317	
18	Thu	49	316	
19	Fri	50	315	
20	Sat	51	314	
21	Sun	52	313	8
22	Mon	53	312	
23	Tue	54	311	
24	Wed	55	310	
25	Thu	56	309	
26	Fri	57	308	
27	Sat	58	307	
28	Sun	59	306	9

Day of Month	3 March			
	Day of Week	Day of Year	Days remaining	Week number
1	Mon	60	305	9
2	Tue	61	304	
3	Wed	62	303	
4	Thu	63	302	
5	Fri	64	301	
6	Sat	65	300	
7	Sun	66	299	10
8	Mon	67	298	
9	Tue	68	297	
10	Wed	69	296	
11	Thu	70	295	
12	Fri	71	294	
13	Sat	72	293	
14	Sun	73	292	11
15	Mon	74	291	
16	Tue	75	290	
17	Wed	76	289	
18	Thu	77	288	
19	Fri	78	287	
20	Sat	79	286	
21	Sun	80	285	12
22	Mon	81	284	
23	Tue	82	283	
24	Wed	83	282	
25	Thu	84	281	
26	Fri	85	280	
27	Sat	86	279	
28	Sun	87	278	13
29	Mon	88	277	
30	Tue	89	276	
31	Wed	90	275	

Day of Month	4 April			
	Day of Week	Day of Year	Days remaining	Week number
1	Thu	91	274	13
2	Fri	92	273	
3	Sat	93	272	
4	Sun	94	271	14
5	Mon	95	270	
6	Tue	96	269	
7	Wed	97	268	
8	Thu	98	267	
9	Fri	99	266	
10	Sat	100	265	
11	Sun	101	264	15
12	Mon	102	263	
13	Tue	103	262	
14	Wed	104	261	
15	Thu	105	260	
16	Fri	106	259	
17	Sat	107	258	
18	Sun	108	257	16
19	Mon	109	256	
20	Tue	110	255	
21	Wed	111	254	
22	Thu	112	253	
23	Fri	113	252	
24	Sat	114	251	
25	Sun	115	250	17
26	Mon	116	249	
27	Tue	117	248	
28	Wed	118	247	
29	Thu	119	246	
30	Fri	120	245	

Day of Month	5 May			
	Day of Week	Day of Year	Days remaining	Week number
1	Sat	121	244	17
2	Sun	122	243	18
3	Mon	123	242	
4	Tue	124	241	
5	Wed	125	240	
6	Thu	126	239	
7	Fri	127	238	
8	Sat	128	237	
9	Sun	129	236	19
10	Mon	130	235	
11	Tue	131	234	
12	Wed	132	233	
13	Thu	133	232	
14	Fri	134	231	
15	Sat	135	230	
16	Sun	136	229	20
17	Mon	137	228	
18	Tue	138	227	
19	Wed	139	226	
20	Thu	140	225	
21	Fri	141	224	
22	Sat	142	223	
23	Sun	143	222	21
24	Mon	144	221	
25	Tue	145	220	
26	Wed	146	219	
27	Thu	147	218	
28	Fri	148	217	
29	Sat	149	216	
30	Sun	150	215	22
31	Mon	151	214	

Day of Month	6 June			
	Day of Week	Day of Year	Days remaining	Week number
1	Tue	152	213	22
2	Wed	153	212	
3	Thu	154	211	
4	Fri	155	210	
5	Sat	156	209	
6	Sun	157	208	23
7	Mon	158	207	
8	Tue	159	206	
9	Wed	160	205	
10	Thu	161	204	
11	Fri	162	203	
12	Sat	163	202	
13	Sun	164	201	24
14	Mon	165	200	
15	Tue	166	199	
16	Wed	167	198	
17	Thu	168	197	
18	Fri	169	196	
19	Sat	170	195	
20	Sun	171	194	25
21	Mon	172	193	
22	Tue	173	192	
23	Wed	174	191	
24	Thu	175	190	
25	Fri	176	189	
26	Sat	177	188	
27	Sun	178	187	26
28	Mon	179	186	
29	Tue	180	185	
30	Wed	181	184	

Day of Week, Week Number, Day of Year, Remaining Days of Year

Day of Month	7 July			
	Day of Week	Day of Year	Days remaining	Week number
1	Thu	182	183	26
2	Fri	183	182	
3	Sat	184	181	
4	Sun	185	180	27
5	Mon	186	179	
6	Tue	187	178	
7	Wed	188	177	
8	Thu	189	176	
9	Fri	190	175	
10	Sat	191	174	
11	Sun	192	173	28
12	Mon	193	172	
13	Tue	194	171	
14	Wed	195	170	
15	Thu	196	169	
16	Fri	197	168	
17	Sat	198	167	
18	Sun	199	166	29
19	Mon	200	165	
20	Tue	201	164	
21	Wed	202	163	
22	Thu	203	162	
23	Fri	204	161	
24	Sat	205	160	
25	Sun	206	159	30
26	Mon	207	158	
27	Tue	208	157	
28	Wed	209	156	
29	Thu	210	155	
30	Fri	211	154	
31	Sat	212	153	

Day of Month	8 August			
	Day of Week	Day of Year	Days remaining	Week number
1	Sun	213	152	31
2	Mon	214	151	
3	Tue	215	150	
4	Wed	216	149	
5	Thu	217	148	
6	Fri	218	147	
7	Sat	219	146	
8	Sun	220	145	32
9	Mon	221	144	
10	Tue	222	143	
11	Wed	223	142	
12	Thu	224	141	
13	Fri	225	140	
14	Sat	226	139	
15	Sun	227	138	33
16	Mon	228	137	
17	Tue	229	136	
18	Wed	230	135	
19	Thu	231	134	
20	Fri	232	133	
21	Sat	233	132	
22	Sun	234	131	34
23	Mon	235	130	
24	Tue	236	129	
25	Wed	237	128	
26	Thu	238	127	
27	Fri	239	126	
28	Sat	240	125	
29	Sun	241	124	35
30	Mon	242	123	
31	Tue	243	122	

Day of Month	9 September			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	244	121	35
2	Thu	245	120	
3	Fri	246	119	
4	Sat	247	118	
5	Sun	248	117	36
6	Mon	249	116	
7	Tue	250	115	
8	Wed	251	114	
9	Thu	252	113	
10	Fri	253	112	
11	Sat	254	111	
12	Sun	255	110	37
13	Mon	256	109	
14	Tue	257	108	
15	Wed	258	107	
16	Thu	259	106	
17	Fri	260	105	
18	Sat	261	104	
19	Sun	262	103	38
20	Mon	263	102	
21	Tue	264	101	
22	Wed	265	100	
23	Thu	266	99	
24	Fri	267	98	
25	Sat	268	97	
26	Sun	269	96	39
27	Mon	270	95	
28	Tue	271	94	
29	Wed	272	93	
30	Thu	273	92	

Day of Month	10 October			
	Day of Week	Day of Year	Days remaining	Week number
1	Fri	274	91	39
2	Sat	275	90	
3	Sun	276	89	40
4	Mon	277	88	
5	Tue	278	87	
6	Wed	279	86	
7	Thu	280	85	
8	Fri	281	84	
9	Sat	282	83	
10	Sun	283	82	41
11	Mon	284	81	
12	Tue	285	80	
13	Wed	286	79	
14	Thu	287	78	
15	Fri	288	77	
16	Sat	289	76	
17	Sun	290	75	42
18	Mon	291	74	
19	Tue	292	73	
20	Wed	293	72	
21	Thu	294	71	
22	Fri	295	70	
23	Sat	296	69	
24	Sun	297	68	43
25	Mon	298	67	
26	Tue	299	66	
27	Wed	300	65	
28	Thu	301	64	
29	Fri	302	63	
30	Sat	303	62	
31	Sun	304	61	44

Day of Month	11 November			
	Day of Week	Day of Year	Days remaining	Week number
1	Mon	305	60	44
2	Tue	306	59	
3	Wed	307	58	
4	Thu	308	57	
5	Fri	309	56	
6	Sat	310	55	
7	Sun	311	54	45
8	Mon	312	53	
9	Tue	313	52	
10	Wed	314	51	
11	Thu	315	50	
12	Fri	316	49	
13	Sat	317	48	
14	Sun	318	47	46
15	Mon	319	46	
16	Tue	320	45	
17	Wed	321	44	
18	Thu	322	43	
19	Fri	323	42	
20	Sat	324	41	
21	Sun	325	40	47
22	Mon	326	39	
23	Tue	327	38	
24	Wed	328	37	
25	Thu	329	36	
26	Fri	330	35	
27	Sat	331	34	
28	Sun	332	33	48
29	Mon	333	32	
30	Tue	334	31	

Day of Month	12 December			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	335	30	48
2	Thu	336	29	
3	Fri	337	28	
4	Sat	338	27	
5	Sun	339	26	49
6	Mon	340	25	
7	Tue	341	24	
8	Wed	342	23	
9	Thu	343	22	
10	Fri	344	21	
11	Sat	345	20	
12	Sun	346	19	50
13	Mon	347	18	
14	Tue	348	17	
15	Wed	349	16	
16	Thu	350	15	
17	Fri	351	14	
18	Sat	352	13	
19	Sun	353	12	51
20	Mon	354	11	
21	Tue	355	10	
22	Wed	356	9	
23	Thu	357	8	
24	Fri	358	7	
25	Sat	359	6	
26	Sun	360	5	52
27	Mon	361	4	
28	Tue	362	3	
29	Wed	363	2	
30	Thu	364	1	
31	Fri	365	0	

Thirty days hath September, April, June, and November; February has twenty-eight alone, All the rest have thirty-one,
Excepting leap-year, that's the time when February's days are twenty-nine.

Useful Information

Time Signals- by telephone

WWV 303-499-7111 **WWVH** 808-335-4363

CHU **English:** 613-745-1576 (CHU provides only Eastern time announcements)
French: 613-745-9426

Time signals- by Radio

WWV (Fort Collins, Colorado)	2.5, 5, 10, 15, 20 MHz (male voice)
WWVH (Kauai, Hawaii)	2.5, 5, 10, 15 MHz (female voice)
CHU (Ottawa, Canada)	3330, 7850, and 14,670 kHz (USB)

Bowditch *2024- The American Practical Navigator*

https://TheNauticalAlmanac.com/2024_Bowditch-_American_Practical_Navigator.html

Organized in a convenient and useful manner. Download the Chapters, Parts or Tables you want or the entire work.

Sight Reduction Tables

Pub. No. 249 Download individual Latitudes or Volumes

Epoch 2025 https://thenauticalalmanac.com/Pub_No_249_Epoch_2025.html

Epoch 2020 https://www.thenauticalalmanac.com/Pub_No_249_Epoch_2020.html

Pub. No. 229 Download individual Volumes covering a range of Latitudes

https://TheNauticalAlmanac.com/Pub_No_229.html

Sight Reduction Forms & Methods

https://www.TheNauticalAlmanac.com/Methods.html

Celestial Navigation

useful Formulas

About Calculators

The Casio *fx-300ES Plus* is an inexpensive calculator at about 11 USD. It features *natural input* so you enter a formula just as it would be written on paper. Entering degrees, minutes and seconds is very simple. The Casio *fx-300ES Plus* has 9 memory locations and you can review many of the previous entries you make using a special key on the calculator.

Determine Hc using a calculator

The formula

Hc = asin[sin(**Declination**)*sin(**Latitude**) + cos(**Latitude**)*cos(**Declination**)*cos(**LHA**)]

As it would be entered into the Casio calculator Note- Sin^{-1} is the arc-sin key

Sin^{-1}(Sin(**Ap Latitude**) x Sin(**Declination**) + Cos(**Ap Latitude)** x Cos(**Declination**) x Cos(**LHA**)

Declination is the declination of the Celestial body you're observing. When the heavenly body's declination is *Contrary name* to your Ap Latitude enter a negative sign before it.

Latitude "The AP latitude is chosen to be the nearest whole degree in latitude to the DR latitude." *from Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310* Consider this to be where you are, think you are or where you would like to determine Hc for. Typically, you'll be using an *Assumed position Latitude* or *Ap Latitude* as it's called. *See Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310*

About LHA determination

Assumed Position longitude (***a* λ**) "The AP longitude is that nearest the DR longitude resulting in a whole degree of LHA for the observed body." *From Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310*

In Western Longitudes *see Bowditch 2019 Vol. 1 Chapter 19 section 1905 p. 313*

LHA is the Local Hour Angle derived by subtracting your Assumed Longitude (***a* λ**) whole degree value from the whole degree ***GHA*** (Greenwich Hour Angle) value. If GHA is less than the ***a* λ** than the add 360° to it then subtract the ***a* λ.** *Ignore the arc minutes* of GHA and ***a* λ.**

Example when GHA is less than ***a* λ** **GHA**= 43° 25.2' ***a* λ**= W 55° 15.1'

360° + 43° = 403° Then....403° – 55° = 348° (LHA)

In Eastern Longitudes *see Bowditch 2019 Vol. 1 Chapter 19 section 1905 p. 313*

LHA**, in **Eastern Longitudes, is determined by adding the entire GHA figure (degrees and minutes) to the whole degree figure of the Assumed longitude (***a* λ**) *plus* the amount of arc minutes required to get to the next degree of the GHA. If the resulting LHA figure is greater than 360° then subtract 360° from the figure to obtain the LHA.

Example- **GHA**= 58° 01.2' ***a* λ**= E 9° 10.1' (ignore the 10.1')

Step 1- *get GHA degree difference;* 59° - 58° 01.2' = 0° 58.8'

Step 2- add *a* λ degrees to *difference* found in step 1; 9° + 0°58.8' = 9° 58.8' *a* λ

Step 3- *get LHA;* 58° 01.2 + 9° 58.8' = 68° (LHA)

Why would you want to determine Hc using a calculator?

It's faster than looking up in Pub. No. 249 and Pub. No. 229, highly accurate and you don't need a lot of printed out pages of Latitudes from Pub. No. 249 and Pub. No. 229. Pub. No. 249 Vol. 2 & 3 don't cover any declination greater than 29 degrees so you'd have to use Pub. No. 229 which is extremely large.

Celestial Navigation

Determine Z

Z = acos[(sin(**Declination**) – sin(**Ap Latitude)** x sin(**Hc**)) ÷ (cos(**Ap Latitude**) x cos(**Hc**))]

As it would be entered into the Casio calculator... Note- Cos^{-1} is the arc-cosine key

Cos^{-1}((Sin(**Declination**) – Sin(**AP Latitude**) x Sin(**Hc**)) ÷ (Cos(**AP Latitude**) x Cos(**Hc**)

If the heavenly body's declination is *Contrary name* to the Ap Latitude enter a negative sign before it.

To obtain Zn see the rules below for Northern and Southern latitudes.

Determine Z independent of Hc

$$Z = \tan^{-1}\left(\frac{\sin \mathrm{LHA}}{(\cos \mathrm{L} \tan \mathrm{d}) - (\sin \mathrm{L} \cos \mathrm{LHA})}\right)$$

"L" is latitude and "*d"* is declination. When the heavenly body's declination is *Contrary name* to your Ap Latitude enter a negative sign before it.

As it would be entered into the Casio calculator... Note- $\tan^{-1}$ is the arc-tangent key

Z = $\tan^{-1}$ ((sin (**LHA**) ÷ (cos(**AP latitude**) x tan(**declination**) – (sin(**AP latitude**) x cos(**LHA**))

The sign convention used in the calculation of this azimuth formula is as follows:
from *Bowditch Chapter 22 CALCULATIONS AND CONVERSIONS, page 331*

1) If latitude and declination are of contrary name, declination is treated as a negative quantity;
2) If the local hour angle is greater than 180°, it is treated as a negative quantity. If the azimuth angle as calculated is negative, add 180° to obtain the desired value.

To obtain Zn apply the following rules

In Northern Latitudes	**In Southern Latitudes**
LHA greater than 180°....Zn=Z	LHA greater than 180°....Zn= 180° – Z
LHA less than 180°.....Zn=360° – Z	LHA less than 180°.....Zn= 180° + Z

Determine Refraction 0.96 ÷ Tan of (Ha)
Gives good results down to about 8° from the horizon but not less.

Refraction (good overall formula from 90° to below 8° from the horizon)

$$R_0 = \cot\left(H_a + \frac{7.31}{H_a + 4.4}\right)$$

As it would be entered into the Casio calculator...

1 ÷ Tan((Ha + (7.31 ÷ (Ha + 4.4))

Both refraction formulas use the standard pressure and temperature of;

1010 mb 10° C
29.83 in 53° F

Determine Dip using feet 0.97 x (Square Root of *He* (Height of Eye) in feet)

Determine Dip using meters 1.76 x (Square Root of *He* (Height of eye) in meters)

Rules to Calculate Latitude using the Sun- *Noon-Sight*

1- Latitude and declination *Same name* but latitude is greater than declination:

Latitude= (90° – Ho) + declination

2- Latitude and declination *Same name* but declination greater than latitude:

Latitude= Declination – (90° – Ho)

3- Latitude and declination *Contrary name*:

Latitude= (90° – Ho) – Declination

To get AP longitude (needed for plotting the LOP)

In Western longitudes

Combine the DR Longitude figure with only the minutes (of arc) of the total GHA figure. The Ap λ figure will be used when plotting the LOP on the UPS.

In Eastern longitudes

In Eastern longitudes the Ap λ is determined as follows;

DR longitude + (0°60' *minus* GHA minutes of arc)

Example- E 075° + (0°60' – 0° 02')= 75° 58' Ap longitude

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Formula Sheet added to NA.odt

Explanation of The Nautical Almanac *Daily Pages*

1	Date and Time based on GMT/UT
2	**Mer. pass**- meridian passage of Aries at the Prime Meridian- Greenwich- 0°. Time figure is GMT/UT.
3	Planet or Moon GHA **v** value and planet or Moon declination **d** value. **v**- "The change in hour angle arising from v of the body at the time of the sight observation is accounted for with the *v correction*." *Source- Bowditch 2017, Chapter 19- Sight Reduction p. 313.* The planet's **v** is positive unless preceeded by a minus sign which is sometimes the case with Venus. The sign of the Moon's **v** is positive. **d**- "The change in declination of the body at the time of the sight observation is accounted for with the *d correction*." *Source- Bowditch 2017, Chapter 19- Sight Reduction p. 313.* The sign of the Moon or planet's **d** correction is determined by the declination trend- positive if successive declination values increase and negative if they decrease. Corrections for both **v** and **d** are found in the Increments and Corrections pages of The Nautical Almanac. To find the correction for either **v** or **d** enter the Increments and Corrections pages for the minutes in time of the observation and find the value in the **v and d corr.** columns Find the **v**, or **d**, value in the left side of one of the three columns. To the right of that value is the **v**, or **d**, correction. Be sure to add or subtract the values depending upon the *sign* of the value as mentioned above.
	Example for v & d correction- June 10, 2020 GMT- 21:19:10 Body- Moon
	GHA= 247° 20.6' ***v =*** 12.1' GHA increment 4° 34.4' ***v-*** correction for 12.1' + 0° 03.9' GHA= 251° 58.9'
	Dec= S 17° 43.8' **d**= 8.9' **d-** correction for 8.9' – 0° 02.9' dec= S 17° 40.9' *declination trend is decreasing so the sign of d correction is negative*
4	**m**- is the *magnitude* or brightness of the planet. A bright planet will have a *minus* sign beside the figure. A fainter planet will have no sign beside its magnitude figure.
5	**Stars**- **SHA**, *Sidereal Hour Angle*, and **Declination**. 59 stars are listed. Typically, only 57 stars are used for navigational purposes in both Northern and Southern Hemispheres. Here you'll also find Polaris and Scheat. In the Northern Hemisphere Polaris is often used for determination of latitude.
6	**Mer. pass**- planet meridian passage time at the Prime Meridian- Greenwich- 0°. Time figure is GMT/UT.
7	**SHA**- planet SHA. Planet SHA is calculated by subtracting Aries GHA from planet GHA. If planet GHA figure is less than Aries GHA, add 360° to planet GHA and then subtract Aries GHA.
8	**Horizontal parallax**- for Venus and Mars. Horizontal parallax is the angle subtended by half the Earth's diameter as viewed from the planet in minutes of arc.
9	**SD**- Semi-diameter of the Sun in minutes of arc. One half of the angular width of the Sun as observed on earth.
10	**d**- the daily average change, per hour, in the Sun's declination in minutes of arc.

11	**SD**- Semi-diameter of the Moon in minutes of arc. Semi-diameter is one half of the angular width of the Moon, as observed on earth.
12	**HP**- the angle between two lines, one from the center of the Moon to the center of the Earth, the other from the center of the Moon to the edge of the Earth. This angle is about 56', but it changes slightly from day to day as the distance to the Moon changes along its elliptical path around the Earth. *Source- starpath.com*
13	**Sun- Eqn. of Time**- Basically the Equation of Time (EoT) is the difference between clock time and time seen on a sundial. This is comparing "clock time", as a mechanical measurement of time, and the sundial being time determined by the position of the Sun at any given moment. The figures listed are for 00^h and 12^h. Using the EoT you can get fairly accurate determination of when Meridian Passage (Local Apparent Noon) occurs at your position. Unshaded EoT values are subtracted from 12:00 to get Meridian Passage. Shaded EoT values are added to 12:00 to get Meridian Passage. An Equation of Time chart (as a curve) is provided in each almanac on TheNauticalAlmanac.com **Example**- Meridian Passage on May 30, 2020 equals 12:00 – EoT of 2 minutes 21 seconds MP= 11:57:39 *Local Apparent Noon* **Example**- Meridian Passage on August 25, 2020 equals 12:00 + EoT of 1 minute 59 seconds MP= 12:01:59 *Local Apparent Noon*
14	**Sun- Mer. Pass** just to the right of the **Eqn. of Time** is the approximate GMT/UT when the Sun crosses The Prime Meridian (at Greenwich) for that specific date.
15	**Moon- Mer. Pass**- is the approximate GMT/UT when the Moon crosses The Prime Meridian (at Greenwich) or the 180° line of longitude. **Upper** means the GMT/UT when the Moon crosses The Prime Meridian (Greenwich). **Lower** means the GMT/UT when the Moon crosses the 180° line of longitude.
16	**Moon- Age**- this is the number of days past a new Moon. Typically, there are 29 days in a lunar month. Moon- %- the amount of the Moon's illumination. 100% would be a full moon. 49% would be about ½ of the Moon is illuminated. A 3 day range percentage is provided but only one graphic for the phase.
17* see notes at bottom	**(morning) Twilight- Naut.**- the approximate GMT/UT when morning Nautical Twilight begins. Nautical twilight is the time when the center of the sun is 12° below the horizon and the horizon is visible enough to be used for marine sextant observations. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(morning) Twilight- Civil-** the approximate GMT/UT of morning civil twilight starts when the geometric center of the sun is 6° below the horizon. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* *see* notes *at bottom*	**Sunrise**- the approximate GMT/UT when the Sun is 0° 50' (semi-diameter plus refraction) below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.

17* see notes at bottom	**Sunset**- the approximate GMT/UT when the Sun is 0° 50' (semi-diameter plus refraction) below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(evening) Twilight- Civil-** the approximate GMT/UT of evening civil twilight that ends when the geometric center of the sun is 6° below the horizon. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(evening) Twilight- Naut.**- the approximate GMT/UT of when evening Nautical Twilight ends. Nautical twilight is the time when the center of the sun is 12° below the horizon and the horizon is no longer visible enough to be used for sextant observations. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.
18* see notes at bottom	**Moonrise**- the approximate GMT/UT when the Moon is about 0° 05' to 0° 10' below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time under the specific day.
18* see notes at bottom	**Moonset**- the approximate GMT/UT when the Moon is about 0° 05' to 0° 10' below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time under the specific day.

* Note-

▭ means the Sun or Moon remains continuously above the horizon on that day.

–:– can also mean twilight lasts all night

▬ means the Sun or Moon remains continuously below the horizon on that day.

–:– means Moon does not rise or set on that day but may have risen or set the previous day or following day.

* **Note**- Time of Sunrise, Sunset, Moonrise, Moonset and twilight is based on GMT/UT of the event at 0° (Greenwich) and can be condsidered as approximate LMT (Local Mean Time) with a tolerance of +/- 30 minutes depending on where you are within a time zone.

January 01, 02 ,03 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°32.5	181°58.1	S23°38.5	318°04.0	N18°45.1	131°37.2	S13°36.5	275°29.9	N00°18.5
1	115°35.0	196°57.1	38.4	333°06.8	45.4	146°39.2	36.4	290°32.3	18.5
2	130°37.4	211°56.1	38.3	348°09.6	45.6	161°41.2	36.2	305°34.7	18.5
3	145°39.9	226°55.1	·· 38.2	3°12.4	·· 45.8	176°43.2	·· 36.0	320°37.1	·· 18.5
4	160°42.4	241°54.2	38.1	18°15.2	46.0	191°45.1	35.8	335°39.5	18.5
5	175°44.8	256°53.2	38.0	33°18.1	46.2	206°47.1	35.7	350°41.9	18.5
6	190°47.3	271°52.2	S23°37.9	48°20.9	N18°46.5	221°49.1	S13°35.5	5°44.3	N00°18.5
7	205°49.8	286°51.3	37.8	63°23.7	46.7	236°51.1	35.3	20°46.7	18.5
8	220°52.2	301°50.3	37.7	78°26.5	46.9	251°53.0	35.1	35°49.2	18.5
9	235°54.7	316°49.3	·· 37.6	93°29.4	·· 47.1	266°55.0	·· 35.0	50°51.6	·· 18.4
10	250°57.2	331°48.4	37.5	108°32.2	47.3	281°57.0	34.8	65°54.0	18.4
11	265°59.6	346°47.4	37.4	123°35.0	47.6	296°59.0	34.6	80°56.4	18.4
12	281°02.1	1°46.4	S23°37.3	138°37.9	N18°47.8	312°00.9	S13°34.4	95°58.8	N00°18.4
13	296°04.5	16°45.5	37.2	153°40.7	48.0	327°02.9	34.3	111°01.2	18.4
14	311°07.0	31°44.5	37.1	168°43.5	48.2	342°04.9	34.1	126°03.6	18.4
15	326°09.5	46°43.5	·· 37.0	183°46.4	·· 48.5	357°06.8	·· 33.9	141°06.0	·· 18.4
16	341°11.9	61°42.6	36.9	198°49.2	48.7	12°08.8	33.7	156°08.4	18.4
17	356°14.4	76°41.6	36.8	213°52.0	48.9	27°10.8	33.6	171°10.8	18.4
18	11°16.9	91°40.6	S23°36.7	228°54.9	N18°49.1	42°12.8	S13°33.4	186°13.2	N00°18.3
19	26°19.3	106°39.6	36.5	243°57.7	49.4	57°14.7	33.2	201°15.7	18.3
20	41°21.8	121°38.7	36.4	259°00.6	49.6	72°16.7	33.0	216°18.1	18.3
21	56°24.3	136°37.7	·· 36.3	274°03.4	·· 49.8	87°18.7	·· 32.9	231°20.5	·· 18.3
22	71°26.7	151°36.7	36.2	289°06.3	50.0	102°20.7	32.7	246°22.9	18.3
23	86°29.2	166°35.8	36.1	304°09.1	50.3	117°22.6	32.5	261°25.3	18.3
Mer.pass.:17:14		v-1.0 d0.1 m-3.8		v2.8 d0.2 m-0.7		v2.0 d0.2 m-2.0		v2.4 d-0.0 m0.9	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	101°31.7	181°34.8	S23°36.0	319°12.0	N18°50.5	132°24.6	S13°32.3	276°27.7	N00°18.3
1	116°34.1	196°33.8	35.8	334°14.8	50.7	147°26.6	32.2	291°30.1	18.3
2	131°36.6	211°32.9	35.7	349°17.7	51.0	162°28.6	32.0	306°32.5	18.3
3	146°39.0	226°31.9	·· 35.6	4°20.5	·· 51.2	177°30.5	·· 31.8	321°34.9	·· 18.3
4	161°41.5	241°30.9	35.5	19°23.4	51.4	192°32.5	31.6	336°37.3	18.2
5	176°44.0	256°30.0	35.3	34°26.2	51.6	207°34.5	31.5	351°39.8	18.2
6	191°46.4	271°29.0	S23°35.2	49°29.1	N18°51.9	222°36.4	S13°31.3	6°42.2	N00°18.2
7	206°48.9	286°28.0	35.1	64°31.9	52.1	237°38.4	31.1	21°44.6	18.2
8	221°51.4	301°27.1	34.9	79°34.8	52.3	252°40.4	30.9	36°47.0	18.2
9	236°53.8	316°26.1	·· 34.8	94°37.7	·· 52.6	267°42.4	·· 30.8	51°49.4	·· 18.2
10	251°56.3	331°25.1	34.7	109°40.5	52.8	282°44.3	30.6	66°51.8	18.2
11	266°58.8	346°24.2	34.5	124°43.4	53.0	297°46.3	30.4	81°54.2	18.2
12	282°01.2	1°23.2	S23°34.4	139°46.3	N18°53.3	312°48.3	S13°30.2	96°56.6	N00°18.2
13	297°03.7	16°22.2	34.3	154°49.1	53.5	327°50.2	30.1	111°59.1	18.2
14	312°06.1	31°21.3	34.1	169°52.0	53.7	342°52.2	29.9	127°01.5	18.2
15	327°08.6	46°20.3	·· 34.0	184°54.9	·· 54.0	357°54.2	·· 29.7	142°03.9	·· 18.1
16	342°11.1	61°19.3	33.8	199°57.7	54.2	12°56.2	29.5	157°06.3	18.1
17	357°13.5	76°18.4	33.7	215°00.6	54.4	27°58.1	29.3	172°08.7	18.1
18	12°16.0	91°17.4	S23°33.6	230°03.5	N18°54.7	43°00.1	S13°29.2	187°11.1	N00°18.1
19	27°18.5	106°16.5	33.4	245°06.4	54.9	58°02.1	29.0	202°13.5	18.1
20	42°20.9	121°15.5	33.3	260°09.3	55.1	73°04.0	28.8	217°16.0	18.1
21	57°23.4	136°14.5	·· 33.1	275°12.1	·· 55.4	88°06.0	·· 28.6	232°18.4	·· 18.1
22	72°25.9	151°13.6	33.0	290°15.0	55.6	103°08.0	28.5	247°20.8	18.1
23	87°28.3	166°12.6	32.8	305°17.9	55.9	118°09.9	28.3	262°23.2	18.1
Mer.pass.:17:11		v-1.0 d0.1 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	102°30.8	181°11.6	S23°32.7	320°20.8	N18°56.1	133°11.9	S13°28.1	277°25.6	N00°18.1
1	117°33.3	196°10.7	32.5	335°23.7	56.3	148°13.9	27.9	292°28.0	18.1
2	132°35.7	211°09.7	32.4	350°26.6	56.6	163°15.9	27.8	307°30.4	18.1
3	147°38.2	226°08.7	·· 32.2	5°29.4	·· 56.8	178°17.8	·· 27.6	322°32.9	·· 18.0
4	162°40.6	241°07.8	32.0	20°32.3	57.0	193°19.8	27.4	337°35.3	18.0
5	177°43.1	256°06.8	31.9	35°35.2	57.3	208°21.8	27.2	352°37.7	18.0
6	192°45.6	271°05.8	S23°31.7	50°38.1	N18°57.5	223°23.7	S13°27.0	7°40.1	N00°18.0
7	207°48.0	286°04.9	31.6	65°41.0	57.8	238°25.7	26.9	22°42.5	18.0
8	222°50.5	301°03.9	31.4	80°43.9	58.0	253°27.7	26.7	37°44.9	18.0
9	237°53.0	316°03.0	·· 31.2	95°46.8	·· 58.2	268°29.6	·· 26.5	52°47.4	·· 18.0
10	252°55.4	331°02.0	31.1	110°49.7	58.5	283°31.6	26.3	67°49.8	18.0
11	267°57.9	346°01.0	30.9	125°52.6	58.7	298°33.6	26.2	82°52.2	18.0
12	283°00.4	1°00.1	S23°30.7	140°55.5	N18°59.0	313°35.5	S13°26.0	97°54.6	N00°18.0
13	298°02.8	15°59.1	30.6	155°58.4	59.2	328°37.5	25.8	112°57.0	18.0
14	313°05.3	30°58.1	30.4	171°01.3	59.5	343°39.5	25.6	127°59.4	18.0
15	328°07.8	45°57.2	·· 30.2	186°04.2	·· 59.7	358°41.4	·· 25.4	143°01.9	·· 18.0
16	343°10.2	60°56.2	30.1	201°07.1	18°59.9	13°43.4	25.3	158°04.3	17.9
17	358°12.7	75°55.3	29.9	216°10.0	19°00.2	28°45.4	25.1	173°06.7	17.9
18	13°15.1	90°54.3	S23°29.7	231°13.0	N19°00.4	43°47.3	S13°24.9	188°09.1	N00°17.9
19	28°17.6	105°53.3	29.5	246°15.9	00.7	58°49.3	24.7	203°11.5	17.9
20	43°20.1	120°52.4	29.4	261°18.8	00.9	73°51.3	24.6	218°13.9	17.9
21	58°22.5	135°51.4	·· 29.2	276°21.7	·· 01.2	88°53.3	·· 24.4	233°16.4	·· 17.9
22	73°25.0	150°50.4	29.0	291°24.6	01.4	103°55.2	24.2	248°18.8	17.9
23	88°27.5	165°49.5	28.8	306°27.5	01.7	118°57.2	24.0	263°21.2	17.9
Mer.pass.:17:07		v-1.0 d0.2 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Stars	SHA	Dec
Alpheratz	357°46.2	29°09.0
Ankaa	353°18.1	-42°15.2
Schedar	349°43.6	56°35.9
Diphda	348°58.3	-17°55.9
Achernar	335°28.3	-57°11.3
Hamal	328°03.5	23°30.8
Polaris	318°47.1	89°18.8
Akamar	315°19.9	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.0
Aldebaran	290°52.0	16°31.9
Rigel	281°14.1	-8°11.4
Capella	280°37.8	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.6	-1°11.7
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.1
Sirius	258°35.5	-16°43.6
Adara	255°14.1	-28°59.2
Procyon	245°01.9	5°12.0
Pollux	243°30.3	28°00.0
Avior	234°18.6	-59°32.4
Suhail	222°54.0	-43°28.3
Miaplacidus	221°39.7	-69°45.4
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.2	61°41.4
Denebola	182°36.0	14°30.8
Gienah	175°54.9	-17°35.9
Acrux	173°12.3	-63°09.1
Gacrux	172°03.9	-57°10.0
Alioth	166°22.8	55°53.9
Spica	158°34.0	-11°12.9
Alcaid	153°00.9	49°15.4
Hadar	148°51.9	-60°25.1
Menkent	148°10.8	-36°25.1
Arcturus	145°58.0	19°07.9
Rigil Kent.	139°55.6	-60°52.4
Zubenelg.	137°08.4	-16°05.0
Kochab	137°20.2	74°06.5
Alphecca	126°13.4	26°40.7
Antares	112°29.7	-26°27.2
Atria	107°34.4	-69°02.6
Sabik	102°15.8	-15°44.3
Shaula	96°25.8	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.2
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.8	-26°17.1
Altair	62°11.1	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.4
Alnair	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.0	15°15.7

Jan 01 Fri	SHA	Mer.pass
Venus	81°25.5	11:53
Mars	217°31.4	02:47
Jupiter	31°04.7	15:12
Saturn	174°57.4	05:37

Jan 02 Sat	SHA	Mer.pass
Venus	80°03.2	11:54
Mars	217°40.3	02:43
Jupiter	30°53.0	15:08
Saturn	174°56.1	05:33

Jan 03 Sun	SHA	Mer.pass
Venus	78°40.8	11:56
Mars	217°50.0	02:38
Jupiter	30°41.1	15:05
Saturn	174°54.8	05:29

Horizontal parallax	
Venus:	0.1
Mars:	0.2

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file date- June 16 2020

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2020 January 01 to Jan. 03

h	Sun		Moon				
Wed	GHA	Dec	GHA	v	Dec	d	HP
0	179° 13.7	S23° 03.5	110° 56.9	15.3′	S09° 58.5	10.7′	54.3′
1	194° 13.4	03.3	125° 31.3	15.4′	09° 47.8	10.7′	54.3′
2	209° 13.1	03.1	140° 05.7	15.4′	09° 37.1	10.7′	54.3′
3	224° 12.8	·· 03.0	154° 40.1	15.5′	09° 26.3	10.8′	54.3′
4	239° 12.5	02.8	169° 14.6	15.5′	09° 15.5	10.8′	54.3′
5	254° 12.2	02.6	183° 49.1	15.5′	09° 04.7	10.8′	54.2′
6	269° 11.9	S23° 02.4	198° 23.6	15.6′	S08° 53.8	10.9′	54.2′
7	284° 11.6	02.2	212° 58.2	15.6′	08° 42.9	10.9′	54.2′
8	299° 11.3	02.0	227° 32.8	15.6′	08° 32.0	10.9′	54.2′
9	314° 11.0	·· 01.8	242° 07.5	15.7′	08° 21.0	11.0′	54.2′
10	329° 10.7	01.6	256° 42.2	15.7′	08° 10.0	11.0′	54.2′
11	344° 10.4	01.4	271° 16.9	15.7′	07° 59.0	11.0′	54.2′
12	359° 10.1	S23° 01.2	285° 51.7	15.8′	S07° 48.0	11.1′	54.2′
13	14° 09.8	01.0	300° 26.4	15.8′	07° 36.9	11.1′	54.2′
14	29° 09.5	00.8	315° 01.2	15.8′	07° 25.8	11.1′	54.2′
15	44° 09.2	·· 00.6	329° 36.1	15.9′	07° 14.7	11.1′	54.2′
16	59° 08.9	00.4	344° 10.9	15.9′	07° 03.5	11.2′	54.2′
17	74° 08.6	00.2	358° 45.8	15.9′	06° 52.3	11.2′	54.2′
18	89° 08.3	S23° 00.0	13° 20.7	15.9′	S06° 41.1	11.2′	54.2′
19	104° 08.0	22° 59.7	27° 55.7	16.0′	06° 29.9	11.2′	54.2′
20	119° 07.7	59.5	42° 30.7	16.0′	06° 18.7	11.3′	54.2′
21	134° 07.5	·· 59.3	57° 05.6	16.0′	06° 07.4	11.3′	54.2′
22	149° 07.2	59.1	71° 40.6	16.0′	05° 56.1	11.3′	54.2′
23	164° 06.9	58.9	86° 15.7	16.0′	05° 44.8	11.3′	54.2′
	SD.=16.3	d=0.2	S.D.=14.8				

Thu	GHA	Dec	GHA	v	Dec	d	HP
0	179° 06.6	S22° 58.7	100° 50.7	16.1′	S05° 33.4	11.3′	54.2′
1	194° 06.3	58.5	115° 25.8	16.1′	05° 22.1	11.4′	54.2′
2	209° 06.0	58.3	130° 00.9	16.1′	05° 10.7	11.4′	54.2′
3	224° 05.7	·· 58.1	144° 36.0	16.1′	04° 59.3	11.4′	54.2′
4	239° 05.4	57.9	159° 11.1	16.1′	04° 47.9	11.4′	54.2′
5	254° 05.1	57.6	173° 46.3	16.1′	04° 36.5	11.4′	54.2′
6	269° 04.8	S22° 57.4	188° 21.4	16.2′	S04° 25.0	11.5′	54.2′
7	284° 04.5	57.2	202° 56.6	16.2′	04° 13.5	11.5′	54.2′
8	299° 04.2	57.0	217° 31.7	16.2′	04° 02.1	11.5′	54.2′
9	314° 03.9	·· 56.8	232° 06.9	16.2′	03° 50.6	11.5′	54.2′
10	329° 03.6	56.6	246° 42.1	16.2′	03° 39.0	11.5′	54.2′
11	344° 03.3	56.3	261° 17.3	16.2′	03° 27.5	11.5′	54.2′
12	359° 03.0	S22° 56.1	275° 52.6	16.2′	S03° 16.0	11.5′	54.2′
13	14° 02.8	55.9	290° 27.8	16.2′	03° 04.4	11.6′	54.2′
14	29° 02.5	55.7	305° 03.0	16.2′	02° 52.8	11.6′	54.2′
15	44° 02.2	·· 55.5	319° 38.3	16.2′	02° 41.3	11.6′	54.2′
16	59° 01.9	55.2	334° 13.5	16.2′	02° 29.7	11.6′	54.2′
17	74° 01.6	55.0	348° 48.8	16.3′	02° 18.1	11.6′	54.2′
18	89° 01.3	S22° 54.8	3° 24.0	16.3′	S02° 06.5	11.6′	54.2′
19	104° 01.0	54.6	17° 59.3	16.3′	01° 54.8	11.6′	54.2′
20	119° 00.7	54.3	32° 34.5	16.3′	01° 43.2	11.6′	54.2′
21	134° 00.4	·· 54.1	47° 09.8	16.3′	01° 31.6	11.6′	54.2′
22	149° 00.1	53.9	61° 45.0	16.3′	01° 19.9	11.7′	54.2′
23	163° 59.8	53.7	76° 20.3	16.3′	01° 08.2	11.7′	54.3′
	SD.=16.3	d=0.2	S.D.=14.8				

Fri	GHA	Dec	GHA	v	Dec	d	HP
0	178° 59.5	S22° 53.4	90° 55.5	16.2′	S00° 56.6	11.7′	54.3′
1	193° 59.3	53.2	105° 30.8	16.2′	00° 44.9	11.7′	54.3′
2	208° 59.0	53.0	120° 06.0	16.2′	00° 33.2	11.7′	54.3′
3	223° 58.7	·· 52.7	134° 41.3	16.2′	00° 21.5	11.7′	54.3′
4	238° 58.4	52.5	149° 16.5	16.2′	S00° 09.9	11.7′	54.3′
5	253° 58.1	52.3	163° 51.7	16.2′	N00° 01.8	11.7′	54.3′
6	268° 57.8	S22° 52.0	178° 26.9	16.2′	N00° 13.5	11.7′	54.3′
7	283° 57.5	51.8	193° 02.1	16.2′	00° 25.2	11.7′	54.3′
8	298° 57.2	51.6	207° 37.3	16.2′	00° 36.9	11.7′	54.3′
9	313° 56.9	·· 51.3	222° 12.5	16.2′	00° 48.6	11.7′	54.3′
10	328° 56.6	51.1	236° 47.7	16.2′	01° 00.3	11.7′	54.3′
11	343° 56.4	50.8	251° 22.8	16.1′	01° 12.0	11.7′	54.4′
12	358° 56.1	S22° 50.6	265° 58.0	16.1′	N01° 23.7	11.7′	54.4′
13	13° 55.8	50.4	280° 33.1	16.1′	01° 35.4	11.7′	54.4′
14	28° 55.5	50.1	295° 08.2	16.1′	01° 47.1	11.7′	54.4′
15	43° 55.2	·· 49.9	309° 43.3	16.1′	01° 58.8	11.7′	54.4′
16	58° 54.9	49.6	324° 18.4	16.1′	02° 10.5	11.7′	54.4′
17	73° 54.6	49.4	338° 53.4	16.0′	02° 22.2	11.7′	54.4′
18	88° 54.3	S22° 49.2	353° 28.4	16.0′	N02° 33.9	11.7′	54.4′
19	103° 54.0	48.9	8° 03.5	16.0′	02° 45.6	11.7′	54.4′
20	118° 53.8	48.7	22° 38.4	16.0′	02° 57.3	11.7′	54.5′
21	133° 53.5	·· 48.4	37° 13.4	16.0′	03° 09.0	11.7′	54.5′
22	148° 53.2	48.2	51° 48.4	15.9′	03° 20.6	11.7′	54.5′
23	163° 52.9	47.9	66° 23.3	15.9′	03° 32.3	11.7′	54.5′
	SD.=16.3	d=0.2	S.D.=14.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:23	10:41	▬	▬	13:27	15:45
N 70°	08:05	09:49	▬	▬	14:19	16:03
68°	07:50	09:16	▬	▬	14:52	16:18
66°	07:37	08:53	10:27	13:41	15:15	16:31
64°	07:26	08:34	09:49	14:19	15:34	16:41
62°	07:17	08:18	09:23	14:45	15:49	16:51
60°	07:09	08:05	09:02	15:06	16:02	16:59
N 58°	07:02	07:54	08:45	15:23	16:14	17:06
56°	06:56	07:44	08:31	15:37	16:24	17:12
54°	06:50	07:35	08:19	15:49	16:32	17:18
52°	06:44	07:28	08:08	16:00	16:40	17:24
50°	06:39	07:20	07:58	16:09	16:47	17:29
45°	06:28	07:05	07:38	16:29	17:03	17:40
N 40°	06:18	06:52	07:22	16:46	17:16	17:50
35°	06:08	06:40	07:08	17:00	17:28	17:59
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:11	06:35	17:32	17:56	18:24
N 10°	05:28	05:54	06:17	17:50	18:13	18:40
0°	05:11	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:24	18:43	19:08	19:37
30°	04:02	04:35	05:03	19:05	19:32	20:05
35°	03:44	04:20	04:50	19:17	19:47	20:23
40°	03:21	04:03	04:35	19:32	20:05	20:46
45°	02:52	03:41	04:18	19:50	20:27	21:15
S 50°	02:08	03:12	03:56	20:11	20:55	21:59
52°	01:42	02:57	03:45	20:22	21:10	22:24
54°	01:02	02:40	03:33	20:34	21:27	23:03
56°	▭	02:19	03:20	20:47	21:48	▭
58°	▭	01:51	03:03	21:04	22:15	▭
S 60°	▭	01:08	02:44	21:23	22:58	▭

18

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	12:37	12:18	12:00	21:58	23:43	–:–
N 70°	12:26	12:13	12:02	22:06	23:44	–:–
68°	12:17	12:10	12:03	22:14	23:45	–:–
66°	12:09	12:07	12:04	22:20	23:46	–:–
64°	12:02	12:04	12:05	22:25	23:47	–:–
62°	11:57	12:02	12:06	22:29	23:48	–:–
60°	11:52	12:00	12:07	22:33	23:49	–:–
N 58°	11:48	11:58	12:08	22:36	23:49	–:–
56°	11:44	11:56	12:08	22:39	23:50	–:–
54°	11:40	11:55	12:09	22:42	23:50	–:–
52°	11:37	11:54	12:10	22:44	23:51	–:–
50°	11:34	11:52	12:10	22:46	23:51	–:–
45°	11:28	11:50	12:11	22:51	23:52	–:–
N 40°	11:23	11:48	12:12	22:55	23:52	–:–
35°	11:18	11:46	12:13	22:58	23:53	–:–
30°	11:14	11:44	12:14	23:01	23:54	–:–
20°	11:07	11:41	12:15	23:06	23:54	–:–
N 10°	11:01	11:39	12:16	23:11	23:55	–:–
0°	10:55	11:36	12:17	23:15	23:56	–:–
S 10°	10:49	11:34	12:18	23:19	23:57	–:–
20°	10:43	11:31	12:19	23:24	23:57	–:–
30°	10:36	11:28	12:20	23:29	23:58	–:–
35°	10:32	11:26	12:21	23:31	23:59	–:–
40°	10:27	11:25	12:22	23:35	23:59	–:–
45°	10:21	11:22	12:23	23:38	–:–	00:00
S 50°	10:15	11:20	12:24	23:43	–:–	00:00
52°	10:12	11:18	12:25	23:45	–:–	00:01
54°	10:08	11:17	12:25	23:47	–:–	00:01
56°	10:05	11:15	12:26	23:49	–:–	00:01
58°	10:01	11:14	12:27	23:52	–:–	00:02
S 60°	09:56	11:12	12:28	23:55	–:–	00:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 6-8 34-53%
01	03:05	03:20	12:03	17:05	04:44	
02	03:34	03:48	12:04	17:46	05:26	
03	04:02	04:16	12:04	18:27	06:06	

9 10 3 11 3 12 13 14 15 16

file date- June 16 2020

Information in the data page footers

Information pertaining to the IERS EOP data has been added to the odd data page footers if using MiKTeX or TeX Live (2020 or later). The International Earth Rotation Service (IERS) provides accurate data (updated weekly) on the Earth Orientation Parameters (EOP).

Earth's speed of rotation is not constant, i.e. the day length fluctuates.[1] This is due to *internal torques* caused by relative movements and mass redistribution of Earth's core, mantle, oceans, atmosphere, and cryosphere. This has an immediate impact on the GHA values of all celestial objects.

The IERS monitors and measures several parameters taking the actual speed of Earth's rotation into account. Their measured data begins on 2nd Januaray 1973. Predictive data begins following the last day of (obtained) data and extends about 360 days into the future. (The IERS results are published with a delay of about 18-hours between the date of publication and the last available date with measured EOP.[2]) These Nautical Almanac daily pages take the (measured or predicted) UT1-UTC values into account providing highly accurate navigational data especially if the predictions are fairly recent.

As long as either measured or predicted data is available the footer will show:
IERS Earth Orientation data as of dd-mmm-yyyy
This indicates that IERS EOP data is in use - older dates are measured; newer dates are predictions.

If the final date of IERS prediction data is on the current data page, the footer shows:
IERS Earth Orientation predictions end dd-mmm-yyyy

Pages with dates beyond the final date of IERS prediction data have the following footer:
No IERS EOP prediction data available
Skyfield then defaults to using the ΔT and leap second files that ship with Skyfield internally.

The footers mentioned are only displayed as long as **'useIERS = True'** is set in *config.py* to enable use of IERS EOP data.

Brief historical overview

The story begins with the XEphem astronomical library, which is declared 'end of life' by its author, Elwood Charles Downey, as no further updates are planned. He generously gave permission for use of XEphem code in Ephem (also known as Pyephem), an astronomical library authored by Brandon Rhodes. Enno Rodegerdts (https://sv-inua.net/) created the original Nautical Almanac 'daily pages' in Pyalmanac using Python 2 and LaTeX. After contacting him I obtained permission for its future enhancement and maintenance. Pyalmanac uses Ephem.

Meanwhile Brandon Rhodes was working on a far more sophisticated astronomical library, Skyfield. This was 'state of the art' and clearly surpassed the 'Jean Meeus'-based Pyephem/Ephem. Skyfield uses NASA's NAIF (Navigation and Ancillary Information Facility) SPICE algorithms. The results agree with those from the HORIZONS System (*operated by NASA JPL (Jet Propulsion Laboratory) SSD (Solar System Dynamics) group, not by NAIF*). This in turn implies that celestial positions calculated by Skyfield agree with those generated by the United States Naval Observatory and their *Astronomical Almanac* to within 0.0005 arcseconds (half a milliarcsecond).

Pyephem was then in 'maintenance mode'. Clearly Pyalmanac needed adaptation to use Skyfield, and thus Skyalmanac was born. However its performance was poor regarding the calculation of 'events' such as: sunrise, sunset, moonrise, moonset, civil twilight start/end and nautical twilight start/end. An interim (faster) solution was required.

A hybrid application, originally named Skyalmanac, was developed using Ephem to calculate 'events' and Skyfield for the rest. This was indeed much faster at the cost of poorer 'event time' data. It took a while to find a better solution: multiprocessing, which was built into Skyalmanac. This now could compare to the execution times in Pyalmanac but with improved data.

New functionality was added to Skyalmanac, e.g. lunar phase as a graphic; Lunar Distance tables and charts. The original Skyalmanac is deprecated and has now been replaced with the latest Skyalmanac code, so Skyalmanac and Skyalmanac are now identical apart from the name. Since January 2015 https://TheNauticalAlmanac.com has been publishing Celestial Navigation related material with software provided here.

[1] https://en.wikipedia.org/wiki/Day_length_fluctuations
[2] https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html

January 01, 02, 03 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°25.5	228°26.7	S15°22.0	297°45.3	N10°53.8	311°25.5	N13°34.5	91°48.2	N01°02.8
1	115°28.0	243°26.7	22.6	312°47.5	53.8	326°28.1	34.6	106°50.6	02.8
2	130°30.4	258°26.6	23.2	327°49.7	53.8	341°30.7	34.7	121°53.0	02.9
3	145°32.9	273°26.6	·· 23.8	342°51.8	·· 53.7	356°33.3	·· 34.7	136°55.4	·· 02.9
4	160°35.3	288°26.5	24.4	357°54.0	53.7	11°35.9	34.8	151°57.7	03.0
5	175°37.8	303°26.5	25.0	12°56.2	53.7	26°38.5	34.9	167°00.1	03.0
6	190°40.3	318°26.4	S15°25.6	27°58.3	N10°53.7	41°41.1	N13°34.9	182°02.5	N01°03.1
7	205°42.7	333°26.4	26.2	43°00.5	53.6	56°43.7	35.0	197°04.9	03.1
8	220°45.2	348°26.3	26.8	58°02.7	53.6	71°46.4	35.0	212°07.3	03.2
9	235°47.7	3°26.3	·· 27.4	73°04.8	·· 53.6	86°49.0	·· 35.1	227°09.6	·· 03.2
10	250°50.1	18°26.2	28.0	88°07.0	53.6	101°51.6	35.2	242°12.0	03.3
11	265°52.6	33°26.1	28.6	103°09.2	53.5	116°54.2	35.2	257°14.4	03.3
12	280°55.1	48°26.1	S15°29.2	118°11.3	N10°53.5	131°56.8	N13°35.3	272°16.8	N01°03.4
13	295°57.5	63°26.0	29.8	133°13.5	53.5	146°59.4	35.4	287°19.2	03.4
14	311°00.0	78°26.0	30.4	148°15.7	53.5	162°02.0	35.4	302°21.5	03.5
15	326°02.5	93°25.9	·· 31.0	163°17.9	·· 53.5	177°04.6	·· 35.5	317°23.9	·· 03.5
16	341°04.9	108°25.8	31.6	178°20.1	53.4	192°07.2	35.5	332°26.3	03.6
17	356°07.4	123°25.8	32.2	193°22.2	53.4	207°09.9	35.6	347°28.7	03.6
18	11°09.8	138°25.7	S15°32.8	208°24.4	N10°53.4	222°12.5	N13°35.7	2°31.1	N01°03.6
19	26°12.3	153°25.6	33.4	223°26.6	53.4	237°15.1	35.7	17°33.4	03.7
20	41°14.8	168°25.6	34.0	238°28.8	53.3	252°17.7	35.8	32°35.8	03.7
21	56°17.2	183°25.5	·· 34.6	253°31.0	·· 53.3	267°20.3	·· 35.9	47°38.2	·· 03.8
22	71°19.7	198°25.4	35.2	268°33.2	53.3	282°22.9	35.9	62°40.6	03.8
23	86°22.2	213°25.4	35.8	283°35.3	53.3	297°25.5	36.0	77°42.9	03.9
Mer.pass. 17:15		ν -0.0′	d 0.6′	m -4.58	ν 2.2′	d 0.0′	m -0.14	ν 2.6′	d 0.1′ m -2.41	ν 2.4′	d 0.0′ m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	101°24.6	228°25.3	S15°36.4	298°37.5	N10°53.3	312°28.2	N13°36.0	92°45.3	N01°03.9
1	116°27.1	243°25.2	37.0	313°39.7	53.3	327°30.8	36.1	107°47.7	04.0
2	131°29.6	258°25.1	37.6	328°41.9	53.2	342°33.4	36.2	122°50.1	04.0
3	146°32.0	273°25.1	·· 38.2	343°44.1	·· 53.2	357°36.0	·· 36.2	137°52.5	·· 04.1
4	161°34.5	288°25.0	38.8	358°46.3	53.2	12°38.6	36.3	152°54.8	04.1
5	176°36.9	303°24.9	39.4	13°48.5	53.2	27°41.2	36.4	167°57.2	04.2
6	191°39.4	318°24.8	S15°39.9	28°50.7	N10°53.2	42°43.8	N13°36.4	182°59.6	N01°04.2
7	206°41.9	333°24.8	40.5	43°52.9	53.2	57°46.5	36.5	198°02.0	04.3
8	221°44.3	348°24.7	41.1	58°55.1	53.1	72°49.1	36.6	213°04.3	04.3
9	236°46.8	3°24.6	·· 41.7	73°57.3	·· 53.1	87°51.7	·· 36.6	228°06.7	·· 04.4
10	251°49.3	18°24.5	42.3	88°59.5	53.1	102°54.3	36.7	243°09.1	04.4
11	266°51.7	33°24.5	42.9	104°01.7	53.1	117°56.9	36.8	258°11.5	04.5
12	281°54.2	48°24.4	S15°43.5	119°03.9	N10°53.1	132°59.6	N13°36.8	273°13.8	N01°04.5
13	296°56.7	63°24.3	44.1	134°06.1	53.1	148°02.2	36.9	288°16.2	04.6
14	311°59.1	78°24.2	44.7	149°08.3	53.1	163°04.8	36.9	303°18.6	04.6
15	327°01.6	93°24.1	·· 45.3	164°10.5	·· 53.1	178°07.4	·· 37.0	318°21.0	·· 04.7
16	342°04.1	108°24.0	45.9	179°12.7	53.0	193°10.0	37.1	333°23.3	04.7
17	357°06.5	123°23.9	46.5	194°14.9	53.0	208°12.6	37.1	348°25.7	04.8
18	12°09.0	138°23.9	S15°47.1	209°17.1	N10°53.0	223°15.3	N13°37.2	3°28.1	N01°04.8
19	27°11.4	153°23.8	47.7	224°19.3	53.0	238°17.9	37.3	18°30.5	04.9
20	42°13.9	168°23.7	48.3	239°21.5	53.0	253°20.5	37.3	33°32.8	04.9
21	57°16.4	183°23.6	·· 48.9	254°23.7	·· 53.0	268°23.1	·· 37.4	48°35.2	·· 05.0
22	72°18.8	198°23.5	49.5	269°25.9	53.0	283°25.8	37.5	63°37.6	05.0
23	87°21.3	213°23.4	50.1	284°28.1	53.0	298°28.4	37.5	78°40.0	05.1
Mer.pass. 17:12		ν -0.1′	d 0.6′	m -4.57	ν 2.2′	d 0.0′	m -0.17	ν 2.6′	d 0.1′ m -2.42	ν 2.4′	d 0.0′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	102°23.8	228°23.3	S15°50.6	299°30.4	N10°53.0	313°31.0	N13°37.6	93°42.3	N01°05.1
1	117°26.2	243°23.2	51.2	314°32.6	53.0	328°33.6	37.7	108°44.7	05.2
2	132°28.7	258°23.1	51.8	329°34.8	53.0	343°36.2	37.7	123°47.1	05.2
3	147°31.2	273°23.0	·· 52.4	344°37.0	·· 53.0	358°38.9	·· 37.8	138°49.5	·· 05.3
4	162°33.6	288°22.9	53.0	359°39.2	53.0	13°41.5	37.9	153°51.8	05.3
5	177°36.1	303°22.8	53.6	14°41.5	52.9	28°44.1	37.9	168°54.2	05.4
6	192°38.6	318°22.7	S15°54.2	29°43.7	N10°52.9	43°46.7	N13°38.0	183°56.6	N01°05.4
7	207°41.0	333°22.6	54.8	44°45.9	52.9	58°49.4	38.1	198°58.9	05.5
8	222°43.5	348°22.5	55.4	59°48.1	52.9	73°52.0	38.1	214°01.3	05.5
9	237°45.9	3°22.4	·· 56.0	74°50.3	·· 52.9	88°54.6	·· 38.2	229°03.7	·· 05.6
10	252°48.4	18°22.3	56.6	89°52.6	52.9	103°57.2	38.3	244°06.1	05.6
11	267°50.9	33°22.2	57.2	104°54.8	52.9	118°59.9	38.3	259°08.4	05.7
12	282°53.3	48°22.1	S15°57.7	119°57.0	N10°52.9	134°02.5	N13°38.4	274°10.8	N01°05.7
13	297°55.8	63°22.0	58.3	134°59.2	52.9	149°05.1	38.5	289°13.2	05.8
14	312°58.3	78°21.9	58.9	150°01.5	52.9	164°07.7	38.5	304°15.5	05.8
15	328°00.7	93°21.8	15°59.5	165°03.7	·· 52.9	179°10.4	·· 38.6	319°17.9	·· 05.9
16	343°03.2	108°21.7	16°00.1	180°05.9	52.9	194°13.0	38.7	334°20.3	05.9
17	358°05.7	123°21.6	00.7	195°08.2	52.9	209°15.6	38.7	349°22.7	06.0
18	13°08.1	138°21.5	S16°01.3	210°10.4	N10°52.9	224°18.2	N13°38.8	4°25.0	N01°06.0
19	28°10.6	153°21.4	01.9	225°12.6	52.9	239°20.9	38.9	19°27.4	06.1
20	43°13.1	168°21.2	02.5	240°14.9	52.9	254°23.5	38.9	34°29.8	06.1
21	58°15.5	183°21.1	·· 03.1	255°17.1	·· 52.9	269°26.1	·· 39.0	49°32.1	·· 06.2
22	73°18.0	198°21.0	03.6	270°19.4	52.9	284°28.8	39.1	64°34.5	06.2
23	88°20.4	213°20.9	04.2	285°21.6	52.9	299°31.4	39.1	79°36.9	06.3
Mer.pass. 17:08		ν -0.1′	d 0.6′	m -4.56	ν 2.2′	d 0.0′	m -0.19	ν 2.6′	d 0.1′ m -2.42	ν 2.4′	d 0.1′ m 0.74

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.1	56°41.5
Diphda	348°45.7	-17°50.4
Achernar	335°18.8	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°50.8	89°22.9
Acamar	315°10.3	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.6
Sirius	258°24.4	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.8	5°09.3
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.7
Suhail	222°44.7	-43°32.4
Miaplacidus	221°37.1	-69°49.5
Alphard	217°45.9	-8°46.6
Regulus	207°32.5	11°50.0
Dubhe	193°38.8	61°36.0
Denebola	182°23.2	14°25.1
Gienah	175°41.9	-17°41.5
Acrux	172°58.2	-63°14.7
Gacrux	171°49.8	-57°15.7
Alioth	166°11.6	55°48.4
Spica	158°20.6	-11°18.2
Alkaid	152°50.9	49°10.4
Hadar	148°33.9	-60°30.0
Menkent	147°55.8	-36°30.0
Arcturus	145°46.6	19°02.3
Rigil Kent.	139°38.3	-60°56.6
Kochab	137°20.6	74°02.3
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.6	26°37.2
Antares	112°14.1	-26°29.4
Atria	107°07.4	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.0
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.8	28°14.0
Markab	13°28.4	15°21.2

Jan 01 Fri	SHA	Mer.pass
Venus	128°01.2	08:46
Mars	197°19.8	04:08
Jupiter	211°00.0	03:14
Saturn	351°22.7	17:50

Jan 02 Sat	SHA	Mer.pass
Venus	127°00.7	08:46
Mars	197°12.9	04:05
Jupiter	211°03.5	03:10
Saturn	351°20.7	17:46

Jan 03 Sun	SHA	Mer.pass
Venus	125°59.5	08:47
Mars	197°06.6	04:01
Jupiter	211°07.2	03:05
Saturn	351°18.6	17:42

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0800 sec ΔT = TT-UT1 = +69.2640 sec

2027 January 01 to Jan. 03 UT

h

Fri	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	179°11.9	S23°02.2	259°22.1	13.8′	S13°49.5	12.9′	55.9′
1	194°11.6	02.0	273°54.9	13.8′	14°02.4	12.8′	55.9′
2	209°11.3	01.8	288°27.6	13.8′	14°15.2	12.8′	55.9′
3	224°11.1	·· 01.6	303°00.4	13.7′	14°28.0	12.6′	55.9′
4	239°10.8	01.4	317°33.1	13.7′	14°40.6	12.6′	55.8′
5	254°10.5	01.2	332°05.8	13.7′	14°53.2	12.6′	55.8′
6	269°10.2	S23°01.0	346°38.5	13.6′	S15°05.8	12.4′	55.8′
7	284°09.9	00.8	1°11.1	13.6′	15°18.2	12.4′	55.7′
8	299°09.6	00.6	15°43.8	13.6′	15°30.6	12.3′	55.7′
9	314°09.3	·· 00.4	30°16.3	13.5′	15°42.9	12.2′	55.7′
10	329°09.0	00.2	44°48.9	13.5′	15°55.1	12.1′	55.7′
11	344°08.7	23°00.0	59°21.4	13.5′	16°07.2	12.1′	55.6′
12	359°08.4	S22°59.8	73°53.9	13.4′	S16°19.3	11.9′	55.6′
13	14°08.1	59.6	88°26.3	13.4′	16°31.2	11.9′	55.6′
14	29°07.8	59.3	102°58.7	13.4′	16°43.1	11.8′	55.5′
15	44°07.5	·· 59.1	117°31.1	13.3′	16°54.9	11.7′	55.5′
16	59°07.2	58.9	132°03.5	13.3′	17°06.6	11.7′	55.5′
17	74°06.9	58.7	146°35.8	13.3′	17°18.3	11.5′	55.5′
18	89°06.6	S22°58.5	161°08.0	13.2′	S17°29.8	11.5′	55.4′
19	104°06.3	58.3	175°40.3	13.2′	17°41.3	11.3′	55.4′
20	119°06.0	58.1	190°12.5	13.2′	17°52.6	11.3′	55.4′
21	134°05.7	·· 57.9	204°44.6	13.1′	18°03.9	11.2′	55.4′
22	149°05.4	57.7	219°16.7	13.1′	18°15.1	11.1′	55.3′
23	164°05.2	57.4	233°48.8	13.0′	18°26.2	11.0′	55.3′
	SD = 16.3′	d = 0.2′		SD = 15.3′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°04.9	S22°57.2	248°20.9	13.0′	S18°37.2	11.0′	55.3′
1	194°04.6	57.0	262°52.8	13.0′	18°48.2	10.8′	55.3′
2	209°04.3	56.8	277°24.8	12.9′	18°59.0	10.8′	55.2′
3	224°04.0	·· 56.6	291°56.7	12.9′	19°09.8	10.6′	55.2′
4	239°03.7	56.4	306°28.6	12.8′	19°20.4	10.6′	55.2′
5	254°03.4	56.1	321°00.4	12.8′	19°31.0	10.4′	55.2′
6	269°03.1	S22°55.9	335°32.2	12.7′	S19°41.4	10.4′	55.2′
7	284°02.8	55.7	350°03.9	12.7′	19°51.8	10.3′	55.1′
8	299°02.5	55.5	4°35.6	12.7′	20°02.1	10.2′	55.1′
9	314°02.2	·· 55.2	19°07.3	12.6′	20°12.3	10.0′	55.1′
10	329°01.9	55.0	33°38.9	12.6′	20°22.3	10.0′	55.1′
11	344°01.6	54.8	48°10.4	12.5′	20°32.3	9.9′	55.0′
12	359°01.3	S22°54.6	62°42.0	12.5′	S20°42.2	9.8′	55.0′
13	14°01.1	54.3	77°13.4	12.4′	20°52.0	9.7′	55.0′
14	29°00.8	54.1	91°44.9	12.4′	21°01.7	9.6′	55.0′
15	44°00.5	·· 53.9	106°16.2	12.3′	21°11.3	9.4′	55.0′
16	59°00.2	53.7	120°47.6	12.3′	21°20.7	9.4′	54.9′
17	73°59.9	53.4	135°18.9	12.2′	21°30.1	9.3′	54.9′
18	88°59.6	S22°53.2	149°50.1	12.2′	S21°39.4	9.2′	54.9′
19	103°59.3	53.0	164°21.3	12.2′	21°48.6	9.0′	54.9′
20	118°59.0	52.7	178°52.5	12.1′	21°57.6	9.0′	54.9′
21	133°58.7	·· 52.5	193°23.6	12.1′	22°06.6	8.9′	54.8′
22	148°58.4	52.3	207°54.6	12.0′	22°15.5	8.7′	54.8′
23	163°58.1	52.0	222°25.6	12.0′	22°24.2	8.7′	54.8′
	SD = 16.3′	d = 0.2′		SD = 15.1′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.9	S22°51.8	236°56.6	11.9′	S22°32.9	8.5′	54.8′
1	193°57.6	51.6	251°27.5	11.9′	22°41.4	8.4′	54.8′
2	208°57.3	51.3	265°58.4	11.8′	22°49.8	8.3′	54.7′
3	223°57.0	·· 51.1	280°29.2	11.8′	22°58.1	8.2′	54.7′
4	238°56.7	50.9	295°00.0	11.7′	23°06.3	8.1′	54.7′
5	253°56.4	50.6	309°30.7	11.7′	23°14.4	8.0′	54.7′
6	268°56.1	S22°50.4	324°01.4	11.6′	S23°22.4	7.9′	54.7′
7	283°55.8	50.1	338°32.1	11.6′	23°30.3	7.8′	54.6′
8	298°55.5	49.9	353°02.7	11.5′	23°38.1	7.6′	54.6′
9	313°55.3	·· 49.6	7°33.2	11.5′	23°45.7	7.6′	54.6′
10	328°55.0	49.4	22°03.7	11.5′	23°53.3	7.4′	54.6′
11	343°54.7	49.2	36°34.2	11.4′	24°00.7	7.3′	54.6′
12	358°54.4	S22°48.9	51°04.6	11.4′	S24°08.0	7.2′	54.6′
13	13°54.1	48.7	65°35.0	11.3′	24°15.2	7.1′	54.5′
14	28°53.8	48.4	80°05.3	11.3′	24°22.3	6.9′	54.5′
15	43°53.5	·· 48.2	94°35.6	11.2′	24°29.2	6.9′	54.5′
16	58°53.2	47.9	109°05.8	11.2′	24°36.1	6.7′	54.5′
17	73°53.0	47.7	123°36.0	11.2′	24°42.8	6.6′	54.5′
18	88°52.7	S22°47.4	138°06.1	11.1′	S24°49.4	6.5′	54.5′
19	103°52.4	47.2	152°36.3	11.1′	24°55.9	6.4′	54.5′
20	118°52.1	46.9	167°06.3	11.0′	25°02.3	6.2′	54.4′
21	133°51.8	·· 46.7	181°36.4	11.0′	25°08.5	6.1′	54.4′
22	148°51.5	46.4	196°06.3	10.9′	25°14.6	6.0′	54.4′
23	163°51.2	46.2	210°36.3	10.9′	25°20.6	5.9′	54.4′
	SD = 16.3′	d = 0.2′		SD = 14.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:23	10:40	▬	▬	13:28	15:45
N 70°	08:04	09:48	▬	▬	14:20	16:04
68°	07:49	09:16	▬	▬	14:52	16:19
66°	07:37	08:52	10:26	13:42	15:16	16:31
64°	07:26	08:34	09:49	14:19	15:34	16:42
62°	07:17	08:18	09:22	14:46	15:50	16:51
60°	07:09	08:05	09:02	15:06	16:03	16:59
N 58°	07:02	07:54	08:45	15:23	16:14	17:06
56°	06:55	07:44	08:31	15:37	16:24	17:13
54°	06:50	07:35	08:19	15:49	16:33	17:19
52°	06:44	07:28	08:08	16:00	16:41	17:24
50°	06:39	07:20	07:58	16:10	16:48	17:29
45°	06:28	07:05	07:38	16:30	17:03	17:40
N 40°	06:18	06:52	07:22	16:46	17:16	17:50
35°	06:09	06:40	07:08	17:00	17:28	17:59
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:11	06:35	17:33	17:56	18:24
N 10°	05:28	05:54	06:17	17:51	18:13	18:40
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:24	18:43	19:08	19:37
30°	04:02	04:36	05:03	19:05	19:32	20:05
35°	03:44	04:21	04:50	19:17	19:47	20:23
40°	03:22	04:03	04:36	19:32	20:05	20:46
45°	02:52	03:41	04:18	19:50	20:27	21:15
S 50°	02:08	03:12	03:56	20:11	20:55	21:59
52°	01:42	02:57	03:46	20:22	21:10	22:24
54°	01:03	02:40	03:34	20:34	21:27	23:03
56°	////	02:19	03:20	20:47	21:48	////
58°	////	01:51	03:04	21:03	22:15	////
S 60°	////	01:08	02:44	21:23	22:57	////

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	04:31	▬	▬	08:56	▬	▬
N 70°	03:55	▬	▬	09:33	▬	▬
68°	03:31	05:49	▬	09:59	09:17	▬
66°	03:12	05:10	07:49	10:20	09:57	08:57
64°	02:57	04:43	06:39	10:36	10:25	10:08
62°	02:44	04:22	06:03	10:50	10:47	10:44
60°	02:34	04:05	05:38	11:01	11:04	11:11
N 58°	02:24	03:51	05:18	11:11	11:19	11:31
56°	02:16	03:39	05:01	11:20	11:32	11:48
54°	02:09	03:29	04:47	11:28	11:43	12:03
52°	02:03	03:20	04:35	11:35	11:53	12:15
50°	01:57	03:11	04:24	11:42	12:01	12:26
45°	01:45	02:54	04:02	11:56	12:20	12:50
N 40°	01:35	02:40	03:44	12:07	12:35	13:08
35°	01:26	02:28	03:29	12:17	12:48	13:24
30°	01:19	02:17	03:16	12:26	13:00	13:38
20°	01:06	02:00	02:54	12:40	13:19	14:01
N 10°	00:55	01:44	02:35	12:54	13:36	14:22
0°	00:44	01:30	02:17	13:06	13:52	14:41
S 10°	00:34	01:16	01:59	13:18	14:08	15:00
20°	00:23	01:00	01:41	13:32	14:26	15:20
30°	00:11	00:43	01:19	13:47	14:46	15:44
35°	00:03	00:33	01:07	13:56	14:57	15:58
40°	·· ··	00:22	00:52	14:06	15:11	16:14
45°	·· ··	00:09	00:35	14:18	15:27	16:33
S 50°	23:53	·· ··	00:15	14:33	15:46	16:58
52°	23:45	·· ··	00:05	14:40	15:56	17:10
54°	23:37	23:54	·· ··	14:47	16:06	17:23
56°	23:27	23:41	·· ··	14:56	16:19	17:39
58°	23:17	23:26	23:42	15:06	16:33	17:57
S 60°	23:05	23:09	23:19	15:17	16:49	18:20

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 38-20%
01	03:12	03:26	12:03	06:55	19:18	
02	03:41	03:55	12:04	07:41	20:05	
03	04:09	04:22	12:04	08:29	20:53	

January 04, 05, 06 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	103°22.9	228°20.8	S16°04.8	300°23.8	N10°53.0	314°34.0	N13°39.2	94°39.2	N01°06.3
1	118°25.4	243°20.7	05.4	315°26.1	53.0	329°36.6	39.3	109°41.6	06.4
2	133°27.8	258°20.5	06.0	330°28.3	53.0	344°39.3	39.4	124°44.0	06.4
3	148°30.3	273°20.4	·· 06.6	345°30.6	·· 53.0	359°41.9	·· 39.4	139°46.4	·· 06.5
4	163°32.8	288°20.3	07.2	0°32.8	53.0	14°44.5	39.5	154°48.7	06.5
5	178°35.2	303°20.2	07.8	15°35.1	53.0	29°47.2	39.6	169°51.1	06.6
6	193°37.7	318°20.1	S16°08.3	30°37.3	N10°53.0	44°49.8	N13°39.6	184°53.5	N01°06.7
7	208°40.2	333°19.9	08.9	45°39.6	53.0	59°52.4	39.7	199°55.8	06.7
8	223°42.6	348°19.8	09.5	60°41.8	53.0	74°55.1	39.8	214°58.2	06.8
9	238°45.1	3°19.7	·· 10.1	75°44.1	·· 53.0	89°57.7	·· 39.8	230°00.6	·· 06.8
10	253°47.5	18°19.6	10.7	90°46.3	53.0	105°00.3	39.9	245°02.9	06.9
11	268°50.0	33°19.5	11.3	105°48.6	53.0	120°03.0	40.0	260°05.3	06.9
12	283°52.5	48°19.3	S16°11.9	120°50.8	N10°53.0	135°05.6	N13°40.0	275°07.7	N01°07.0
13	298°54.9	63°19.2	12.4	135°53.1	53.0	150°08.2	40.1	290°10.0	07.0
14	313°57.4	78°19.1	13.0	150°55.3	53.1	165°10.8	40.2	305°12.4	07.1
15	328°59.9	93°18.9	·· 13.6	165°57.6	·· 53.1	180°13.5	·· 40.3	320°14.8	·· 07.1
16	344°02.3	108°18.8	14.2	180°59.9	53.1	195°16.1	40.3	335°17.1	07.2
17	359°04.8	123°18.7	14.8	196°02.1	53.1	210°18.8	40.4	350°19.5	07.2
18	14°07.3	138°18.5	S16°15.4	211°04.4	N10°53.1	225°21.4	N13°40.5	5°21.9	N01°07.3
19	29°09.7	153°18.4	16.0	226°06.6	53.1	240°24.0	40.5	20°24.2	07.3
20	44°12.2	168°18.3	16.5	241°08.9	53.1	255°26.7	40.6	35°26.6	07.4
21	59°14.7	183°18.1	·· 17.1	256°11.2	·· 53.2	270°29.3	·· 40.7	50°29.0	·· 07.4
22	74°17.1	198°18.0	17.7	271°13.4	53.2	285°31.9	40.7	65°31.3	07.5
23	89°19.6	213°17.9	18.3	286°15.7	53.2	300°34.6	40.8	80°33.7	07.5
Mer.pass. 17:04		ν -0.1′	d 0.6′	m -4.55	ν 2.2′	d 0.0′	m -0.21	ν 2.6′	d 0.1′ m -2.43	ν 2.4′	d 0.1′ m 0.74

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	104°22.0	228°17.7	S16°18.9	301°18.0	N10°53.2	315°37.2	N13°40.9	95°36.1	N01°07.6
1	119°24.5	243°17.6	19.5	316°20.3	53.2	330°39.8	41.0	110°38.4	07.7
2	134°27.0	258°17.5	20.0	331°22.5	53.2	345°42.5	41.0	125°40.8	07.7
3	149°29.4	273°17.3	·· 20.6	346°24.8	·· 53.2	0°45.1	·· 41.1	140°43.2	·· 07.8
4	164°31.9	288°17.2	21.2	1°27.1	53.3	15°47.7	41.2	155°45.5	07.8
5	179°34.4	303°17.0	21.8	16°29.3	53.3	30°50.4	41.2	170°47.9	07.9
6	194°36.8	318°16.9	S16°22.4	31°31.6	N10°53.3	45°53.0	N13°41.3	185°50.3	N01°07.9
7	209°39.3	333°16.7	23.0	46°33.9	53.3	60°55.7	41.4	200°52.6	08.0
8	224°41.8	348°16.6	23.5	61°36.2	53.3	75°58.3	41.5	215°55.0	08.0
9	239°44.2	3°16.5	·· 24.1	76°38.5	·· 53.4	91°00.9	·· 41.5	230°57.4	·· 08.1
10	254°46.7	18°16.3	24.7	91°40.7	53.4	106°03.6	41.6	245°59.7	08.1
11	269°49.2	33°16.2	25.3	106°43.0	53.4	121°06.2	41.7	261°02.1	08.2
12	284°51.6	48°16.0	S16°25.9	121°45.3	N10°53.4	136°08.9	N13°41.7	276°04.4	N01°08.2
13	299°54.1	63°15.9	26.4	136°47.6	53.4	151°11.5	41.8	291°06.8	08.3
14	314°56.5	78°15.7	27.0	151°49.9	53.5	166°14.1	41.9	306°09.2	08.4
15	329°59.0	93°15.6	·· 27.6	166°52.2	·· 53.5	181°16.8	·· 42.0	321°11.5	·· 08.4
16	345°01.5	108°15.4	28.2	181°54.4	53.5	196°19.4	42.0	336°13.9	08.5
17	0°03.9	123°15.3	28.8	196°56.7	53.5	211°22.1	42.1	351°16.3	08.5
18	15°06.4	138°15.1	S16°29.3	211°59.0	N10°53.6	226°24.7	N13°42.2	6°18.6	N01°08.6
19	30°08.9	153°15.0	29.9	227°01.3	53.6	241°27.3	42.2	21°21.0	08.6
20	45°11.3	168°14.8	30.5	242°03.6	53.6	256°30.0	42.3	36°23.4	08.7
21	60°13.8	183°14.6	·· 31.1	257°05.9	·· 53.6	271°32.6	·· 42.4	51°25.7	·· 08.7
22	75°16.3	198°14.5	31.6	272°08.2	53.7	286°35.3	42.5	66°28.1	08.8
23	90°18.7	213°14.3	32.2	287°10.5	53.7	301°37.9	42.5	81°30.4	08.8
Mer.pass. 17:00		ν -0.1′	d 0.6′	m -4.54	ν 2.3′	d 0.0′	m -0.24	ν 2.6′	d 0.1′ m -2.44	ν 2.4′	d 0.1′ m 0.74

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	105°21.2	228°14.2	S16°32.8	302°12.8	N10°53.7	316°40.6	N13°42.6	96°32.8	N01°08.9
1	120°23.7	243°14.0	33.4	317°15.1	53.7	331°43.2	42.7	111°35.2	09.0
2	135°26.1	258°13.8	34.0	332°17.4	53.8	346°45.8	42.8	126°37.5	09.0
3	150°28.6	273°13.7	·· 34.5	347°19.7	·· 53.8	1°48.5	·· 42.8	141°39.9	·· 09.1
4	165°31.0	288°13.5	35.1	2°22.0	53.8	16°51.1	42.9	156°42.2	09.1
5	180°33.5	303°13.4	35.7	17°24.3	53.9	31°53.8	43.0	171°44.6	09.2
6	195°36.0	318°13.2	S16°36.3	32°26.6	N10°53.9	46°56.4	N13°43.1	186°47.0	N01°09.2
7	210°38.4	333°13.0	36.8	47°28.9	53.9	61°59.1	43.1	201°49.3	09.3
8	225°40.9	348°12.9	37.4	62°31.2	54.0	77°01.7	43.2	216°51.7	09.3
9	240°43.4	3°12.7	·· 38.0	77°33.5	·· 54.0	92°04.4	·· 43.3	231°54.0	·· 09.4
10	255°45.8	18°12.5	38.6	92°35.8	54.0	107°07.0	43.3	246°56.4	09.5
11	270°48.3	33°12.4	39.1	107°38.1	54.0	122°09.7	43.4	261°58.8	09.5
12	285°50.8	48°12.2	S16°39.7	122°40.4	N10°54.1	137°12.3	N13°43.5	277°01.1	N01°09.6
13	300°53.2	63°12.0	40.3	137°42.8	54.1	152°14.9	43.6	292°03.5	09.6
14	315°55.7	78°11.8	40.9	152°45.1	54.1	167°17.6	43.6	307°05.8	09.7
15	330°58.2	93°11.7	·· 41.4	167°47.4	·· 54.2	182°20.2	·· 43.7	322°08.2	·· 09.7
16	346°00.6	108°11.5	42.0	182°49.7	54.2	197°22.9	43.8	337°10.6	09.8
17	1°03.1	123°11.3	42.6	197°52.0	54.3	212°25.5	43.9	352°12.9	09.8
18	16°05.5	138°11.2	S16°43.2	212°54.3	N10°54.3	227°28.2	N13°43.9	7°15.3	N01°09.9
19	31°08.0	153°11.0	43.7	227°56.7	54.3	242°30.8	44.0	22°17.6	10.0
20	46°10.5	168°10.8	44.3	242°59.0	54.4	257°33.5	44.1	37°20.0	10.0
21	61°12.9	183°10.6	·· 44.9	258°01.3	·· 54.4	272°36.1	·· 44.2	52°22.4	·· 10.1
22	76°15.4	198°10.4	45.4	273°03.6	54.4	287°38.8	44.2	67°24.7	10.1
23	91°17.9	213°10.3	46.0	288°05.9	54.5	302°41.4	44.3	82°27.1	10.2
Mer.pass. 16:56		ν -0.2′	d 0.6′	m -4.53	ν 2.3′	d 0.0′	m -0.26	ν 2.6′	d 0.1′ m -2.44	ν 2.4′	d 0.1′ m 0.75

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.1	56°41.5
Diphda	348°45.7	-17°50.4
Achernar	335°18.9	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°51.7	89°22.9
Acamar	315°10.3	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.6
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.7
Suhail	222°44.7	-43°32.4
Miaplacidus	221°37.1	-69°49.5
Alphard	217°45.9	-8°46.6
Regulus	207°32.5	11°49.9
Dubhe	193°38.7	61°36.0
Denebola	182°23.2	14°25.1
Gienah	175°41.8	-17°41.5
Acrux	172°58.1	-63°14.7
Gacrux	171°49.7	-57°15.7
Alioth	166°11.6	55°48.4
Spica	158°20.6	-11°18.2
Alkaid	152°50.8	49°10.4
Hadar	148°33.8	-60°30.0
Menkent	147°55.8	-36°30.0
Arcturus	145°46.5	19°02.3
Rigil Kent.	139°38.3	-60°56.6
Kochab	137°20.5	74°02.3
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.6	26°37.2
Antares	112°14.1	-26°29.4
Atria	107°07.3	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.3	12°32.4
Eltanin	90°41.9	51°29.0
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.5	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.2

Jan 04 Mon	SHA	Mer.pass
Venus	124°57.9	08:47
Mars	197°00.9	03:58
Jupiter	211°11.1	03:01
Saturn	351°16.3	17:39

Jan 05 Tue	SHA	Mer.pass
Venus	123°55.7	08:47
Mars	196°55.9	03:54
Jupiter	211°15.1	02:57
Saturn	351°14.0	17:35

Jan 06 Wed	SHA	Mer.pass
Venus	122°53.0	08:47
Mars	196°51.6	03:51
Jupiter	211°19.4	02:53
Saturn	351°11.6	17:31

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0805 sec ΔT = TT-UT1 = +69.2645 sec

2027 January 04 to Jan. 06 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°50.9	S22°45.9	225°06.2	10.9′	S25°26.5	5.8′	54.4′
1	193°50.7	45.7	239°36.1	10.8′	25°32.3	5.6′	54.4′
2	208°50.4	45.4	254°05.9	10.8′	25°37.9	5.5′	54.4′
3	223°50.1	·· 45.2	268°35.7	10.8′	25°43.4	5.4′	54.3′
4	238°49.8	44.9	283°05.4	10.7′	25°48.8	5.3′	54.3′
5	253°49.5	44.6	297°35.2	10.7′	25°54.1	5.1′	54.3′
6	268°49.2	S22°44.4	312°04.8	10.6′	S25°59.2	5.1′	54.3′
7	283°48.9	44.1	326°34.5	10.6′	26°04.3	4.8′	54.3′
8	298°48.7	43.9	341°04.1	10.6′	26°09.1	4.8′	54.3′
9	313°48.4	·· 43.6	355°33.7	10.5′	26°13.9	4.6′	54.3′
10	328°48.1	43.3	10°03.2	10.5′	26°18.5	4.6′	54.3′
11	343°47.8	43.1	24°32.7	10.5′	26°23.1	4.3′	54.2′
12	358°47.5	S22°42.8	39°02.2	10.5′	S26°27.4	4.3′	54.2′
13	13°47.2	42.5	53°31.7	10.4′	26°31.7	4.1′	54.2′
14	28°47.0	42.3	68°01.1	10.4′	26°35.8	4.0′	54.2′
15	43°46.7	·· 42.0	82°30.5	10.4′	26°39.8	3.9′	54.2′
16	58°46.4	41.8	96°59.9	10.3′	26°43.7	3.7′	54.2′
17	73°46.1	41.5	111°29.2	10.3′	26°47.4	3.6′	54.2′
18	88°45.8	S22°41.2	125°58.5	10.3′	S26°51.0	3.5′	54.2′
19	103°45.5	40.9	140°27.8	10.3′	26°54.5	3.4′	54.2′
20	118°45.3	40.7	154°57.1	10.2′	26°57.9	3.2′	54.1′
21	133°45.0	·· 40.4	169°26.3	10.2′	27°01.1	3.1′	54.1′
22	148°44.7	40.1	183°55.5	10.2′	27°04.2	2.9′	54.1′
23	163°44.4	39.9	198°24.7	10.2′	27°07.1	2.8′	54.1′
	SD = 16.3′	d = 0.3′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°44.1	S22°39.6	212°53.9	10.2′	S27°09.9	2.7′	54.1′
1	193°43.8	39.3	227°23.1	10.1′	27°12.6	2.6′	54.1′
2	208°43.6	39.0	241°52.2	10.1′	27°15.2	2.4′	54.1′
3	223°43.3	·· 38.8	256°21.3	10.1′	27°17.6	2.3′	54.1′
4	238°43.0	38.5	270°50.5	10.1′	27°19.9	2.2′	54.1′
5	253°42.7	38.2	285°19.5	10.1′	27°22.1	2.0′	54.1′
6	268°42.4	S22°37.9	299°48.6	10.1′	S27°24.1	1.9′	54.1′
7	283°42.2	37.7	314°17.7	10.1′	27°26.0	1.8′	54.1′
8	298°41.9	37.4	328°46.8	10.0′	27°27.8	1.6′	54.0′
9	313°41.6	·· 37.1	343°15.8	10.0′	27°29.4	1.5′	54.0′
10	328°41.3	36.8	357°44.8	10.0′	27°30.9	1.3′	54.0′
11	343°41.0	36.5	12°13.9	10.0′	27°32.2	1.3′	54.0′
12	358°40.8	S22°36.3	26°42.9	10.0′	S27°33.5	1.1′	54.0′
13	13°40.5	36.0	41°11.9	10.0′	27°34.6	0.9′	54.0′
14	28°40.2	35.7	55°40.9	10.0′	27°35.5	0.8′	54.0′
15	43°39.9	·· 35.4	70°09.9	10.0′	27°36.3	0.7′	54.0′
16	58°39.6	35.1	84°38.9	10.0′	27°37.0	0.6′	54.0′
17	73°39.4	34.8	99°08.0	10.0′	27°37.6	0.4′	54.0′
18	88°39.1	S22°34.5	113°37.0	10.0′	S27°38.0	0.3′	54.0′
19	103°38.8	34.3	128°06.0	10.0′	27°38.3	0.2′	54.0′
20	118°38.5	34.0	142°35.0	10.0′	27°38.5	0.0′	54.0′
21	133°38.2	·· 33.7	157°04.0	10.0′	27°38.5	0.1′	54.0′
22	148°38.0	33.4	171°33.0	10.0′	27°38.4	0.3′	54.0′
23	163°37.7	33.1	186°02.0	10.0′	27°38.1	0.4′	53.9′
	SD = 16.3′	d = 0.3′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°37.4	S22°32.8	200°31.1	10.0′	S27°37.7	0.5′	53.9′
1	193°37.1	32.5	215°00.1	10.1′	27°37.2	0.6′	53.9′
2	208°36.9	32.2	229°29.2	10.1′	27°36.6	0.8′	53.9′
3	223°36.6	·· 31.9	243°58.2	10.1′	27°35.8	0.9′	53.9′
4	238°36.3	31.6	258°27.3	10.1′	27°34.9	1.1′	53.9′
5	253°36.0	31.3	272°56.4	10.1′	27°33.8	1.2′	53.9′
6	268°35.7	S22°31.0	287°25.5	10.1′	S27°32.6	1.3′	53.9′
7	283°35.5	30.7	301°54.6	10.1′	27°31.3	1.4′	53.9′
8	298°35.2	30.4	316°23.8	10.2′	27°29.9	1.6′	53.9′
9	313°34.9	·· 30.1	330°52.9	10.2′	27°28.3	1.7′	53.9′
10	328°34.6	29.8	345°22.1	10.2′	27°26.6	1.8′	53.9′
11	343°34.4	29.5	359°51.3	10.2′	27°24.8	2.0′	53.9′
12	358°34.1	S22°29.2	14°20.5	10.2′	S27°22.8	2.1′	53.9′
13	13°33.8	28.9	28°49.7	10.3′	27°20.7	2.3′	53.9′
14	28°33.5	28.6	43°19.0	10.3′	27°18.4	2.3′	53.9′
15	43°33.3	·· 28.3	57°48.3	10.3′	27°16.1	2.5′	53.9′
16	58°33.0	28.0	72°17.6	10.3′	27°13.6	2.7′	53.9′
17	73°32.7	27.7	86°47.0	10.4′	27°10.9	2.7′	53.9′
18	88°32.4	S22°27.4	101°16.3	10.4′	S27°08.2	2.9′	53.9′
19	103°32.2	27.1	115°45.7	10.4′	27°05.3	3.0′	53.9′
20	118°31.9	26.8	130°15.2	10.5′	27°02.3	3.2′	53.9′
21	133°31.6	·· 26.5	144°44.6	10.5′	26°59.1	3.2′	53.9′
22	148°31.3	26.2	159°14.1	10.5′	26°55.9	3.5′	53.9′
23	163°31.1	25.9	173°43.6	10.6′	26°52.4	3.5′	53.9′
	SD = 16.3′	d = 0.3′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:20	10:30	▬	▬	13:41	15:51
N 70°	08:02	09:43	▬	▬	14:28	16:09
68°	07:47	09:12	11:31	12:40	14:59	16:24
66°	07:35	08:50	10:20	13:51	15:21	16:36
64°	07:25	08:32	09:45	14:26	15:39	16:46
62°	07:16	08:17	09:20	14:51	15:54	16:55
60°	07:08	08:04	09:00	15:11	16:07	17:03
N 58°	07:01	07:53	08:44	15:27	16:18	17:10
56°	06:55	07:43	08:30	15:41	16:27	17:16
54°	06:49	07:35	08:18	15:53	16:36	17:22
52°	06:44	07:27	08:07	16:04	16:44	17:27
50°	06:39	07:20	07:58	16:13	16:51	17:32
45°	06:28	07:05	07:38	16:33	17:06	17:43
N 40°	06:18	06:52	07:22	16:49	17:19	17:53
35°	06:09	06:41	07:08	17:02	17:30	18:02
30°	06:01	06:30	06:57	17:14	17:40	18:10
20°	05:45	06:12	06:36	17:34	17:58	18:26
N 10°	05:29	05:56	06:18	17:52	18:15	18:41
0°	05:13	05:39	06:02	18:09	18:31	18:57
S 10°	04:55	05:22	05:45	18:26	18:49	19:16
20°	04:33	05:02	05:26	18:44	19:08	19:37
30°	04:05	04:38	05:05	19:05	19:32	20:05
35°	03:47	04:23	04:53	19:18	19:47	20:23
40°	03:25	04:06	04:38	19:32	20:04	20:45
45°	02:56	03:44	04:21	19:49	20:26	21:14
S 50°	02:13	03:16	03:59	20:11	20:54	21:56
52°	01:48	03:02	03:49	20:21	21:08	22:21
54°	01:12	02:45	03:37	20:33	21:25	22:56
56°	////	02:24	03:24	20:46	21:45	////
58°	////	01:58	03:08	21:01	22:11	////
S 60°	////	01:18	02:49	21:20	22:50	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	07:47	09:25	10:13	10:44	10:52	11:51
60°	07:07	08:25	09:16	11:24	11:52	12:48
N 58°	06:40	07:51	08:43	11:51	12:26	13:21
56°	06:19	07:26	08:18	12:13	12:51	13:45
54°	06:01	07:06	07:58	12:31	13:11	14:05
52°	05:46	06:50	07:42	12:46	13:27	14:21
50°	05:33	06:36	07:28	12:59	13:42	14:35
45°	05:07	06:07	06:59	13:26	14:11	15:04
N 40°	04:46	05:44	06:36	13:48	14:34	15:27
35°	04:28	05:25	06:17	14:05	14:53	15:45
30°	04:14	05:09	06:01	14:21	15:09	16:01
20°	03:48	04:42	05:34	14:47	15:36	16:28
N 10°	03:26	04:19	05:10	15:10	16:00	16:51
0°	03:06	03:57	04:48	15:31	16:22	17:13
S 10°	02:46	03:35	04:26	15:52	16:44	17:34
20°	02:25	03:12	04:03	16:14	17:07	17:57
30°	02:00	02:45	03:36	16:41	17:35	18:24
35°	01:45	02:29	03:19	16:56	17:51	18:40
40°	01:28	02:11	03:01	17:14	18:10	18:58
45°	01:08	01:49	02:38	17:36	18:32	19:20
S 50°	00:43	01:21	02:09	18:04	19:01	19:48
52°	00:31	01:07	01:55	18:18	19:16	20:01
54°	00:17	00:51	01:38	18:33	19:32	20:17
56°	00:01	00:32	01:18	18:52	19:52	20:35
58°	·· ··	00:09	00:54	19:15	20:17	20:58
S 60°	23:39	·· ··	00:20	19:45	20:50	21:27

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 13-3%
04	04:36	04:50	12:05	09:18	21:44	
05	05:04	05:17	12:05	10:09	22:35	
06	05:30	05:44	12:06	11:01	23:26	

January 07, 08, 09 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	106°20.3	228°10.1	S16°46.6	303°08.3	N10°54.5	317°44.1	N13°44.4	97°29.4	N01°10.2
1	121°22.8	243°09.9	47.1	318°10.6	54.6	332°46.7	44.5	112°31.8	10.3
2	136°25.3	258°09.7	47.7	333°12.9	54.6	347°49.4	44.5	127°34.1	10.3
3	151°27.7	273°09.5	·· 48.3	348°15.3	·· 54.6	2°52.0	·· 44.6	142°36.5	·· 10.4
4	166°30.2	288°09.4	48.9	3°17.6	54.7	17°54.7	44.7	157°38.9	10.5
5	181°32.7	303°09.2	49.4	18°19.9	54.7	32°57.3	44.8	172°41.2	10.5
6	196°35.1	318°09.0	S16°50.0	33°22.3	N10°54.8	48°00.0	N13°44.8	187°43.6	N01°10.6
7	211°37.6	333°08.8	50.6	48°24.6	54.8	63°02.6	44.9	202°45.9	10.6
8	226°40.0	348°08.6	51.1	63°26.9	54.8	78°05.3	45.0	217°48.3	10.7
9	241°42.5	3°08.4	·· 51.7	78°29.3	·· 54.9	93°07.9	·· 45.1	232°50.6	·· 10.7
10	256°45.0	18°08.2	52.3	93°31.6	54.9	108°10.6	45.2	247°53.0	10.8
11	271°47.4	33°08.1	52.8	108°33.9	55.0	123°13.3	45.2	262°55.4	10.9
12	286°49.9	48°07.9	S16°53.4	123°36.3	N10°55.0	138°15.9	N13°45.3	277°57.7	N01°10.9
13	301°52.4	63°07.7	54.0	138°38.6	55.1	153°18.6	45.4	293°00.1	11.0
14	316°54.8	78°07.5	54.5	153°41.0	55.1	168°21.2	45.5	308°02.4	11.0
15	331°57.3	93°07.3	·· 55.1	168°43.3	·· 55.2	183°23.9	·· 45.5	323°04.8	·· 11.1
16	346°59.8	108°07.1	55.7	183°45.6	55.2	198°26.5	45.6	338°07.1	11.1
17	2°02.2	123°06.9	56.2	198°48.0	55.3	213°29.2	45.7	353°09.5	11.2
18	17°04.7	138°06.7	S16°56.8	213°50.3	N10°55.3	228°31.8	N13°45.8	8°11.8	N01°11.3
19	32°07.2	153°06.5	57.4	228°52.7	55.3	243°34.5	45.8	23°14.2	11.3
20	47°09.6	168°06.3	57.9	243°55.0	55.4	258°37.1	45.9	38°16.6	11.4
21	62°12.1	183°06.1	·· 58.5	258°57.4	·· 55.4	273°39.8	·· 46.0	53°18.9	·· 11.4
22	77°14.5	198°05.9	59.1	273°59.7	55.5	288°42.5	46.1	68°21.3	11.5
23	92°17.0	213°05.7	59.6	289°02.1	55.5	303°45.1	46.2	83°23.6	11.6
Mer.pass. 16:52		ν -0.2′	d 0.6′	ν 2.3′	d 0.0′	ν 2.7′	d 0.1′	ν 2.4′	d 0.1′
		m -4.51		m -0.28		m -2.45		m 0.75	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	107°19.5	228°05.5	S17°00.2	304°04.4	N10°55.6	318°47.8	N13°46.2	98°26.0	N01°11.6
1	122°21.9	243°05.3	00.7	319°06.8	55.6	333°50.4	46.3	113°28.3	11.7
2	137°24.4	258°05.1	01.3	334°09.2	55.7	348°53.1	46.4	128°30.7	11.7
3	152°26.9	273°04.9	·· 01.9	349°11.5	·· 55.8	3°55.7	·· 46.5	143°33.0	·· 11.8
4	167°29.3	288°04.7	02.4	4°13.9	55.8	18°58.4	46.5	158°35.4	11.8
5	182°31.8	303°04.5	03.0	19°16.2	55.9	34°01.1	46.6	173°37.7	11.9
6	197°34.3	318°04.3	S17°03.6	34°18.6	N10°55.9	49°03.7	N13°46.7	188°40.1	N01°12.0
7	212°36.7	333°04.1	04.1	49°21.0	56.0	64°06.4	46.8	203°42.5	12.0
8	227°39.2	348°03.9	04.7	64°23.3	56.0	79°09.0	46.9	218°44.8	12.1
9	242°41.6	3°03.7	·· 05.2	79°25.7	·· 56.1	94°11.7	·· 46.9	233°47.2	·· 12.1
10	257°44.1	18°03.5	05.8	94°28.1	56.1	109°14.4	47.0	248°49.5	12.2
11	272°46.6	33°03.3	06.4	109°30.4	56.2	124°17.0	47.1	263°51.9	12.3
12	287°49.0	48°03.0	S17°06.9	124°32.8	N10°56.2	139°19.7	N13°47.2	278°54.2	N01°12.3
13	302°51.5	63°02.8	07.5	139°35.2	56.3	154°22.3	47.2	293°56.6	12.4
14	317°54.0	78°02.6	08.0	154°37.5	56.4	169°25.0	47.3	308°58.9	12.4
15	332°56.4	93°02.4	·· 08.6	169°39.9	·· 56.4	184°27.7	·· 47.4	324°01.3	·· 12.5
16	347°58.9	108°02.2	09.1	184°42.3	56.5	199°30.3	47.5	339°03.6	12.5
17	3°01.4	123°02.0	09.7	199°44.7	56.5	214°33.0	47.6	354°06.0	12.6
18	18°03.8	138°01.8	S17°10.3	214°47.0	N10°56.6	229°35.6	N13°47.6	9°08.3	N01°12.7
19	33°06.3	153°01.6	10.8	229°49.4	56.7	244°38.3	47.7	24°10.7	12.7
20	48°08.8	168°01.3	11.4	244°51.8	56.7	259°41.0	47.8	39°13.0	12.8
21	63°11.2	183°01.1	·· 11.9	259°54.2	·· 56.8	274°43.6	·· 47.9	54°15.4	·· 12.8
22	78°13.7	198°00.9	12.5	274°56.5	56.8	289°46.3	48.0	69°17.7	12.9
23	93°16.1	213°00.7	13.0	289°58.9	56.9	304°49.0	48.0	84°20.1	13.0
Mer.pass. 16:48		ν -0.2′	d 0.6′	ν 2.4′	d 0.1′	ν 2.7′	d 0.1′	ν 2.4′	d 0.1′
		m -4.50		m -0.31		m -2.45		m 0.75	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	108°18.6	228°00.5	S17°13.6	305°01.3	N10°57.0	319°51.6	N13°48.1	99°22.4	N01°13.0
1	123°21.1	243°00.2	14.2	320°03.7	57.0	334°54.3	48.2	114°24.8	13.1
2	138°23.5	258°00.0	14.7	335°06.1	57.1	349°57.0	48.3	129°27.1	13.1
3	153°26.0	272°59.8	·· 15.3	350°08.5	·· 57.2	4°59.6	·· 48.4	144°29.5	·· 13.2
4	168°28.5	287°59.6	15.8	5°10.9	57.2	20°02.3	48.4	159°31.8	13.3
5	183°30.9	302°59.3	16.4	20°13.3	57.3	35°04.9	48.5	174°34.2	13.3
6	198°33.4	317°59.1	S17°16.9	35°15.6	N10°57.3	50°07.6	N13°48.6	189°36.5	N01°13.4
7	213°35.9	332°58.9	17.5	50°18.0	57.4	65°10.3	48.7	204°38.9	13.4
8	228°38.3	347°58.7	18.0	65°20.4	57.5	80°12.9	48.8	219°41.2	13.5
9	243°40.8	2°58.4	·· 18.6	80°22.8	·· 57.5	95°15.6	·· 48.8	234°43.6	·· 13.6
10	258°43.3	17°58.2	19.1	95°25.2	57.6	110°18.3	48.9	249°45.9	13.6
11	273°45.7	32°58.0	19.7	110°27.6	57.7	125°20.9	49.0	264°48.3	13.7
12	288°48.2	47°57.7	S17°20.2	125°30.0	N10°57.7	140°23.6	N13°49.1	279°50.6	N01°13.7
13	303°50.6	62°57.5	20.8	140°32.4	57.8	155°26.3	49.2	294°53.0	13.8
14	318°53.1	77°57.3	21.3	155°34.8	57.9	170°28.9	49.2	309°55.3	13.9
15	333°55.6	92°57.0	·· 21.9	170°37.2	·· 58.0	185°31.6	·· 49.3	324°57.7	·· 13.9
16	348°58.0	107°56.8	22.4	185°39.6	58.0	200°34.3	49.4	340°00.0	14.0
17	4°00.5	122°56.6	23.0	200°42.0	58.1	215°36.9	49.5	355°02.4	14.0
18	19°03.0	137°56.3	S17°23.5	215°44.4	N10°58.2	230°39.6	N13°49.6	10°04.7	N01°14.1
19	34°05.4	152°56.1	24.1	230°46.8	58.2	245°42.3	49.7	25°07.1	14.2
20	49°07.9	167°55.9	24.6	245°49.2	58.3	260°45.0	49.7	40°09.4	14.2
21	64°10.4	182°55.6	·· 25.2	260°51.7	·· 58.4	275°47.6	·· 49.8	55°11.7	·· 14.3
22	79°12.8	197°55.4	25.7	275°54.1	58.5	290°50.3	49.9	70°14.1	14.4
23	94°15.3	212°55.2	26.3	290°56.5	58.5	305°53.0	50.0	85°16.4	14.4
Mer.pass. 16:44		ν -0.2′	d 0.6′	ν 2.4′	d 0.1′	ν 2.7′	d 0.1′	ν 2.4′	d 0.1′
		m -4.49		m -0.33		m -2.46		m 0.75	

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.2	56°41.5
Diphda	348°45.7	-17°50.4
Achernar	335°18.9	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°52.7	89°22.9
Acamar	315°10.3	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.7
Suhail	222°44.7	-43°32.4
Miaplacidus	221°37.1	-69°49.5
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°38.7	61°36.0
Denebola	182°23.1	14°25.1
Gienah	175°41.8	-17°41.5
Acrux	172°58.1	-63°14.7
Gacrux	171°49.7	-57°15.7
Alioth	166°11.5	55°48.4
Spica	158°20.6	-11°18.2
Alkaid	152°50.8	49°10.3
Hadar	148°33.8	-60°30.0
Menkent	147°55.8	-36°30.1
Arcturus	145°46.5	19°02.3
Rigil Kent.	139°38.2	-60°56.6
Kochab	137°20.5	74°02.3
Zuben'ubi	136°54.3	-16°09.2
Alphecca	126°02.6	26°37.2
Antares	112°14.1	-26°29.4
Atria	107°07.3	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.3	12°32.4
Eltanin	90°41.9	51°29.0
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.5	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.2

Jan 07 Thu	SHA	Mer.pass
Venus	121°49.8	08:47
Mars	196°47.9	03:47
Jupiter	211°23.8	02:49
Saturn	351°09.1	17:27

Jan 08 Fri	SHA	Mer.pass
Venus	120°46.0	08:48
Mars	196°45.0	03:43
Jupiter	211°28.3	02:44
Saturn	351°06.5	17:24

Jan 09 Sat	SHA	Mer.pass
Venus	119°41.8	08:48
Mars	196°42.7	03:39
Jupiter	211°33.0	02:40
Saturn	351°03.8	17:20

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0798 sec ΔT = TT-UT1 = +69.2638 sec

2027 January 07 to Jan. 09 UT

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.8	S22°25.6	188°13.2	10.6′	S26°48.9	3.6′	53.9′
1	193°30.5	25.3	202°42.8	10.6′	26°45.3	3.8′	53.9′
2	208°30.3	25.0	217°12.4	10.7′	26°41.5	3.9′	53.9′
3	223°30.0	·· 24.6	231°42.1	10.7′	26°37.6	4.1′	53.9′
4	238°29.7	24.3	246°11.8	10.7′	26°33.5	4.1′	53.9′
5	253°29.4	24.0	260°41.5	10.8′	26°29.4	4.3′	53.9′
6	268°29.2	S22°23.7	275°11.3	10.8′	S26°25.1	4.4′	53.9′
7	283°28.9	23.4	289°41.1	10.9′	26°20.7	4.5′	53.9′
8	298°28.6	23.1	304°11.0	10.9′	26°16.2	4.7′	53.9′
9	313°28.4	·· 22.8	318°40.9	11.0′	26°11.5	4.8′	53.9′
10	328°28.1	22.4	333°10.9	11.0′	26°06.7	4.9′	53.9′
11	343°27.8	22.1	347°40.9	11.0′	26°01.8	5.0′	53.9′
12	358°27.5	S22°21.8	2°10.9	11.1′	S25°56.8	5.1′	53.9′
13	13°27.3	21.5	16°41.0	11.1′	25°51.7	5.3′	53.9′
14	28°27.0	21.2	31°11.1	11.2′	25°46.4	5.4′	53.9′
15	43°26.7	·· 20.8	45°41.3	11.2′	25°41.0	5.5′	53.9′
16	58°26.5	20.5	60°11.5	11.3′	25°35.5	5.6′	53.9′
17	73°26.2	20.2	74°41.8	11.3′	25°29.9	5.7′	53.9′
18	88°25.9	S22°19.9	89°12.1	11.4′	S25°24.2	5.9′	53.9′
19	103°25.7	19.5	103°42.5	11.4′	25°18.3	5.9′	53.9′
20	118°25.4	19.2	118°12.9	11.5′	25°12.4	6.1′	53.9′
21	133°25.1	·· 18.9	132°43.4	11.5′	25°06.3	6.2′	53.9′
22	148°24.8	18.6	147°14.0	11.6′	25°00.1	6.3′	53.9′
23	163°24.6	18.2	161°44.5	11.6′	24°53.8	6.4′	53.9′
	SD = 16.3′	d = 0.3′	SD = 14.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.3	S22°17.9	176°15.2	11.7′	S24°47.4	6.6′	53.9′
1	193°24.0	17.6	190°45.8	11.7′	24°40.8	6.6′	53.9′
2	208°23.8	17.2	205°16.6	11.8′	24°34.2	6.8′	53.9′
3	223°23.5	·· 16.9	219°47.4	11.8′	24°27.4	6.9′	53.9′
4	238°23.2	16.6	234°18.2	11.9′	24°20.5	6.9′	53.9′
5	253°23.0	16.3	248°49.1	12.0′	24°13.6	7.1′	53.9′
6	268°22.7	S22°15.9	263°20.1	12.0′	S24°06.5	7.2′	53.9′
7	283°22.4	15.6	277°51.1	12.1′	23°59.3	7.3′	53.9′
8	298°22.2	15.3	292°22.2	12.1′	23°52.0	7.4′	53.9′
9	313°21.9	·· 14.9	306°53.3	12.2′	23°44.6	7.6′	53.9′
10	328°21.6	14.6	321°24.5	12.2′	23°37.0	7.6′	53.9′
11	343°21.4	14.2	335°55.7	12.3′	23°29.4	7.7′	53.9′
12	358°21.1	S22°13.9	350°27.0	12.3′	S23°21.7	7.9′	53.9′
13	13°20.9	13.6	4°58.3	12.4′	23°13.8	7.9′	53.9′
14	28°20.6	13.2	19°29.7	12.5′	23°05.9	8.0′	53.9′
15	43°20.3	·· 12.9	34°01.2	12.5′	22°57.9	8.2′	53.9′
16	58°20.1	12.6	48°32.7	12.6′	22°49.7	8.2′	53.9′
17	73°19.8	12.2	63°04.3	12.6′	22°41.5	8.4′	53.9′
18	88°19.5	S22°11.9	77°35.9	12.7′	S22°33.1	8.4′	53.9′
19	103°19.3	11.5	92°07.6	12.8′	22°24.7	8.5′	53.9′
20	118°19.0	11.2	106°39.4	12.8′	22°16.2	8.7′	54.0′
21	133°18.7	·· 10.8	121°11.2	12.9′	22°07.5	8.7′	54.0′
22	148°18.5	10.5	135°43.1	12.9′	21°58.8	8.8′	54.0′
23	163°18.2	10.1	150°15.0	13.0′	21°50.0	9.0′	54.0′
	SD = 16.3′	d = 0.3′	SD = 14.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°18.0	S22°09.8	164°47.0	13.0′	S21°41.0	9.0′	54.0′
1	193°17.7	09.5	179°19.0	13.1′	21°32.0	9.1′	54.0′
2	208°17.4	09.1	193°51.1	13.2′	21°22.9	9.2′	54.0′
3	223°17.2	·· 08.8	208°23.3	13.2′	21°13.7	9.3′	54.0′
4	238°16.9	08.4	222°55.5	13.3′	21°04.4	9.4′	54.0′
5	253°16.6	08.1	237°27.8	13.3′	20°55.0	9.5′	54.0′
6	268°16.4	S22°07.7	252°00.1	13.4′	S20°45.5	9.6′	54.0′
7	283°16.1	07.4	266°32.5	13.4′	20°35.9	9.6′	54.0′
8	298°15.9	07.0	281°04.9	13.5′	20°26.3	9.8′	54.0′
9	313°15.6	·· 06.6	295°37.4	13.6′	20°16.5	9.8′	54.0′
10	328°15.3	06.3	310°10.0	13.6′	20°06.7	9.9′	54.0′
11	343°15.1	05.9	324°42.6	13.7′	19°56.8	10.0′	54.0′
12	358°14.8	S22°05.6	339°15.3	13.7′	S19°46.8	10.1′	54.1′
13	13°14.6	05.2	353°48.0	13.8′	19°36.7	10.2′	54.1′
14	28°14.3	04.9	8°20.8	13.8′	19°26.5	10.2′	54.1′
15	43°14.0	·· 04.5	22°53.6	13.9′	19°16.3	10.4′	54.1′
16	58°13.8	04.2	37°26.5	13.9′	19°05.9	10.4′	54.1′
17	73°13.5	03.8	51°59.5	14.0′	18°55.5	10.5′	54.1′
18	88°13.3	S22°03.4	66°32.5	14.1′	S18°45.0	10.6′	54.1′
19	103°13.0	03.1	81°05.5	14.1′	18°34.4	10.6′	54.1′
20	118°12.8	02.7	95°38.6	14.2′	18°23.8	10.8′	54.1′
21	133°12.5	·· 02.3	110°11.8	14.2′	18°13.0	10.8′	54.1′
22	148°12.2	02.0	124°45.0	14.3′	18°02.2	10.9′	54.1′
23	163°12.0	01.6	139°18.3	14.3′	17°51.3	10.9′	54.1′
	SD = 16.3′	d = 0.3′	SD = 14.7′				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:15	10:20	▬	▬	13:54	15:59
N 70°	07:58	09:37	▬	▬	14:37	16:16
68°	07:44	09:08	11:10	13:03	15:06	16:30
66°	07:33	08:46	10:13	14:01	15:28	16:41
64°	07:23	08:29	09:40	14:33	15:45	16:51
62°	07:14	08:14	09:16	14:58	15:59	16:59
60°	07:07	08:02	08:57	15:17	16:12	17:07
N 58°	07:00	07:51	08:41	15:32	16:22	17:14
56°	06:54	07:42	08:28	15:46	16:32	17:20
54°	06:48	07:34	08:16	15:57	16:40	17:25
52°	06:43	07:26	08:06	16:07	16:47	17:30
50°	06:38	07:19	07:57	16:17	16:54	17:35
45°	06:28	07:04	07:38	16:36	17:09	17:46
N 40°	06:18	06:52	07:22	16:52	17:22	17:55
35°	06:09	06:41	07:09	17:05	17:33	18:04
30°	06:01	06:31	06:57	17:16	17:43	18:12
20°	05:46	06:13	06:37	17:36	18:00	18:27
N 10°	05:31	05:57	06:19	17:54	18:16	18:43
0°	05:15	05:41	06:03	18:10	18:33	18:59
S 10°	04:57	05:23	05:46	18:27	18:50	19:17
20°	04:35	05:04	05:28	18:45	19:09	19:38
30°	04:08	04:40	05:07	19:05	19:33	20:05
35°	03:50	04:26	04:55	19:18	19:47	20:23
40°	03:28	04:09	04:41	19:32	20:04	20:44
45°	03:00	03:48	04:24	19:49	20:25	21:13
S 50°	02:19	03:20	04:03	20:09	20:52	21:53
52°	01:55	03:06	03:53	20:19	21:06	22:16
54°	01:22	02:50	03:42	20:31	21:22	22:49
56°	////	02:30	03:29	20:44	21:42	////
58°	////	02:05	03:13	20:59	22:06	////
S 60°	////	01:29	02:55	21:17	22:41	////

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	12:46	▬	▬	14:23
68°	▬	▬	11:38	▬	▬	15:30
66°	▬	11:47	11:01	▬	13:43	16:05
64°	▬	10:50	10:35	▬	14:39	16:30
62°	10:18	10:17	10:15	13:30	15:12	16:50
60°	09:41	09:52	09:58	14:07	15:36	17:06
N 58°	09:14	09:33	09:44	14:33	15:55	17:19
56°	08:53	09:16	09:31	14:54	16:11	17:31
54°	08:36	09:02	09:21	15:11	16:25	17:41
52°	08:21	08:50	09:11	15:26	16:36	17:50
50°	08:08	08:39	09:03	15:38	16:47	17:58
45°	07:42	08:17	08:45	16:04	17:09	18:15
N 40°	07:21	07:58	08:30	16:25	17:26	18:28
35°	07:03	07:43	08:17	16:42	17:41	18:40
30°	06:48	07:29	08:06	16:57	17:53	18:50
20°	06:22	07:06	07:47	17:22	18:15	19:07
N 10°	06:00	06:47	07:30	17:43	18:34	19:22
0°	05:39	06:28	07:15	18:03	18:51	19:36
S 10°	05:18	06:09	06:59	18:23	19:08	19:50
20°	04:56	05:49	06:42	18:44	19:26	20:05
30°	04:30	05:26	06:23	19:08	19:47	20:22
35°	04:14	05:12	06:11	19:23	20:00	20:31
40°	03:56	04:56	05:58	19:39	20:14	20:43
45°	03:35	04:37	05:43	19:59	20:30	20:55
S 50°	03:07	04:14	05:24	20:23	20:50	21:11
52°	02:54	04:02	05:14	20:35	21:00	21:18
54°	02:39	03:49	05:04	20:49	21:11	21:26
56°	02:20	03:34	04:52	21:04	21:23	21:36
58°	01:58	03:16	04:39	21:23	21:37	21:46
S 60°	01:29	02:54	04:23	21:45	21:53	21:57

Day	Sun			Moon		Age
	Eqn.of Time		Mer.	Mer.Pass.		
	00^h	12^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-1%
07	05:57	06:10	12:06	11:51	–:–	
08	06:23	06:36	12:07	12:39	00:15	
09	06:48	07:01	12:07	13:26	01:03	

January 10, 11, 12 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	109°17.8	227°54.9	S17°26.8	305°58.9	N10°58.6	320°55.6	N13°50.1	100°18.8	N01°14.5
1	124°20.2	242°54.7	27.4	321°01.3	58.7	335°58.3	50.1	115°21.1	14.5
2	139°22.7	257°54.4	27.9	336°03.7	58.8	351°01.0	50.2	130°23.5	14.6
3	154°25.1	272°54.2	·· 28.4	351°06.1	·· 58.8	6°03.6	·· 50.3	145°25.8	·· 14.7
4	169°27.6	287°53.9	29.0	6°08.6	58.9	21°06.3	50.4	160°28.2	14.7
5	184°30.1	302°53.7	29.5	21°11.0	59.0	36°09.0	50.5	175°30.5	14.8
6	199°32.5	317°53.5	S17°30.1	36°13.4	N10°59.1	51°11.7	N13°50.6	190°32.9	N01°14.8
7	214°35.0	332°53.2	30.6	51°15.8	59.1	66°14.3	50.6	205°35.2	14.9
8	229°37.5	347°53.0	31.2	66°18.2	59.2	81°17.0	50.7	220°37.6	15.0
9	244°39.9	2°52.7	·· 31.7	81°20.7	·· 59.3	96°19.7	·· 50.8	235°39.9	·· 15.0
10	259°42.4	17°52.5	32.2	96°23.1	59.4	111°22.4	50.9	250°42.2	15.1
11	274°44.9	32°52.2	32.8	111°25.5	59.5	126°25.0	51.0	265°44.6	15.2
12	289°47.3	47°52.0	S17°33.3	126°27.9	N10°59.5	141°27.7	N13°51.1	280°46.9	N01°15.2
13	304°49.8	62°51.7	33.9	141°30.4	59.6	156°30.4	51.1	295°49.3	15.3
14	319°52.2	77°51.5	34.4	156°32.8	59.7	171°33.0	51.2	310°51.6	15.3
15	334°54.7	92°51.2	·· 35.0	171°35.2	·· 59.8	186°35.7	·· 51.3	325°54.0	·· 15.4
16	349°57.2	107°51.0	35.5	186°37.7	10°59.9	201°38.4	51.4	340°56.3	15.5
17	4°59.6	122°50.7	36.0	201°40.1	11°00.0	216°41.1	51.5	355°58.7	15.5
18	20°02.1	137°50.5	S17°36.6	216°42.5	N11°00.0	231°43.7	N13°51.5	11°01.0	N01°15.6
19	35°04.6	152°50.2	37.1	231°45.0	00.1	246°46.4	51.6	26°03.3	15.6
20	50°07.0	167°49.9	37.6	246°47.4	00.2	261°49.1	51.7	41°05.7	15.7
21	65°09.5	182°49.7	·· 38.2	261°49.9	·· 00.3	276°51.8	·· 51.8	56°08.0	·· 15.8
22	80°12.0	197°49.4	38.7	276°52.3	00.4	291°54.4	51.9	71°10.4	15.8
23	95°14.4	212°49.2	39.3	291°54.7	00.5	306°57.1	52.0	86°12.7	15.9
Mer.pass. 16:40		ν -0.2′	d 0.5′	m -4.48	ν 2.4′	d 0.1′	m -0.36	ν 2.7′	d 0.1′ m -2.46	ν 2.3′	d 0.1′ m 0.76

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	110°16.9	227°48.9	S17°39.8	306°57.2	N11°00.5	321°59.8	N13°52.1	101°15.1	N01°16.0
1	125°19.4	242°48.6	40.3	321°59.6	00.6	337°02.5	52.1	116°17.4	16.0
2	140°21.8	257°48.4	40.9	337°02.1	00.7	352°05.2	52.2	131°19.7	16.1
3	155°24.3	272°48.1	·· 41.4	352°04.5	·· 00.8	7°07.8	·· 52.3	146°22.1	·· 16.1
4	170°26.7	287°47.9	41.9	7°07.0	00.9	22°10.5	52.4	161°24.4	16.2
5	185°29.2	302°47.6	42.5	22°09.4	01.0	37°13.2	52.5	176°26.8	16.3
6	200°31.7	317°47.3	S17°43.0	37°11.9	N11°01.1	52°15.9	N13°52.6	191°29.1	N01°16.3
7	215°34.1	332°47.1	43.5	52°14.3	01.2	67°18.5	52.6	206°31.4	16.4
8	230°36.6	347°46.8	44.1	67°16.8	01.3	82°21.2	52.7	221°33.8	16.5
9	245°39.1	2°46.5	·· 44.6	82°19.2	·· 01.3	97°23.9	·· 52.8	236°36.1	·· 16.5
10	260°41.5	17°46.3	45.1	97°21.7	01.4	112°26.6	52.9	251°38.5	16.6
11	275°44.0	32°46.0	45.7	112°24.1	01.5	127°29.3	53.0	266°40.8	16.7
12	290°46.5	47°45.7	S17°46.2	127°26.6	N11°01.6	142°31.9	N13°53.1	281°43.2	N01°16.7
13	305°48.9	62°45.5	46.7	142°29.1	01.7	157°34.6	53.2	296°45.5	16.8
14	320°51.4	77°45.2	47.3	157°31.5	01.8	172°37.3	53.2	311°47.8	16.8
15	335°53.9	92°44.9	·· 47.8	172°34.0	·· 01.9	187°40.0	·· 53.3	326°50.2	·· 16.9
16	350°56.3	107°44.6	48.3	187°36.4	02.0	202°42.7	53.4	341°52.5	17.0
17	5°58.8	122°44.4	48.8	202°38.9	02.1	217°45.3	53.5	356°54.9	17.0
18	21°01.2	137°44.1	S17°49.4	217°41.4	N11°02.2	232°48.0	N13°53.6	11°57.2	N01°17.1
19	36°03.7	152°43.8	49.9	232°43.8	02.3	247°50.7	53.7	26°59.5	17.2
20	51°06.2	167°43.6	50.4	247°46.3	02.4	262°53.4	53.7	42°01.9	17.2
21	66°08.6	182°43.3	·· 51.0	262°48.8	·· 02.5	277°56.1	·· 53.8	57°04.2	·· 17.3
22	81°11.1	197°43.0	51.5	277°51.2	02.6	292°58.8	53.9	72°06.6	17.4
23	96°13.6	212°42.7	52.0	292°53.7	02.7	308°01.4	54.0	87°08.9	17.4
Mer.pass. 16:36		ν -0.3′	d 0.5′	m -4.47	ν 2.4′	d 0.1′	m -0.38	ν 2.7′	d 0.1′ m -2.47	ν 2.3′	d 0.1′ m 0.76

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	111°16.0	227°42.4	S17°52.5	307°56.2	N11°02.8	323°04.1	N13°54.1	102°11.2	N01°17.5
1	126°18.5	242°42.2	53.1	322°58.7	02.9	338°06.8	54.2	117°13.6	17.5
2	141°21.0	257°41.9	53.6	338°01.1	03.0	353°09.5	54.3	132°15.9	17.6
3	156°23.4	272°41.6	·· 54.1	353°03.6	·· 03.1	8°12.2	·· 54.4	147°18.2	·· 17.7
4	171°25.9	287°41.3	54.6	8°06.1	03.2	23°14.9	54.4	162°20.6	17.7
5	186°28.3	302°41.0	55.2	23°08.6	03.3	38°17.5	54.5	177°22.9	17.8
6	201°30.8	317°40.8	S17°55.7	38°11.1	N11°03.4	53°20.2	N13°54.6	192°25.3	N01°17.9
7	216°33.3	332°40.5	56.2	53°13.5	03.5	68°22.9	54.7	207°27.6	17.9
8	231°35.7	347°40.2	56.7	68°16.0	03.6	83°25.6	54.8	222°29.9	18.0
9	246°38.2	2°39.9	·· 57.3	83°18.5	·· 03.7	98°28.3	·· 54.9	237°32.3	·· 18.1
10	261°40.7	17°39.6	57.8	98°21.0	03.8	113°31.0	55.0	252°34.6	18.1
11	276°43.1	32°39.3	58.3	113°23.5	03.9	128°33.7	55.0	267°36.9	18.2
12	291°45.6	47°39.0	S17°58.8	128°26.0	N11°04.0	143°36.3	N13°55.1	282°39.3	N01°18.3
13	306°48.1	62°38.7	59.3	143°28.5	04.1	158°39.0	55.2	297°41.6	18.3
14	321°50.5	77°38.5	17°59.9	158°31.0	04.2	173°41.7	55.3	312°44.0	18.4
15	336°53.0	92°38.2	18°00.4	173°33.4	·· 04.3	188°44.4	·· 55.4	327°46.3	·· 18.5
16	351°55.5	107°37.9	00.9	188°35.9	04.4	203°47.1	55.5	342°48.6	18.5
17	6°57.9	122°37.6	01.4	203°38.4	04.5	218°49.8	55.6	357°51.0	18.6
18	22°00.4	137°37.3	S18°01.9	218°40.9	N11°04.6	233°52.5	N13°55.7	12°53.3	N01°18.7
19	37°02.8	152°37.0	02.4	233°43.4	04.7	248°55.1	55.7	27°55.6	18.7
20	52°05.3	167°36.7	03.0	248°45.9	04.8	263°57.8	55.8	42°58.0	18.8
21	67°07.8	182°36.4	·· 03.5	263°48.4	·· 04.9	279°00.5	·· 55.9	58°00.3	·· 18.8
22	82°10.2	197°36.1	04.0	278°50.9	05.1	294°03.2	56.0	73°02.6	18.9
23	97°12.7	212°35.8	04.5	293°53.4	05.2	309°05.9	56.1	88°05.0	19.0
Mer.pass. 16:32		ν -0.3′	d 0.5′	m -4.46	ν 2.5′	d 0.1′	m -0.41	ν 2.7′	d 0.1′ m -2.48	ν 2.3′	d 0.1′ m 0.76

Stars

	SHA	**Dec**
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.2	56°41.5
Diphda	348°45.7	-17°50.4
Achernar	335°18.9	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°54.0	89°23.0
Acamar	315°10.3	-40°12.0
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.7
Suhail	222°44.7	-43°32.5
Miaplacidus	221°37.0	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.0
Denebola	182°23.1	14°25.1
Gienah	175°41.8	-17°41.5
Acrux	172°58.0	-63°14.7
Gacrux	171°49.6	-57°15.7
Alioth	166°11.5	55°48.4
Spica	158°20.5	-11°18.2
Alkaid	152°50.8	49°10.3
Hadar	148°33.7	-60°30.0
Menkent	147°55.7	-36°30.1
Arcturus	145°46.5	19°02.3
Rigil Kent.	139°38.2	-60°56.6
Kochab	137°20.4	74°02.2
Zuben'ubi	136°54.3	-16°09.2
Alphecca	126°02.5	26°37.2
Antares	112°14.1	-26°29.5
Atria	107°07.2	-69°04.3
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.9	51°29.0
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 10 Sun	**SHA**	**Mer.pass**
Venus	118°37.2	08:48
Mars	196°41.1	03:35
Jupiter	211°37.9	02:36
Saturn	351°01.0	17:16

Jan 11 Mon	**SHA**	**Mer.pass**
Venus	117°32.0	08:49
Mars	196°40.3	03:32
Jupiter	211°42.9	02:32
Saturn	350°58.2	17:12

Jan 12 Tue	**SHA**	**Mer.pass**
Venus	116°26.4	08:49
Mars	196°40.2	03:28
Jupiter	211°48.1	02:27
Saturn	350°55.2	17:09

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°11.7	S22°01.3	153°51.6	14.4′	S17°40.4	11.1′	54.2′
1	193°11.5	00.9	168°25.0	14.4′	17°29.3	11.1′	54.2′
2	208°11.2	00.5	182°58.4	14.5′	17°18.2	11.2′	54.2′
3	223°11.0	22°00.2	197°31.8	14.5′	17°07.0	11.2′	54.2′
4	238°10.7	21°59.8	212°05.4	14.6′	16°55.8	11.4′	54.2′
5	253°10.4	59.4	226°38.9	14.6′	16°44.4	11.4′	54.2′
6	268°10.2	S21°59.1	241°12.5	14.7′	S16°33.0	11.4′	54.2′
7	283°09.9	58.7	255°46.2	14.7′	16°21.6	11.6′	54.2′
8	298°09.7	58.3	270°19.9	14.8′	16°10.0	11.6′	54.2′
9	313°09.4	·· 57.9	284°53.7	14.8′	15°58.4	11.7′	54.2′
10	328°09.2	57.6	299°27.5	14.9′	15°46.7	11.7′	54.3′
11	343°08.9	57.2	314°01.3	14.9′	15°35.0	11.8′	54.3′
12	358°08.7	S21°56.8	328°35.2	14.9′	S15°23.2	11.9′	54.3′
13	13°08.4	56.4	343°09.2	15.0′	15°11.3	11.9′	54.3′
14	28°08.2	56.1	357°43.2	15.0′	14°59.4	12.0′	54.3′
15	43°07.9	·· 55.7	12°17.2	15.1′	14°47.4	12.1′	54.3′
16	58°07.7	55.3	26°51.3	15.1′	14°35.3	12.1′	54.3′
17	73°07.4	54.9	41°25.4	15.2′	14°23.2	12.2′	54.3′
18	88°07.1	S21°54.6	55°59.5	15.2′	S14°11.0	12.3′	54.4′
19	103°06.9	54.2	70°33.7	15.2′	13°58.7	12.3′	54.4′
20	118°06.6	53.8	85°08.0	15.3′	13°46.4	12.3′	54.4′
21	133°06.4	·· 53.4	99°42.2	15.3′	13°34.1	12.4′	54.4′
22	148°06.1	53.0	114°16.5	15.3′	13°21.7	12.5′	54.4′
23	163°05.9	52.7	128°50.9	15.4′	13°09.2	12.6′	54.4′
	SD = 16.3′	d = 0.4′	SD = 14.8′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°05.6	S21°52.3	143°25.3	15.4′	S12°56.6	12.5′	54.4′
1	193°05.4	51.9	157°59.7	15.5′	12°44.1	12.7′	54.4′
2	208°05.1	51.5	172°34.2	15.5′	12°31.4	12.7′	54.5′
3	223°04.9	·· 51.1	187°08.6	15.5′	12°18.7	12.7′	54.5′
4	238°04.6	50.7	201°43.2	15.6′	12°06.0	12.8′	54.5′
5	253°04.4	50.4	216°17.7	15.6′	11°53.2	12.9′	54.5′
6	268°04.1	S21°50.0	230°52.3	15.6′	S11°40.3	12.9′	54.5′
7	283°03.9	49.6	245°26.9	15.6′	11°27.4	13.0′	54.5′
8	298°03.6	49.2	260°01.6	15.7′	11°14.4	13.0′	54.5′
9	313°03.4	·· 48.8	274°36.2	15.7′	11°01.4	13.0′	54.6′
10	328°03.1	48.4	289°11.0	15.7′	10°48.4	13.1′	54.6′
11	343°02.9	48.0	303°45.7	15.8′	10°35.3	13.2′	54.6′
12	358°02.6	S21°47.6	318°20.4	15.8′	S10°22.1	13.2′	54.6′
13	13°02.4	47.2	332°55.2	15.8′	10°08.9	13.2′	54.6′
14	28°02.2	46.9	347°30.0	15.8′	09°55.7	13.3′	54.6′
15	43°01.9	·· 46.5	2°04.9	15.9′	09°42.4	13.3′	54.7′
16	58°01.7	46.1	16°39.7	15.9′	09°29.1	13.4′	54.7′
17	73°01.4	45.7	31°14.6	15.9′	09°15.7	13.4′	54.7′
18	88°01.2	S21°45.3	45°49.5	15.9′	S09°02.3	13.4′	54.7′
19	103°00.9	44.9	60°24.4	15.9′	08°48.9	13.5′	54.7′
20	118°00.7	44.5	74°59.4	16.0′	08°35.4	13.6′	54.7′
21	133°00.4	·· 44.1	89°34.3	16.0′	08°21.8	13.5′	54.8′
22	148°00.2	43.7	104°09.3	16.0′	08°08.3	13.6′	54.8′
23	162°59.9	43.3	118°44.3	16.0′	07°54.7	13.7′	54.8′
	SD = 16.3′	d = 0.4′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°59.7	S21°42.9	133°19.3	16.0′	S07°41.0	13.7′	54.8′
1	192°59.5	42.5	147°54.3	16.0′	07°27.3	13.7′	54.8′
2	207°59.2	42.1	162°29.3	16.0′	07°13.6	13.8′	54.8′
3	222°59.0	·· 41.7	177°04.4	16.1′	06°59.8	13.8′	54.9′
4	237°58.7	41.3	191°39.4	16.1′	06°46.0	13.8′	54.9′
5	252°58.5	40.9	206°14.5	16.1′	06°32.2	13.8′	54.9′
6	267°58.2	S21°40.5	220°49.5	16.1′	S06°18.4	13.9′	54.9′
7	282°58.0	40.1	235°24.6	16.1′	06°04.5	14.0′	54.9′
8	297°57.8	39.7	249°59.7	16.1′	05°50.5	13.9′	55.0′
9	312°57.5	·· 39.2	264°34.8	16.1′	05°36.6	14.0′	55.0′
10	327°57.3	38.8	279°09.9	16.1′	05°22.6	14.0′	55.0′
11	342°57.0	38.4	293°45.0	16.1′	05°08.6	14.0′	55.0′
12	357°56.8	S21°38.0	308°20.1	16.1′	S04°54.6	14.1′	55.0′
13	12°56.5	37.6	322°55.2	16.1′	04°40.5	14.1′	55.1′
14	27°56.3	37.2	337°30.3	16.1′	04°26.4	14.1′	55.1′
15	42°56.1	·· 36.8	352°05.4	16.1′	04°12.3	14.2′	55.1′
16	57°55.8	36.4	6°40.5	16.1′	03°58.1	14.2′	55.1′
17	72°55.6	36.0	21°15.6	16.1′	03°43.9	14.1′	55.1′
18	87°55.3	S21°35.6	35°50.7	16.1′	S03°29.8	14.3′	55.2′
19	102°55.1	35.1	50°25.8	16.1′	03°15.5	14.2′	55.2′
20	117°54.9	34.7	65°00.9	16.1′	03°01.3	14.3′	55.2′
21	132°54.6	·· 34.3	79°36.0	16.1′	02°47.0	14.3′	55.2′
22	147°54.4	33.9	94°11.1	16.1′	02°32.7	14.3′	55.2′
23	162°54.1	33.5	108°46.1	16.1′	02°18.4	14.3′	55.3′
	SD = 16.3′	d = 0.4′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:10	10:08	▬	▬	14:08	16:07
N 70°	07:54	09:29	▬	▬	14:47	16:23
68°	07:40	09:02	10:54	13:22	15:14	16:36
66°	07:29	08:42	10:05	14:11	15:35	16:47
64°	07:20	08:25	09:35	14:42	15:51	16:56
62°	07:12	08:11	09:12	15:04	16:05	17:04
60°	07:05	07:59	08:54	15:23	16:17	17:11
N 58°	06:58	07:49	08:38	15:38	16:27	17:18
56°	06:52	07:40	08:26	15:51	16:36	17:24
54°	06:47	07:32	08:14	16:02	16:44	17:29
52°	06:42	07:25	08:04	16:12	16:51	17:34
50°	06:37	07:18	07:55	16:21	16:58	17:39
45°	06:27	07:04	07:37	16:39	17:12	17:49
N 40°	06:18	06:51	07:21	16:55	17:25	17:58
35°	06:09	06:41	07:08	17:08	17:35	18:07
30°	06:01	06:31	06:57	17:19	17:45	18:14
20°	05:46	06:14	06:37	17:38	18:02	18:29
N 10°	05:32	05:58	06:20	17:55	18:18	18:44
0°	05:16	05:42	06:04	18:12	18:34	19:00
S 10°	04:58	05:25	05:48	18:28	18:50	19:17
20°	04:37	05:06	05:30	18:45	19:09	19:38
30°	04:10	04:43	05:10	19:05	19:32	20:05
35°	03:53	04:29	04:58	19:17	19:46	20:22
40°	03:32	04:12	04:44	19:31	20:03	20:43
45°	03:04	03:51	04:28	19:48	20:24	21:11
S 50°	02:25	03:25	04:07	20:08	20:50	21:50
52°	02:02	03:11	03:57	20:18	21:03	22:11
54°	01:32	02:56	03:46	20:28	21:19	22:41
56°	00:29	02:37	03:34	20:41	21:37	23:37
58°	////	02:13	03:19	20:55	22:01	////
S 60°	////	01:40	03:02	21:13	22:33	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	11:59	11:07	10:31	16:42	19:03	21:06
N 70°	11:25	10:50	10:24	17:15	19:18	21:10
68°	11:00	10:37	10:18	17:38	19:29	21:14
66°	10:40	10:26	10:13	17:56	19:38	21:17
64°	10:25	10:16	10:09	18:11	19:46	21:19
62°	10:11	10:08	10:05	18:23	19:53	21:21
60°	10:00	10:01	10:02	18:33	19:58	21:23
N 58°	09:50	09:55	09:59	18:42	20:04	21:24
56°	09:42	09:50	09:56	18:50	20:08	21:26
54°	09:34	09:45	09:54	18:57	20:12	21:27
52°	09:27	09:40	09:52	19:03	20:16	21:28
50°	09:21	09:36	09:50	19:08	20:19	21:29
45°	09:08	09:27	09:45	19:20	20:26	21:31
N 40°	08:56	09:20	09:42	19:30	20:32	21:33
35°	08:47	09:14	09:39	19:39	20:37	21:35
30°	08:38	09:08	09:36	19:46	20:41	21:36
20°	08:24	08:58	09:31	19:59	20:49	21:38
N 10°	08:11	08:50	09:27	20:09	20:55	21:40
0°	07:59	08:41	09:23	20:20	21:01	21:42
S 10°	07:47	08:33	09:19	20:30	21:07	21:44
20°	07:34	08:25	09:14	20:40	21:14	21:46
30°	07:19	08:15	09:09	20:53	21:21	21:48
35°	07:10	08:09	09:07	21:00	21:25	21:50
40°	07:00	08:02	09:03	21:08	21:30	21:51
45°	06:49	07:54	09:00	21:17	21:35	21:53
S 50°	06:34	07:45	08:55	21:28	21:42	21:55
52°	06:28	07:41	08:53	21:33	21:45	21:56
54°	06:20	07:36	08:51	21:38	21:48	21:57
56°	06:12	07:31	08:48	21:45	21:52	21:58
58°	06:03	07:25	08:45	21:51	21:56	21:59
S 60°	05:52	07:18	08:42	21:59	22:00	22:00

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 4-15%
10	07:13	07:25	12:07	14:09	01:48	
11	07:37	07:49	12:08	14:51	02:31	
12	08:01	08:13	12:08	15:33	03:12	

January 13, 14, 15 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	112°15.2	227°35.5	S18°05.0	308°55.9	N11°05.3	324°08.6	N13°56.2	103°07.3	N01°19.0
1	127°17.6	242°35.2	05.5	323°58.4	05.4	339°11.3	56.3	118°09.7	19.1
2	142°20.1	257°34.9	06.1	339°00.9	05.5	354°14.0	56.4	133°12.0	19.2
3	157°22.6	272°34.6	·· 06.6	354°03.5	·· 05.6	9°16.7	·· 56.4	148°14.3	·· 19.2
4	172°25.0	287°34.3	07.1	9°06.0	05.7	24°19.4	56.5	163°16.7	19.3
5	187°27.5	302°34.0	07.6	24°08.5	05.8	39°22.0	56.6	178°19.0	19.4
6	202°30.0	317°33.7	S18°08.1	39°11.0	N11°06.0	54°24.7	N13°56.7	193°21.3	N01°19.4
7	217°32.4	332°33.4	08.6	54°13.5	06.1	69°27.4	56.8	208°23.7	19.5
8	232°34.9	347°33.1	09.1	69°16.0	06.2	84°30.1	56.9	223°26.0	19.6
9	247°37.3	2°32.8	·· 09.6	84°18.5	·· 06.3	99°32.8	·· 57.0	238°28.3	·· 19.6
10	262°39.8	17°32.5	10.2	99°21.0	06.4	114°35.5	57.1	253°30.7	19.7
11	277°42.3	32°32.2	10.7	114°23.6	06.5	129°38.2	57.2	268°33.0	19.8
12	292°44.7	47°31.9	S18°11.2	129°26.1	N11°06.6	144°40.9	N13°57.2	283°35.3	N01°19.8
13	307°47.2	62°31.6	11.7	144°28.6	06.8	159°43.6	57.3	298°37.7	19.9
14	322°49.7	77°31.3	12.2	159°31.1	06.9	174°46.3	57.4	313°40.0	20.0
15	337°52.1	92°31.0	·· 12.7	174°33.6	·· 07.0	189°49.0	·· 57.5	328°42.3	·· 20.0
16	352°54.6	107°30.7	13.2	189°36.2	07.1	204°51.7	57.6	343°44.7	20.1
17	7°57.1	122°30.4	13.7	204°38.7	07.2	219°54.3	57.7	358°47.0	20.2
18	22°59.5	137°30.0	S18°14.2	219°41.2	N11°07.4	234°57.0	N13°57.8	13°49.3	N01°20.2
19	38°02.0	152°29.7	14.7	234°43.8	07.5	249°59.7	57.9	28°51.7	20.3
20	53°04.4	167°29.4	15.2	249°46.3	07.6	265°02.4	58.0	43°54.0	20.4
21	68°06.9	182°29.1	·· 15.7	264°48.8	·· 07.7	280°05.1	·· 58.0	58°56.3	·· 20.4
22	83°09.4	197°28.8	16.2	279°51.3	07.8	295°07.8	58.1	73°58.7	20.5
23	98°11.8	212°28.5	16.7	294°53.9	08.0	310°10.5	58.2	89°01.0	20.6
Mer.pass. 16:28		ν -0.3′	d 0.5′	ν 2.5′	d 0.1′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.45		m -0.43		m -2.48		m 0.76	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	113°14.3	227°28.2	S18°17.2	309°56.4	N11°08.1	325°13.2	N13°58.3	104°03.3	N01°20.6
1	128°16.8	242°27.8	17.8	324°59.0	08.2	340°15.9	58.4	119°05.7	20.7
2	143°19.2	257°27.5	18.3	340°01.5	08.3	355°18.6	58.5	134°08.0	20.8
3	158°21.7	272°27.2	·· 18.8	355°04.0	·· 08.4	10°21.3	·· 58.6	149°10.3	·· 20.8
4	173°24.2	287°26.9	19.3	10°06.6	08.6	25°24.0	58.7	164°12.6	20.9
5	188°26.6	302°26.6	19.8	25°09.1	08.7	40°26.7	58.8	179°15.0	21.0
6	203°29.1	317°26.2	S18°20.3	40°11.6	N11°08.8	55°29.4	N13°58.9	194°17.3	N01°21.0
7	218°31.6	332°25.9	20.8	55°14.2	08.9	70°32.1	58.9	209°19.6	21.1
8	233°34.0	347°25.6	21.3	70°16.7	09.1	85°34.8	59.0	224°22.0	21.2
9	248°36.5	2°25.3	·· 21.8	85°19.3	·· 09.2	100°37.5	·· 59.1	239°24.3	·· 21.2
10	263°38.9	17°25.0	22.3	100°21.8	09.3	115°40.2	59.2	254°26.6	21.3
11	278°41.4	32°24.6	22.8	115°24.4	09.5	130°42.9	59.3	269°29.0	21.4
12	293°43.9	47°24.3	S18°23.3	130°26.9	N11°09.6	145°45.6	N13°59.4	284°31.3	N01°21.4
13	308°46.3	62°24.0	23.7	145°29.5	09.7	160°48.3	59.5	299°33.6	21.5
14	323°48.8	77°23.7	24.2	160°32.0	09.8	175°51.0	59.6	314°35.9	21.6
15	338°51.3	92°23.3	·· 24.7	175°34.6	·· 10.0	190°53.7	·· 59.7	329°38.3	·· 21.7
16	353°53.7	107°23.0	25.2	190°37.1	10.1	205°56.4	59.8	344°40.6	21.7
17	8°56.2	122°22.7	25.7	205°39.7	10.2	220°59.1	59.8	359°42.9	21.8
18	23°58.7	137°22.4	S18°26.2	220°42.3	N11°10.4	236°01.8	N13°59.9	14°45.3	N01°21.9
19	39°01.1	152°22.0	26.7	235°44.8	10.5	251°04.5	14°00.0	29°47.6	21.9
20	54°03.6	167°21.7	27.2	250°47.4	10.6	266°07.2	00.1	44°49.9	22.0
21	69°06.1	182°21.4	·· 27.7	265°49.9	·· 10.8	281°09.9	·· 00.2	59°52.2	·· 22.1
22	84°08.5	197°21.0	28.2	280°52.5	10.9	296°12.6	00.3	74°54.6	22.1
23	99°11.0	212°20.7	28.7	295°55.1	11.0	311°15.3	00.4	89°56.9	22.2
Mer.pass. 16:24		ν -0.3′	d 0.5′	ν 2.5′	d 0.1′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.44		m -0.45		m -2.49		m 0.77	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	114°13.4	227°20.4	S18°29.2	310°57.6	N11°11.2	326°18.0	N14°00.5	104°59.2	N01°22.3
1	129°15.9	242°20.0	29.7	326°00.2	11.3	341°20.7	00.6	120°01.6	22.3
2	144°18.4	257°19.7	30.2	341°02.8	11.4	356°23.4	00.7	135°03.9	22.4
3	159°20.8	272°19.4	·· 30.7	356°05.3	·· 11.6	11°26.1	·· 00.8	150°06.2	·· 22.5
4	174°23.3	287°19.0	31.1	11°07.9	11.7	26°28.8	00.9	165°08.5	22.5
5	189°25.8	302°18.7	31.6	26°10.5	11.8	41°31.5	00.9	180°10.9	22.6
6	204°28.2	317°18.3	S18°32.1	41°13.1	N11°12.0	56°34.2	N14°01.0	195°13.2	N01°22.7
7	219°30.7	332°18.0	32.6	56°15.6	12.1	71°36.9	01.1	210°15.5	22.7
8	234°33.2	347°17.7	33.1	71°18.2	12.3	86°39.6	01.2	225°17.9	22.8
9	249°35.6	2°17.3	·· 33.6	86°20.8	·· 12.4	101°42.3	·· 01.3	240°20.2	·· 22.9
10	264°38.1	17°17.0	34.1	101°23.4	12.5	116°45.0	01.4	255°22.5	23.0
11	279°40.5	32°16.6	34.5	116°25.9	12.7	131°47.7	01.5	270°24.8	23.0
12	294°43.0	47°16.3	S18°35.0	131°28.5	N11°12.8	146°50.4	N14°01.6	285°27.2	N01°23.1
13	309°45.5	62°16.0	35.5	146°31.1	13.0	161°53.1	01.7	300°29.5	23.2
14	324°47.9	77°15.6	36.0	161°33.7	13.1	176°55.8	01.8	315°31.8	23.2
15	339°50.4	92°15.3	·· 36.5	176°36.3	·· 13.2	191°58.5	·· 01.9	330°34.1	·· 23.3
16	354°52.9	107°14.9	37.0	191°38.9	13.4	207°01.2	02.0	345°36.5	23.4
17	9°55.3	122°14.6	37.4	206°41.4	13.5	222°03.9	02.1	0°38.8	23.4
18	24°57.8	137°14.2	S18°37.9	221°44.0	N11°13.7	237°06.6	N14°02.1	15°41.1	N01°23.5
19	40°00.3	152°13.9	38.4	236°46.6	13.8	252°09.3	02.2	30°43.4	23.6
20	55°02.7	167°13.5	38.9	251°49.2	14.0	267°12.0	02.3	45°45.8	23.7
21	70°05.2	182°13.2	·· 39.4	266°51.8	·· 14.1	282°14.7	·· 02.4	60°48.1	·· 23.7
22	85°07.7	197°12.8	39.9	281°54.4	14.2	297°17.4	02.5	75°50.4	23.8
23	100°10.1	212°12.5	40.3	296°57.0	14.4	312°20.2	02.6	90°52.7	23.9
Mer.pass. 16:20		ν -0.3′	d 0.5′	ν 2.6′	d 0.1′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.43		m -0.48		m -2.49		m 0.77	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.2	56°41.5
Diphda	348°45.7	-17°50.4
Achernar	335°18.9	-57°06.2
Hamal	327°49.2	23°35.5
Polaris	312°55.4	89°23.0
Acamar	315°10.3	-40°12.0
Menkar	314°04.2	4°11.8
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.7
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.0	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.0
Denebola	182°23.1	14°25.1
Gienah	175°41.7	-17°41.5
Acrux	172°58.0	-63°14.7
Gacrux	171°49.6	-57°15.7
Alioth	166°11.4	55°48.4
Spica	158°20.5	-11°18.2
Alkaid	152°50.7	49°10.3
Hadar	148°33.7	-60°30.0
Menkent	147°55.7	-36°30.1
Arcturus	145°46.5	19°02.3
Rigil Kent.	139°38.2	-60°56.6
Kochab	137°20.3	74°02.2
Zuben'ubi	136°54.3	-16°09.2
Alphecca	126°02.5	26°37.2
Antares	112°14.0	-26°29.5
Atria	107°07.2	-69°04.3
Sabik	102°01.1	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.9	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.5	38°48.4
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 13 Wed	SHA	Mer.pass
Venus	115°20.4	08:50
Mars	196°40.8	03:24
Jupiter	211°53.4	02:23
Saturn	350°52.2	17:05

Jan 14 Thu	SHA	Mer.pass
Venus	114°13.9	08:50
Mars	196°42.1	03:20
Jupiter	211°58.9	02:19
Saturn	350°49.0	17:01

Jan 15 Fri	SHA	Mer.pass
Venus	113°06.9	08:51
Mars	196°44.2	03:16
Jupiter	212°04.5	02:14
Saturn	350°45.8	16:57

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°53.9	S21°33.1	123°21.2	16.0′	S02°04.1	14.3′	55.3′
1	192°53.7	32.6	137°56.2	16.0′	01°49.8	14.4′	55.3′
2	207°53.4	32.2	152°31.2	16.0′	01°35.4	14.4′	55.3′
3	222°53.2	·· 31.8	167°06.3	16.0′	01°21.0	14.4′	55.4′
4	237°53.0	31.4	181°41.2	16.0′	01°06.6	14.4′	55.4′
5	252°52.7	31.0	196°16.2	16.0′	00°52.2	14.4′	55.4′
6	267°52.5	S21°30.5	210°51.2	15.9′	S00°37.8	14.4′	55.4′
7	282°52.3	30.1	225°26.1	15.9′	00°23.4	14.5′	55.5′
8	297°52.0	29.7	240°01.1	15.9′	S00°08.9	14.4′	55.5′
9	312°51.8	·· 29.3	254°36.0	15.9′	N00°05.5	14.5′	55.5′
10	327°51.5	28.8	269°10.8	15.9′	00°20.0	14.5′	55.5′
11	342°51.3	28.4	283°45.7	15.8′	00°34.5	14.5′	55.6′
12	357°51.1	S21°28.0	298°20.5	15.8′	N00°49.0	14.5′	55.6′
13	12°50.8	27.6	312°55.3	15.8′	01°03.5	14.5′	55.6′
14	27°50.6	27.1	327°30.1	15.7′	01°18.0	14.5′	55.6′
15	42°50.4	·· 26.7	342°04.9	15.7′	01°32.5	14.6′	55.7′
16	57°50.1	26.3	356°39.6	15.7′	01°47.1	14.5′	55.7′
17	72°49.9	25.9	11°14.3	15.7′	02°01.6	14.5′	55.7′
18	87°49.7	S21°25.4	25°48.9	15.6′	N02°16.1	14.6′	55.7′
19	102°49.4	25.0	40°23.5	15.6′	02°30.7	14.5′	55.8′
20	117°49.2	24.6	54°58.1	15.6′	02°45.2	14.6′	55.8′
21	132°49.0	·· 24.1	69°32.7	15.5′	02°59.8	14.5′	55.8′
22	147°48.7	23.7	84°07.2	15.5′	03°14.3	14.5′	55.8′
23	162°48.5	23.3	98°41.7	15.4′	03°28.8	14.6′	55.9′
	SD = 16.3′	d = 0.4′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°48.3	S21°22.8	113°16.1	15.4′	N03°43.4	14.5′	55.9′
1	192°48.1	22.4	127°50.5	15.4′	03°57.9	14.6′	55.9′
2	207°47.8	22.0	142°24.8	15.3′	04°12.5	14.5′	55.9′
3	222°47.6	·· 21.5	156°59.1	15.3′	04°27.0	14.6′	56.0′
4	237°47.4	21.1	171°33.4	15.2′	04°41.6	14.5′	56.0′
5	252°47.1	20.6	186°07.6	15.2′	04°56.1	14.5′	56.0′
6	267°46.9	S21°20.2	200°41.8	15.1′	N05°10.6	14.5′	56.1′
7	282°46.7	19.8	215°15.9	15.1′	05°25.1	14.5′	56.1′
8	297°46.4	19.3	229°50.0	15.0′	05°39.6	14.5′	56.1′
9	312°46.2	·· 18.9	244°24.0	15.0′	05°54.1	14.5′	56.1′
10	327°46.0	18.4	258°58.0	14.9′	06°08.6	14.5′	56.2′
11	342°45.8	18.0	273°31.9	14.9′	06°23.1	14.5′	56.2′
12	357°45.5	S21°17.6	288°05.7	14.8′	N06°37.6	14.4′	56.2′
13	12°45.3	17.1	302°39.5	14.7′	06°52.0	14.5′	56.3′
14	27°45.1	16.7	317°13.2	14.7′	07°06.5	14.4′	56.3′
15	42°44.9	·· 16.2	331°46.9	14.6′	07°20.9	14.4′	56.3′
16	57°44.6	15.8	346°20.5	14.6′	07°35.3	14.4′	56.4′
17	72°44.4	15.3	0°54.1	14.5′	07°49.7	14.4′	56.4′
18	87°44.2	S21°14.9	15°27.6	14.4′	N08°04.1	14.4′	56.4′
19	102°43.9	14.4	30°01.0	14.4′	08°18.5	14.3′	56.4′
20	117°43.7	14.0	44°34.4	14.3′	08°32.8	14.3′	56.5′
21	132°43.5	·· 13.5	59°07.7	14.2′	08°47.1	14.3′	56.5′
22	147°43.3	13.1	73°40.9	14.2′	09°01.4	14.3′	56.5′
23	162°43.0	12.6	88°14.0	14.1′	09°15.7	14.2′	56.6′
	SD = 16.3′	d = 0.4′	SD = 15.2′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°42.8	S21°12.2	102°47.1	14.0′	N09°29.9	14.3′	56.6′
1	192°42.6	11.7	117°20.1	13.9′	09°44.2	14.2′	56.6′
2	207°42.4	11.3	131°53.1	13.9′	09°58.4	14.1′	56.7′
3	222°42.2	·· 10.8	146°25.9	13.8′	10°12.5	14.2′	56.7′
4	237°41.9	10.4	160°58.7	13.7′	10°26.7	14.1′	56.7′
5	252°41.7	09.9	175°31.4	13.6′	10°40.8	14.1′	56.8′
6	267°41.5	S21°09.4	190°04.0	13.5′	N10°54.9	14.0′	56.8′
7	282°41.3	09.0	204°36.6	13.5′	11°08.9	14.0′	56.8′
8	297°41.0	08.5	219°09.0	13.4′	11°22.9	14.0′	56.9′
9	312°40.8	·· 08.1	233°41.4	13.3′	11°36.9	13.9′	56.9′
10	327°40.6	07.6	248°13.7	13.2′	11°50.8	14.0′	56.9′
11	342°40.4	07.2	262°45.9	13.1′	12°04.8	13.8′	57.0′
12	357°40.2	S21°06.7	277°18.0	13.0′	N12°18.6	13.9′	57.0′
13	12°39.9	06.2	291°50.0	12.9′	12°32.5	13.7′	57.0′
14	27°39.7	05.8	306°22.0	12.8′	12°46.2	13.8′	57.1′
15	42°39.5	·· 05.3	320°53.8	12.7′	13°00.0	13.7′	57.1′
16	57°39.3	04.9	335°25.6	12.7′	13°13.7	13.6′	57.1′
17	72°39.1	04.4	349°57.2	12.6′	13°27.3	13.7′	57.2′
18	87°38.8	S21°03.9	4°28.8	12.5′	N13°41.0	13.5′	57.2′
19	102°38.6	03.5	19°00.2	12.4′	13°54.5	13.5′	57.2′
20	117°38.4	03.0	33°31.6	12.3′	14°08.0	13.5′	57.3′
21	132°38.2	·· 02.5	48°02.9	12.2′	14°21.5	13.4′	57.3′
22	147°38.0	02.1	62°34.0	12.1′	14°34.9	13.4′	57.3′
23	162°37.7	01.6	77°05.1	12.0′	14°48.3	13.3′	57.4′
	SD = 16.3′	d = 0.5′	SD = 15.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:03	09:56	▬	▬	14:22	16:15
N 70°	07:48	09:21	▬	▬	14:57	16:31
68°	07:36	08:56	10:39	13:40	15:23	16:43
66°	07:26	08:37	09:57	14:22	15:42	16:53
64°	07:17	08:21	09:28	14:50	15:58	17:02
62°	07:09	08:08	09:07	15:12	16:11	17:10
60°	07:02	07:56	08:49	15:29	16:22	17:16
N 58°	06:56	07:46	08:35	15:43	16:32	17:23
56°	06:50	07:38	08:23	15:56	16:41	17:28
54°	06:45	07:30	08:12	16:07	16:48	17:33
52°	06:40	07:23	08:02	16:16	16:55	17:38
50°	06:36	07:17	07:54	16:25	17:02	17:42
45°	06:26	07:03	07:35	16:43	17:16	17:52
N 40°	06:17	06:51	07:20	16:58	17:28	18:01
35°	06:09	06:40	07:08	17:10	17:38	18:09
30°	06:01	06:31	06:57	17:21	17:47	18:17
20°	05:47	06:14	06:38	17:40	18:04	18:31
N 10°	05:33	05:59	06:21	17:57	18:19	18:45
0°	05:17	05:43	06:05	18:13	18:35	19:01
S 10°	05:00	05:27	05:49	18:28	18:51	19:18
20°	04:40	05:08	05:32	18:45	19:10	19:38
30°	04:13	04:46	05:12	19:05	19:32	20:04
35°	03:56	04:32	05:01	19:17	19:46	20:21
40°	03:36	04:16	04:47	19:30	20:02	20:41
45°	03:09	03:55	04:31	19:46	20:22	21:08
S 50°	02:31	03:30	04:11	20:06	20:47	21:45
52°	02:10	03:17	04:02	20:15	21:00	22:06
54°	01:42	03:02	03:51	20:26	21:15	22:33
56°	00:55	02:44	03:39	20:38	21:33	23:17
58°	////	02:21	03:25	20:52	21:55	////
S 60°	////	01:51	03:08	21:08	22:24	////

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	10:01	09:29	08:51	23:08	·· ··	01:18
N 70°	10:01	09:37	09:09	23:03	·· ··	01:02
68°	10:01	09:44	09:24	22:59	·· ··	00:49
66°	10:01	09:49	09:36	22:55	·· ··	00:39
64°	10:01	09:54	09:47	22:52	·· ··	00:30
62°	10:02	09:58	09:55	22:50	·· ··	00:23
60°	10:02	10:02	10:03	22:48	·· ··	00:16
N 58°	10:02	10:05	10:10	22:46	·· ··	00:11
56°	10:02	10:08	10:16	22:44	·· ··	00:06
54°	10:02	10:11	10:21	22:43	·· ··	00:01
52°	10:02	10:13	10:26	22:41	23:57	·· ··
50°	10:02	10:16	10:30	22:40	23:54	·· ··
45°	10:03	10:20	10:40	22:38	23:46	·· ··
N 40°	10:03	10:24	10:48	22:35	23:40	·· ··
35°	10:03	10:28	10:55	22:33	23:34	·· ··
30°	10:03	10:31	11:01	22:32	23:29	·· ··
20°	10:03	10:36	11:12	22:29	23:21	·· ··
N 10°	10:04	10:41	11:21	22:26	23:14	·· ··
0°	10:04	10:46	11:30	22:24	23:07	23:53
S 10°	10:04	10:51	11:39	22:21	23:00	23:42
20°	10:04	10:56	11:49	22:19	22:53	23:30
30°	10:05	11:01	12:00	22:16	22:45	23:16
35°	10:05	11:05	12:07	22:14	22:40	23:09
40°	10:05	11:08	12:14	22:12	22:35	23:00
45°	10:05	11:13	12:23	22:10	22:28	22:49
S 50°	10:06	11:18	12:34	22:07	22:21	22:37
52°	10:06	11:21	12:39	22:06	22:18	22:31
54°	10:06	11:23	12:44	22:05	22:14	22:25
56°	10:06	11:26	12:50	22:03	22:10	22:18
58°	10:07	11:30	12:57	22:02	22:05	22:10
S 60°	10:07	11:33	13:05	22:00	22:00	22:01

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 22-41%
13	08:24	08:36	12:09	16:14	03:53	
14	08:47	08:58	12:09	16:56	04:35	
15	09:09	09:19	12:09	17:41	05:18	

January 16, 17, 18 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	115°12.6	227°12.1	S18°40.8	311°59.6	N11°14.5	327°22.9	N14°02.7	105°55.1	N01°23.9
1	130°15.0	242°11.8	41.3	327°02.2	14.7	342°25.6	02.8	120°57.4	24.0
2	145°17.5	257°11.4	41.8	342°04.8	14.8	357°28.3	02.9	135°59.7	24.1
3	160°20.0	272°11.1	·· 42.2	357°07.4	·· 15.0	12°31.0	·· 03.0	151°02.0	·· 24.1
4	175°22.4	287°10.7	42.7	12°10.0	15.1	27°33.7	03.1	166°04.4	24.2
5	190°24.9	302°10.4	43.2	27°12.6	15.3	42°36.4	03.2	181°06.7	24.3
6	205°27.4	317°10.0	S18°43.7	42°15.2	N11°15.4	57°39.1	N14°03.3	196°09.0	N01°24.4
7	220°29.8	332°09.7	44.1	57°17.8	15.6	72°41.8	03.4	211°11.3	24.4
8	235°32.3	347°09.3	44.6	72°20.4	15.7	87°44.5	03.5	226°13.6	24.5
9	250°34.8	2°08.9	·· 45.1	87°23.0	·· 15.9	102°47.2	·· 03.5	241°16.0	·· 24.6
10	265°37.2	17°08.6	45.6	102°25.6	16.0	117°49.9	03.6	256°18.3	24.6
11	280°39.7	32°08.2	46.0	117°28.3	16.2	132°52.6	03.7	271°20.6	24.7
12	295°42.2	47°07.9	S18°46.5	132°30.9	N11°16.3	147°55.4	N14°03.8	286°22.9	N01°24.8
13	310°44.6	62°07.5	47.0	147°33.5	16.5	162°58.1	03.9	301°25.3	24.8
14	325°47.1	77°07.1	47.4	162°36.1	16.6	178°00.8	04.0	316°27.6	24.9
15	340°49.5	92°06.8	·· 47.9	177°38.7	·· 16.8	193°03.5	·· 04.1	331°29.9	·· 25.0
16	355°52.0	107°06.4	48.4	192°41.3	16.9	208°06.2	04.2	346°32.2	25.1
17	10°54.5	122°06.1	48.9	207°43.9	17.1	223°08.9	04.3	1°34.6	25.1
18	25°56.9	137°05.7	S18°49.3	222°46.6	N11°17.3	238°11.6	N14°04.4	16°36.9	N01°25.2
19	40°59.4	152°05.3	49.8	237°49.2	17.4	253°14.3	04.5	31°39.2	25.3
20	56°01.9	167°05.0	50.3	252°51.8	17.6	268°17.0	04.6	46°41.5	25.3
21	71°04.3	182°04.6	·· 50.7	267°54.4	·· 17.7	283°19.8	·· 04.7	61°43.8	·· 25.4
22	86°06.8	197°04.2	51.2	282°57.1	17.9	298°22.5	04.8	76°46.2	25.5
23	101°09.3	212°03.9	51.7	297°59.7	18.0	313°25.2	04.9	91°48.5	25.6
Mer.pass. 16:16		ν -0.4′	d 0.5′	ν 2.6′	d 0.1′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.42		m -0.51		m -2.50		m 0.77	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	116°11.7	227°03.5	S18°52.1	313°02.3	N11°18.2	328°27.9	N14°05.0	106°50.8	N01°25.6
1	131°14.2	242°03.1	52.6	328°04.9	18.4	343°30.6	05.1	121°53.1	25.7
2	146°16.6	257°02.8	53.0	343°07.6	18.5	358°33.3	05.2	136°55.4	25.8
3	161°19.1	272°02.4	·· 53.5	358°10.2	·· 18.7	13°36.0	·· 05.3	151°57.8	·· 25.8
4	176°21.6	287°02.0	54.0	13°12.8	18.8	28°38.7	05.3	167°00.1	25.9
5	191°24.0	302°01.6	54.4	28°15.5	19.0	43°41.5	05.4	182°02.4	26.0
6	206°26.5	317°01.3	S18°54.9	43°18.1	N11°19.2	58°44.2	N14°05.5	197°04.7	N01°26.1
7	221°29.0	332°00.9	55.4	58°20.8	19.3	73°46.9	05.6	212°07.0	26.1
8	236°31.4	347°00.5	55.8	73°23.4	19.5	88°49.6	05.7	227°09.4	26.2
9	251°33.9	2°00.2	·· 56.3	88°26.0	·· 19.6	103°52.3	·· 05.8	242°11.7	·· 26.3
10	266°36.4	16°59.8	56.7	103°28.7	19.8	118°55.0	05.9	257°14.0	26.3
11	281°38.8	31°59.4	57.2	118°31.3	20.0	133°57.7	06.0	272°16.3	26.4
12	296°41.3	46°59.0	S18°57.7	133°34.0	N11°20.1	149°00.5	N14°06.1	287°18.6	N01°26.5
13	311°43.8	61°58.6	58.1	148°36.6	20.3	164°03.2	06.2	302°21.0	26.6
14	326°46.2	76°58.3	58.6	163°39.3	20.5	179°05.9	06.3	317°23.3	26.6
15	341°48.7	91°57.9	·· 59.0	178°41.9	·· 20.6	194°08.6	·· 06.4	332°25.6	·· 26.7
16	356°51.1	106°57.5	59.5	193°44.5	20.8	209°11.3	06.5	347°27.9	26.8
17	11°53.6	121°57.1	18°59.9	208°47.2	21.0	224°14.0	06.6	2°30.2	26.9
18	26°56.1	136°56.7	S19°00.4	223°49.9	N11°21.1	239°16.7	N14°06.7	17°32.6	N01°26.9
19	41°58.5	151°56.4	00.8	238°52.5	21.3	254°19.5	06.8	32°34.9	27.0
20	57°01.0	166°56.0	01.3	253°55.2	21.5	269°22.2	06.9	47°37.2	27.1
21	72°03.5	181°55.6	·· 01.7	268°57.8	·· 21.6	284°24.9	·· 07.0	62°39.5	·· 27.1
22	87°05.9	196°55.2	02.2	284°00.5	21.8	299°27.6	07.1	77°41.8	27.2
23	102°08.4	211°54.8	02.6	299°03.1	22.0	314°30.3	07.2	92°44.1	27.3
Mer.pass. 16:13		ν -0.4′	d 0.5′	ν 2.6′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.41		m -0.53		m -2.50		m 0.77	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	117°10.9	226°54.4	S19°03.1	314°05.8	N11°22.1	329°33.1	N14°07.3	107°46.5	N01°27.4
1	132°13.3	241°54.1	03.5	329°08.5	22.3	344°35.8	07.4	122°48.8	27.4
2	147°15.8	256°53.7	04.0	344°11.1	22.5	359°38.5	07.5	137°51.1	27.5
3	162°18.3	271°53.3	·· 04.4	359°13.8	·· 22.6	14°41.2	·· 07.6	152°53.4	·· 27.6
4	177°20.7	286°52.9	04.9	14°16.4	22.8	29°43.9	07.6	167°55.7	27.7
5	192°23.2	301°52.5	05.3	29°19.1	23.0	44°46.6	07.7	182°58.0	27.7
6	207°25.6	316°52.1	S19°05.8	44°21.8	N11°23.2	59°49.4	N14°07.8	198°00.4	N01°27.8
7	222°28.1	331°51.7	06.2	59°24.4	23.3	74°52.1	07.9	213°02.7	27.9
8	237°30.6	346°51.3	06.7	74°27.1	23.5	89°54.8	08.0	228°05.0	27.9
9	252°33.0	1°51.0	·· 07.1	89°29.8	·· 23.7	104°57.5	·· 08.1	243°07.3	·· 28.0
10	267°35.5	16°50.6	07.6	104°32.5	23.9	120°00.2	08.2	258°09.6	28.1
11	282°38.0	31°50.2	08.0	119°35.1	24.0	135°03.0	08.3	273°11.9	28.2
12	297°40.4	46°49.8	S19°08.5	134°37.8	N11°24.2	150°05.7	N14°08.4	288°14.3	N01°28.2
13	312°42.9	61°49.4	08.9	149°40.5	24.4	165°08.4	08.5	303°16.6	28.3
14	327°45.4	76°49.0	09.3	164°43.2	24.6	180°11.1	08.6	318°18.9	28.4
15	342°47.8	91°48.6	·· 09.8	179°45.8	·· 24.7	195°13.8	·· 08.7	333°21.2	·· 28.5
16	357°50.3	106°48.2	10.2	194°48.5	24.9	210°16.6	08.8	348°23.5	28.5
17	12°52.8	121°47.8	10.7	209°51.2	25.1	225°19.3	08.9	3°25.8	28.6
18	27°55.2	136°47.4	S19°11.1	224°53.9	N11°25.3	240°22.0	N14°09.0	18°28.1	N01°28.7
19	42°57.7	151°47.0	11.5	239°56.6	25.5	255°24.7	09.1	33°30.5	28.8
20	58°00.1	166°46.6	12.0	254°59.3	25.6	270°27.4	09.2	48°32.8	28.8
21	73°02.6	181°46.2	·· 12.4	270°02.0	·· 25.8	285°30.2	·· 09.3	63°35.1	·· 28.9
22	88°05.1	196°45.8	12.9	285°04.6	26.0	300°32.9	09.4	78°37.4	29.0
23	103°07.5	211°45.4	13.3	300°07.3	26.2	315°35.6	09.5	93°39.7	29.1
Mer.pass. 16:09		ν -0.4′	d 0.5′	ν 2.7′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.40		m -0.56		m -2.50		m 0.77	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.2	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.0	-57°06.2
Hamal	327°49.2	23°35.5
Polaris	312°56.6	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.8
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.0	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.0
Denebola	182°23.1	14°25.0
Gienah	175°41.7	-17°41.6
Acrux	172°58.0	-63°14.7
Gacrux	171°49.6	-57°15.7
Alioth	166°11.4	55°48.4
Spica	158°20.5	-11°18.2
Alkaid	152°50.7	49°10.3
Hadar	148°33.7	-60°30.0
Menkent	147°55.7	-36°30.1
Arcturus	145°46.4	19°02.3
Rigil Kent.	139°38.1	-60°56.6
Kochab	137°20.3	74°02.2
Zuben'ubi	136°54.3	-16°09.3
Alphecca	126°02.5	26°37.2
Antares	112°14.0	-26°29.5
Atria	107°07.2	-69°04.3
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.9	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.5	38°48.4
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 16 Sat	SHA	Mer.pass
Venus	111°59.6	08:51
Mars	196°47.0	03:11
Jupiter	212°10.3	02:10
Saturn	350°42.5	16:54

Jan 17 Sun	SHA	Mer.pass
Venus	110°51.8	08:52
Mars	196°50.6	03:07
Jupiter	212°16.2	02:06
Saturn	350°39.1	16:50

Jan 18 Mon	SHA	Mer.pass
Venus	109°43.6	08:53
Mars	196°54.9	03:03
Jupiter	212°22.2	02:01
Saturn	350°35.6	16:46

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	177°37.5	S21°01.1	91°36.0	11.9′	N15°01.6	13.2′	57.4′
1	192°37.3	00.7	106°06.9	11.7′	15°14.8	13.2′	57.5′
2	207°37.1	21°00.2	120°37.6	11.6′	15°28.0	13.2′	57.5′
3	222°36.9	20°59.7	135°08.3	11.5′	15°41.2	13.0′	57.5′
4	237°36.7	59.2	149°38.8	11.4′	15°54.2	13.0′	57.6′
5	252°36.5	58.8	164°09.2	11.3′	16°07.2	13.0′	57.6′
6	267°36.2	S20°58.3	178°39.5	11.2′	N16°20.2	12.9′	57.6′
7	282°36.0	57.8	193°09.7	11.1′	16°33.1	12.8′	57.7′
8	297°35.8	57.3	207°39.8	11.0′	16°45.9	12.7′	57.7′
9	312°35.6	·· 56.9	222°09.8	10.9′	16°58.6	12.7′	57.7′
10	327°35.4	56.4	236°39.7	10.7′	17°11.3	12.6′	57.8′
11	342°35.2	55.9	251°09.4	10.6′	17°23.9	12.5′	57.8′
12	357°35.0	S20°55.4	265°39.0	10.5′	N17°36.4	12.5′	57.9′
13	12°34.7	55.0	280°08.5	10.4′	17°48.9	12.4′	57.9′
14	27°34.5	54.5	294°37.9	10.3′	18°01.3	12.3′	57.9′
15	42°34.3	·· 54.0	309°07.2	10.1′	18°13.6	12.2′	58.0′
16	57°34.1	53.5	323°36.3	10.0′	18°25.8	12.2′	58.0′
17	72°33.9	53.0	338°05.3	9.9′	18°38.0	12.0′	58.0′
18	87°33.7	S20°52.6	352°34.2	9.8′	N18°50.0	12.0′	58.1′
19	102°33.5	52.1	7°03.0	9.6′	19°02.0	11.9′	58.1′
20	117°33.3	51.6	21°31.6	9.5′	19°13.9	11.8′	58.2′
21	132°33.0	·· 51.1	36°00.2	9.4′	19°25.7	11.7′	58.2′
22	147°32.8	50.6	50°28.6	9.3′	19°37.4	11.6′	58.2′
23	162°32.6	50.2	64°56.8	9.1′	19°49.0	11.5′	58.3′
	SD = 16.3′	d = 0.5′		SD = 15.7′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°32.4	S20°49.7	79°25.0	9.0′	N20°00.5	11.5′	58.3′
1	192°32.2	49.2	93°53.0	8.9′	20°12.0	11.3′	58.3′
2	207°32.0	48.7	108°20.9	8.7′	20°23.3	11.2′	58.4′
3	222°31.8	·· 48.2	122°48.6	8.6′	20°34.5	11.2′	58.4′
4	237°31.6	47.7	137°16.2	8.5′	20°45.7	11.0′	58.4′
5	252°31.4	47.2	151°43.7	8.4′	20°56.7	10.9′	58.5′
6	267°31.2	S20°46.7	166°11.1	8.2′	N21°07.6	10.8′	58.5′
7	282°31.0	46.2	180°38.3	8.1′	21°18.4	10.7′	58.6′
8	297°30.7	45.8	195°05.4	8.0′	21°29.1	10.6′	58.6′
9	312°30.5	·· 45.3	209°32.3	7.8′	21°39.7	10.5′	58.6′
10	327°30.3	44.8	223°59.2	7.7′	21°50.2	10.4′	58.7′
11	342°30.1	44.3	238°25.8	7.6′	22°00.6	10.2′	58.7′
12	357°29.9	S20°43.8	252°52.4	7.4′	N22°10.8	10.2′	58.7′
13	12°29.7	43.3	267°18.8	7.3′	22°21.0	10.0′	58.8′
14	27°29.5	42.8	281°45.1	7.1′	22°31.0	9.9′	58.8′
15	42°29.3	·· 42.3	296°11.2	7.0′	22°40.9	9.8′	58.9′
16	57°29.1	41.8	310°37.3	6.9′	22°50.7	9.6′	58.9′
17	72°28.9	41.3	325°03.1	6.7′	23°00.3	9.5′	58.9′
18	87°28.7	S20°40.8	339°28.9	6.6′	N23°09.8	9.4′	59.0′
19	102°28.5	40.3	353°54.5	6.5′	23°19.2	9.3′	59.0′
20	117°28.3	39.8	8°20.0	6.3′	23°28.5	9.1′	59.0′
21	132°28.1	·· 39.3	22°45.3	6.2′	23°37.6	9.0′	59.1′
22	147°27.9	38.8	37°10.5	6.1′	23°46.6	8.8′	59.1′
23	162°27.7	38.3	51°35.6	5.9′	23°55.4	8.7′	59.2′
	SD = 16.3′	d = 0.5′		SD = 15.9′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°27.5	S20°37.8	66°00.5	5.8′	N24°04.1	8.6′	59.2′
1	192°27.3	37.3	80°25.3	5.7′	24°12.7	8.4′	59.2′
2	207°27.1	36.8	94°50.0	5.5′	24°21.1	8.3′	59.3′
3	222°26.9	·· 36.3	109°14.5	5.4′	24°29.4	8.1′	59.3′
4	237°26.7	35.8	123°38.9	5.3′	24°37.5	8.0′	59.3′
5	252°26.5	35.3	138°03.2	5.1′	24°45.5	7.8′	59.4′
6	267°26.3	S20°34.8	152°27.4	5.0′	N24°53.3	7.7′	59.4′
7	282°26.1	34.3	166°51.4	4.9′	25°01.0	7.5′	59.4′
8	297°25.9	33.8	181°15.3	4.8′	25°08.5	7.3′	59.5′
9	312°25.7	·· 33.3	195°39.0	4.6′	25°15.8	7.2′	59.5′
10	327°25.5	32.8	210°02.7	4.5′	25°23.0	7.1′	59.6′
11	342°25.3	32.3	224°26.2	4.4′	25°30.1	6.9′	59.6′
12	357°25.1	S20°31.7	238°49.6	4.3′	N25°37.0	6.7′	59.6′
13	12°24.9	31.2	253°12.8	4.1′	25°43.7	6.5′	59.7′
14	27°24.7	30.7	267°36.0	4.0′	25°50.2	6.4′	59.7′
15	42°24.5	·· 30.2	281°59.0	3.9′	25°56.6	6.2′	59.7′
16	57°24.3	29.7	296°21.9	3.8′	26°02.8	6.0′	59.8′
17	72°24.1	29.2	310°44.7	3.7′	26°08.8	5.9′	59.8′
18	87°23.9	S20°28.7	325°07.4	3.6′	N26°14.7	5.6′	59.8′
19	102°23.7	28.2	339°29.9	3.4′	26°20.3	5.5′	59.9′
20	117°23.5	27.6	353°52.4	3.3′	26°25.8	5.3′	59.9′
21	132°23.3	·· 27.1	8°14.7	3.2′	26°31.1	5.2′	59.9′
22	147°23.1	26.6	22°36.9	3.1′	26°36.3	4.9′	60.0′
23	162°22.9	26.1	36°59.1	3.0′	26°41.2	4.8′	60.0′
	SD = 16.3′	d = 0.5′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:56	09:44	▬	▬	14:37	16:25
N 70°	07:42	09:12	11:46	12:35	15:09	16:39
68°	07:31	08:49	10:25	13:56	15:32	16:50
66°	07:21	08:31	09:47	14:33	15:50	17:00
64°	07:13	08:16	09:21	14:59	16:05	17:08
62°	07:05	08:03	09:01	15:19	16:17	17:15
60°	06:59	07:53	08:45	15:36	16:28	17:22
N 58°	06:53	07:43	08:31	15:50	16:37	17:27
56°	06:48	07:35	08:19	16:01	16:46	17:33
54°	06:43	07:27	08:09	16:12	16:53	17:38
52°	06:39	07:21	08:00	16:21	17:00	17:42
50°	06:34	07:15	07:51	16:29	17:06	17:46
45°	06:25	07:01	07:34	16:47	17:19	17:56
N 40°	06:16	06:50	07:19	17:01	17:31	18:04
35°	06:09	06:40	07:07	17:13	17:41	18:12
30°	06:01	06:31	06:56	17:24	17:50	18:19
20°	05:47	06:14	06:38	17:42	18:06	18:33
N 10°	05:33	05:59	06:22	17:58	18:21	18:47
0°	05:19	05:44	06:06	18:14	18:36	19:01
S 10°	05:02	05:28	05:51	18:29	18:52	19:18
20°	04:42	05:10	05:34	18:45	19:09	19:38
30°	04:16	04:48	05:15	19:05	19:31	20:03
35°	04:00	04:35	05:04	19:16	19:45	20:20
40°	03:40	04:19	04:51	19:29	20:00	20:39
45°	03:14	04:00	04:35	19:44	20:19	21:05
S 50°	02:38	03:35	04:16	20:03	20:44	21:41
52°	02:18	03:22	04:07	20:12	20:57	22:00
54°	01:52	03:08	03:57	20:22	21:11	22:25
56°	01:14	02:51	03:45	20:34	21:27	23:02
58°	////	02:30	03:32	20:47	21:48	////
S 60°	////	02:02	03:16	21:03	22:15	////

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	07:43	▭	▭	04:03	▭	▭
N 70°	08:28	▭	▭	03:21	▭	▭
68°	08:57	07:59	▭	02:53	05:39	▭
66°	09:20	08:53	▭	02:32	04:46	▭
64°	09:38	09:26	09:02	02:15	04:14	06:37
62°	09:53	09:50	09:50	02:02	03:50	05:49
60°	10:05	10:10	10:21	01:50	03:32	05:19
N 58°	10:16	10:26	10:45	01:40	03:16	04:56
56°	10:25	10:40	11:04	01:32	03:03	04:37
54°	10:34	10:52	11:20	01:24	02:52	04:22
52°	10:42	11:03	11:34	01:17	02:41	04:08
50°	10:48	11:12	11:46	01:11	02:33	03:56
45°	11:03	11:33	12:12	00:58	02:14	03:32
N 40°	11:15	11:49	12:32	00:47	01:58	03:13
35°	11:26	12:03	12:49	00:38	01:46	02:56
30°	11:35	12:15	13:03	00:30	01:34	02:42
20°	11:51	12:36	13:29	00:16	01:15	02:19
N 10°	12:05	12:55	13:50	00:04	00:59	01:58
0°	12:19	13:12	14:11	·· ··	00:43	01:39
S 10°	12:32	13:29	14:31	·· ··	00:28	01:20
20°	12:46	13:48	14:53	·· ··	00:12	01:00
30°	13:03	14:10	15:19	23:53	·· ··	00:37
35°	13:13	14:22	15:34	23:42	·· ··	00:23
40°	13:24	14:37	15:52	23:30	·· ··	00:07
45°	13:37	14:55	16:13	23:15	23:48	·· ··
S 50°	13:53	15:17	16:41	22:57	23:25	·· ··
52°	14:01	15:27	16:54	22:49	23:14	23:52
54°	14:10	15:39	17:09	22:40	23:02	23:36
56°	14:19	15:53	17:27	22:29	22:47	23:18
58°	14:30	16:09	17:49	22:18	22:31	22:55
S 60°	14:43	16:29	18:18	22:04	22:10	22:26

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Age 9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	52-73%
16	09:30	09:40	12:10	18:31	06:06	
17	09:50	10:00	12:10	19:25	06:57	
18	10:10	10:20	12:10	20:26	07:55	

January 19, 20, 21 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	118°10.0	226°45.0	S19°13.7	315°10.0	N11°26.4	330°38.3	N14°09.6	108°42.0	N01°29.1
1	133°12.5	241°44.6	14.2	330°12.7	26.5	345°41.1	09.7	123°44.3	29.2
2	148°14.9	256°44.2	14.6	345°15.4	26.7	0°43.8	09.8	138°46.7	29.3
3	163°17.4	271°43.8	·· 15.0	0°18.1	·· 26.9	15°46.5	·· 09.9	153°49.0	·· 29.3
4	178°19.9	286°43.4	15.5	15°20.8	27.1	30°49.2	10.0	168°51.3	29.4
5	193°22.3	301°43.0	15.9	30°23.5	27.3	45°52.0	10.1	183°53.6	29.5
6	208°24.8	316°42.6	S19°16.3	45°26.2	N11°27.5	60°54.7	N14°10.2	198°55.9	N01°29.6
7	223°27.3	331°42.2	16.8	60°28.9	27.6	75°57.4	10.3	213°58.2	29.6
8	238°29.7	346°41.8	17.2	75°31.6	27.8	91°00.1	10.4	229°00.5	29.7
9	253°32.2	1°41.4	·· 17.6	90°34.3	·· 28.0	106°02.9	·· 10.5	244°02.8	·· 29.8
10	268°34.6	16°40.9	18.1	105°37.0	28.2	121°05.6	10.6	259°05.2	29.9
11	283°37.1	31°40.5	18.5	120°39.7	28.4	136°08.3	10.7	274°07.5	29.9
12	298°39.6	46°40.1	S19°18.9	135°42.4	N11°28.6	151°11.0	N14°10.8	289°09.8	N01°30.0
13	313°42.0	61°39.7	19.3	150°45.1	28.8	166°13.8	10.9	304°12.1	30.1
14	328°44.5	76°39.3	19.8	165°47.8	29.0	181°16.5	11.0	319°14.4	30.2
15	343°47.0	91°38.9	·· 20.2	180°50.6	·· 29.1	196°19.2	·· 11.1	334°16.7	·· 30.2
16	358°49.4	106°38.5	20.6	195°53.3	29.3	211°21.9	11.2	349°19.0	30.3
17	13°51.9	121°38.1	21.0	210°56.0	29.5	226°24.7	11.3	4°21.3	30.4
18	28°54.4	136°37.7	S19°21.5	225°58.7	N11°29.7	241°27.4	N14°11.4	19°23.7	N01°30.5
19	43°56.8	151°37.2	21.9	241°01.4	29.9	256°30.1	11.5	34°26.0	30.5
20	58°59.3	166°36.8	22.3	256°04.1	30.1	271°32.8	11.6	49°28.3	30.6
21	74°01.7	181°36.4	·· 22.7	271°06.8	·· 30.3	286°35.6	·· 11.7	64°30.6	·· 30.7
22	89°04.2	196°36.0	23.2	286°09.6	30.5	301°38.3	11.8	79°32.9	30.8
23	104°06.7	211°35.6	23.6	301°12.3	30.7	316°41.0	11.9	94°35.2	30.8
Mer.pass. 16:05		ν -0.4′	d 0.4′	ν 2.7′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.39		m -0.58		m -2.51		m 0.78	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	119°09.1	226°35.2	S19°24.0	316°15.0	N11°30.9	331°43.7	N14°12.0	109°37.5	N01°30.9
1	134°11.6	241°34.7	24.4	331°17.7	31.1	346°46.5	12.1	124°39.8	31.0
2	149°14.1	256°34.3	24.8	346°20.5	31.3	1°49.2	12.2	139°42.1	31.1
3	164°16.5	271°33.9	·· 25.3	1°23.2	·· 31.4	16°51.9	·· 12.3	154°44.5	·· 31.2
4	179°19.0	286°33.5	25.7	16°25.9	31.6	31°54.7	12.4	169°46.8	31.2
5	194°21.5	301°33.1	26.1	31°28.7	31.8	46°57.4	12.5	184°49.1	31.3
6	209°23.9	316°32.6	S19°26.5	46°31.4	N11°32.0	62°00.1	N14°12.6	199°51.4	N01°31.4
7	224°26.4	331°32.2	26.9	61°34.1	32.2	77°02.8	12.7	214°53.7	31.5
8	239°28.9	346°31.8	27.3	76°36.8	32.4	92°05.6	12.8	229°56.0	31.5
9	254°31.3	1°31.4	·· 27.8	91°39.6	·· 32.6	107°08.3	·· 12.9	244°58.3	·· 31.6
10	269°33.8	16°30.9	28.2	106°42.3	32.8	122°11.0	13.0	260°00.6	31.7
11	284°36.2	31°30.5	28.6	121°45.1	33.0	137°13.8	13.1	275°02.9	31.8
12	299°38.7	46°30.1	S19°29.0	136°47.8	N11°33.2	152°16.5	N14°13.2	290°05.2	N01°31.8
13	314°41.2	61°29.7	29.4	151°50.5	33.4	167°19.2	13.3	305°07.5	31.9
14	329°43.6	76°29.2	29.8	166°53.3	33.6	182°22.0	13.4	320°09.9	32.0
15	344°46.1	91°28.8	·· 30.2	181°56.0	·· 33.8	197°24.7	·· 13.5	335°12.2	·· 32.1
16	359°48.6	106°28.4	30.6	196°58.8	34.0	212°27.4	13.6	350°14.5	32.1
17	14°51.0	121°27.9	31.1	212°01.5	34.2	227°30.2	13.7	5°16.8	32.2
18	29°53.5	136°27.5	S19°31.5	227°04.3	N11°34.4	242°32.9	N14°13.8	20°19.1	N01°32.3
19	44°56.0	151°27.1	31.9	242°07.0	34.6	257°35.6	13.9	35°21.4	32.4
20	59°58.4	166°26.7	32.3	257°09.8	34.8	272°38.3	14.0	50°23.7	32.4
21	75°00.9	181°26.2	·· 32.7	272°12.5	·· 35.0	287°41.1	·· 14.1	65°26.0	·· 32.5
22	90°03.4	196°25.8	33.1	287°15.3	35.2	302°43.8	14.2	80°28.3	32.6
23	105°05.8	211°25.4	33.5	302°18.0	35.4	317°46.5	14.3	95°30.6	32.7
Mer.pass. 16:01		ν -0.4′	d 0.4′	ν 2.7′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.38		m -0.61		m -2.51		m 0.78	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	120°08.3	226°24.9	S19°33.9	317°20.8	N11°35.6	332°49.3	N14°14.4	110°32.9	N01°32.8
1	135°10.7	241°24.5	34.3	332°23.5	35.8	347°52.0	14.5	125°35.2	32.8
2	150°13.2	256°24.1	34.7	347°26.3	36.1	2°54.7	14.6	140°37.5	32.9
3	165°15.7	271°23.6	·· 35.1	2°29.0	·· 36.3	17°57.5	·· 14.7	155°39.8	·· 33.0
4	180°18.1	286°23.2	35.5	17°31.8	36.5	33°00.2	14.8	170°42.2	33.1
5	195°20.6	301°22.7	35.9	32°34.6	36.7	48°02.9	14.9	185°44.5	33.1
6	210°23.1	316°22.3	S19°36.3	47°37.3	N11°36.9	63°05.7	N14°15.0	200°46.8	N01°33.2
7	225°25.5	331°21.9	36.7	62°40.1	37.1	78°08.4	15.1	215°49.1	33.3
8	240°28.0	346°21.4	37.1	77°42.9	37.3	93°11.1	15.2	230°51.4	33.4
9	255°30.5	1°21.0	·· 37.5	92°45.6	·· 37.5	108°13.9	·· 15.3	245°53.7	·· 33.5
10	270°32.9	16°20.6	37.9	107°48.4	37.7	123°16.6	15.4	260°56.0	33.5
11	285°35.4	31°20.1	38.3	122°51.2	37.9	138°19.3	15.5	275°58.3	33.6
12	300°37.9	46°19.7	S19°38.7	137°53.9	N11°38.1	153°22.1	N14°15.6	291°00.6	N01°33.7
13	315°40.3	61°19.2	39.1	152°56.7	38.3	168°24.8	15.7	306°02.9	33.8
14	330°42.8	76°18.8	39.5	167°59.5	38.6	183°27.6	15.8	321°05.2	33.8
15	345°45.2	91°18.3	·· 39.9	183°02.3	·· 38.8	198°30.3	·· 15.9	336°07.5	·· 33.9
16	0°47.7	106°17.9	40.3	198°05.0	39.0	213°33.0	16.0	351°09.8	34.0
17	15°50.2	121°17.5	40.7	213°07.8	39.2	228°35.8	16.1	6°12.1	34.1
18	30°52.6	136°17.0	S19°41.1	228°10.6	N11°39.4	243°38.5	N14°16.2	21°14.4	N01°34.2
19	45°55.1	151°16.6	41.5	243°13.4	39.6	258°41.2	16.3	36°16.7	34.2
20	60°57.6	166°16.1	41.9	258°16.2	39.8	273°44.0	16.4	51°19.0	34.3
21	76°00.0	181°15.7	·· 42.3	273°18.9	·· 40.0	288°46.7	·· 16.5	66°21.3	·· 34.4
22	91°02.5	196°15.2	42.6	288°21.7	40.3	303°49.4	16.6	81°23.6	34.5
23	106°05.0	211°14.8	43.0	303°24.5	40.5	318°52.2	16.7	96°26.0	34.5
Mer.pass. 15:57		ν -0.4′	d 0.4′	ν 2.8′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.37		m -0.63		m -2.52		m 0.78	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.6
Ankaa	353°05.7	-42°09.7
Schedar	349°29.2	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.0	-57°06.2
Hamal	327°49.2	23°35.5
Polaris	312°57.7	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.5
Avior	234°13.4	-59°35.8
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.0	-69°49.6
Alphard	217°45.8	-8°46.7
Regulus	207°32.4	11°49.9
Dubhe	193°38.5	61°36.0
Denebola	182°23.1	14°25.0
Gienah	175°41.7	-17°41.6
Acrux	172°57.9	-63°14.8
Gacrux	171°49.5	-57°15.7
Alioth	166°11.4	55°48.4
Spica	158°20.5	-11°18.2
Alkaid	152°50.7	49°10.3
Hadar	148°33.6	-60°30.0
Menkent	147°55.6	-36°30.1
Arcturus	145°46.4	19°02.3
Rigil Kent.	139°38.1	-60°56.6
Kochab	137°20.2	74°02.2
Zuben'ubi	136°54.2	-16°09.3
Alphecca	126°02.5	26°37.2
Antares	112°14.0	-26°29.5
Atria	107°07.1	-69°04.3
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.9	51°28.9
Kaus Aust.	83°30.6	-34°22.2
Vega	80°32.5	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 19 Tue	SHA	Mer.pass
Venus	108°35.0	08:53
Mars	197°00.0	02:59
Jupiter	212°28.3	01:57
Saturn	350°32.0	16:43

Jan 20 Wed	SHA	Mer.pass
Venus	107°26.0	08:54
Mars	197°05.9	02:54
Jupiter	212°34.6	01:53
Saturn	350°28.4	16:39

Jan 21 Thu	SHA	Mer.pass
Venus	106°16.6	08:55
Mars	197°12.5	02:50
Jupiter	212°41.0	01:48
Saturn	350°24.6	16:35

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0832 sec ΔT = TT-UT1 = +69.2672 sec

2027 January 19 to Jan. 21 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°22.7	S20°25.6	51°21.1	2.9′	N26°46.0	4.6′	60.0′
1	192°22.5	25.1	65°43.0	2.8′	26°50.6	4.4′	60.1′
2	207°22.3	24.5	80°04.8	2.7′	26°55.0	4.2′	60.1′
3	222°22.1	·· 24.0	94°26.5	2.6′	26°59.2	4.0′	60.1′
4	237°21.9	23.5	108°48.1	2.5′	27°03.2	3.8′	60.2′
5	252°21.8	23.0	123°09.7	2.4′	27°07.0	3.6′	60.2′
6	267°21.6	S20°22.5	137°31.1	2.4′	N27°10.6	3.5′	60.2′
7	282°21.4	21.9	151°52.5	2.3′	27°14.1	3.2′	60.2′
8	297°21.2	21.4	166°13.7	2.2′	27°17.3	3.0′	60.3′
9	312°21.0	·· 20.9	180°34.9	2.1′	27°20.3	2.9′	60.3′
10	327°20.8	20.4	194°56.0	2.0′	27°23.2	2.6′	60.3′
11	342°20.6	19.8	209°17.0	2.0′	27°25.8	2.4′	60.4′
12	357°20.4	S20°19.3	223°38.0	1.9′	N27°28.2	2.3′	60.4′
13	12°20.2	18.8	237°58.9	1.8′	27°30.5	2.0′	60.4′
14	27°20.0	18.3	252°19.7	1.7′	27°32.5	1.8′	60.4′
15	42°19.8	·· 17.7	266°40.4	1.7′	27°34.3	1.6′	60.5′
16	57°19.7	17.2	281°01.1	1.6′	27°35.9	1.4′	60.5′
17	72°19.5	16.7	295°21.7	1.6′	27°37.3	1.2′	60.5′
18	87°19.3	S20°16.1	309°42.3	1.5′	N27°38.5	1.0′	60.6′
19	102°19.1	15.6	324°02.8	1.5′	27°39.5	0.8′	60.6′
20	117°18.9	15.1	338°23.3	1.4′	27°40.3	0.6′	60.6′
21	132°18.7	·· 14.5	352°43.7	1.4′	27°40.9	0.3′	60.6′
22	147°18.5	14.0	7°04.1	1.3′	27°41.2	0.1′	60.7′
23	162°18.3	13.5	21°24.4	1.3′	27°41.3	0.0′	60.7′
	SD = 16.2′	d = 0.5′	SD = 16.4′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°18.2	S20°12.9	35°44.7	1.3′	N27°41.3	0.3′	60.7′
1	192°18.0	12.4	50°04.9	1.2′	27°41.0	0.5′	60.7′
2	207°17.8	11.9	64°25.2	1.2′	27°40.5	0.7′	60.8′
3	222°17.6	·· 11.3	78°45.4	1.2′	27°39.8	0.9′	60.8′
4	237°17.4	10.8	93°05.5	1.2′	27°38.9	1.2′	60.8′
5	252°17.2	10.3	107°25.7	1.1′	27°37.7	1.3′	60.8′
6	267°17.0	S20°09.7	121°45.8	1.1′	N27°36.4	1.6′	60.8′
7	282°16.9	09.2	136°06.0	1.1′	27°34.8	1.8′	60.9′
8	297°16.7	08.7	150°26.1	1.1′	27°33.0	2.0′	60.9′
9	312°16.5	·· 08.1	164°46.2	1.1′	27°31.0	2.2′	60.9′
10	327°16.3	07.6	179°06.3	1.1′	27°28.8	2.5′	60.9′
11	342°16.1	07.0	193°26.4	1.1′	27°26.3	2.6′	60.9′
12	357°15.9	S20°06.5	207°46.5	1.1′	N27°23.7	2.9′	61.0′
13	12°15.8	06.0	222°06.6	1.1′	27°20.8	3.0′	61.0′
14	27°15.6	05.4	236°26.7	1.1′	27°17.8	3.3′	61.0′
15	42°15.4	·· 04.9	250°46.9	1.2′	27°14.5	3.5′	61.0′
16	57°15.2	04.3	265°07.0	1.2′	27°11.0	3.8′	61.0′
17	72°15.0	03.8	279°27.2	1.2′	27°07.2	3.9′	61.1′
18	87°14.8	S20°03.2	293°47.4	1.2′	N27°03.3	4.2′	61.1′
19	102°14.7	02.7	308°07.6	1.3′	26°59.1	4.3′	61.1′
20	117°14.5	02.1	322°27.9	1.3′	26°54.8	4.6′	61.1′
21	132°14.3	·· 01.6	336°48.2	1.3′	26°50.2	4.8′	61.1′
22	147°14.1	01.0	351°08.5	1.4′	26°45.4	5.0′	61.1′
23	162°14.0	00.5	5°28.8	1.4′	26°40.4	5.2′	61.1′
	SD = 16.2′	d = 0.5′	SD = 16.6′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°13.8	S19°59.9	19°49.2	1.5′	N26°35.2	5.4′	61.2′
1	192°13.6	59.4	34°09.7	1.5′	26°29.8	5.6′	61.2′
2	207°13.4	58.8	48°30.2	1.6′	26°24.2	5.8′	61.2′
3	222°13.2	·· 58.3	62°50.8	1.6′	26°18.4	6.0′	61.2′
4	237°13.1	57.7	77°11.4	1.7′	26°12.4	6.3′	61.2′
5	252°12.9	57.2	91°32.0	1.7′	26°06.1	6.4′	61.2′
6	267°12.7	S19°56.6	105°52.7	1.8′	N25°59.7	6.7′	61.2′
7	282°12.5	56.1	120°13.5	1.9′	25°53.0	6.8′	61.2′
8	297°12.4	55.5	134°34.4	1.9′	25°46.2	7.0′	61.2′
9	312°12.2	·· 55.0	148°55.3	2.0′	25°39.2	7.3′	61.2′
10	327°12.0	54.4	163°16.3	2.1′	25°31.9	7.4′	61.3′
11	342°11.8	53.9	177°37.4	2.1′	25°24.5	7.6′	61.3′
12	357°11.7	S19°53.3	191°58.5	2.2′	N25°16.9	7.8′	61.3′
13	12°11.5	52.7	206°19.7	2.3′	25°09.1	8.1′	61.3′
14	27°11.3	52.2	220°41.0	2.4′	25°01.0	8.2′	61.3′
15	42°11.1	·· 51.6	235°02.4	2.5′	24°52.8	8.3′	61.3′
16	57°11.0	51.1	249°23.9	2.6′	24°44.5	8.6′	61.3′
17	72°10.8	50.5	263°45.5	2.6′	24°35.9	8.8′	61.3′
18	87°10.6	S19°50.0	278°07.1	2.7′	N24°27.1	8.9′	61.3′
19	102°10.4	49.4	292°28.8	2.8′	24°18.2	9.2′	61.3′
20	117°10.3	48.8	306°50.7	2.9′	24°09.0	9.3′	61.3′
21	132°10.1	·· 48.3	321°12.6	3.0′	23°59.7	9.4′	61.3′
22	147°09.9	47.7	335°34.6	3.1′	23°50.3	9.7′	61.3′
23	162°09.8	47.1	349°56.8	3.2′	23°40.6	9.8′	61.3′
	SD = 16.2′	d = 0.5′	SD = 16.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:48	09:32	▬	▬	14:51	16:35
N 70°	07:35	09:03	11:07	13:16	15:20	16:47
68°	07:25	08:41	10:11	14:12	15:41	16:58
66°	07:16	08:24	09:38	14:45	15:58	17:07
64°	07:08	08:10	09:14	15:09	16:12	17:15
62°	07:01	07:59	08:55	15:27	16:24	17:21
60°	06:55	07:48	08:40	15:43	16:34	17:27
N 58°	06:50	07:40	08:27	15:56	16:43	17:33
56°	06:45	07:32	08:15	16:07	16:51	17:38
54°	06:40	07:24	08:05	16:17	16:58	17:42
52°	06:36	07:18	07:56	16:26	17:04	17:46
50°	06:32	07:12	07:49	16:34	17:10	17:50
45°	06:23	06:59	07:32	16:51	17:23	17:59
N 40°	06:15	06:48	07:18	17:04	17:34	18:07
35°	06:08	06:39	07:06	17:16	17:43	18:14
30°	06:01	06:30	06:56	17:26	17:52	18:21
20°	05:47	06:14	06:38	17:44	18:08	18:35
N 10°	05:34	06:00	06:22	18:00	18:22	18:48
0°	05:20	05:45	06:07	18:15	18:37	19:02
S 10°	05:04	05:30	05:52	18:29	18:52	19:18
20°	04:44	05:12	05:36	18:45	19:09	19:37
30°	04:19	04:51	05:18	19:04	19:30	20:02
35°	04:03	04:38	05:07	19:15	19:43	20:18
40°	03:44	04:23	04:54	19:27	19:58	20:37
45°	03:19	04:04	04:39	19:42	20:17	21:02
S 50°	02:45	03:40	04:21	20:00	20:41	21:36
52°	02:26	03:28	04:12	20:09	20:52	21:54
54°	02:03	03:15	04:02	20:19	21:06	22:17
56°	01:29	02:58	03:51	20:30	21:22	22:48
58°	////	02:39	03:38	20:42	21:41	////
S 60°	////	02:14	03:23	20:57	22:05	////

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	12:19	▭	▭	10:12
62°	09:59	11:03	13:11	07:52	09:07	09:19
60°	10:50	11:57	13:43	07:02	08:14	08:47
N 58°	11:21	12:29	14:07	06:30	07:41	08:22
56°	11:45	12:53	14:26	06:07	07:17	08:03
54°	12:05	13:13	14:42	05:47	06:58	07:46
52°	12:21	13:29	14:55	05:31	06:41	07:32
50°	12:35	13:43	15:08	05:17	06:27	07:20
45°	13:04	14:12	15:32	04:49	05:58	06:54
N 40°	13:27	14:34	15:52	04:27	05:35	06:33
35°	13:45	14:53	16:09	04:08	05:16	06:16
30°	14:02	15:09	16:23	03:52	05:00	06:01
20°	14:29	15:36	16:47	03:25	04:32	05:36
N 10°	14:53	16:00	17:08	03:02	04:08	05:13
0°	15:15	16:21	17:27	02:41	03:46	04:53
S 10°	15:37	16:43	17:46	02:19	03:24	04:32
20°	16:01	17:06	18:07	01:56	03:00	04:10
30°	16:28	17:33	18:30	01:29	02:32	03:43
35°	16:45	17:49	18:44	01:14	02:16	03:28
40°	17:04	18:08	19:00	00:55	01:57	03:10
45°	17:27	18:30	19:19	00:33	01:33	02:48
S 50°	17:57	18:58	19:43	00:06	01:04	02:21
52°	18:12	19:12	19:54	·· ··	00:49	02:07
54°	18:29	19:28	20:07	·· ··	00:32	01:51
56°	18:49	19:47	20:22	·· ··	00:11	01:33
58°	19:15	20:10	20:39	23:45	·· ··	01:10
S 60°	19:51	20:40	20:59	23:10	·· ··	00:40

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 12-14 83-96%
19	10:29	10:38	12:11	21:30	08:58	
20	10:47	10:56	12:11	22:37	10:04	
21	11:05	11:13	12:11	23:42	11:10	

January 22, 23, 24 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	121°07.4	226°14.3	S19°43.4	318°27.3	N11°40.7	333°54.9	N14°16.8	111°28.3	N01°34.6
1	136°09.9	241°13.9	43.8	333°30.1	40.9	348°57.7	16.9	126°30.6	34.7
2	151°12.4	256°13.4	44.2	348°32.9	41.1	4°00.4	17.0	141°32.9	34.8
3	166°14.8	271°13.0	·· 44.6	3°35.7	·· 41.3	19°03.1	·· 17.1	156°35.2	·· 34.9
4	181°17.3	286°12.5	45.0	18°38.5	41.6	34°05.9	17.2	171°37.5	34.9
5	196°19.7	301°12.1	45.4	33°41.2	41.8	49°08.6	17.3	186°39.8	35.0
6	211°22.2	316°11.6	S19°45.7	48°44.0	N11°42.0	64°11.3	N14°17.4	201°42.1	N01°35.1
7	226°24.7	331°11.2	46.1	63°46.8	42.2	79°14.1	17.5	216°44.4	35.2
8	241°27.1	346°10.7	46.5	78°49.6	42.4	94°16.8	17.6	231°46.7	35.2
9	256°29.6	1°10.2	·· 46.9	93°52.4	·· 42.7	109°19.6	·· 17.7	246°49.0	·· 35.3
10	271°32.1	16°09.8	47.3	108°55.2	42.9	124°22.3	17.8	261°51.3	35.4
11	286°34.5	31°09.3	47.6	123°58.0	43.1	139°25.0	17.9	276°53.6	35.5
12	301°37.0	46°08.9	S19°48.0	139°00.8	N11°43.3	154°27.8	N14°18.0	291°55.9	N01°35.6
13	316°39.5	61°08.4	48.4	154°03.6	43.5	169°30.5	18.1	306°58.2	35.6
14	331°41.9	76°08.0	48.8	169°06.4	43.8	184°33.3	18.2	322°00.5	35.7
15	346°44.4	91°07.5	·· 49.2	184°09.3	·· 44.0	199°36.0	·· 18.3	337°02.8	·· 35.8
16	1°46.9	106°07.0	49.5	199°12.1	44.2	214°38.7	18.4	352°05.1	35.9
17	16°49.3	121°06.6	49.9	214°14.9	44.4	229°41.5	18.6	7°07.4	36.0
18	31°51.8	136°06.1	S19°50.3	229°17.7	N11°44.7	244°44.2	N14°18.7	22°09.7	N01°36.0
19	46°54.2	151°05.7	50.7	244°20.5	44.9	259°47.0	18.8	37°12.0	36.1
20	61°56.7	166°05.2	51.0	259°23.3	45.1	274°49.7	18.9	52°14.3	36.2
21	76°59.2	181°04.7	·· 51.4	274°26.1	·· 45.3	289°52.4	·· 19.0	67°16.6	·· 36.3
22	92°01.6	196°04.3	51.8	289°28.9	45.6	304°55.2	19.1	82°18.9	36.4
23	107°04.1	211°03.8	52.2	304°31.8	45.8	319°57.9	19.2	97°21.2	36.4
Mer.pass. 15:53		ν -0.4′	d 0.4′	ν 2.8′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.36		m -0.66		m -2.52		m 0.78	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	122°06.6	226°03.3	S19°52.5	319°34.6	N11°46.0	335°00.7	N14°19.3	112°23.5	N01°36.5
1	137°09.0	241°02.9	52.9	334°37.4	46.2	350°03.4	19.4	127°25.8	36.6
2	152°11.5	256°02.4	53.3	349°40.2	46.5	5°06.2	19.5	142°28.1	36.7
3	167°14.0	271°01.9	·· 53.6	4°43.0	·· 46.7	20°08.9	·· 19.6	157°30.4	·· 36.8
4	182°16.4	286°01.5	54.0	19°45.9	46.9	35°11.6	19.7	172°32.7	36.8
5	197°18.9	301°01.0	54.4	34°48.7	47.2	50°14.4	19.8	187°35.0	36.9
6	212°21.4	316°00.5	S19°54.7	49°51.5	N11°47.4	65°17.1	N14°19.9	202°37.3	N01°37.0
7	227°23.8	331°00.1	55.1	64°54.3	47.6	80°19.9	20.0	217°39.6	37.1
8	242°26.3	345°59.6	55.5	79°57.2	47.8	95°22.6	20.1	232°41.9	37.2
9	257°28.7	0°59.1	·· 55.8	95°00.0	·· 48.1	110°25.4	·· 20.2	247°44.2	·· 37.2
10	272°31.2	15°58.7	56.2	110°02.8	48.3	125°28.1	20.3	262°46.5	37.3
11	287°33.7	30°58.2	56.6	125°05.7	48.5	140°30.8	20.4	277°48.8	37.4
12	302°36.1	45°57.7	S19°56.9	140°08.5	N11°48.8	155°33.6	N14°20.5	292°51.1	N01°37.5
13	317°38.6	60°57.3	57.3	155°11.3	49.0	170°36.3	20.6	307°53.4	37.6
14	332°41.1	75°56.8	57.7	170°14.2	49.2	185°39.1	20.7	322°55.7	37.6
15	347°43.5	90°56.3	·· 58.0	185°17.0	·· 49.5	200°41.8	·· 20.8	337°58.0	·· 37.7
16	2°46.0	105°55.8	58.4	200°19.9	49.7	215°44.6	20.9	353°00.3	37.8
17	17°48.5	120°55.4	58.7	215°22.7	49.9	230°47.3	21.0	8°02.6	37.9
18	32°50.9	135°54.9	S19°59.1	230°25.5	N11°50.2	245°50.1	N14°21.1	23°04.9	N01°38.0
19	47°53.4	150°54.4	59.5	245°28.4	50.4	260°52.8	21.2	38°07.2	38.0
20	62°55.8	165°53.9	19°59.8	260°31.2	50.7	275°55.5	21.4	53°09.5	38.1
21	77°58.3	180°53.5	20°00.2	275°34.1	·· 50.9	290°58.3	·· 21.5	68°11.8	·· 38.2
22	93°00.8	195°53.0	00.5	290°36.9	51.1	306°01.0	21.6	83°14.1	38.3
23	108°03.2	210°52.5	00.9	305°39.8	51.4	321°03.8	21.7	98°16.4	38.4
Mer.pass. 15:49		ν -0.5′	d 0.4′	ν 2.8′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.35		m -0.68		m -2.52		m 0.78	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	123°05.7	225°52.0	S20°01.2	320°42.6	N11°51.6	336°06.5	N14°21.8	113°18.7	N01°38.4
1	138°08.2	240°51.5	01.6	335°45.5	51.8	351°09.3	21.9	128°21.0	38.5
2	153°10.6	255°51.1	01.9	350°48.3	52.1	6°12.0	22.0	143°23.3	38.6
3	168°13.1	270°50.6	·· 02.3	5°51.2	·· 52.3	21°14.8	·· 22.1	158°25.6	·· 38.7
4	183°15.6	285°50.1	02.6	20°54.0	52.6	36°17.5	22.2	173°27.9	38.8
5	198°18.0	300°49.6	03.0	35°56.9	52.8	51°20.3	22.3	188°30.2	38.8
6	213°20.5	315°49.1	S20°03.3	50°59.8	N11°53.0	66°23.0	N14°22.4	203°32.5	N01°38.9
7	228°23.0	330°48.6	03.7	66°02.6	53.3	81°25.8	22.5	218°34.7	39.0
8	243°25.4	345°48.2	04.0	81°05.5	53.5	96°28.5	22.6	233°37.0	39.1
9	258°27.9	0°47.7	·· 04.4	96°08.3	·· 53.8	111°31.3	·· 22.7	248°39.3	·· 39.2
10	273°30.3	15°47.2	04.7	111°11.2	54.0	126°34.0	22.8	263°41.6	39.2
11	288°32.8	30°46.7	05.1	126°14.1	54.3	141°36.7	22.9	278°43.9	39.3
12	303°35.3	45°46.2	S20°05.4	141°16.9	N11°54.5	156°39.5	N14°23.0	293°46.2	N01°39.4
13	318°37.7	60°45.7	05.8	156°19.8	54.7	171°42.2	23.1	308°48.5	39.5
14	333°40.2	75°45.2	06.1	171°22.7	55.0	186°45.0	23.2	323°50.8	39.6
15	348°42.7	90°44.8	·· 06.5	186°25.5	·· 55.2	201°47.7	·· 23.3	338°53.1	·· 39.7
16	3°45.1	105°44.3	06.8	201°28.4	55.5	216°50.5	23.4	353°55.4	39.7
17	18°47.6	120°43.8	07.1	216°31.3	55.7	231°53.2	23.6	8°57.7	39.8
18	33°50.1	135°43.3	S20°07.5	231°34.2	N11°56.0	246°56.0	N14°23.7	24°00.0	N01°39.9
19	48°52.5	150°42.8	07.8	246°37.0	56.2	261°58.7	23.8	39°02.3	40.0
20	63°55.0	165°42.3	08.2	261°39.9	56.5	277°01.5	23.9	54°04.6	40.1
21	78°57.5	180°41.8	·· 08.5	276°42.8	·· 56.7	292°04.2	·· 24.0	69°06.9	·· 40.1
22	93°59.9	195°41.3	08.8	291°45.7	57.0	307°07.0	24.1	84°09.2	40.2
23	109°02.4	210°40.8	09.2	306°48.6	57.2	322°09.7	24.2	99°11.5	40.3
Mer.pass. 15:45		ν -0.5′	d 0.4′	ν 2.9′	d 0.2′	ν 2.7′	d 0.1′	ν 2.3′	d 0.1′
		m -4.34		m -0.71		m -2.53		m 0.78	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.3	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.0	-57°06.2
Hamal	327°49.2	23°35.5
Polaris	312°58.9	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°49.9	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.6
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.8
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.0	-69°49.6
Alphard	217°45.8	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.5	61°36.0
Denebola	182°23.0	14°25.0
Gienah	175°41.7	-17°41.6
Acrux	172°57.9	-63°14.8
Gacrux	171°49.5	-57°15.7
Alioth	166°11.3	55°48.4
Spica	158°20.4	-11°18.2
Alkaid	152°50.6	49°10.3
Hadar	148°33.6	-60°30.0
Menkent	147°55.6	-36°30.1
Arcturus	145°46.4	19°02.2
Rigil Kent.	139°38.0	-60°56.6
Kochab	137°20.1	74°02.2
Zuben'ubi	136°54.2	-16°09.3
Alphecca	126°02.4	26°37.2
Antares	112°14.0	-26°29.5
Atria	107°07.0	-69°04.3
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.8	51°28.9
Kaus Aust.	83°30.6	-34°22.2
Vega	80°32.5	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.4
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.6
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 22 Fri	SHA	Mer.pass
Venus	105°06.9	08:55
Mars	197°19.9	02:46
Jupiter	212°47.5	01:44
Saturn	350°20.8	16:32

Jan 23 Sat	SHA	Mer.pass
Venus	103°56.8	08:56
Mars	197°28.0	02:41
Jupiter	212°54.1	01:40
Saturn	350°16.9	16:28

Jan 24 Sun	SHA	Mer.pass
Venus	102°46.3	08:57
Mars	197°36.9	02:37
Jupiter	213°00.8	01:35
Saturn	350°13.0	16:24

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0830 sec ΔT = TT-UT1 = +69.2670 sec

2027 January 22 to Jan. 24 UT

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	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°09.6	S19°46.6	4°19.0	3.3′	N23°30.8	10.0′	61.3′
1	192°09.4	46.0	18°41.3	3.4′	23°20.8	10.2′	61.3′
2	207°09.2	45.4	33°03.7	3.5′	23°10.6	10.4′	61.3′
3	222°09.1	·· 44.9	47°26.3	3.6′	23°00.2	10.5′	61.3′
4	237°08.9	44.3	61°48.9	3.7′	22°49.7	10.6′	61.3′
5	252°08.7	43.7	76°11.7	3.9′	22°39.1	10.9′	61.3′
6	267°08.6	S19°43.2	90°34.5	4.0′	N22°28.2	11.0′	61.3′
7	282°08.4	42.6	104°57.5	4.1′	22°17.2	11.1′	61.3′
8	297°08.2	42.0	119°20.6	4.2′	22°06.1	11.3′	61.3′
9	312°08.1	·· 41.5	133°43.7	4.3′	21°54.8	11.5′	61.3′
10	327°07.9	40.9	148°07.0	4.4′	21°43.3	11.6′	61.3′
11	342°07.7	40.3	162°30.5	4.5′	21°31.7	11.7′	61.2′
12	357°07.6	S19°39.7	176°54.0	4.6′	N21°20.0	11.9′	61.2′
13	12°07.4	39.2	191°17.6	4.8′	21°08.1	12.1′	61.2′
14	27°07.2	38.6	205°41.4	4.9′	20°56.0	12.2′	61.2′
15	42°07.1	·· 38.0	220°05.3	5.0′	20°43.8	12.3′	61.2′
16	57°06.9	37.5	234°29.3	5.1′	20°31.5	12.5′	61.2′
17	72°06.7	36.9	248°53.4	5.2′	20°19.0	12.6′	61.2′
18	87°06.6	S19°36.3	263°17.6	5.3′	N20°06.4	12.7′	61.2′
19	102°06.4	35.7	277°42.0	5.5′	19°53.7	12.9′	61.2′
20	117°06.2	35.1	292°06.4	5.6′	19°40.8	12.9′	61.2′
21	132°06.1	·· 34.6	306°31.0	5.7′	19°27.9	13.1′	61.1′
22	147°05.9	34.0	320°55.7	5.8′	19°14.8	13.3′	61.1′
23	162°05.7	33.4	335°20.5	5.9′	19°01.5	13.3′	61.1′
	SD = 16.2′	d = 0.6′	SD = 16.7′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°05.6	S19°32.8	349°45.5	6.1′	N18°48.2	13.5′	61.1′
1	192°05.4	32.3	4°10.5	6.2′	18°34.7	13.6′	61.1′
2	207°05.3	31.7	18°35.7	6.3′	18°21.1	13.7′	61.1′
3	222°05.1	·· 31.1	33°01.0	6.4′	18°07.4	13.8′	61.0′
4	237°04.9	30.5	47°26.4	6.5′	17°53.6	13.9′	61.0′
5	252°04.8	29.9	61°52.0	6.7′	17°39.7	14.0′	61.0′
6	267°04.6	S19°29.3	76°17.6	6.8′	N17°25.7	14.2′	61.0′
7	282°04.5	28.8	90°43.4	6.9′	17°11.5	14.2′	61.0′
8	297°04.3	28.2	105°09.3	7.0′	16°57.3	14.3′	61.0′
9	312°04.1	·· 27.6	119°35.3	7.1′	16°43.0	14.5′	60.9′
10	327°04.0	27.0	134°01.4	7.2′	16°28.5	14.5′	60.9′
11	342°03.8	26.4	148°27.6	7.4′	16°14.0	14.6′	60.9′
12	357°03.7	S19°25.8	162°54.0	7.5′	N15°59.4	14.7′	60.9′
13	12°03.5	25.2	177°20.4	7.6′	15°44.7	14.8′	60.9′
14	27°03.3	24.6	191°47.0	7.7′	15°29.9	14.8′	60.8′
15	42°03.2	·· 24.1	206°13.7	7.8′	15°15.1	15.0′	60.8′
16	57°03.0	23.5	220°40.5	7.9′	15°00.1	15.0′	60.8′
17	72°02.9	22.9	235°07.4	8.0′	14°45.1	15.1′	60.8′
18	87°02.7	S19°22.3	249°34.5	8.1′	N14°30.0	15.2′	60.7′
19	102°02.6	21.7	264°01.6	8.3′	14°14.8	15.3′	60.7′
20	117°02.4	21.1	278°28.9	8.4′	13°59.5	15.3′	60.7′
21	132°02.2	·· 20.5	292°56.2	8.5′	13°44.2	15.4′	60.7′
22	147°02.1	19.9	307°23.7	8.6′	13°28.8	15.5′	60.6′
23	162°01.9	19.3	321°51.3	8.7′	13°13.3	15.5′	60.6′
	SD = 16.2′	d = 0.6′	SD = 16.7′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°01.8	S19°18.7	336°18.9	8.8′	N12°57.8	15.6′	60.6′
1	192°01.6	18.1	350°46.7	8.9′	12°42.2	15.7′	60.6′
2	207°01.5	17.5	5°14.6	9.0′	12°26.5	15.7′	60.5′
3	222°01.3	·· 16.9	19°42.6	9.1′	12°10.8	15.8′	60.5′
4	237°01.2	16.3	34°10.7	9.2′	11°55.0	15.8′	60.5′
5	252°01.0	15.7	48°38.9	9.3′	11°39.2	15.8′	60.4′
6	267°00.9	S19°15.1	63°07.2	9.4′	N11°23.4	16.0′	60.4′
7	282°00.7	14.5	77°35.6	9.5′	11°07.4	15.9′	60.4′
8	297°00.5	13.9	92°04.1	9.6′	10°51.5	16.0′	60.4′
9	312°00.4	·· 13.3	106°32.7	9.7′	10°35.5	16.1′	60.3′
10	327°00.2	12.7	121°01.4	9.8′	10°19.4	16.1′	60.3′
11	342°00.1	12.1	135°30.2	9.9′	10°03.3	16.1′	60.3′
12	356°59.9	S19°11.5	149°59.0	10.0′	N09°47.2	16.2′	60.2′
13	11°59.8	10.9	164°28.0	10.1′	09°31.0	16.2′	60.2′
14	26°59.6	10.3	178°57.1	10.1′	09°14.8	16.3′	60.2′
15	41°59.5	·· 09.7	193°26.2	10.2′	08°58.5	16.2′	60.1′
16	56°59.3	09.1	207°55.5	10.3′	08°42.3	16.3′	60.1′
17	71°59.2	08.5	222°24.8	10.4′	08°26.0	16.3′	60.1′
18	86°59.0	S19°07.9	236°54.2	10.5′	N08°09.7	16.4′	60.0′
19	101°58.9	07.3	251°23.7	10.6′	07°53.3	16.4′	60.0′
20	116°58.8	06.7	265°53.3	10.7′	07°36.9	16.4′	60.0′
21	131°58.6	·· 06.1	280°22.9	10.7′	07°20.5	16.4′	59.9′
22	146°58.5	05.5	294°52.7	10.8′	07°04.1	16.4′	59.9′
23	161°58.3	04.9	309°22.5	10.9′	06°47.7	16.5′	59.9′
	SD = 16.2′	d = 0.6′	SD = 16.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:40	09:19	▬	▬	15:06	16:45
N 70°	07:28	08:53	10:42	13:42	15:32	16:57
68°	07:18	08:33	09:57	14:27	15:51	17:06
66°	07:10	08:17	09:28	14:56	16:07	17:14
64°	07:03	08:04	09:06	15:18	16:20	17:21
62°	06:57	07:53	08:48	15:36	16:31	17:28
60°	06:51	07:44	08:34	15:50	16:41	17:33
N 58°	06:46	07:35	08:22	16:03	16:49	17:38
56°	06:42	07:28	08:11	16:13	16:56	17:43
54°	06:37	07:21	08:01	16:23	17:03	17:47
52°	06:33	07:15	07:53	16:31	17:09	17:51
50°	06:30	07:09	07:45	16:39	17:15	17:54
45°	06:21	06:57	07:29	16:55	17:27	18:03
N 40°	06:14	06:47	07:16	17:08	17:37	18:10
35°	06:07	06:38	07:05	17:19	17:46	18:17
30°	06:00	06:29	06:55	17:29	17:55	18:24
20°	05:47	06:14	06:38	17:46	18:10	18:36
N 10°	05:35	06:00	06:22	18:01	18:23	18:49
0°	05:21	05:46	06:08	18:15	18:37	19:03
S 10°	05:05	05:31	05:54	18:30	18:52	19:18
20°	04:46	05:15	05:38	18:45	19:09	19:37
30°	04:22	04:54	05:20	19:03	19:29	20:01
35°	04:07	04:42	05:10	19:13	19:41	20:16
40°	03:48	04:27	04:58	19:25	19:56	20:34
45°	03:25	04:09	04:43	19:39	20:14	20:58
S 50°	02:52	03:46	04:26	19:57	20:37	21:30
52°	02:34	03:34	04:17	20:05	20:48	21:47
54°	02:13	03:21	04:08	20:14	21:01	22:08
56°	01:44	03:06	03:57	20:25	21:16	22:36
58°	00:52	02:48	03:45	20:37	21:33	23:22
S 60°	////	02:25	03:31	20:51	21:56	////

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▭	15:36	18:33	▭	11:15	10:09
N 70°	▭	16:12	18:46	▭	10:36	09:54
68°	13:34	16:37	18:56	11:10	10:09	09:41
66°	14:27	16:56	19:04	10:17	09:48	09:31
64°	14:59	17:12	19:11	09:44	09:31	09:22
62°	15:22	17:24	19:17	09:19	09:17	09:15
60°	15:41	17:35	19:22	09:00	09:05	09:08
N 58°	15:56	17:44	19:26	08:43	08:55	09:02
56°	16:09	17:52	19:30	08:29	08:46	08:57
54°	16:21	18:00	19:34	08:17	08:38	08:52
52°	16:31	18:06	19:37	08:07	08:30	08:48
50°	16:40	18:12	19:40	07:57	08:24	08:44
45°	16:59	18:24	19:46	07:37	08:10	08:36
N 40°	17:14	18:34	19:51	07:20	07:58	08:28
35°	17:27	18:43	19:56	07:06	07:47	08:22
30°	17:38	18:51	19:59	06:54	07:38	08:17
20°	17:57	19:04	20:06	06:33	07:23	08:07
N 10°	18:13	19:15	20:12	06:14	07:09	07:59
0°	18:29	19:26	20:18	05:57	06:56	07:51
S 10°	18:44	19:36	20:23	05:39	06:43	07:43
20°	19:00	19:47	20:29	05:20	06:29	07:34
30°	19:19	20:00	20:36	04:58	06:13	07:24
35°	19:30	20:07	20:40	04:46	06:03	07:18
40°	19:42	20:16	20:44	04:31	05:52	07:11
45°	19:56	20:25	20:49	04:13	05:39	07:03
S 50°	20:14	20:37	20:55	03:50	05:24	06:54
52°	20:22	20:42	20:57	03:40	05:16	06:50
54°	20:31	20:48	21:00	03:27	05:08	06:45
56°	20:42	20:55	21:04	03:13	04:58	06:39
58°	20:53	21:02	21:07	02:57	04:48	06:33
S 60°	21:07	21:10	21:11	02:37	04:35	06:26

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 15-17 100-97%
22	11:22	11:30	12:11	–:–	12:13	
23	11:38	11:45	12:12	00:43	13:11	
24	11:53	12:00	12:12	01:38	14:04	

January 25, 26, 27 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	124°04.8	225°40.3	S20°09.5	321°51.4	N11°57.5	337°12.5	N14°24.3	114°13.8	N01°40.4
1	139°07.3	240°39.8	09.8	336°54.3	57.7	352°15.2	24.4	129°16.1	40.5
2	154°09.8	255°39.3	10.2	351°57.2	58.0	7°18.0	24.5	144°18.4	40.6
3	169°12.2	270°38.9	·· 10.5	7°00.1	·· 58.2	22°20.7	·· 24.6	159°20.6	·· 40.6
4	184°14.7	285°38.4	10.8	22°03.0	58.5	37°23.5	24.7	174°22.9	40.7
5	199°17.2	300°37.9	11.2	37°05.9	58.7	52°26.2	24.8	189°25.2	40.8
6	214°19.6	315°37.4	S20°11.5	52°08.8	N11°59.0	67°29.0	N14°24.9	204°27.5	N01°40.9
7	229°22.1	330°36.9	11.8	67°11.7	59.2	82°31.7	25.0	219°29.8	41.0
8	244°24.6	345°36.4	12.2	82°14.6	59.5	97°34.5	25.1	234°32.1	41.0
9	259°27.0	0°35.9	·· 12.5	97°17.4	11°59.7	112°37.2	·· 25.2	249°34.4	·· 41.1
10	274°29.5	15°35.4	12.8	112°20.3	12°00.0	127°40.0	25.4	264°36.7	41.2
11	289°31.9	30°34.9	13.1	127°23.2	00.2	142°42.8	25.5	279°39.0	41.3
12	304°34.4	45°34.4	S20°13.5	142°26.1	N12°00.5	157°45.5	N14°25.6	294°41.3	N01°41.4
13	319°36.9	60°33.9	13.8	157°29.0	00.7	172°48.3	25.7	309°43.6	41.5
14	334°39.3	75°33.4	14.1	172°31.9	01.0	187°51.0	25.8	324°45.9	41.5
15	349°41.8	90°32.9	·· 14.5	187°34.8	·· 01.2	202°53.8	·· 25.9	339°48.2	·· 41.6
16	4°44.3	105°32.4	14.8	202°37.7	01.5	217°56.5	26.0	354°50.4	41.7
17	19°46.7	120°31.9	15.1	217°40.6	01.8	232°59.3	26.1	9°52.7	41.8
18	34°49.2	135°31.4	S20°15.4	232°43.6	N12°02.0	248°02.0	N14°26.2	24°55.0	N01°41.9
19	49°51.7	150°30.9	15.7	247°46.5	02.3	263°04.8	26.3	39°57.3	42.0
20	64°54.1	165°30.3	16.1	262°49.4	02.5	278°07.5	26.4	54°59.6	42.0
21	79°56.6	180°29.8	·· 16.4	277°52.3	·· 02.8	293°10.3	·· 26.5	70°01.9	·· 42.1
22	94°59.1	195°29.3	16.7	292°55.2	03.0	308°13.0	26.6	85°04.2	42.2
23	110°01.5	210°28.8	17.0	307°58.1	03.3	323°15.8	26.7	100°06.5	42.3
Mer.pass. 15:41		ν -0.5′	d 0.3′	m -4.33	ν 2.9′	d 0.2′	m -0.74	ν 2.8′	d 0.1′ m -2.53	ν 2.3′	d 0.1′ m 0.78

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	125°04.0	225°28.3	S20°17.3	323°01.0	N12°03.6	338°18.5	N14°26.8	115°08.8	N01°42.4
1	140°06.4	240°27.8	17.7	338°03.9	03.8	353°21.3	26.9	130°11.1	42.5
2	155°08.9	255°27.3	18.0	353°06.9	04.1	8°24.1	27.1	145°13.4	42.5
3	170°11.4	270°26.8	·· 18.3	8°09.8	·· 04.3	23°26.8	·· 27.2	160°15.6	·· 42.6
4	185°13.8	285°26.3	18.6	23°12.7	04.6	38°29.6	27.3	175°17.9	42.7
5	200°16.3	300°25.8	18.9	38°15.6	04.9	53°32.3	27.4	190°20.2	42.8
6	215°18.8	315°25.3	S20°19.2	53°18.5	N12°05.1	68°35.1	N14°27.5	205°22.5	N01°42.9
7	230°21.2	330°24.8	19.5	68°21.5	05.4	83°37.8	27.6	220°24.8	43.0
8	245°23.7	345°24.2	19.8	83°24.4	05.7	98°40.6	27.7	235°27.1	43.0
9	260°26.2	0°23.7	·· 20.2	98°27.3	·· 05.9	113°43.3	·· 27.8	250°29.4	·· 43.1
10	275°28.6	15°23.2	20.5	113°30.2	06.2	128°46.1	27.9	265°31.7	43.2
11	290°31.1	30°22.7	20.8	128°33.2	06.4	143°48.9	28.0	280°34.0	43.3
12	305°33.6	45°22.2	S20°21.1	143°36.1	N12°06.7	158°51.6	N14°28.1	295°36.3	N01°43.4
13	320°36.0	60°21.7	21.4	158°39.0	07.0	173°54.4	28.2	310°38.5	43.5
14	335°38.5	75°21.2	21.7	173°42.0	07.2	188°57.1	28.3	325°40.8	43.5
15	350°40.9	90°20.6	·· 22.0	188°44.9	·· 07.5	203°59.9	·· 28.4	340°43.1	·· 43.6
16	5°43.4	105°20.1	22.3	203°47.8	07.8	219°02.6	28.6	355°45.4	43.7
17	20°45.9	120°19.6	22.6	218°50.8	08.0	234°05.4	28.7	10°47.7	43.8
18	35°48.3	135°19.1	S20°22.9	233°53.7	N12°08.3	249°08.2	N14°28.8	25°50.0	N01°43.9
19	50°50.8	150°18.6	23.2	248°56.6	08.6	264°10.9	28.9	40°52.3	44.0
20	65°53.3	165°18.1	23.5	263°59.6	08.8	279°13.7	29.0	55°54.6	44.1
21	80°55.7	180°17.5	·· 23.8	279°02.5	·· 09.1	294°16.4	·· 29.1	70°56.8	·· 44.1
22	95°58.2	195°17.0	24.1	294°05.5	09.4	309°19.2	29.2	85°59.1	44.2
23	111°00.7	210°16.5	24.4	309°08.4	09.6	324°21.9	29.3	101°01.4	44.3
Mer.pass. 15:37		ν -0.5′	d 0.3′	m -4.33	ν 2.9′	d 0.3′	m -0.76	ν 2.8′	d 0.1′ m -2.53	ν 2.3′	d 0.1′ m 0.79

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	126°03.1	225°16.0	S20°24.7	324°11.4	N12°09.9	339°24.7	N14°29.4	116°03.7	N01°44.4
1	141°05.6	240°15.5	25.0	339°14.3	10.2	354°27.5	29.5	131°06.0	44.5
2	156°08.0	255°14.9	25.3	354°17.3	10.5	9°30.2	29.6	146°08.3	44.6
3	171°10.5	270°14.4	·· 25.6	9°20.2	·· 10.7	24°33.0	·· 29.7	161°10.6	·· 44.6
4	186°13.0	285°13.9	25.9	24°23.2	11.0	39°35.7	29.8	176°12.9	44.7
5	201°15.4	300°13.4	26.2	39°26.1	11.3	54°38.5	30.0	191°15.1	44.8
6	216°17.9	315°12.8	S20°26.5	54°29.1	N12°11.5	69°41.2	N14°30.1	206°17.4	N01°44.9
7	231°20.4	330°12.3	26.8	69°32.0	11.8	84°44.0	30.2	221°19.7	45.0
8	246°22.8	345°11.8	27.1	84°35.0	12.1	99°46.8	30.3	236°22.0	45.1
9	261°25.3	0°11.3	·· 27.4	99°37.9	·· 12.4	114°49.5	·· 30.4	251°24.3	·· 45.2
10	276°27.8	15°10.7	27.7	114°40.9	12.6	129°52.3	30.5	266°26.6	45.2
11	291°30.2	30°10.2	27.9	129°43.9	12.9	144°55.0	30.6	281°28.9	45.3
12	306°32.7	45°09.7	S20°28.2	144°46.8	N12°13.2	159°57.8	N14°30.7	296°31.2	N01°45.4
13	321°35.2	60°09.2	28.5	159°49.8	13.5	175°00.6	30.8	311°33.4	45.5
14	336°37.6	75°08.6	28.8	174°52.7	13.7	190°03.3	30.9	326°35.7	45.6
15	351°40.1	90°08.1	·· 29.1	189°55.7	·· 14.0	205°06.1	·· 31.0	341°38.0	·· 45.7
16	6°42.5	105°07.6	29.4	204°58.7	14.3	220°08.8	31.1	356°40.3	45.7
17	21°45.0	120°07.1	29.7	220°01.6	14.6	235°11.6	31.3	11°42.6	45.8
18	36°47.5	135°06.5	S20°30.0	235°04.6	N12°14.8	250°14.4	N14°31.4	26°44.9	N01°45.9
19	51°49.9	150°06.0	30.2	250°07.6	15.1	265°17.1	31.5	41°47.1	46.0
20	66°52.4	165°05.5	30.5	265°10.6	15.4	280°19.9	31.6	56°49.4	46.1
21	81°54.9	180°04.9	·· 30.8	280°13.5	·· 15.7	295°22.7	·· 31.7	71°51.7	·· 46.2
22	96°57.3	195°04.4	31.1	295°16.5	16.0	310°25.4	31.8	86°54.0	46.3
23	111°59.8	210°03.9	31.4	310°19.5	16.2	325°28.2	31.9	101°56.3	46.3
Mer.pass. 15:33		ν -0.5′	d 0.3′	m -4.32	ν 2.9′	d 0.3′	m -0.79	ν 2.8′	d 0.1′ m -2.54	ν 2.3′	d 0.1′ m 0.79

Stars	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.3	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.0	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°00.5	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.7
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.8
Suhail	222°44.6	-43°32.6
Miaplacidus	221°37.0	-69°49.7
Alphard	217°45.8	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.0
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.6
Acrux	172°57.8	-63°14.8
Gacrux	171°49.4	-57°15.7
Alioth	166°11.3	55°48.4
Spica	158°20.4	-11°18.2
Alkaid	152°50.6	49°10.3
Hadar	148°33.5	-60°30.0
Menkent	147°55.6	-36°30.1
Arcturus	145°46.4	19°02.2
Rigil Kent.	139°38.0	-60°56.6
Kochab	137°20.1	74°02.2
Zuben'ubi	136°54.2	-16°09.3
Alphecca	126°02.4	26°37.1
Antares	112°13.9	-26°29.5
Atria	107°07.0	-69°04.3
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.8	51°28.9
Kaus Aust.	83°30.6	-34°22.2
Vega	80°32.5	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.3
Peacock	53°03.7	-56°38.9
Deneb	49°25.1	45°22.6
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 25 Mon	SHA	Mer.pass
Venus	101°35.5	08:58
Mars	197°46.6	02:32
Jupiter	213°07.6	01:31
Saturn	350°08.9	16:21

Jan 26 Tue	SHA	Mer.pass
Venus	100°24.3	08:58
Mars	197°57.0	02:27
Jupiter	213°14.6	01:26
Saturn	350°04.8	16:17

Jan 27 Wed	SHA	Mer.pass
Venus	99°12.9	08:59
Mars	198°08.2	02:23
Jupiter	213°21.6	01:22
Saturn	350°00.6	16:13

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0848 sec ΔT = TT-UT1 = +69.2688 sec

2027 January 25 to Jan. 27 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°58.2	S19°04.3	323°52.4	11.0′	N06°31.2	16.4′	59.8′
1	191°58.0	03.7	338°22.4	11.1′	06°14.8	16.5′	59.8′
2	206°57.9	03.0	352°52.4	11.1′	05°58.3	16.5′	59.7′
3	221°57.7	·· 02.4	7°22.5	11.2′	05°41.8	16.5′	59.7′
4	236°57.6	01.8	21°52.7	11.3′	05°25.3	16.5′	59.7′
5	251°57.4	01.2	36°23.0	11.3′	05°08.8	16.5′	59.6′
6	266°57.3	S19°00.6	50°53.3	11.4′	N04°52.3	16.5′	59.6′
7	281°57.1	19°00.0	65°23.7	11.5′	04°35.8	16.5′	59.6′
8	296°57.0	18°59.4	79°54.2	11.5′	04°19.3	16.5′	59.5′
9	311°56.9	·· 58.8	94°24.8	11.6′	04°02.8	16.5′	59.5′
10	326°56.7	58.1	108°55.4	11.7′	03°46.3	16.5′	59.5′
11	341°56.6	57.5	123°26.0	11.7′	03°29.8	16.5′	59.4′
12	356°56.4	S18°56.9	137°56.8	11.8′	N03°13.3	16.5′	59.4′
13	11°56.3	56.3	152°27.6	11.9′	02°56.8	16.5′	59.3′
14	26°56.1	55.7	166°58.4	11.9′	02°40.3	16.5′	59.3′
15	41°56.0	·· 55.1	181°29.3	12.0′	02°23.8	16.5′	59.3′
16	56°55.9	54.4	196°00.3	12.0′	02°07.3	16.4′	59.2′
17	71°55.7	53.8	210°31.3	12.1′	01°50.9	16.5′	59.2′
18	86°55.6	S18°53.2	225°02.4	12.1′	N01°34.4	16.4′	59.1′
19	101°55.4	52.6	239°33.5	12.2′	01°18.0	16.4′	59.1′
20	116°55.3	52.0	254°04.7	12.2′	01°01.6	16.4′	59.1′
21	131°55.2	·· 51.3	268°35.9	12.3′	00°45.2	16.4′	59.0′
22	146°55.0	50.7	283°07.2	12.3′	00°28.8	16.3′	59.0′
23	161°54.9	50.1	297°38.5	12.4′	00°12.5	16.4′	58.9′
	SD = 16.2′	d = 0.6′	SD = 16.3′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°54.7	S18°49.5	312°09.9	12.4′	S00°03.9	16.3′	58.9′
1	191°54.6	48.8	326°41.3	12.5′	00°20.2	16.3′	58.9′
2	206°54.5	48.2	341°12.8	12.5′	00°36.5	16.2′	58.8′
3	221°54.3	·· 47.6	355°44.3	12.5′	00°52.7	16.2′	58.8′
4	236°54.2	47.0	10°15.8	12.6′	01°08.9	16.2′	58.7′
5	251°54.1	46.3	24°47.4	12.6′	01°25.1	16.2′	58.7′
6	266°53.9	S18°45.7	39°19.0	12.7′	S01°41.3	16.1′	58.7′
7	281°53.8	45.1	53°50.7	12.7′	01°57.4	16.1′	58.6′
8	296°53.6	44.4	68°22.4	12.7′	02°13.5	16.1′	58.6′
9	311°53.5	·· 43.8	82°54.1	12.8′	02°29.6	16.0′	58.5′
10	326°53.4	43.2	97°25.8	12.8′	02°45.6	16.0′	58.5′
11	341°53.2	42.6	111°57.6	12.8′	03°01.6	16.0′	58.5′
12	356°53.1	S18°41.9	126°29.4	12.8′	S03°17.6	15.9′	58.4′
13	11°53.0	41.3	141°01.3	12.9′	03°33.5	15.9′	58.4′
14	26°52.8	40.7	155°33.2	12.9′	03°49.4	15.8′	58.3′
15	41°52.7	·· 40.0	170°05.1	12.9′	04°05.2	15.8′	58.3′
16	56°52.6	39.4	184°37.0	13.0′	04°21.0	15.8′	58.3′
17	71°52.4	38.8	199°09.0	13.0′	04°36.8	15.7′	58.2′
18	86°52.3	S18°38.1	213°40.9	13.0′	S04°52.5	15.6′	58.2′
19	101°52.2	37.5	228°12.9	13.0′	05°08.1	15.6′	58.1′
20	116°52.0	36.9	242°44.9	13.0′	05°23.7	15.6′	58.1′
21	131°51.9	·· 36.2	257°17.0	13.1′	05°39.3	15.5′	58.0′
22	146°51.8	35.6	271°49.0	13.1′	05°54.8	15.5′	58.0′
23	161°51.7	34.9	286°21.1	13.1′	06°10.3	15.4′	58.0′
	SD = 16.2′	d = 0.6′	SD = 16.1′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°51.5	S18°34.3	300°53.2	13.1′	S06°25.7	15.4′	57.9′
1	191°51.4	33.7	315°25.3	13.1′	06°41.1	15.3′	57.9′
2	206°51.3	33.0	329°57.4	13.1′	06°56.4	15.2′	57.8′
3	221°51.1	·· 32.4	344°29.5	13.1′	07°11.6	15.2′	57.8′
4	236°51.0	31.7	359°01.7	13.1′	07°26.8	15.1′	57.8′
5	251°50.9	31.1	13°33.8	13.2′	07°41.9	15.1′	57.7′
6	266°50.7	S18°30.5	28°06.0	13.2′	S07°57.0	15.1′	57.7′
7	281°50.6	29.8	42°38.1	13.2′	08°12.1	14.9′	57.6′
8	296°50.5	29.2	57°10.3	13.2′	08°27.0	14.9′	57.6′
9	311°50.4	·· 28.5	71°42.5	13.2′	08°41.9	14.9′	57.6′
10	326°50.2	27.9	86°14.7	13.2′	08°56.8	14.7′	57.5′
11	341°50.1	27.2	100°46.8	13.2′	09°11.5	14.7′	57.5′
12	356°50.0	S18°26.6	115°19.0	13.2′	S09°26.2	14.7′	57.4′
13	11°49.9	26.0	129°51.2	13.2′	09°40.9	14.6′	57.4′
14	26°49.7	25.3	144°23.4	13.2′	09°55.5	14.5′	57.4′
15	41°49.6	·· 24.7	158°55.6	13.2′	10°10.0	14.5′	57.3′
16	56°49.5	24.0	173°27.8	13.2′	10°24.5	14.3′	57.3′
17	71°49.4	23.4	187°59.9	13.2′	10°38.8	14.4′	57.2′
18	86°49.2	S18°22.7	202°32.1	13.2′	S10°53.2	14.2′	57.2′
19	101°49.1	22.1	217°04.3	13.2′	11°07.4	14.2′	57.2′
20	116°49.0	21.4	231°36.4	13.2′	11°21.6	14.1′	57.1′
21	131°48.9	·· 20.8	246°08.6	13.1′	11°35.7	14.0′	57.1′
22	146°48.7	20.1	260°40.7	13.1′	11°49.7	14.0′	57.0′
23	161°48.6	19.5	275°12.9	13.1′	12°03.7	13.8′	57.0′
	SD = 16.2′	d = 0.6′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:30	09:06	11:44	12:42	15:20	16:56
N 70°	07:20	08:43	10:22	14:04	15:43	17:06
68°	07:11	08:25	09:44	14:42	16:01	17:15
66°	07:04	08:10	09:18	15:08	16:16	17:22
64°	06:57	07:58	08:58	15:28	16:28	17:28
62°	06:52	07:48	08:41	15:44	16:38	17:34
60°	06:47	07:39	08:28	15:58	16:47	17:39
N 58°	06:42	07:31	08:16	16:09	16:55	17:44
56°	06:38	07:24	08:06	16:20	17:02	17:48
54°	06:34	07:17	07:57	16:28	17:08	17:52
52°	06:30	07:12	07:49	16:36	17:14	17:55
50°	06:27	07:06	07:42	16:44	17:19	17:59
45°	06:19	06:55	07:27	16:59	17:31	18:06
N 40°	06:12	06:45	07:14	17:11	17:41	18:13
35°	06:05	06:36	07:03	17:22	17:49	18:20
30°	05:59	06:28	06:54	17:32	17:57	18:26
20°	05:47	06:14	06:37	17:48	18:11	18:38
N 10°	05:35	06:00	06:23	18:02	18:25	18:50
0°	05:22	05:47	06:09	18:16	18:38	19:03
S 10°	05:07	05:33	05:55	18:30	18:52	19:18
20°	04:49	05:17	05:40	18:44	19:08	19:36
30°	04:25	04:57	05:23	19:02	19:28	19:59
35°	04:11	04:45	05:13	19:12	19:40	20:13
40°	03:53	04:31	05:01	19:23	19:54	20:31
45°	03:30	04:13	04:48	19:37	20:11	20:54
S 50°	02:59	03:51	04:31	19:53	20:32	21:24
52°	02:43	03:41	04:23	20:01	20:43	21:40
54°	02:23	03:28	04:14	20:10	20:55	21:59
56°	01:57	03:14	04:04	20:20	21:09	22:24
58°	01:18	02:57	03:52	20:31	21:26	23:01
S 60°	////	02:36	03:39	20:44	21:46	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	20:58	23:16	·· ··	09:30	08:56	08:20
N 70°	20:59	23:06	·· ··	09:25	08:59	08:33
68°	21:00	22:58	·· ··	09:21	09:02	08:43
66°	21:00	22:52	·· ··	09:17	09:05	08:51
64°	21:01	22:46	·· ··	09:14	09:07	08:59
62°	21:01	22:41	·· ··	09:12	09:08	09:05
60°	21:02	22:37	·· ··	09:09	09:10	09:11
N 58°	21:02	22:34	·· ··	09:07	09:11	09:15
56°	21:02	22:31	23:57	09:05	09:13	09:20
54°	21:03	22:28	23:51	09:04	09:14	09:24
52°	21:03	22:25	23:46	09:02	09:15	09:27
50°	21:03	22:23	23:41	09:01	09:16	09:31
45°	21:04	22:18	23:31	08:58	09:18	09:38
N 40°	21:04	22:14	23:22	08:55	09:20	09:44
35°	21:04	22:10	23:15	08:53	09:21	09:49
30°	21:05	22:07	23:08	08:51	09:22	09:53
20°	21:05	22:02	22:57	08:47	09:25	10:01
N 10°	21:06	21:57	22:48	08:44	09:27	10:08
0°	21:06	21:53	22:39	08:41	09:29	10:15
S 10°	21:07	21:49	22:30	08:38	09:31	10:22
20°	21:08	21:44	22:21	08:35	09:33	10:29
30°	21:08	21:39	22:10	08:31	09:35	10:37
35°	21:09	21:36	22:04	08:29	09:36	10:41
40°	21:09	21:33	21:57	08:26	09:38	10:47
45°	21:10	21:29	21:50	08:23	09:40	10:53
S 50°	21:10	21:25	21:40	08:20	09:42	11:01
52°	21:11	21:23	21:36	08:18	09:43	11:04
54°	21:11	21:21	21:31	08:16	09:44	11:08
56°	21:11	21:18	21:26	08:14	09:45	11:12
58°	21:12	21:15	21:20	08:12	09:46	11:17
S 60°	21:12	21:12	21:13	08:10	09:48	11:22

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 91-75%
25	12:07	12:14	12:12	02:29	14:54	
26	12:21	12:28	12:12	03:18	15:41	
27	12:34	12:40	12:13	04:04	16:27	

January 28, 29, 30 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	127°02.3	225°03.3	S20°31.6	325°22.5	N12°16.5	340°30.9	N14°32.0	116°58.6	N01°46.4
1	142°04.7	240°02.8	31.9	340°25.4	16.8	355°33.7	32.1	132°00.9	46.5
2	157°07.2	255°02.3	32.2	355°28.4	17.1	10°36.5	32.2	147°03.1	46.6
3	172°09.6	270°01.7	·· 32.5	10°31.4	·· 17.4	25°39.2	·· 32.3	162°05.4	·· 46.7
4	187°12.1	285°01.2	32.7	25°34.4	17.6	40°42.0	32.4	177°07.7	46.8
5	202°14.6	300°00.7	33.0	40°37.4	17.9	55°44.7	32.6	192°10.0	46.9
6	217°17.0	315°00.1	S20°33.3	55°40.3	N12°18.2	70°47.5	N14°32.7	207°12.3	N01°46.9
7	232°19.5	329°59.6	33.6	70°43.3	18.5	85°50.3	32.8	222°14.6	47.0
8	247°22.0	344°59.0	33.8	85°46.3	18.8	100°53.0	32.9	237°16.8	47.1
9	262°24.4	359°58.5	·· 34.1	100°49.3	·· 19.0	115°55.8	·· 33.0	252°19.1	·· 47.2
10	277°26.9	14°58.0	34.4	115°52.3	19.3	130°58.6	33.1	267°21.4	47.3
11	292°29.4	29°57.4	34.7	130°55.3	19.6	146°01.3	33.2	282°23.7	47.4
12	307°31.8	44°56.9	S20°34.9	145°58.3	N12°19.9	161°04.1	N14°33.3	297°26.0	N01°47.5
13	322°34.3	59°56.4	35.2	161°01.3	20.2	176°06.8	33.4	312°28.3	47.6
14	337°36.8	74°55.8	35.5	176°04.3	20.5	191°09.6	33.5	327°30.5	47.6
15	352°39.2	89°55.3	·· 35.7	191°07.3	·· 20.8	206°12.4	·· 33.6	342°32.8	·· 47.7
16	7°41.7	104°54.7	36.0	206°10.3	21.0	221°15.1	33.8	357°35.1	47.8
17	22°44.1	119°54.2	36.3	221°13.3	21.3	236°17.9	33.9	12°37.4	47.9
18	37°46.6	134°53.6	S20°36.5	236°16.3	N12°21.6	251°20.7	N14°34.0	27°39.7	N01°48.0
19	52°49.1	149°53.1	36.8	251°19.3	21.9	266°23.4	34.1	42°42.0	48.1
20	67°51.5	164°52.6	37.0	266°22.3	22.2	281°26.2	34.2	57°44.2	48.2
21	82°54.0	179°52.0	·· 37.3	281°25.3	·· 22.5	296°29.0	·· 34.3	72°46.5	·· 48.2
22	97°56.5	194°51.5	37.6	296°28.3	22.8	311°31.7	34.4	87°48.8	48.3
23	112°58.9	209°50.9	37.8	311°31.3	23.0	326°34.5	34.5	102°51.1	48.4
Mer.pass. 15:29		ν -0.5′	d 0.3′	m -4.31	ν 3.0′	d 0.3′	m -0.81	ν 2.8′	d 0.1′ m -2.54	ν 2.3′	d 0.1′ m 0.79

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	128°01.4	224°50.4	S20°38.1	326°34.3	N12°23.3	341°37.3	N14°34.6	117°53.4	N01°48.5
1	143°03.9	239°49.8	38.3	341°37.3	23.6	356°40.0	34.7	132°55.6	48.6
2	158°06.3	254°49.3	38.6	356°40.3	23.9	11°42.8	34.8	147°57.9	48.7
3	173°08.8	269°48.7	·· 38.9	11°43.3	·· 24.2	26°45.6	·· 35.0	163°00.2	·· 48.8
4	188°11.3	284°48.2	39.1	26°46.3	24.5	41°48.3	35.1	178°02.5	48.9
5	203°13.7	299°47.6	39.4	41°49.4	24.8	56°51.1	35.2	193°04.8	48.9
6	218°16.2	314°47.1	S20°39.6	56°52.4	N12°25.1	71°53.8	N14°35.3	208°07.0	N01°49.0
7	233°18.6	329°46.5	39.9	71°55.4	25.4	86°56.6	35.4	223°09.3	49.1
8	248°21.1	344°46.0	40.1	86°58.4	25.7	101°59.4	35.5	238°11.6	49.2
9	263°23.6	359°45.4	·· 40.4	102°01.4	·· 26.0	117°02.1	·· 35.6	253°13.9	·· 49.3
10	278°26.0	14°44.9	40.6	117°04.4	26.2	132°04.9	35.7	268°16.2	49.4
11	293°28.5	29°44.3	40.9	132°07.5	26.5	147°07.7	35.8	283°18.4	49.5
12	308°31.0	44°43.8	S20°41.1	147°10.5	N12°26.8	162°10.4	N14°35.9	298°20.7	N01°49.6
13	323°33.4	59°43.2	41.4	162°13.5	27.1	177°13.2	36.0	313°23.0	49.6
14	338°35.9	74°42.7	41.6	177°16.5	27.4	192°16.0	36.2	328°25.3	49.7
15	353°38.4	89°42.1	·· 41.9	192°19.6	·· 27.7	207°18.7	·· 36.3	343°27.6	·· 49.8
16	8°40.8	104°41.6	42.1	207°22.6	28.0	222°21.5	36.4	358°29.8	49.9
17	23°43.3	119°41.0	42.4	222°25.6	28.3	237°24.3	36.5	13°32.1	50.0
18	38°45.7	134°40.5	S20°42.6	237°28.7	N12°28.6	252°27.0	N14°36.6	28°34.4	N01°50.1
19	53°48.2	149°39.9	42.8	252°31.7	28.9	267°29.8	36.7	43°36.7	50.2
20	68°50.7	164°39.4	43.1	267°34.7	29.2	282°32.6	36.8	58°39.0	50.3
21	83°53.1	179°38.8	·· 43.3	282°37.8	·· 29.5	297°35.4	·· 36.9	73°41.2	·· 50.3
22	98°55.6	194°38.3	43.6	297°40.8	29.8	312°38.1	37.0	88°43.5	50.4
23	113°58.1	209°37.7	43.8	312°43.8	30.1	327°40.9	37.1	103°45.8	50.5
Mer.pass. 15:25		ν -0.5′	d 0.3′	m -4.30	ν 3.0′	d 0.3′	m -0.84	ν 2.8′	d 0.1′ m -2.54	ν 2.3′	d 0.1′ m 0.79

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	129°00.5	224°37.1	S20°44.1	327°46.9	N12°30.4	342°43.7	N14°37.3	118°48.1	N01°50.6
1	144°03.0	239°36.6	44.3	342°49.9	30.7	357°46.4	37.4	133°50.3	50.7
2	159°05.5	254°36.0	44.5	357°53.0	31.0	12°49.2	37.5	148°52.6	50.8
3	174°07.9	269°35.5	·· 44.8	12°56.0	·· 31.3	27°52.0	·· 37.6	163°54.9	·· 50.9
4	189°10.4	284°34.9	45.0	27°59.0	31.6	42°54.7	37.7	178°57.2	51.0
5	204°12.9	299°34.3	45.2	43°02.1	31.9	57°57.5	37.8	193°59.5	51.0
6	219°15.3	314°33.8	S20°45.5	58°05.1	N12°32.2	73°00.3	N14°37.9	209°01.7	N01°51.1
7	234°17.8	329°33.2	45.7	73°08.2	32.5	88°03.0	38.0	224°04.0	51.2
8	249°20.2	344°32.7	45.9	88°11.2	32.8	103°05.8	38.1	239°06.3	51.3
9	264°22.7	359°32.1	·· 46.2	103°14.3	·· 33.1	118°08.6	·· 38.2	254°08.6	·· 51.4
10	279°25.2	14°31.5	46.4	118°17.3	33.4	133°11.3	38.4	269°10.8	51.5
11	294°27.6	29°31.0	46.6	133°20.4	33.7	148°14.1	38.5	284°13.1	51.6
12	309°30.1	44°30.4	S20°46.8	148°23.4	N12°34.0	163°16.9	N14°38.6	299°15.4	N01°51.7
13	324°32.6	59°29.9	47.1	163°26.5	34.3	178°19.7	38.7	314°17.7	51.8
14	339°35.0	74°29.3	47.3	178°29.5	34.6	193°22.4	38.8	329°20.0	51.8
15	354°37.5	89°28.7	·· 47.5	193°32.6	·· 34.9	208°25.2	·· 38.9	344°22.2	·· 51.9
16	9°40.0	104°28.2	47.8	208°35.7	35.2	223°28.0	39.0	359°24.5	52.0
17	24°42.4	119°27.6	48.0	223°38.7	35.5	238°30.7	39.1	14°26.8	52.1
18	39°44.9	134°27.0	S20°48.2	238°41.8	N12°35.8	253°33.5	N14°39.2	29°29.1	N01°52.2
19	54°47.4	149°26.5	48.4	253°44.8	36.1	268°36.3	39.3	44°31.3	52.3
20	69°49.8	164°25.9	48.6	268°47.9	36.4	283°39.0	39.5	59°33.6	52.4
21	84°52.3	179°25.3	·· 48.9	283°51.0	·· 36.7	298°41.8	·· 39.6	74°35.9	·· 52.5
22	99°54.7	194°24.8	49.1	298°54.0	37.0	313°44.6	39.7	89°38.2	52.6
23	114°57.2	209°24.2	49.3	313°57.1	37.3	328°47.4	39.8	104°40.4	52.6
Mer.pass. 15:21		ν -0.6′	d 0.2′	m -4.29	ν 3.0′	d 0.3′	m -0.86	ν 2.8′	d 0.1′ m -2.55	ν 2.3′	d 0.1′ m 0.79

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.3	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.1	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°02.0	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.2	-52°42.8
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.8
Suhail	222°44.6	-43°32.6
Miaplacidus	221°37.0	-69°49.7
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.0
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.6
Acrux	172°57.8	-63°14.8
Gacrux	171°49.4	-57°15.8
Alioth	166°11.3	55°48.4
Spica	158°20.4	-11°18.2
Alkaid	152°50.6	49°10.3
Hadar	148°33.5	-60°30.0
Menkent	147°55.5	-36°30.1
Arcturus	145°46.3	19°02.2
Rigil Kent.	139°37.9	-60°56.6
Kochab	137°20.0	74°02.2
Zuben'ubi	136°54.2	-16°09.3
Alphecca	126°02.4	26°37.1
Antares	112°13.9	-26°29.5
Atria	107°06.9	-69°04.3
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.8	51°28.9
Kaus Aust.	83°30.6	-34°22.2
Vega	80°32.4	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.3
Peacock	53°03.7	-56°38.8
Deneb	49°25.1	45°22.6
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 28 Thu	SHA	Mer.pass
Venus	98°01.1	09:00
Mars	198°20.2	02:18
Jupiter	213°28.7	01:18
Saturn	349°56.3	16:10

Jan 29 Fri	SHA	Mer.pass
Venus	96°49.0	09:01
Mars	198°32.9	02:13
Jupiter	213°35.9	01:13
Saturn	349°52.0	16:06

Jan 30 Sat	SHA	Mer.pass
Venus	95°36.6	09:02
Mars	198°46.3	02:08
Jupiter	213°43.1	01:09
Saturn	349°47.5	16:02

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0873 sec ΔT = TT-UT1 = +69.2713 sec

2027 January 28 to Jan. 30 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°48.5	S18°18.8	289°45.0	13.1′	S12°17.5	13.8′	57.0′
1	191°48.4	18.2	304°17.1	13.1′	12°31.3	13.8′	56.9′
2	206°48.3	17.5	318°49.2	13.1′	12°45.1	13.6′	56.9′
3	221°48.1	·· 16.9	333°21.3	13.1′	12°58.7	13.6′	56.9′
4	236°48.0	16.2	347°53.4	13.1′	13°12.3	13.5′	56.8′
5	251°47.9	15.5	2°25.5	13.0′	13°25.8	13.4′	56.8′
6	266°47.8	S18°14.9	16°57.5	13.0′	S13°39.2	13.4′	56.7′
7	281°47.7	14.2	31°29.6	13.0′	13°52.6	13.2′	56.7′
8	296°47.5	13.6	46°01.6	13.0′	14°05.8	13.2′	56.7′
9	311°47.4	·· 12.9	60°33.6	13.0′	14°19.0	13.1′	56.6′
10	326°47.3	12.3	75°05.5	13.0′	14°32.1	13.0′	56.6′
11	341°47.2	11.6	89°37.5	12.9′	14°45.1	12.9′	56.6′
12	356°47.1	S18°10.9	104°09.4	12.9′	S14°58.0	12.9′	56.5′
13	11°46.9	10.3	118°41.4	12.9′	15°10.9	12.8′	56.5′
14	26°46.8	09.6	133°13.3	12.9′	15°23.7	12.6′	56.4′
15	41°46.7	·· 09.0	147°45.1	12.9′	15°36.3	12.6′	56.4′
16	56°46.6	08.3	162°17.0	12.8′	15°48.9	12.5′	56.4′
17	71°46.5	07.6	176°48.8	12.8′	16°01.4	12.4′	56.3′
18	86°46.4	S18°07.0	191°20.6	12.8′	S16°13.8	12.3′	56.3′
19	101°46.2	06.3	205°52.4	12.8′	16°26.1	12.3′	56.3′
20	116°46.1	05.6	220°24.1	12.7′	16°38.4	12.1′	56.2′
21	131°46.0	·· 05.0	234°55.9	12.7′	16°50.5	12.1′	56.2′
22	146°45.9	04.3	249°27.6	12.7′	17°02.6	11.9′	56.2′
23	161°45.8	03.7	263°59.2	12.6′	17°14.5	11.9′	56.1′
	SD = 16.2′	d = 0.7′	SD = 15.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°45.7	S18°03.0	278°30.9	12.6′	S17°26.4	11.8′	56.1′
1	191°45.6	02.3	293°02.5	12.6′	17°38.2	11.6′	56.1′
2	206°45.4	01.7	307°34.1	12.6′	17°49.8	11.6′	56.0′
3	221°45.3	·· 01.0	322°05.6	12.5′	18°01.4	11.5′	56.0′
4	236°45.2	18°00.3	336°37.2	12.5′	18°12.9	11.4′	56.0′
5	251°45.1	17°59.6	351°08.6	12.5′	18°24.3	11.3′	55.9′
6	266°45.0	S17°59.0	5°40.1	12.4′	S18°35.6	11.2′	55.9′
7	281°44.9	58.3	20°11.5	12.4′	18°46.8	11.1′	55.9′
8	296°44.8	57.6	34°42.9	12.4′	18°57.9	11.0′	55.8′
9	311°44.7	·· 57.0	49°14.3	12.3′	19°08.9	10.9′	55.8′
10	326°44.5	56.3	63°45.6	12.3′	19°19.8	10.8′	55.8′
11	341°44.4	55.6	78°16.9	12.3′	19°30.6	10.7′	55.7′
12	356°44.3	S17°54.9	92°48.2	12.2′	S19°41.3	10.6′	55.7′
13	11°44.2	54.3	107°19.4	12.2′	19°51.9	10.4′	55.7′
14	26°44.1	53.6	121°50.6	12.2′	20°02.3	10.4′	55.7′
15	41°44.0	·· 52.9	136°21.7	12.1′	20°12.7	10.3′	55.6′
16	56°43.9	52.3	150°52.8	12.1′	20°23.0	10.2′	55.6′
17	71°43.8	51.6	165°23.9	12.0′	20°33.2	10.1′	55.6′
18	86°43.7	S17°50.9	179°55.0	12.0′	S20°43.3	10.0′	55.5′
19	101°43.6	50.2	194°26.0	12.0′	20°53.3	9.8′	55.5′
20	116°43.5	49.5	208°57.0	11.9′	21°03.1	9.8′	55.5′
21	131°43.4	·· 48.9	223°27.9	11.9′	21°12.9	9.6′	55.4′
22	146°43.2	48.2	237°58.8	11.9′	21°22.5	9.6′	55.4′
23	161°43.1	47.5	252°29.7	11.8′	21°32.1	9.4′	55.4′
	SD = 16.2′	d = 0.7′	SD = 15.3′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°43.0	S17°46.8	267°00.5	11.8′	S21°41.5	9.3′	55.4′
1	191°42.9	46.2	281°31.3	11.7′	21°50.8	9.2′	55.3′
2	206°42.8	45.5	296°02.0	11.7′	22°00.0	9.1′	55.3′
3	221°42.7	·· 44.8	310°32.7	11.7′	22°09.1	9.0′	55.3′
4	236°42.6	44.1	325°03.4	11.6′	22°18.1	8.9′	55.3′
5	251°42.5	43.4	339°34.0	11.6′	22°27.0	8.8′	55.2′
6	266°42.4	S17°42.7	354°04.6	11.6′	S22°35.8	8.6′	55.2′
7	281°42.3	42.1	8°35.2	11.5′	22°44.4	8.6′	55.2′
8	296°42.2	41.4	23°05.7	11.5′	22°53.0	8.4′	55.1′
9	311°42.1	·· 40.7	37°36.2	11.4′	23°01.4	8.3′	55.1′
10	326°42.0	40.0	52°06.6	11.4′	23°09.7	8.2′	55.1′
11	341°41.9	39.3	66°37.0	11.4′	23°17.9	8.1′	55.1′
12	356°41.8	S17°38.6	81°07.4	11.3′	S23°26.0	8.0′	55.0′
13	11°41.7	37.9	95°37.7	11.3′	23°34.0	7.8′	55.0′
14	26°41.6	37.3	110°08.0	11.3′	23°41.8	7.8′	55.0′
15	41°41.5	·· 36.6	124°38.3	11.2′	23°49.6	7.6′	55.0′
16	56°41.4	35.9	139°08.5	11.2′	23°57.2	7.5′	55.0′
17	71°41.3	35.2	153°38.7	11.1′	24°04.7	7.3′	54.9′
18	86°41.2	S17°34.5	168°08.8	11.1′	S24°12.0	7.3′	54.9′
19	101°41.1	33.8	182°38.9	11.1′	24°19.3	7.1′	54.9′
20	116°41.0	33.1	197°09.0	11.0′	24°26.4	7.0′	54.9′
21	131°40.9	·· 32.4	211°39.0	11.0′	24°33.4	6.9′	54.8′
22	146°40.8	31.7	226°09.0	11.0′	24°40.3	6.8′	54.8′
23	161°40.7	31.1	240°39.0	10.9′	24°47.1	6.7′	54.8′
	SD = 16.2′	d = 0.7′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:21	08:53	10:58	13:30	15:35	17:07
N 70°	07:11	08:32	10:04	14:24	15:55	17:16
68°	07:04	08:15	09:31	14:56	16:12	17:24
66°	06:57	08:02	09:08	15:19	16:25	17:30
64°	06:51	07:51	08:49	15:38	16:36	17:36
62°	06:46	07:41	08:34	15:53	16:46	17:41
60°	06:42	07:33	08:21	16:06	16:54	17:45
N 58°	06:38	07:26	08:10	16:16	17:01	17:49
56°	06:34	07:19	08:01	16:26	17:08	17:53
54°	06:30	07:13	07:52	16:34	17:14	17:57
52°	06:27	07:08	07:45	16:42	17:19	18:00
50°	06:24	07:03	07:38	16:49	17:24	18:03
45°	06:17	06:52	07:23	17:03	17:35	18:10
N 40°	06:10	06:43	07:11	17:15	17:44	18:17
35°	06:04	06:34	07:01	17:25	17:52	18:23
30°	05:58	06:27	06:52	17:34	18:00	18:28
20°	05:47	06:13	06:36	17:50	18:13	18:40
N 10°	05:35	06:01	06:23	18:04	18:26	18:51
0°	05:22	05:48	06:10	18:17	18:38	19:04
S 10°	05:08	05:34	05:56	18:30	18:52	19:18
20°	04:51	05:19	05:42	18:44	19:07	19:35
30°	04:29	05:00	05:26	19:00	19:26	19:57
35°	04:14	04:48	05:16	19:10	19:37	20:11
40°	03:57	04:35	05:05	19:20	19:51	20:28
45°	03:36	04:18	04:52	19:33	20:07	20:49
S 50°	03:06	03:57	04:36	19:49	20:28	21:18
52°	02:51	03:47	04:28	19:57	20:38	21:33
54°	02:33	03:35	04:20	20:05	20:49	21:51
56°	02:10	03:22	04:11	20:14	21:02	22:13
58°	01:37	03:06	04:00	20:25	21:18	22:44
S 60°	////	02:47	03:47	20:37	21:37	23:44

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	01:42	▬	▬	07:32	▬	▬
N 70°	01:17	03:55	▬	07:59	06:59	▬
68°	00:58	03:09	▬	08:20	07:46	▬
66°	00:43	02:40	04:57	08:37	08:17	07:39
64°	00:31	02:17	04:12	08:50	08:40	08:26
62°	00:20	02:00	03:42	09:02	08:59	08:56
60°	00:11	01:45	03:20	09:12	09:14	09:19
N 58°	00:04	01:33	03:02	09:20	09:27	09:37
56°	·· ··	01:23	02:47	09:28	09:38	09:53
54°	·· ··	01:13	02:34	09:35	09:48	10:06
52°	·· ··	01:05	02:22	09:41	09:57	10:18
50°	·· ··	00:58	02:12	09:47	10:05	10:29
45°	·· ··	00:42	01:52	09:59	10:23	10:51
N 40°	·· ··	00:29	01:35	10:09	10:37	11:08
35°	·· ··	00:18	01:21	10:18	10:49	11:23
30°	·· ··	00:09	01:08	10:25	10:59	11:36
20°	23:52	·· ··	00:48	10:38	11:17	11:59
N 10°	23:38	·· ··	00:30	10:50	11:33	12:18
0°	23:25	·· ··	00:13	11:01	11:48	12:36
S 10°	23:12	23:56	·· ··	11:12	12:03	12:54
20°	22:59	23:39	·· ··	11:24	12:19	13:14
30°	22:43	23:18	23:58	11:37	12:37	13:37
35°	22:34	23:07	23:44	11:45	12:48	13:50
40°	22:24	22:53	23:28	11:54	13:01	14:06
45°	22:12	22:37	23:08	12:05	13:15	14:24
S 50°	21:57	22:18	22:44	12:18	13:34	14:47
52°	21:50	22:09	22:33	12:24	13:42	14:58
54°	21:43	21:59	22:20	12:30	13:52	15:11
56°	21:35	21:47	22:05	12:38	14:03	15:25
58°	21:25	21:34	21:47	12:46	14:15	15:43
S 60°	21:15	21:18	21:26	12:56	14:30	16:04

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 65-45%
28	12:46	12:52	12:13	04:50	17:13	
29	12:57	13:03	12:13	05:37	18:00	
30	13:08	13:13	12:13	06:24	18:49	

January 31, 01, 02 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	129°59.7	224°23.6	S20°49.5	329°00.2	N12°37.7	343°50.1	N14°39.9	119°42.7	N01°52.7
1	145°02.1	239°23.1	49.7	344°03.3	38.0	358°52.9	40.0	134°45.0	52.8
2	160°04.6	254°22.5	50.0	359°06.3	38.3	13°55.7	40.1	149°47.3	52.9
3	175°07.1	269°21.9	·· 50.2	14°09.4	·· 38.6	28°58.4	·· 40.2	164°49.5	·· 53.0
4	190°09.5	284°21.3	50.4	29°12.5	38.9	44°01.2	40.3	179°51.8	53.1
5	205°12.0	299°20.8	50.6	44°15.5	39.2	59°04.0	40.5	194°54.1	53.2
6	220°14.5	314°20.2	S20°50.8	59°18.6	N12°39.5	74°06.8	N14°40.6	209°56.4	N01°53.3
7	235°16.9	329°19.6	51.0	74°21.7	39.8	89°09.5	40.7	224°58.6	53.4
8	250°19.4	344°19.1	51.2	89°24.8	40.1	104°12.3	40.8	240°00.9	53.5
9	265°21.9	359°18.5	·· 51.4	104°27.9	·· 40.4	119°15.1	·· 40.9	255°03.2	·· 53.5
10	280°24.3	14°17.9	51.7	119°30.9	40.7	134°17.8	41.0	270°05.5	53.6
11	295°26.8	29°17.3	51.9	134°34.0	41.1	149°20.6	41.1	285°07.7	53.7
12	310°29.2	44°16.8	S20°52.1	149°37.1	N12°41.4	164°23.4	N14°41.2	300°10.0	N01°53.8
13	325°31.7	59°16.2	52.3	164°40.2	41.7	179°26.2	41.3	315°12.3	53.9
14	340°34.2	74°15.6	52.5	179°43.3	42.0	194°28.9	41.5	330°14.5	54.0
15	355°36.6	89°15.0	·· 52.7	194°46.4	·· 42.3	209°31.7	·· 41.6	345°16.8	·· 54.1
16	10°39.1	104°14.5	52.9	209°49.4	42.6	224°34.5	41.7	0°19.1	54.2
17	25°41.6	119°13.9	53.1	224°52.5	42.9	239°37.3	41.8	15°21.4	54.3
18	40°44.0	134°13.3	S20°53.3	239°55.6	N12°43.2	254°40.0	N14°41.9	30°23.6	N01°54.3
19	55°46.5	149°12.7	53.5	254°58.7	43.6	269°42.8	42.0	45°25.9	54.4
20	70°49.0	164°12.2	53.7	270°01.8	43.9	284°45.6	42.1	60°28.2	54.5
21	85°51.4	179°11.6	·· 53.9	285°04.9	·· 44.2	299°48.3	·· 42.2	75°30.5	·· 54.6
22	100°53.9	194°11.0	54.1	300°08.0	44.5	314°51.1	42.3	90°32.7	54.7
23	115°56.3	209°10.4	54.3	315°11.1	44.8	329°53.9	42.5	105°35.0	54.8
Mer.pass. 15:18		ν -0.6′	d 0.2′	ν 3.1′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.28		m -0.89		m -2.55		m 0.79	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	130°58.8	224°09.8	S20°54.5	330°14.2	N12°45.1	344°56.7	N14°42.6	120°37.3	N01°54.9
1	146°01.3	239°09.3	54.7	345°17.3	45.4	359°59.4	42.7	135°39.5	55.0
2	161°03.7	254°08.7	54.9	0°20.4	45.8	15°02.2	42.8	150°41.8	55.1
3	176°06.2	269°08.1	·· 55.1	15°23.5	·· 46.1	30°05.0	·· 42.9	165°44.1	·· 55.2
4	191°08.7	284°07.5	55.3	30°26.6	46.4	45°07.8	43.0	180°46.4	55.3
5	206°11.1	299°06.9	55.5	45°29.7	46.7	60°10.5	43.1	195°48.6	55.3
6	221°13.6	314°06.4	S20°55.7	60°32.8	N12°47.0	75°13.3	N14°43.2	210°50.9	N01°55.4
7	236°16.1	329°05.8	55.8	75°35.9	47.3	90°16.1	43.3	225°53.2	55.5
8	251°18.5	344°05.2	56.0	90°39.0	47.7	105°18.9	43.5	240°55.4	55.6
9	266°21.0	359°04.6	·· 56.2	105°42.1	·· 48.0	120°21.6	·· 43.6	255°57.7	·· 55.7
10	281°23.5	14°04.0	56.4	120°45.2	48.3	135°24.4	43.7	271°00.0	55.8
11	296°25.9	29°03.5	56.6	135°48.4	48.6	150°27.2	43.8	286°02.3	55.9
12	311°28.4	44°02.9	S20°56.8	150°51.5	N12°48.9	165°30.0	N14°43.9	301°04.5	N01°56.0
13	326°30.8	59°02.3	57.0	165°54.6	49.2	180°32.7	44.0	316°06.8	56.1
14	341°33.3	74°01.7	57.2	180°57.7	49.6	195°35.5	44.1	331°09.1	56.2
15	356°35.8	89°01.1	·· 57.3	196°00.8	·· 49.9	210°38.3	·· 44.2	346°11.3	·· 56.3
16	11°38.2	104°00.5	57.5	211°03.9	50.2	225°41.1	44.3	1°13.6	56.3
17	26°40.7	118°59.9	57.7	226°07.1	50.5	240°43.8	44.5	16°15.9	56.4
18	41°43.2	133°59.4	S20°57.9	241°10.2	N12°50.9	255°46.6	N14°44.6	31°18.2	N01°56.5
19	56°45.6	148°58.8	58.1	256°13.3	51.2	270°49.4	44.7	46°20.4	56.6
20	71°48.1	163°58.2	58.2	271°16.4	51.5	285°52.2	44.8	61°22.7	56.7
21	86°50.6	178°57.6	·· 58.4	286°19.5	·· 51.8	300°54.9	·· 44.9	76°25.0	·· 56.8
22	101°53.0	193°57.0	58.6	301°22.7	52.1	315°57.7	45.0	91°27.2	56.9
23	116°55.5	208°56.4	58.8	316°25.8	52.5	331°00.5	45.1	106°29.5	57.0
Mer.pass. 15:14		ν -0.6′	d 0.2′	ν 3.1′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.27		m -0.91		m -2.55		m 0.79	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	131°58.0	223°55.8	S20°58.9	331°28.9	N12°52.8	346°03.3	N14°45.2	121°31.8	N01°57.1
1	147°00.4	238°55.2	59.1	346°32.0	53.1	1°06.0	45.3	136°34.0	57.2
2	162°02.9	253°54.6	59.3	1°35.2	53.4	16°08.8	45.5	151°36.3	57.3
3	177°05.3	268°54.1	·· 59.5	16°38.3	·· 53.8	31°11.6	·· 45.6	166°38.6	·· 57.4
4	192°07.8	283°53.5	59.6	31°41.4	54.1	46°14.4	45.7	181°40.8	57.4
5	207°10.3	298°52.9	20°59.8	46°44.6	54.4	61°17.2	45.8	196°43.1	57.5
6	222°12.7	313°52.3	S21°00.0	61°47.7	N12°54.7	76°19.9	N14°45.9	211°45.4	N01°57.6
7	237°15.2	328°51.7	00.2	76°50.8	55.0	91°22.7	46.0	226°47.6	57.7
8	252°17.7	343°51.1	00.3	91°54.0	55.4	106°25.5	46.1	241°49.9	57.8
9	267°20.1	358°50.5	·· 00.5	106°57.1	·· 55.7	121°28.3	·· 46.2	256°52.2	·· 57.9
10	282°22.6	13°49.9	00.7	122°00.3	56.0	136°31.0	46.4	271°54.5	58.0
11	297°25.1	28°49.3	00.8	137°03.4	56.4	151°33.8	46.5	286°56.7	58.1
12	312°27.5	43°48.7	S21°01.0	152°06.5	N12°56.7	166°36.6	N14°46.6	301°59.0	N01°58.2
13	327°30.0	58°48.1	01.1	167°09.7	57.0	181°39.4	46.7	317°01.3	58.3
14	342°32.5	73°47.5	01.3	182°12.8	57.3	196°42.1	46.8	332°03.5	58.4
15	357°34.9	88°46.9	·· 01.5	197°16.0	·· 57.7	211°44.9	·· 46.9	347°05.8	·· 58.5
16	12°37.4	103°46.3	01.6	212°19.1	58.0	226°47.7	47.0	2°08.1	58.5
17	27°39.8	118°45.8	01.8	227°22.3	58.3	241°50.5	47.1	17°10.3	58.6
18	42°42.3	133°45.2	S21°02.0	242°25.4	N12°58.6	256°53.3	N14°47.2	32°12.6	N01°58.7
19	57°44.8	148°44.6	02.1	257°28.6	59.0	271°56.0	47.4	47°14.9	58.8
20	72°47.2	163°44.0	02.3	272°31.7	59.3	286°58.8	47.5	62°17.1	58.9
21	87°49.7	178°43.4	·· 02.4	287°34.9	12°59.6	302°01.6	·· 47.6	77°19.4	·· 59.0
22	102°52.2	193°42.8	02.6	302°38.0	13°00.0	317°04.4	47.7	92°21.7	59.1
23	117°54.6	208°42.2	02.7	317°41.2	00.3	332°07.2	47.8	107°23.9	59.2
Mer.pass. 15:10		ν -0.6′	d 0.2′	ν 3.1′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.26		m -0.94		m -2.55		m 0.79	

Stars

	SHA	**Dec**
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.3	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.1	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°03.2	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.6	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.2	-52°42.8
Sirius	258°24.4	-16°45.3
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.9
Suhail	222°44.6	-43°32.6
Miaplacidus	221°37.0	-69°49.7
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.0
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.6
Acrux	172°57.7	-63°14.8
Gacrux	171°49.4	-57°15.8
Alioth	166°11.2	55°48.4
Spica	158°20.4	-11°18.3
Alkaid	152°50.6	49°10.3
Hadar	148°33.4	-60°30.0
Menkent	147°55.5	-36°30.1
Arcturus	145°46.3	19°02.2
Rigil Kent.	139°37.9	-60°56.6
Kochab	137°20.0	74°02.2
Zuben'ubi	136°54.1	-16°09.3
Alphecca	126°02.4	26°37.1
Antares	112°13.9	-26°29.5
Atria	107°06.9	-69°04.3
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.8	51°28.9
Kaus Aust.	83°30.6	-34°22.2
Vega	80°32.4	38°48.3
Nunki	75°46.0	-26°15.7
Altair	61°58.6	8°56.3
Peacock	53°03.6	-56°38.8
Deneb	49°25.1	45°22.6
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.9
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Jan 31 Sun	**SHA**	**Mer.pass**
Venus	94°23.9	09:03
Mars	199°00.5	02:04
Jupiter	213°50.5	01:04
Saturn	349°43.0	15:59

Feb 01 Mon	**SHA**	**Mer.pass**
Venus	93°11.0	09:04
Mars	199°15.4	01:59
Jupiter	213°57.9	01:00
Saturn	349°38.5	15:55

Feb 02 Tue	**SHA**	**Mer.pass**
Venus	91°57.9	09:05
Mars	199°31.0	01:54
Jupiter	214°05.3	00:56
Saturn	349°33.8	15:51

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°40.6	S17°30.4	255°08.9	10.9′	S24°53.8	6.5′	54.8′
1	191°40.5	29.7	269°38.8	10.9′	25°00.3	6.4′	54.8′
2	206°40.4	29.0	284°08.7	10.8′	25°06.7	6.3′	54.7′
3	221°40.3	·· 28.3	298°38.5	10.8′	25°13.0	6.1′	54.7′
4	236°40.2	27.6	313°08.3	10.8′	25°19.1	6.1′	54.7′
5	251°40.1	26.9	327°38.1	10.7′	25°25.2	5.9′	54.7′
6	266°40.0	S17°26.2	342°07.8	10.7′	S25°31.1	5.8′	54.7′
7	281°39.9	25.5	356°37.5	10.7′	25°36.9	5.6′	54.6′
8	296°39.8	24.8	11°07.2	10.6′	25°42.5	5.6′	54.6′
9	311°39.7	·· 24.1	25°36.8	10.6′	25°48.1	5.4′	54.6′
10	326°39.7	23.4	40°06.4	10.6′	25°53.5	5.3′	54.6′
11	341°39.6	22.7	54°36.0	10.5′	25°58.8	5.1′	54.6′
12	356°39.5	S17°22.0	69°05.6	10.5′	S26°03.9	5.0′	54.5′
13	11°39.4	21.3	83°35.1	10.5′	26°08.9	4.9′	54.5′
14	26°39.3	20.6	98°04.6	10.5′	26°13.8	4.8′	54.5′
15	41°39.2	·· 19.9	112°34.0	10.4′	26°18.6	4.6′	54.5′
16	56°39.1	19.2	127°03.5	10.4′	26°23.2	4.6′	54.5′
17	71°39.0	18.5	141°32.9	10.4′	26°27.8	4.3′	54.5′
18	86°38.9	S17°17.8	156°02.3	10.4′	S26°32.1	4.3′	54.4′
19	101°38.8	17.1	170°31.6	10.3′	26°36.4	4.1′	54.4′
20	116°38.7	16.4	185°01.0	10.3′	26°40.5	4.0′	54.4′
21	131°38.6	·· 15.7	199°30.3	10.3′	26°44.5	3.9′	54.4′
22	146°38.6	15.0	213°59.6	10.3′	26°48.4	3.7′	54.4′
23	161°38.5	14.3	228°28.9	10.3′	26°52.1	3.6′	54.4′
	SD = 16.2′	d = 0.7′	SD = 14.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°38.4	S17°13.6	242°58.1	10.2′	S26°55.7	3.5′	54.3′
1	191°38.3	12.9	257°27.4	10.2′	26°59.2	3.3′	54.3′
2	206°38.2	12.2	271°56.6	10.2′	27°02.5	3.2′	54.3′
3	221°38.1	·· 11.5	286°25.8	10.2′	27°05.7	3.1′	54.3′
4	236°38.0	10.8	300°55.0	10.2′	27°08.8	2.9′	54.3′
5	251°37.9	10.0	315°24.1	10.2′	27°11.7	2.8′	54.3′
6	266°37.8	S17°09.3	329°53.3	10.1′	S27°14.5	2.7′	54.3′
7	281°37.8	08.6	344°22.4	10.1′	27°17.2	2.6′	54.3′
8	296°37.7	07.9	358°51.5	10.1′	27°19.8	2.4′	54.2′
9	311°37.6	·· 07.2	13°20.6	10.1′	27°22.2	2.3′	54.2′
10	326°37.5	06.5	27°49.7	10.1′	27°24.5	2.1′	54.2′
11	341°37.4	05.8	42°18.8	10.1′	27°26.6	2.0′	54.2′
12	356°37.3	S17°05.1	56°47.9	10.1′	S27°28.6	1.9′	54.2′
13	11°37.2	04.4	71°17.0	10.1′	27°30.5	1.7′	54.2′
14	26°37.2	03.6	85°46.0	10.1′	27°32.2	1.7′	54.2′
15	41°37.1	·· 02.9	100°15.1	10.1′	27°33.9	1.4′	54.2′
16	56°37.0	02.2	114°44.1	10.0′	27°35.3	1.4′	54.1′
17	71°36.9	01.5	129°13.2	10.0′	27°36.7	1.2′	54.1′
18	86°36.8	S17°00.8	143°42.2	10.0′	S27°37.9	1.1′	54.1′
19	101°36.7	17°00.1	158°11.3	10.0′	27°39.0	0.9′	54.1′
20	116°36.7	16°59.4	172°40.3	10.0′	27°39.9	0.8′	54.1′
21	131°36.6	·· 58.6	187°09.4	10.0′	27°40.7	0.7′	54.1′
22	146°36.5	57.9	201°38.4	10.0′	27°41.4	0.5′	54.1′
23	161°36.4	57.2	216°07.4	10.0′	27°41.9	0.4′	54.1′
	SD = 16.2′	d = 0.7′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°36.3	S16°56.5	230°36.5	10.0′	S27°42.3	0.3′	54.1′
1	191°36.3	55.8	245°05.5	10.1′	27°42.6	0.1′	54.1′
2	206°36.2	55.1	259°34.6	10.1′	27°42.7	0.1′	54.1′
3	221°36.1	·· 54.3	274°03.6	10.1′	27°42.8	0.2′	54.0′
4	236°36.0	53.6	288°32.7	10.1′	27°42.6	0.2′	54.0′
5	251°35.9	52.9	303°01.8	10.1′	27°42.4	0.4′	54.0′
6	266°35.9	S16°52.2	317°30.9	10.1′	S27°42.0	0.6′	54.0′
7	281°35.8	51.4	332°00.0	10.1′	27°41.4	0.6′	54.0′
8	296°35.7	50.7	346°29.1	10.1′	27°40.8	0.8′	54.0′
9	311°35.6	·· 50.0	0°58.2	10.1′	27°40.0	0.9′	54.0′
10	326°35.6	49.3	15°27.3	10.1′	27°39.1	1.1′	54.0′
11	341°35.5	48.6	29°56.4	10.2′	27°38.0	1.2′	54.0′
12	356°35.4	S16°47.8	44°25.6	10.2′	S27°36.8	1.3′	54.0′
13	11°35.3	47.1	58°54.8	10.2′	27°35.5	1.5′	54.0′
14	26°35.2	46.4	73°24.0	10.2′	27°34.0	1.6′	54.0′
15	41°35.2	·· 45.7	87°53.2	10.2′	27°32.4	1.7′	54.0′
16	56°35.1	44.9	102°22.4	10.3′	27°30.7	1.8′	54.0′
17	71°35.0	44.2	116°51.7	10.3′	27°28.9	2.0′	54.0′
18	86°35.0	S16°43.5	131°20.9	10.3′	S27°26.9	2.1′	54.0′
19	101°34.9	42.7	145°50.2	10.3′	27°24.8	2.3′	54.0′
20	116°34.8	42.0	160°19.6	10.3′	27°22.5	2.4′	54.0′
21	131°34.7	·· 41.3	174°48.9	10.4′	27°20.1	2.5′	53.9′
22	146°34.7	40.6	189°18.3	10.4′	27°17.6	2.6′	53.9′
23	161°34.6	39.8	203°47.7	10.4′	27°15.0	2.8′	53.9′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:10	08:39	10:29	13:59	15:49	17:18
N 70°	07:02	08:21	09:47	14:42	16:08	17:26
68°	06:56	08:06	09:18	15:10	16:22	17:33
66°	06:50	07:54	08:57	15:31	16:34	17:38
64°	06:45	07:43	08:40	15:48	16:45	17:43
62°	06:40	07:35	08:26	16:02	16:53	17:48
60°	06:36	07:27	08:14	16:13	17:01	17:52
N 58°	06:33	07:20	08:04	16:24	17:08	17:55
56°	06:29	07:14	07:55	16:32	17:14	17:59
54°	06:26	07:09	07:47	16:40	17:19	18:02
52°	06:23	07:04	07:40	16:47	17:24	18:05
50°	06:20	06:59	07:34	16:54	17:29	18:07
45°	06:14	06:49	07:20	17:07	17:39	18:14
N 40°	06:08	06:40	07:09	17:19	17:47	18:20
35°	06:02	06:32	06:59	17:28	17:55	18:25
30°	05:57	06:25	06:50	17:37	18:02	18:31
20°	05:46	06:13	06:36	17:52	18:15	18:41
N 10°	05:35	06:00	06:22	18:05	18:27	18:52
0°	05:23	05:48	06:10	18:17	18:39	19:04
S 10°	05:10	05:35	05:57	18:29	18:52	19:17
20°	04:53	05:21	05:44	18:43	19:06	19:34
30°	04:32	05:03	05:28	18:58	19:24	19:55
35°	04:18	04:52	05:19	19:07	19:35	20:08
40°	04:02	04:39	05:09	19:18	19:48	20:24
45°	03:41	04:23	04:56	19:30	20:03	20:45
S 50°	03:13	04:03	04:41	19:45	20:23	21:12
52°	02:59	03:54	04:34	19:52	20:32	21:26
54°	02:42	03:43	04:26	20:00	20:43	21:42
56°	02:21	03:30	04:17	20:08	20:55	22:03
58°	01:54	03:15	04:07	20:18	21:10	22:29
S 60°	01:08	02:57	03:56	20:30	21:27	23:11

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	06:33	▬	▬	07:47	▬	▬
62°	05:27	07:11	08:22	08:54	08:55	09:31
60°	04:52	06:15	07:16	09:29	09:51	10:37
N 58°	04:27	05:43	06:41	09:54	10:24	11:12
56°	04:07	05:19	06:16	10:15	10:48	11:37
54°	03:50	04:59	05:56	10:32	11:07	11:57
52°	03:36	04:43	05:39	10:46	11:24	12:14
50°	03:24	04:29	05:24	10:59	11:38	12:28
45°	02:58	04:00	04:55	11:25	12:07	12:58
N 40°	02:38	03:38	04:32	11:46	12:30	13:20
35°	02:21	03:20	04:13	12:03	12:48	13:39
30°	02:07	03:04	03:57	12:18	13:05	13:56
20°	01:43	02:37	03:29	12:44	13:32	14:23
N 10°	01:21	02:14	03:06	13:06	13:55	14:46
0°	01:02	01:52	02:44	13:26	14:17	15:08
S 10°	00:42	01:31	02:22	13:47	14:39	15:30
20°	00:22	01:08	01:58	14:09	15:02	15:54
30°	·· ··	00:42	01:31	14:35	15:30	16:21
35°	·· ··	00:26	01:14	14:50	15:46	16:37
40°	·· ··	00:08	00:55	15:07	16:05	16:55
45°	23:46	·· ··	00:33	15:29	16:27	17:18
S 50°	23:19	·· ··	00:04	15:56	16:56	17:46
52°	23:05	23:49	·· ··	16:09	17:11	18:00
54°	22:50	23:32	·· ··	16:24	17:27	18:17
56°	22:32	23:13	·· ··	16:42	17:47	18:36
58°	22:10	22:48	23:46	17:04	18:12	19:00
S 60°	21:41	22:14	23:15	17:32	18:45	19:31

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 35-18%
31	13:18	13:22	12:13	07:14	19:39	
01	13:27	13:31	12:14	08:05	20:30	
02	13:35	13:38	12:14	08:56	21:21	

February 03, 04, 05 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	132°57.1	223°41.6	S21°02.9	332°44.3	N13°00.6	347°09.9	N14°47.9	122°26.2	N01°59.3
1	147°59.6	238°41.0	03.0	347°47.5	00.9	2°12.7	48.0	137°28.5	59.4
2	163°02.0	253°40.4	03.2	2°50.6	01.3	17°15.5	48.1	152°30.7	59.5
3	178°04.5	268°39.8	·· 03.3	17°53.8	·· 01.6	32°18.3	·· 48.3	167°33.0	·· 59.6
4	193°07.0	283°39.2	03.5	32°56.9	01.9	47°21.0	48.4	182°35.3	59.7
5	208°09.4	298°38.6	03.6	48°00.1	02.3	62°23.8	48.5	197°37.5	59.8
6	223°11.9	313°38.0	S21°03.8	63°03.3	N13°02.6	77°26.6	N14°48.6	212°39.8	N01°59.8
7	238°14.3	328°37.4	03.9	78°06.4	02.9	92°29.4	48.7	227°42.1	01°59.9
8	253°16.8	343°36.8	04.1	93°09.6	03.3	107°32.2	48.8	242°44.3	02°00.0
9	268°19.3	358°36.2	·· 04.2	108°12.8	·· 03.6	122°34.9	·· 48.9	257°46.6	·· 00.1
10	283°21.7	13°35.6	04.4	123°15.9	03.9	137°37.7	49.0	272°48.8	00.2
11	298°24.2	28°35.0	04.5	138°19.1	04.3	152°40.5	49.2	287°51.1	00.3
12	313°26.7	43°34.4	S21°04.7	153°22.3	N13°04.6	167°43.3	N14°49.3	302°53.4	N02°00.4
13	328°29.1	58°33.8	04.8	168°25.4	04.9	182°46.1	49.4	317°55.6	00.5
14	343°31.6	73°33.2	04.9	183°28.6	05.3	197°48.8	49.5	332°57.9	00.6
15	358°34.1	88°32.6	·· 05.1	198°31.8	·· 05.6	212°51.6	·· 49.6	348°00.2	·· 00.7
16	13°36.5	103°31.9	05.2	213°34.9	05.9	227°54.4	49.7	3°02.4	00.8
17	28°39.0	118°31.3	05.4	228°38.1	06.3	242°57.2	49.8	18°04.7	00.9
18	43°41.4	133°30.7	S21°05.5	243°41.3	N13°06.6	258°00.0	N14°49.9	33°07.0	N02°01.0
19	58°43.9	148°30.1	05.6	258°44.5	06.9	273°02.7	50.0	48°09.2	01.1
20	73°46.4	163°29.5	05.8	273°47.7	07.3	288°05.5	50.2	63°11.5	01.1
21	88°48.8	178°28.9	·· 05.9	288°50.8	·· 07.6	303°08.3	·· 50.3	78°13.8	·· 01.2
22	103°51.3	193°28.3	06.0	303°54.0	07.9	318°11.1	50.4	93°16.0	01.3
23	118°53.8	208°27.7	06.2	318°57.2	08.3	333°13.9	50.5	108°18.3	01.4
Mer.pass. 15:06		ν -0.6′	d 0.2′	ν 3.2′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.26		m -0.96		m -2.55		m 0.79	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	133°56.2	223°27.1	S21°06.3	334°00.4	N13°08.6	348°16.6	N14°50.6	123°20.5	N02°01.5
1	148°58.7	238°26.5	06.4	349°03.6	09.0	3°19.4	50.7	138°22.8	01.6
2	164°01.2	253°25.9	06.6	4°06.7	09.3	18°22.2	50.8	153°25.1	01.7
3	179°03.6	268°25.3	·· 06.7	19°09.9	·· 09.6	33°25.0	·· 50.9	168°27.3	·· 01.8
4	194°06.1	283°24.7	06.8	34°13.1	10.0	48°27.8	51.1	183°29.6	01.9
5	209°08.6	298°24.1	06.9	49°16.3	10.3	63°30.5	51.2	198°31.9	02.0
6	224°11.0	313°23.4	S21°07.1	64°19.5	N13°10.6	78°33.3	N14°51.3	213°34.1	N02°02.1
7	239°13.5	328°22.8	07.2	79°22.7	11.0	93°36.1	51.4	228°36.4	02.2
8	254°15.9	343°22.2	07.3	94°25.9	11.3	108°38.9	51.5	243°38.6	02.3
9	269°18.4	358°21.6	·· 07.4	109°29.1	·· 11.7	123°41.7	·· 51.6	258°40.9	·· 02.4
10	284°20.9	13°21.0	07.6	124°32.3	12.0	138°44.4	51.7	273°43.2	02.5
11	299°23.3	28°20.4	07.7	139°35.4	12.3	153°47.2	51.8	288°45.4	02.6
12	314°25.8	43°19.8	S21°07.8	154°38.6	N13°12.7	168°50.0	N14°52.0	303°47.7	N02°02.7
13	329°28.3	58°19.2	07.9	169°41.8	13.0	183°52.8	52.1	318°50.0	02.7
14	344°30.7	73°18.6	08.0	184°45.0	13.4	198°55.6	52.2	333°52.2	02.8
15	359°33.2	88°17.9	·· 08.2	199°48.2	·· 13.7	213°58.4	·· 52.3	348°54.5	·· 02.9
16	14°35.7	103°17.3	08.3	214°51.4	14.0	229°01.1	52.4	3°56.7	03.0
17	29°38.1	118°16.7	08.4	229°54.6	14.4	244°03.9	52.5	18°59.0	03.1
18	44°40.6	133°16.1	S21°08.5	244°57.8	N13°14.7	259°06.7	N14°52.6	34°01.3	N02°03.2
19	59°43.1	148°15.5	08.6	260°01.0	15.1	274°09.5	52.7	49°03.5	03.3
20	74°45.5	163°14.9	08.7	275°04.2	15.4	289°12.3	52.9	64°05.8	03.4
21	89°48.0	178°14.3	·· 08.8	290°07.4	·· 15.7	304°15.0	·· 53.0	79°08.0	·· 03.5
22	104°50.4	193°13.7	09.0	305°10.7	16.1	319°17.8	53.1	94°10.3	03.6
23	119°52.9	208°13.0	09.1	320°13.9	16.4	334°20.6	53.2	109°12.6	03.7
Mer.pass. 15:02		ν -0.6′	d 0.1′	ν 3.2′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.25		m -0.99		m -2.55		m 0.79	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	134°55.4	223°12.4	S21°09.2	335°17.1	N13°16.8	349°23.4	N14°53.3	124°14.8	N02°03.8
1	149°57.8	238°11.8	09.3	350°20.3	17.1	4°26.2	53.4	139°17.1	03.9
2	165°00.3	253°11.2	09.4	5°23.5	17.4	19°29.0	53.5	154°19.4	04.0
3	180°02.8	268°10.6	·· 09.5	20°26.7	·· 17.8	34°31.7	·· 53.6	169°21.6	·· 04.1
4	195°05.2	283°10.0	09.6	35°29.9	18.1	49°34.5	53.8	184°23.9	04.2
5	210°07.7	298°09.3	09.7	50°33.1	18.5	64°37.3	53.9	199°26.1	04.3
6	225°10.2	313°08.7	S21°09.8	65°36.3	N13°18.8	79°40.1	N14°54.0	214°28.4	N02°04.4
7	240°12.6	328°08.1	09.9	80°39.6	19.2	94°42.9	54.1	229°30.7	04.5
8	255°15.1	343°07.5	10.0	95°42.8	19.5	109°45.7	54.2	244°32.9	04.5
9	270°17.6	358°06.9	·· 10.1	110°46.0	·· 19.9	124°48.4	·· 54.3	259°35.2	·· 04.6
10	285°20.0	13°06.2	10.2	125°49.2	20.2	139°51.2	54.4	274°37.4	04.7
11	300°22.5	28°05.6	10.3	140°52.4	20.5	154°54.0	54.5	289°39.7	04.8
12	315°24.9	43°05.0	S21°10.4	155°55.6	N13°20.9	169°56.8	N14°54.7	304°41.9	N02°04.9
13	330°27.4	58°04.4	10.5	170°58.9	21.2	184°59.6	54.8	319°44.2	05.0
14	345°29.9	73°03.8	10.6	186°02.1	21.6	200°02.4	54.9	334°46.5	05.1
15	0°32.3	88°03.1	·· 10.7	201°05.3	·· 21.9	215°05.1	·· 55.0	349°48.7	·· 05.2
16	15°34.8	103°02.5	10.8	216°08.5	22.3	230°07.9	55.1	4°51.0	05.3
17	30°37.3	118°01.9	10.9	231°11.8	22.6	245°10.7	55.2	19°53.2	05.4
18	45°39.7	133°01.3	S21°11.0	246°15.0	N13°23.0	260°13.5	N14°55.3	34°55.5	N02°05.5
19	60°42.2	148°00.7	11.1	261°18.2	23.3	275°16.3	55.4	49°57.8	05.6
20	75°44.7	163°00.0	11.2	276°21.5	23.7	290°19.1	55.6	65°00.0	05.7
21	90°47.1	177°59.4	·· 11.3	291°24.7	·· 24.0	305°21.8	·· 55.7	80°02.3	·· 05.8
22	105°49.6	192°58.8	11.3	306°27.9	24.3	320°24.6	55.8	95°04.5	05.9
23	120°52.0	207°58.2	11.4	321°31.1	24.7	335°27.4	55.9	110°06.8	06.0
Mer.pass. 14:58		ν -0.6′	d 0.1′	ν 3.2′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.24		m -1.01		m -2.55		m 0.79	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.3	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.1	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°04.6	89°23.0
Acamar	315°10.4	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.7	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.2	-52°42.8
Sirius	258°24.4	-16°45.4
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.9
Suhail	222°44.6	-43°32.6
Miaplacidus	221°36.9	-69°49.7
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.0
Denebola	182°22.9	14°25.0
Gienah	175°41.6	-17°41.6
Acrux	172°57.7	-63°14.8
Gacrux	171°49.3	-57°15.8
Alioth	166°11.2	55°48.4
Spica	158°20.4	-11°18.3
Alkaid	152°50.5	49°10.3
Hadar	148°33.4	-60°30.0
Menkent	147°55.5	-36°30.1
Arcturus	145°46.3	19°02.2
Rigil Kent.	139°37.8	-60°56.6
Kochab	137°19.9	74°02.2
Zuben'ubi	136°54.1	-16°09.3
Alphecca	126°02.4	26°37.1
Antares	112°13.9	-26°29.5
Atria	107°06.8	-69°04.3
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.8	51°28.8
Kaus Aust.	83°30.5	-34°22.2
Vega	80°32.4	38°48.3
Nunki	75°45.9	-26°15.7
Altair	61°58.6	8°56.3
Peacock	53°03.6	-56°38.8
Deneb	49°25.1	45°22.6
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Feb 03 Wed	SHA	Mer.pass
Venus	90°44.5	09:06
Mars	199°47.2	01:49
Jupiter	214°12.8	00:51
Saturn	349°29.1	15:48

Feb 04 Thu	SHA	Mer.pass
Venus	89°30.9	09:07
Mars	200°04.1	01:44
Jupiter	214°20.4	00:47
Saturn	349°24.3	15:44

Feb 05 Fri	SHA	Mer.pass
Venus	88°17.0	09:08
Mars	200°21.7	01:39
Jupiter	214°28.0	00:42
Saturn	349°19.5	15:41

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°34.5	S16°39.1	218°17.1	10.5′	S27°12.2	2.9′	53.9′
1	191°34.4	38.4	232°46.5	10.5′	27°09.3	3.0′	53.9′
2	206°34.4	37.6	247°16.0	10.5′	27°06.3	3.1′	53.9′
3	221°34.3	·· 36.9	261°45.5	10.5′	27°03.2	3.3′	53.9′
4	236°34.2	36.2	276°15.1	10.6′	26°59.9	3.4′	53.9′
5	251°34.2	35.4	290°44.7	10.6′	26°56.5	3.6′	53.9′
6	266°34.1	S16°34.7	305°14.3	10.6′	S26°52.9	3.6′	53.9′
7	281°34.0	34.0	319°43.9	10.7′	26°49.3	3.8′	53.9′
8	296°33.9	33.2	334°13.6	10.7′	26°45.5	3.9′	53.9′
9	311°33.9	·· 32.5	348°43.3	10.7′	26°41.6	4.0′	53.9′
10	326°33.8	31.8	3°13.0	10.8′	26°37.6	4.2′	53.9′
11	341°33.7	31.0	17°42.8	10.8′	26°33.4	4.3′	53.9′
12	356°33.7	S16°30.3	32°12.6	10.9′	S26°29.1	4.4′	53.9′
13	11°33.6	29.6	46°42.5	10.9′	26°24.7	4.5′	53.9′
14	26°33.5	28.8	61°12.4	10.9′	26°20.2	4.7′	53.9′
15	41°33.5	·· 28.1	75°42.3	11.0′	26°15.5	4.8′	53.9′
16	56°33.4	27.3	90°12.3	11.0′	26°10.7	4.9′	53.9′
17	71°33.3	26.6	104°42.3	11.1′	26°05.8	5.0′	53.9′
18	86°33.3	S16°25.9	119°12.4	11.1′	S26°00.8	5.1′	53.9′
19	101°33.2	25.1	133°42.5	11.2′	25°55.7	5.3′	53.9′
20	116°33.1	24.4	148°12.7	11.2′	25°50.4	5.4′	53.9′
21	131°33.1	·· 23.6	162°42.9	11.2′	25°45.0	5.5′	53.9′
22	146°33.0	22.9	177°13.1	11.3′	25°39.5	5.6′	53.9′
23	161°32.9	22.2	191°43.4	11.3′	25°33.9	5.8′	53.9′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°32.9	S16°21.4	206°13.7	11.4′	S25°28.1	5.8′	53.9′
1	191°32.8	20.7	220°44.1	11.4′	25°22.3	6.0′	53.9′
2	206°32.8	19.9	235°14.5	11.5′	25°16.3	6.1′	53.9′
3	221°32.7	·· 19.2	249°45.0	11.5′	25°10.2	6.2′	53.9′
4	236°32.6	18.4	264°15.5	11.6′	25°04.0	6.3′	53.9′
5	251°32.6	17.7	278°46.1	11.6′	24°57.7	6.4′	53.9′
6	266°32.5	S16°17.0	293°16.7	11.7′	S24°51.3	6.6′	53.9′
7	281°32.4	16.2	307°47.4	11.7′	24°44.7	6.6′	53.9′
8	296°32.4	15.5	322°18.1	11.8′	24°38.1	6.8′	54.0′
9	311°32.3	·· 14.7	336°48.9	11.8′	24°31.3	6.9′	54.0′
10	326°32.3	14.0	351°19.7	11.9′	24°24.4	7.0′	54.0′
11	341°32.2	13.2	5°50.6	11.9′	24°17.4	7.1′	54.0′
12	356°32.1	S16°12.5	20°21.5	12.0′	S24°10.3	7.2′	54.0′
13	11°32.1	11.7	34°52.5	12.0′	24°03.1	7.3′	54.0′
14	26°32.0	11.0	49°23.5	12.1′	23°55.8	7.5′	54.0′
15	41°32.0	·· 10.2	63°54.6	12.1′	23°48.3	7.5′	54.0′
16	56°31.9	09.5	78°25.7	12.2′	23°40.8	7.7′	54.0′
17	71°31.8	08.7	92°56.9	12.2′	23°33.1	7.7′	54.0′
18	86°31.8	S16°08.0	107°28.1	12.3′	S23°25.4	7.9′	54.0′
19	101°31.7	07.2	121°59.4	12.3′	23°17.5	7.9′	54.0′
20	116°31.7	06.5	136°30.8	12.4′	23°09.6	8.1′	54.0′
21	131°31.6	·· 05.7	151°02.2	12.5′	23°01.5	8.2′	54.0′
22	146°31.6	05.0	165°33.6	12.5′	22°53.3	8.2′	54.0′
23	161°31.5	04.2	180°05.1	12.6′	22°45.1	8.4′	54.0′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°31.5	S16°03.5	194°36.7	12.6′	S22°36.7	8.5′	54.0′
1	191°31.4	02.7	209°08.3	12.7′	22°28.2	8.6′	54.0′
2	206°31.3	01.9	223°40.0	12.7′	22°19.6	8.6′	54.0′
3	221°31.3	·· 01.2	238°11.7	12.8′	22°11.0	8.8′	54.0′
4	236°31.2	16°00.4	252°43.5	12.8′	22°02.2	8.9′	54.1′
5	251°31.2	15°59.7	267°15.3	12.9′	21°53.3	8.9′	54.1′
6	266°31.1	S15°58.9	281°47.2	12.9′	S21°44.4	9.1′	54.1′
7	281°31.1	58.2	296°19.2	13.0′	21°35.3	9.2′	54.1′
8	296°31.0	57.4	310°51.2	13.1′	21°26.1	9.2′	54.1′
9	311°31.0	·· 56.6	325°23.2	13.1′	21°16.9	9.4′	54.1′
10	326°30.9	55.9	339°55.3	13.2′	21°07.5	9.4′	54.1′
11	341°30.9	55.1	354°27.5	13.2′	20°58.1	9.5′	54.1′
12	356°30.8	S15°54.4	8°59.7	13.3′	S20°48.6	9.7′	54.1′
13	11°30.8	53.6	23°32.0	13.3′	20°38.9	9.7′	54.1′
14	26°30.7	52.8	38°04.3	13.4′	20°29.2	9.8′	54.1′
15	41°30.7	·· 52.1	52°36.7	13.4′	20°19.4	9.9′	54.1′
16	56°30.6	51.3	67°09.1	13.5′	20°09.5	10.0′	54.1′
17	71°30.6	50.6	81°41.6	13.5′	19°59.5	10.0′	54.2′
18	86°30.5	S15°49.8	96°14.1	13.6′	S19°49.5	10.2′	54.2′
19	101°30.5	49.0	110°46.7	13.6′	19°39.3	10.2′	54.2′
20	116°30.4	48.3	125°19.3	13.7′	19°29.1	10.3′	54.2′
21	131°30.4	·· 47.5	139°52.0	13.7′	19°18.8	10.5′	54.2′
22	146°30.3	46.7	154°24.8	13.8′	19°08.3	10.4′	54.2′
23	161°30.3	46.0	168°57.6	13.8′	18°57.9	10.6′	54.2′
	SD = 16.2′	d = 0.8′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:59	08:26	10:05	14:24	16:03	17:30
N 70°	06:53	08:09	09:30	14:59	16:20	17:37
68°	06:47	07:56	09:05	15:23	16:33	17:42
66°	06:42	07:45	08:46	15:42	16:44	17:47
64°	06:38	07:36	08:31	15:58	16:53	17:51
62°	06:34	07:28	08:18	16:11	17:01	17:55
60°	06:30	07:21	08:07	16:21	17:08	17:58
N 58°	06:27	07:14	07:58	16:31	17:14	18:01
56°	06:24	07:09	07:50	16:39	17:20	18:04
54°	06:22	07:04	07:42	16:46	17:25	18:07
52°	06:19	06:59	07:36	16:53	17:29	18:10
50°	06:16	06:55	07:30	16:59	17:33	18:12
45°	06:11	06:46	07:17	17:12	17:43	18:18
N 40°	06:05	06:37	07:06	17:22	17:51	18:23
35°	06:00	06:30	06:57	17:31	17:58	18:28
30°	05:55	06:24	06:49	17:39	18:04	18:33
20°	05:45	06:12	06:35	17:53	18:16	18:43
N 10°	05:35	06:00	06:22	18:06	18:28	18:53
0°	05:24	05:49	06:10	18:17	18:39	19:04
S 10°	05:11	05:37	05:59	18:29	18:51	19:17
20°	04:55	05:22	05:46	18:42	19:05	19:32
30°	04:35	05:05	05:31	18:56	19:22	19:52
35°	04:22	04:55	05:22	19:05	19:32	20:05
40°	04:06	04:43	05:12	19:15	19:44	20:20
45°	03:47	04:28	05:01	19:26	19:59	20:40
S 50°	03:21	04:09	04:46	19:40	20:17	21:05
52°	03:07	04:00	04:40	19:47	20:26	21:18
54°	02:52	03:50	04:32	19:54	20:36	21:34
56°	02:33	03:38	04:24	20:02	20:48	21:52
58°	02:08	03:24	04:15	20:11	21:01	22:16
S 60°	01:33	03:08	04:04	20:22	21:17	22:49

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	10:15	▬	▬	12:46
66°	▬	▬	09:24	▬	▬	13:36
64°	▬	09:12	08:52	▬	12:09	14:07
62°	08:32	08:31	08:28	11:07	12:50	14:30
60°	07:48	08:02	08:09	11:50	13:18	14:48
N 58°	07:19	07:40	07:53	12:19	13:39	15:03
56°	06:56	07:23	07:40	12:42	13:57	15:16
54°	06:38	07:07	07:28	13:00	14:12	15:28
52°	06:22	06:54	07:17	13:15	14:24	15:37
50°	06:09	06:42	07:08	13:28	14:36	15:46
45°	05:41	06:18	06:48	13:56	14:59	16:05
N 40°	05:19	05:59	06:32	14:17	15:18	16:20
35°	05:01	05:43	06:19	14:35	15:33	16:33
30°	04:45	05:29	06:07	14:50	15:47	16:44
20°	04:19	05:04	05:46	15:16	16:09	17:02
N 10°	03:56	04:44	05:28	15:38	16:29	17:19
0°	03:35	04:24	05:12	15:59	16:47	17:34
S 10°	03:13	04:05	04:55	16:19	17:06	17:49
20°	02:50	03:44	04:37	16:41	17:25	18:05
30°	02:24	03:19	04:16	17:07	17:47	18:23
35°	02:08	03:05	04:04	17:22	18:00	18:34
40°	01:49	02:48	03:50	17:39	18:15	18:46
45°	01:27	02:28	03:33	17:59	18:33	19:00
S 50°	00:59	02:03	03:12	18:25	18:55	19:17
52°	00:45	01:51	03:02	18:38	19:05	19:25
54°	00:29	01:37	02:51	18:52	19:17	19:34
56°	00:10	01:20	02:38	19:09	19:30	19:44
58°	·· ··	01:01	02:23	19:29	19:46	19:56
S 60°	·· ··	00:36	02:05	19:54	20:04	20:09

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 27-29 12-3%
03	13:42	13:45	12:14	09:47	22:12	
04	13:48	13:51	12:14	10:36	23:00	
05	13:54	13:57	12:14	11:23	23:46	

February 06, 07, 08 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	135°54.5	222°57.6	S21°11.5	336°34.4	N13°25.0	350°30.2	N14°56.0	125°09.0	N02°06.1
1	150°57.0	237°56.9	11.6	351°37.6	25.4	5°33.0	56.1	140°11.3	06.2
2	165°59.4	252°56.3	11.7	6°40.8	25.7	20°35.8	56.2	155°13.6	06.3
3	181°01.9	267°55.7	·· 11.8	21°44.1	·· 26.1	35°38.5	·· 56.3	170°15.8	·· 06.4
4	196°04.4	282°55.1	11.8	36°47.3	26.4	50°41.3	56.5	185°18.1	06.5
5	211°06.8	297°54.4	11.9	51°50.6	26.8	65°44.1	56.6	200°20.3	06.6
6	226°09.3	312°53.8	S21°12.0	66°53.8	N13°27.1	80°46.9	N14°56.7	215°22.6	N02°06.6
7	241°11.8	327°53.2	12.1	81°57.0	27.5	95°49.7	56.8	230°24.9	06.7
8	256°14.2	342°52.6	12.2	97°00.3	27.8	110°52.5	56.9	245°27.1	06.8
9	271°16.7	357°51.9	·· 12.2	112°03.5	·· 28.2	125°55.2	·· 57.0	260°29.4	·· 06.9
10	286°19.2	12°51.3	12.3	127°06.8	28.5	140°58.0	57.1	275°31.6	07.0
11	301°21.6	27°50.7	12.4	142°10.0	28.9	156°00.8	57.2	290°33.9	07.1
12	316°24.1	42°50.1	S21°12.5	157°13.3	N13°29.2	171°03.6	N14°57.4	305°36.1	N02°07.2
13	331°26.5	57°49.4	12.5	172°16.5	29.6	186°06.4	57.5	320°38.4	07.3
14	346°29.0	72°48.8	12.6	187°19.7	29.9	201°09.2	57.6	335°40.6	07.4
15	1°31.5	87°48.2	·· 12.7	202°23.0	·· 30.3	216°12.0	·· 57.7	350°42.9	·· 07.5
16	16°33.9	102°47.5	12.8	217°26.2	30.6	231°14.7	57.8	5°45.2	07.6
17	31°36.4	117°46.9	12.8	232°29.5	31.0	246°17.5	57.9	20°47.4	07.7
18	46°38.9	132°46.3	S21°12.9	247°32.7	N13°31.3	261°20.3	N14°58.0	35°49.7	N02°07.8
19	61°41.3	147°45.7	13.0	262°36.0	31.7	276°23.1	58.1	50°51.9	07.9
20	76°43.8	162°45.0	13.0	277°39.3	32.0	291°25.9	58.3	65°54.2	08.0
21	91°46.3	177°44.4	·· 13.1	292°42.5	·· 32.4	306°28.7	·· 58.4	80°56.4	·· 08.1
22	106°48.7	192°43.8	13.2	307°45.8	32.7	321°31.4	58.5	95°58.7	08.2
23	121°51.2	207°43.1	13.2	322°49.0	33.1	336°34.2	58.6	111°00.9	08.3
Mer.pass. 14:54		ν -0.6′	d 0.1′	ν 3.2′	d 0.3′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.23		m -1.04		m -2.56		m 0.80	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	136°53.7	222°42.5	S21°13.3	337°52.3	N13°33.4	351°37.0	N14°58.7	126°03.2	N02°08.4
1	151°56.1	237°41.9	13.4	352°55.5	33.8	6°39.8	58.8	141°05.5	08.5
2	166°58.6	252°41.2	13.4	7°58.8	34.1	21°42.6	58.9	156°07.7	08.6
3	182°01.0	267°40.6	·· 13.5	23°02.0	·· 34.5	36°45.4	·· 59.0	171°10.0	·· 08.7
4	197°03.5	282°40.0	13.5	38°05.3	34.8	51°48.2	59.2	186°12.2	08.8
5	212°06.0	297°39.4	13.6	53°08.6	35.2	66°50.9	59.3	201°14.5	08.9
6	227°08.4	312°38.7	S21°13.7	68°11.8	N13°35.6	81°53.7	N14°59.4	216°16.7	N02°09.0
7	242°10.9	327°38.1	13.7	83°15.1	35.9	96°56.5	59.5	231°19.0	09.1
8	257°13.4	342°37.5	13.8	98°18.4	36.3	111°59.3	59.6	246°21.2	09.2
9	272°15.8	357°36.8	·· 13.8	113°21.6	·· 36.6	127°02.1	·· 59.7	261°23.5	·· 09.3
10	287°18.3	12°36.2	13.9	128°24.9	37.0	142°04.9	14°59.8	276°25.7	09.4
11	302°20.8	27°35.6	13.9	143°28.2	37.3	157°07.7	15°00.0	291°28.0	09.5
12	317°23.2	42°34.9	S21°14.0	158°31.4	N13°37.7	172°10.4	N15°00.1	306°30.3	N02°09.6
13	332°25.7	57°34.3	14.0	173°34.7	38.0	187°13.2	00.2	321°32.5	09.6
14	347°28.1	72°33.7	14.1	188°38.0	38.4	202°16.0	00.3	336°34.8	09.7
15	2°30.6	87°33.0	·· 14.1	203°41.2	·· 38.7	217°18.8	·· 00.4	351°37.0	·· 09.8
16	17°33.1	102°32.4	14.2	218°44.5	39.1	232°21.6	00.5	6°39.3	09.9
17	32°35.5	117°31.8	14.2	233°47.8	39.4	247°24.4	00.6	21°41.5	10.0
18	47°38.0	132°31.1	S21°14.3	248°51.1	N13°39.8	262°27.2	N15°00.7	36°43.8	N02°10.1
19	62°40.5	147°30.5	14.3	263°54.3	40.2	277°29.9	00.9	51°46.0	10.2
20	77°42.9	162°29.8	14.4	278°57.6	40.5	292°32.7	01.0	66°48.3	10.3
21	92°45.4	177°29.2	·· 14.4	294°00.9	·· 40.9	307°35.5	·· 01.1	81°50.5	·· 10.4
22	107°47.9	192°28.6	14.5	309°04.2	41.2	322°38.3	01.2	96°52.8	10.5
23	122°50.3	207°27.9	14.5	324°07.4	41.6	337°41.1	01.3	111°55.0	10.6
Mer.pass. 14:50		ν -0.6′	d 0.1′	ν 3.3′	d 0.4′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.22		m -1.06		m -2.56		m 0.80	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	137°52.8	222°27.3	S21°14.5	339°10.7	N13°41.9	352°43.9	N15°01.4	126°57.3	N02°10.7
1	152°55.3	237°26.7	14.6	354°14.0	42.3	7°46.7	01.5	141°59.5	10.8
2	167°57.7	252°26.0	14.6	9°17.3	42.6	22°49.4	01.6	157°01.8	10.9
3	183°00.2	267°25.4	·· 14.7	24°20.6	·· 43.0	37°52.2	·· 01.8	172°04.0	·· 11.0
4	198°02.6	282°24.8	14.7	39°23.9	43.4	52°55.0	01.9	187°06.3	11.1
5	213°05.1	297°24.1	14.7	54°27.1	43.7	67°57.8	02.0	202°08.5	11.2
6	228°07.6	312°23.5	S21°14.8	69°30.4	N13°44.1	83°00.6	N15°02.1	217°10.8	N02°11.3
7	243°10.0	327°22.8	14.8	84°33.7	44.4	98°03.4	02.2	232°13.1	11.4
8	258°12.5	342°22.2	14.8	99°37.0	44.8	113°06.2	02.3	247°15.3	11.5
9	273°15.0	357°21.6	·· 14.9	114°40.3	·· 45.1	128°08.9	·· 02.4	262°17.6	·· 11.6
10	288°17.4	12°20.9	14.9	129°43.6	45.5	143°11.7	02.5	277°19.8	11.7
11	303°19.9	27°20.3	14.9	144°46.9	45.9	158°14.5	02.7	292°22.1	11.8
12	318°22.4	42°19.6	S21°14.9	159°50.2	N13°46.2	173°17.3	N15°02.8	307°24.3	N02°11.9
13	333°24.8	57°19.0	15.0	174°53.4	46.6	188°20.1	02.9	322°26.6	12.0
14	348°27.3	72°18.4	15.0	189°56.7	46.9	203°22.9	03.0	337°28.8	12.1
15	3°29.8	87°17.7	·· 15.0	205°00.0	·· 47.3	218°25.7	·· 03.1	352°31.1	·· 12.2
16	18°32.2	102°17.1	15.1	220°03.3	47.6	233°28.5	03.2	7°33.3	12.3
17	33°34.7	117°16.4	15.1	235°06.6	48.0	248°31.2	03.3	22°35.6	12.4
18	48°37.1	132°15.8	S21°15.1	250°09.9	N13°48.4	263°34.0	N15°03.4	37°37.8	N02°12.5
19	63°39.6	147°15.2	15.1	265°13.2	48.7	278°36.8	03.6	52°40.1	12.6
20	78°42.1	162°14.5	15.1	280°16.5	49.1	293°39.6	03.7	67°42.3	12.7
21	93°44.5	177°13.9	·· 15.2	295°19.8	·· 49.4	308°42.4	·· 03.8	82°44.6	·· 12.8
22	108°47.0	192°13.2	15.2	310°23.1	49.8	323°45.2	03.9	97°46.8	12.9
23	123°49.5	207°12.6	15.2	325°26.4	50.2	338°48.0	04.0	112°49.1	13.0
Mer.pass. 14:46		ν -0.6′	d 0.0′	ν 3.3′	d 0.4′	ν 2.8′	d 0.1′	ν 2.3′	d 0.1′
		m -4.21		m -1.08		m -2.56		m 0.80	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.4	56°41.4
Diphda	348°45.7	-17°50.4
Achernar	335°19.1	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°06.2	89°23.0
Acamar	315°10.5	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.7	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.2	-52°42.8
Sirius	258°24.4	-16°45.4
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.9
Suhail	222°44.6	-43°32.6
Miaplacidus	221°37.0	-69°49.7
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.0
Denebola	182°22.9	14°25.0
Gienah	175°41.6	-17°41.6
Acrux	172°57.7	-63°14.8
Gacrux	171°49.3	-57°15.8
Alioth	166°11.2	55°48.4
Spica	158°20.3	-11°18.3
Alkaid	152°50.5	49°10.3
Hadar	148°33.3	-60°30.0
Menkent	147°55.5	-36°30.1
Arcturus	145°46.3	19°02.2
Rigil Kent.	139°37.8	-60°56.6
Kochab	137°19.8	74°02.2
Zuben'ubi	136°54.1	-16°09.3
Alphecca	126°02.3	26°37.1
Antares	112°13.8	-26°29.5
Atria	107°06.8	-69°04.3
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.3
Rasalhague	95°57.1	12°32.3
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°30.5	-34°22.2
Vega	80°32.4	38°48.3
Nunki	75°45.9	-26°15.7
Altair	61°58.6	8°56.3
Peacock	53°03.6	-56°38.8
Deneb	49°25.1	45°22.6
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.9
Markab	13°28.4	15°21.1

Feb 06 Sat	SHA	Mer.pass
Venus	87°03.0	09:09
Mars	200°39.9	01:33
Jupiter	214°35.7	00:38
Saturn	349°14.5	15:37

Feb 07 Sun	SHA	Mer.pass
Venus	85°48.9	09:10
Mars	200°58.6	01:28
Jupiter	214°43.4	00:33
Saturn	349°09.5	15:33

Feb 08 Mon	SHA	Mer.pass
Venus	84°34.5	09:11
Mars	201°17.9	01:23
Jupiter	214°51.1	00:29
Saturn	349°04.5	15:30

Horizontal parallax	
Venus:	0.2
Mars:	0.2

DUT1 = UT1-UTC = -0.0873 sec ΔT = TT-UT1 = +69.2713 sec

2027 February 06 to Feb. 08 UT

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°30.2	S15°45.2	183°30.4	13.9′	S18°47.3	10.7′	54.2′
1	191°30.2	44.4	198°03.3	14.0′	18°36.6	10.7′	54.2′
2	206°30.1	43.7	212°36.3	14.0′	18°25.9	10.8′	54.2′
3	221°30.1	·· 42.9	227°09.3	14.1′	18°15.1	10.9′	54.2′
4	236°30.0	42.1	241°42.3	14.1′	18°04.2	11.0′	54.3′
5	251°30.0	41.4	256°15.4	14.2′	17°53.2	11.1′	54.3′
6	266°29.9	S15°40.6	270°48.6	14.2′	S17°42.1	11.1′	54.3′
7	281°29.9	39.8	285°21.8	14.2′	17°31.0	11.2′	54.3′
8	296°29.9	39.1	299°55.0	14.3′	17°19.8	11.3′	54.3′
9	311°29.8	·· 38.3	314°28.3	14.3′	17°08.5	11.3′	54.3′
10	326°29.8	37.5	329°01.7	14.4′	16°57.2	11.5′	54.3′
11	341°29.7	36.8	343°35.1	14.4′	16°45.7	11.5′	54.3′
12	356°29.7	S15°36.0	358°08.5	14.5′	S16°34.2	11.5′	54.3′
13	11°29.6	35.2	12°42.0	14.5′	16°22.7	11.7′	54.3′
14	26°29.6	34.4	27°15.5	14.6′	16°11.0	11.7′	54.4′
15	41°29.6	·· 33.7	41°49.1	14.6′	15°59.3	11.8′	54.4′
16	56°29.5	32.9	56°22.7	14.7′	15°47.5	11.8′	54.4′
17	71°29.5	32.1	70°56.4	14.7′	15°35.7	11.9′	54.4′
18	86°29.4	S15°31.4	85°30.1	14.7′	S15°23.8	12.0′	54.4′
19	101°29.4	30.6	100°03.8	14.8′	15°11.8	12.1′	54.4′
20	116°29.4	29.8	114°37.6	14.8′	14°59.7	12.1′	54.4′
21	131°29.3	·· 29.0	129°11.4	14.9′	14°47.6	12.2′	54.4′
22	146°29.3	28.3	143°45.3	14.9′	14°35.4	12.2′	54.5′
23	161°29.2	27.5	158°19.2	15.0′	14°23.2	12.3′	54.5′
	SD = 16.2′	d = 0.8′	SD = 14.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°29.2	S15°26.7	172°53.2	15.0′	S14°10.9	12.4′	54.5′
1	191°29.2	25.9	187°27.2	15.0′	13°58.5	12.4′	54.5′
2	206°29.1	25.1	202°01.2	15.1′	13°46.1	12.5′	54.5′
3	221°29.1	·· 24.4	216°35.3	15.1′	13°33.6	12.5′	54.5′
4	236°29.0	23.6	231°09.4	15.1′	13°21.1	12.7′	54.5′
5	251°29.0	22.8	245°43.5	15.2′	13°08.4	12.6′	54.5′
6	266°29.0	S15°22.0	260°17.7	15.2′	S12°55.8	12.7′	54.6′
7	281°28.9	21.3	274°51.9	15.2′	12°43.1	12.8′	54.6′
8	296°28.9	20.5	289°26.1	15.3′	12°30.3	12.8′	54.6′
9	311°28.9	·· 19.7	304°00.4	15.3′	12°17.5	12.9′	54.6′
10	326°28.8	18.9	318°34.7	15.3′	12°04.6	13.0′	54.6′
11	341°28.8	18.1	333°09.1	15.4′	11°51.6	12.9′	54.6′
12	356°28.8	S15°17.3	347°43.5	15.4′	S11°38.7	13.1′	54.6′
13	11°28.7	16.6	2°17.9	15.4′	11°25.6	13.1′	54.6′
14	26°28.7	15.8	16°52.3	15.5′	11°12.5	13.1′	54.7′
15	41°28.7	·· 15.0	31°26.8	15.5′	10°59.4	13.2′	54.7′
16	56°28.6	14.2	46°01.3	15.5′	10°46.2	13.3′	54.7′
17	71°28.6	13.4	60°35.8	15.5′	10°32.9	13.2′	54.7′
18	86°28.6	S15°12.6	75°10.3	15.6′	S10°19.7	13.4′	54.7′
19	101°28.5	11.9	89°44.9	15.6′	10°06.3	13.3′	54.7′
20	116°28.5	11.1	104°19.5	15.6′	09°53.0	13.5′	54.7′
21	131°28.5	·· 10.3	118°54.1	15.6′	09°39.5	13.4′	54.8′
22	146°28.4	09.5	133°28.8	15.7′	09°26.1	13.5′	54.8′
23	161°28.4	08.7	148°03.4	15.7′	09°12.6	13.6′	54.8′
	SD = 16.2′	d = 0.8′	SD = 14.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°28.4	S15°07.9	162°38.1	15.7′	S08°59.0	13.6′	54.8′
1	191°28.3	07.1	177°12.8	15.7′	08°45.4	13.6′	54.8′
2	206°28.3	06.4	191°47.5	15.7′	08°31.8	13.7′	54.8′
3	221°28.3	·· 05.6	206°22.3	15.8′	08°18.1	13.7′	54.9′
4	236°28.3	04.8	220°57.1	15.8′	08°04.4	13.8′	54.9′
5	251°28.2	04.0	235°31.8	15.8′	07°50.6	13.8′	54.9′
6	266°28.2	S15°03.2	250°06.6	15.8′	S07°36.8	13.8′	54.9′
7	281°28.2	02.4	264°41.4	15.8′	07°23.0	13.8′	54.9′
8	296°28.1	01.6	279°16.3	15.8′	07°09.2	13.9′	54.9′
9	311°28.1	·· 00.8	293°51.1	15.9′	06°55.3	14.0′	54.9′
10	326°28.1	15°00.0	308°26.0	15.9′	06°41.3	13.9′	55.0′
11	341°28.1	14°59.2	323°00.8	15.9′	06°27.4	14.0′	55.0′
12	356°28.0	S14°58.4	337°35.7	15.9′	S06°13.4	14.0′	55.0′
13	11°28.0	57.7	352°10.6	15.9′	05°59.4	14.1′	55.0′
14	26°28.0	56.9	6°45.5	15.9′	05°45.3	14.1′	55.0′
15	41°28.0	·· 56.1	21°20.4	15.9′	05°31.2	14.1′	55.0′
16	56°27.9	55.3	35°55.3	15.9′	05°17.1	14.1′	55.1′
17	71°27.9	54.5	50°30.2	15.9′	05°03.0	14.2′	55.1′
18	86°27.9	S14°53.7	65°05.2	15.9′	S04°48.8	14.2′	55.1′
19	101°27.9	52.9	79°40.1	15.9′	04°34.6	14.2′	55.1′
20	116°27.8	52.1	94°15.0	15.9′	04°20.4	14.3′	55.1′
21	131°27.8	·· 51.3	108°49.9	15.9′	04°06.1	14.2′	55.1′
22	146°27.8	50.5	123°24.9	15.9′	03°51.9	14.3′	55.2′
23	161°27.8	49.7	137°59.8	15.9′	03°37.6	14.3′	55.2′
	SD = 16.2′	d = 0.8′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:48	08:12	09:44	14:45	16:17	17:42
N 70°	06:43	07:58	09:15	15:15	16:32	17:47
68°	06:38	07:46	08:53	15:37	16:44	17:52
66°	06:34	07:36	08:36	15:54	16:53	17:55
64°	06:30	07:28	08:22	16:08	17:02	17:59
62°	06:27	07:20	08:10	16:19	17:09	18:02
60°	06:24	07:14	08:00	16:29	17:15	18:05
N 58°	06:22	07:08	07:51	16:38	17:21	18:08
56°	06:19	07:03	07:43	16:46	17:26	18:10
54°	06:17	06:59	07:37	16:52	17:30	18:12
52°	06:14	06:54	07:30	16:58	17:34	18:15
50°	06:12	06:51	07:25	17:04	17:38	18:17
45°	06:07	06:42	07:13	17:16	17:47	18:22
N 40°	06:02	06:35	07:03	17:26	17:54	18:26
35°	05:58	06:28	06:54	17:34	18:01	18:31
30°	05:53	06:22	06:47	17:42	18:07	18:35
20°	05:44	06:11	06:33	17:55	18:18	18:44
N 10°	05:35	06:00	06:22	18:07	18:28	18:53
0°	05:24	05:49	06:11	18:18	18:39	19:04
S 10°	05:12	05:38	05:59	18:29	18:50	19:16
20°	04:57	05:24	05:47	18:40	19:04	19:31
30°	04:38	05:08	05:33	18:54	19:20	19:50
35°	04:26	04:58	05:25	19:02	19:29	20:02
40°	04:11	04:47	05:16	19:11	19:41	20:16
45°	03:52	04:33	05:05	19:22	19:55	20:35
S 50°	03:28	04:15	04:52	19:35	20:12	20:59
52°	03:15	04:06	04:46	19:41	20:20	21:11
54°	03:01	03:57	04:39	19:48	20:30	21:25
56°	02:44	03:46	04:31	19:56	20:40	21:42
58°	02:22	03:33	04:22	20:04	20:53	22:03
S 60°	01:53	03:18	04:12	20:14	21:07	22:31

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	10:42	09:33	08:54	13:54	16:34	18:41
N 70°	09:54	09:12	08:44	14:41	16:53	18:48
68°	09:22	08:56	08:36	15:12	17:07	18:54
66°	08:59	08:42	08:29	15:34	17:19	18:59
64°	08:40	08:31	08:23	15:51	17:29	19:03
62°	08:25	08:22	08:18	16:05	17:37	19:06
60°	08:12	08:13	08:14	16:17	17:44	19:09
N 58°	08:01	08:06	08:10	16:28	17:50	19:12
56°	07:51	08:00	08:07	16:36	17:56	19:14
54°	07:43	07:54	08:03	16:44	18:01	19:16
52°	07:35	07:49	08:01	16:51	18:05	19:18
50°	07:28	07:44	07:58	16:58	18:09	19:20
45°	07:13	07:34	07:52	17:11	18:18	19:23
N 40°	07:01	07:25	07:47	17:22	18:25	19:26
35°	06:50	07:18	07:43	17:32	18:31	19:29
30°	06:41	07:11	07:40	17:40	18:36	19:31
20°	06:24	07:00	07:33	17:54	18:45	19:35
N 10°	06:10	06:50	07:28	18:07	18:53	19:39
0°	05:57	06:40	07:22	18:18	19:01	19:42
S 10°	05:44	06:31	07:17	18:30	19:08	19:45
20°	05:29	06:21	07:11	18:42	19:16	19:49
30°	05:13	06:09	07:05	18:55	19:25	19:52
35°	05:03	06:02	07:01	19:03	19:30	19:55
40°	04:52	05:55	06:57	19:12	19:35	19:57
45°	04:39	05:46	06:52	19:23	19:42	20:00
S 50°	04:23	05:35	06:46	19:35	19:50	20:03
52°	04:16	05:30	06:43	19:41	19:54	20:05
54°	04:08	05:24	06:40	19:47	19:57	20:06
56°	03:58	05:18	06:36	19:54	20:02	20:08
58°	03:47	05:11	06:33	20:02	20:07	20:10
S 60°	03:35	05:03	06:28	20:11	20:12	20:12

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 0-2%
06	13:59	14:01	12:14	12:08	–:–	
07	14:03	14:05	12:14	12:51	00:29	
08	14:07	14:08	12:14	13:32	01:11	

February 09, 10, 11 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	138°51.9	222°12.0	S21°15.2	340°29.7	N13°50.5	353°50.7	N15°04.1	127°51.3	N02°13.1
1	153°54.4	237°11.3	15.2	355°33.0	50.9	8°53.5	04.2	142°53.6	13.2
2	168°56.9	252°10.7	15.2	10°36.3	51.2	23°56.3	04.3	157°55.8	13.3
3	183°59.3	267°10.0	·· 15.3	25°39.6	·· 51.6	38°59.1	·· 04.4	172°58.1	·· 13.4
4	199°01.8	282°09.4	15.3	40°42.9	51.9	54°01.9	04.6	188°00.3	13.5
5	214°04.2	297°08.7	15.3	55°46.2	52.3	69°04.7	04.7	203°02.6	13.6
6	229°06.7	312°08.1	S21°15.3	70°49.5	N13°52.7	84°07.5	N15°04.8	218°04.8	N02°13.7
7	244°09.2	327°07.5	15.3	85°52.8	53.0	99°10.3	04.9	233°07.1	13.8
8	259°11.6	342°06.8	15.3	100°56.1	53.4	114°13.0	05.0	248°09.3	13.9
9	274°14.1	357°06.2	·· 15.3	115°59.5	·· 53.7	129°15.8	·· 05.1	263°11.6	·· 14.0
10	289°16.6	12°05.5	15.3	131°02.8	54.1	144°18.6	05.2	278°13.8	14.1
11	304°19.0	27°04.9	15.3	146°06.1	54.5	159°21.4	05.3	293°16.1	14.2
12	319°21.5	42°04.2	S21°15.3	161°09.4	N13°54.8	174°24.2	N15°05.5	308°18.3	N02°14.3
13	334°24.0	57°03.6	15.3	176°12.7	55.2	189°27.0	05.6	323°20.5	14.4
14	349°26.4	72°02.9	15.4	191°16.0	55.5	204°29.8	05.7	338°22.8	14.5
15	4°28.9	87°02.3	·· 15.4	206°19.3	·· 55.9	219°32.6	·· 05.8	353°25.0	·· 14.6
16	19°31.4	102°01.6	15.4	221°22.6	56.3	234°35.3	05.9	8°27.3	14.7
17	34°33.8	117°01.0	15.4	236°26.0	56.6	249°38.1	06.0	23°29.5	14.8
18	49°36.3	132°00.4	S21°15.4	251°29.3	N13°57.0	264°40.9	N15°06.1	38°31.8	N02°14.9
19	64°38.7	146°59.7	15.4	266°32.6	57.4	279°43.7	06.2	53°34.0	15.0
20	79°41.2	161°59.1	15.3	281°35.9	57.7	294°46.5	06.4	68°36.3	15.1
21	94°43.7	176°58.4	·· 15.3	296°39.2	·· 58.1	309°49.3	·· 06.5	83°38.5	·· 15.2
22	109°46.1	191°57.8	15.3	311°42.5	58.4	324°52.1	06.6	98°40.8	15.3
23	124°48.6	206°57.1	15.3	326°45.9	58.8	339°54.9	06.7	113°43.0	15.4
Mer.pass. 14:42		ν -0.6′	d 0.0′	m -4.21	ν 3.3′	d 0.4′	m -1.11	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	139°51.1	221°56.5	S21°15.3	341°49.2	N13°59.2	354°57.6	N15°06.8	128°45.3	N02°15.5
1	154°53.5	236°55.8	15.3	356°52.5	59.5	10°00.4	06.9	143°47.5	15.6
2	169°56.0	251°55.2	15.3	11°55.8	13°59.9	25°03.2	07.0	158°49.8	15.7
3	184°58.5	266°54.5	·· 15.3	26°59.1	14°00.2	40°06.0	·· 07.1	173°52.0	·· 15.8
4	200°00.9	281°53.9	15.3	42°02.5	00.6	55°08.8	07.3	188°54.3	15.9
5	215°03.4	296°53.2	15.3	57°05.8	01.0	70°11.6	07.4	203°56.5	16.0
6	230°05.8	311°52.6	S21°15.3	72°09.1	N14°01.3	85°14.4	N15°07.5	218°58.8	N02°16.1
7	245°08.3	326°51.9	15.3	87°12.5	01.7	100°17.2	07.6	234°01.0	16.2
8	260°10.8	341°51.3	15.2	102°15.8	02.0	115°19.9	07.7	249°03.2	16.3
9	275°13.2	356°50.6	·· 15.2	117°19.1	·· 02.4	130°22.7	·· 07.8	264°05.5	·· 16.4
10	290°15.7	11°50.0	15.2	132°22.4	02.8	145°25.5	07.9	279°07.7	16.5
11	305°18.2	26°49.3	15.2	147°25.8	03.1	160°28.3	08.0	294°10.0	16.6
12	320°20.6	41°48.7	S21°15.2	162°29.1	N14°03.5	175°31.1	N15°08.2	309°12.2	N02°16.7
13	335°23.1	56°48.0	15.2	177°32.4	03.9	190°33.9	08.3	324°14.5	16.8
14	350°25.6	71°47.4	15.1	192°35.8	04.2	205°36.7	08.4	339°16.7	16.9
15	5°28.0	86°46.7	·· 15.1	207°39.1	·· 04.6	220°39.5	·· 08.5	354°19.0	·· 17.0
16	20°30.5	101°46.1	15.1	222°42.4	04.9	235°42.2	08.6	9°21.2	17.1
17	35°33.0	116°45.4	15.1	237°45.8	05.3	250°45.0	08.7	24°23.5	17.2
18	50°35.4	131°44.8	S21°15.0	252°49.1	N14°05.7	265°47.8	N15°08.8	39°25.7	N02°17.3
19	65°37.9	146°44.1	15.0	267°52.4	06.0	280°50.6	08.9	54°27.9	17.4
20	80°40.3	161°43.5	15.0	282°55.8	06.4	295°53.4	09.0	69°30.2	17.5
21	95°42.8	176°42.8	·· 15.0	297°59.1	·· 06.8	310°56.2	·· 09.2	84°32.4	·· 17.6
22	110°45.3	191°42.2	14.9	313°02.4	07.1	325°59.0	09.3	99°34.7	17.7
23	125°47.7	206°41.5	14.9	328°05.8	07.5	341°01.8	09.4	114°36.9	17.8
Mer.pass. 14:38		ν -0.6′	d 0.0′	m -4.20	ν 3.3′	d 0.4′	m -1.13	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	140°50.2	221°40.9	S21°14.9	343°09.1	N14°07.8	356°04.5	N15°09.5	129°39.2	N02°17.9
1	155°52.7	236°40.2	14.8	358°12.5	08.2	11°07.3	09.6	144°41.4	18.0
2	170°55.1	251°39.6	14.8	13°15.8	08.6	26°10.1	09.7	159°43.7	18.1
3	185°57.6	266°38.9	·· 14.8	28°19.1	·· 08.9	41°12.9	·· 09.8	174°45.9	·· 18.2
4	201°00.1	281°38.3	14.7	43°22.5	09.3	56°15.7	09.9	189°48.1	18.3
5	216°02.5	296°37.6	14.7	58°25.8	09.7	71°18.5	10.1	204°50.4	18.4
6	231°05.0	311°36.9	S21°14.7	73°29.2	N14°10.0	86°21.3	N15°10.2	219°52.6	N02°18.5
7	246°07.5	326°36.3	14.6	88°32.5	10.4	101°24.1	10.3	234°54.9	18.6
8	261°09.9	341°35.6	14.6	103°35.9	10.7	116°26.8	10.4	249°57.1	18.7
9	276°12.4	356°35.0	·· 14.6	118°39.2	·· 11.1	131°29.6	·· 10.5	264°59.4	·· 18.8
10	291°14.8	11°34.3	14.5	133°42.5	11.5	146°32.4	10.6	280°01.6	18.9
11	306°17.3	26°33.7	14.5	148°45.9	11.8	161°35.2	10.7	295°03.8	19.0
12	321°19.8	41°33.0	S21°14.4	163°49.2	N14°12.2	176°38.0	N15°10.8	310°06.1	N02°19.1
13	336°22.2	56°32.4	14.4	178°52.6	12.6	191°40.8	10.9	325°08.3	19.2
14	351°24.7	71°31.7	14.3	193°55.9	12.9	206°43.6	11.1	340°10.6	19.3
15	6°27.2	86°31.1	·· 14.3	208°59.3	·· 13.3	221°46.4	·· 11.2	355°12.8	·· 19.4
16	21°29.6	101°30.4	14.3	224°02.6	13.6	236°49.1	11.3	10°15.1	19.5
17	36°32.1	116°29.7	14.2	239°06.0	14.0	251°51.9	11.4	25°17.3	19.6
18	51°34.6	131°29.1	S21°14.2	254°09.3	N14°14.4	266°54.7	N15°11.5	40°19.6	N02°19.7
19	66°37.0	146°28.4	14.1	269°12.7	14.7	281°57.5	11.6	55°21.8	19.8
20	81°39.5	161°27.8	14.1	284°16.1	15.1	297°00.3	11.7	70°24.0	19.9
21	96°41.9	176°27.1	·· 14.0	299°19.4	·· 15.5	312°03.1	·· 11.8	85°26.3	·· 20.0
22	111°44.4	191°26.5	14.0	314°22.8	15.8	327°05.9	11.9	100°28.5	20.1
23	126°46.9	206°25.8	13.9	329°26.1	16.2	342°08.7	12.1	115°30.8	20.2
Mer.pass. 14:34		ν -0.7′	d 0.0′	m -4.19	ν 3.3′	d 0.4′	m -1.15	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.4	56°41.4
Diphda	348°45.8	-17°50.4
Achernar	335°19.1	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°07.8	89°23.0
Acamar	315°10.5	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.7	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.1	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.2	-52°42.8
Sirius	258°24.4	-16°45.4
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.9
Suhail	222°44.6	-43°32.6
Miaplacidus	221°37.0	-69°49.8
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.0
Denebola	182°22.9	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°57.6	-63°14.9
Gacrux	171°49.3	-57°15.8
Alioth	166°11.1	55°48.4
Spica	158°20.3	-11°18.3
Alkaid	152°50.5	49°10.3
Hadar	148°33.3	-60°30.0
Menkent	147°55.4	-36°30.2
Arcturus	145°46.2	19°02.2
Rigil Kent.	139°37.7	-60°56.7
Kochab	137°19.8	74°02.2
Zuben'ubi	136°54.0	-16°09.3
Alphecca	126°02.3	26°37.1
Antares	112°13.8	-26°29.5
Atria	107°06.7	-69°04.3
Sabik	102°00.9	-15°45.5
Shaula	96°08.2	-37°07.3
Rasalhague	95°57.1	12°32.2
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°30.5	-34°22.2
Vega	80°32.4	38°48.3
Nunki	75°45.9	-26°15.7
Altair	61°58.6	8°56.3
Peacock	53°03.6	-56°38.8
Deneb	49°25.1	45°22.6
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.5	15°21.1

Feb 09 Tue	SHA	Mer.pass
Venus	83°20.0	09:12
Mars	201°37.8	01:18
Jupiter	214°58.8	00:25
Saturn	348°59.4	15:26

Feb 10 Wed	SHA	Mer.pass
Venus	82°05.4	09:13
Mars	201°58.1	01:12
Jupiter	215°06.6	00:20
Saturn	348°54.2	15:23

Feb 11 Thu	SHA	Mer.pass
Venus	80°50.7	09:14
Mars	202°18.9	01:07
Jupiter	215°14.3	00:16
Saturn	348°49.0	15:19

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.7	S14°48.9	152°34.7	15.9′	S03°23.3	14.4′	55.2′
1	191°27.7	48.1	167°09.7	15.9′	03°08.9	14.3′	55.2′
2	206°27.7	47.3	181°44.6	15.9′	02°54.6	14.4′	55.2′
3	221°27.7	·· 46.5	196°19.5	15.9′	02°40.2	14.4′	55.2′
4	236°27.7	45.7	210°54.4	15.9′	02°25.8	14.4′	55.3′
5	251°27.6	44.9	225°29.3	15.9′	02°11.4	14.4′	55.3′
6	266°27.6	S14°44.1	240°04.2	15.9′	S01°57.0	14.5′	55.3′
7	281°27.6	43.3	254°39.1	15.9′	01°42.5	14.4′	55.3′
8	296°27.6	42.5	269°14.0	15.9′	01°28.1	14.5′	55.3′
9	311°27.6	·· 41.7	283°48.9	15.9′	01°13.6	14.5′	55.4′
10	326°27.5	40.9	298°23.8	15.9′	00°59.1	14.5′	55.4′
11	341°27.5	40.1	312°58.6	15.8′	00°44.6	14.5′	55.4′
12	356°27.5	S14°39.3	327°33.4	15.8′	S00°30.1	14.5′	55.4′
13	11°27.5	38.5	342°08.3	15.8′	00°15.6	14.6′	55.4′
14	26°27.5	37.7	356°43.1	15.8′	S00°01.0	14.5′	55.5′
15	41°27.5	·· 36.9	11°17.9	15.8′	N00°13.5	14.5′	55.5′
16	56°27.4	36.1	25°52.6	15.8′	00°28.0	14.6′	55.5′
17	71°27.4	35.3	40°27.4	15.7′	00°42.6	14.6′	55.5′
18	86°27.4	S14°34.5	55°02.1	15.7′	N00°57.2	14.5′	55.5′
19	101°27.4	33.7	69°36.9	15.7′	01°11.7	14.6′	55.5′
20	116°27.4	32.8	84°11.5	15.7′	01°26.3	14.6′	55.6′
21	131°27.4	·· 32.0	98°46.2	15.6′	01°40.9	14.5′	55.6′
22	146°27.3	31.2	113°20.9	15.6′	01°55.4	14.6′	55.6′
23	161°27.3	30.4	127°55.5	15.6′	02°10.0	14.6′	55.6′
	SD = 16.2′	d = 0.8′	SD = 15.1′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.3	S14°29.6	142°30.1	15.6′	N02°24.6	14.6′	55.6′
1	191°27.3	28.8	157°04.6	15.5′	02°39.2	14.5′	55.7′
2	206°27.3	28.0	171°39.2	15.5′	02°53.7	14.6′	55.7′
3	221°27.3	·· 27.2	186°13.7	15.5′	03°08.3	14.6′	55.7′
4	236°27.3	26.4	200°48.2	15.4′	03°22.9	14.6′	55.7′
5	251°27.3	25.6	215°22.6	15.4′	03°37.5	14.5′	55.7′
6	266°27.2	S14°24.8	229°57.0	15.4′	N03°52.0	14.6′	55.8′
7	281°27.2	23.9	244°31.4	15.3′	04°06.6	14.5′	55.8′
8	296°27.2	23.1	259°05.7	15.3′	04°21.1	14.6′	55.8′
9	311°27.2	·· 22.3	273°40.0	15.3′	04°35.7	14.5′	55.8′
10	326°27.2	21.5	288°14.3	15.2′	04°50.2	14.5′	55.9′
11	341°27.2	20.7	302°48.5	15.2′	05°04.7	14.5′	55.9′
12	356°27.2	S14°19.9	317°22.7	15.1′	N05°19.2	14.5′	55.9′
13	11°27.2	19.1	331°56.8	15.1′	05°33.7	14.5′	55.9′
14	26°27.2	18.3	346°30.9	15.1′	05°48.2	14.5′	55.9′
15	41°27.1	·· 17.4	1°05.0	15.0′	06°02.7	14.5′	56.0′
16	56°27.1	16.6	15°39.0	15.0′	06°17.2	14.4′	56.0′
17	71°27.1	15.8	30°13.0	14.9′	06°31.6	14.4′	56.0′
18	86°27.1	S14°15.0	44°46.9	14.9′	N06°46.0	14.5′	56.0′
19	101°27.1	14.2	59°20.8	14.8′	07°00.5	14.3′	56.0′
20	116°27.1	13.4	73°54.6	14.8′	07°14.8	14.4′	56.1′
21	131°27.1	·· 12.6	88°28.4	14.7′	07°29.2	14.4′	56.1′
22	146°27.1	11.7	103°02.1	14.7′	07°43.6	14.3′	56.1′
23	161°27.1	10.9	117°35.7	14.6′	07°57.9	14.3′	56.1′
	SD = 16.2′	d = 0.8′	SD = 15.2′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.1	S14°10.1	132°09.3	14.6′	N08°12.2	14.3′	56.2′
1	191°27.1	09.3	146°42.9	14.5′	08°26.5	14.2′	56.2′
2	206°27.1	08.5	161°16.4	14.4′	08°40.7	14.3′	56.2′
3	221°27.1	·· 07.6	175°49.8	14.4′	08°55.0	14.2′	56.2′
4	236°27.1	06.8	190°23.2	14.3′	09°09.2	14.2′	56.3′
5	251°27.1	06.0	204°56.5	14.3′	09°23.4	14.1′	56.3′
6	266°27.1	S14°05.2	219°29.8	14.2′	N09°37.5	14.1′	56.3′
7	281°27.1	04.4	234°03.0	14.1′	09°51.6	14.1′	56.3′
8	296°27.0	03.5	248°36.1	14.1′	10°05.7	14.1′	56.3′
9	311°27.0	·· 02.7	263°09.2	14.0′	10°19.8	14.0′	56.4′
10	326°27.0	01.9	277°42.2	13.9′	10°33.8	14.0′	56.4′
11	341°27.0	01.1	292°15.1	13.9′	10°47.8	13.9′	56.4′
12	356°27.0	S14°00.2	306°48.0	13.8′	N11°01.7	13.9′	56.4′
13	11°27.0	13°59.4	321°20.8	13.7′	11°15.6	13.9′	56.5′
14	26°27.0	58.6	335°53.5	13.7′	11°29.5	13.8′	56.5′
15	41°27.0	·· 57.8	350°26.2	13.6′	11°43.3	13.8′	56.5′
16	56°27.0	57.0	4°58.8	13.5′	11°57.1	13.8′	56.5′
17	71°27.0	56.1	19°31.3	13.4′	12°10.9	13.7′	56.6′
18	86°27.0	S13°55.3	34°03.7	13.4′	N12°24.6	13.6′	56.6′
19	101°27.0	54.5	48°36.1	13.3′	12°38.2	13.6′	56.6′
20	116°27.0	53.7	63°08.3	13.2′	12°51.8	13.6′	56.6′
21	131°27.0	·· 52.8	77°40.5	13.1′	13°05.4	13.5′	56.7′
22	146°27.0	52.0	92°12.6	13.0′	13°18.9	13.5′	56.7′
23	161°27.0	51.2	106°44.7	13.0′	13°32.4	13.4′	56.7′
	SD = 16.2′	d = 0.8′	SD = 15.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:36	07:59	09:25	15:05	16:31	17:54
N 70°	06:32	07:46	08:59	15:30	16:44	17:58
68°	06:29	07:35	08:40	15:50	16:54	18:01
66°	06:25	07:27	08:25	16:05	17:03	18:04
64°	06:23	07:19	08:12	16:17	17:10	18:07
62°	06:20	07:13	08:01	16:28	17:17	18:09
60°	06:18	07:07	07:52	16:37	17:22	18:12
N 58°	06:16	07:02	07:44	16:45	17:27	18:14
56°	06:14	06:57	07:37	16:52	17:32	18:16
54°	06:12	06:53	07:31	16:58	17:36	18:18
52°	06:10	06:49	07:25	17:04	17:40	18:20
50°	06:08	06:46	07:20	17:09	17:43	18:21
45°	06:04	06:38	07:09	17:20	17:51	18:26
N 40°	05:59	06:31	06:59	17:30	17:58	18:30
35°	05:55	06:25	06:51	17:37	18:04	18:33
30°	05:51	06:20	06:44	17:44	18:09	18:37
20°	05:43	06:09	06:32	17:57	18:19	18:45
N 10°	05:34	05:59	06:21	18:07	18:29	18:54
0°	05:25	05:49	06:11	18:18	18:39	19:04
S 10°	05:13	05:39	06:00	18:28	18:50	19:15
20°	04:59	05:26	05:49	18:39	19:02	19:29
30°	04:41	05:11	05:36	18:52	19:17	19:47
35°	04:29	05:02	05:28	18:59	19:26	19:58
40°	04:15	04:51	05:20	19:08	19:37	20:12
45°	03:58	04:37	05:10	19:18	19:50	20:29
S 50°	03:35	04:21	04:57	19:30	20:06	20:52
52°	03:23	04:13	04:51	19:36	20:14	21:03
54°	03:10	04:04	04:45	19:42	20:23	21:16
56°	02:54	03:54	04:38	19:49	20:33	21:32
58°	02:35	03:42	04:30	19:57	20:44	21:50
S 60°	02:09	03:28	04:21	20:06	20:58	22:15

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	08:22	07:51	07:16	20:43	22:49	·· ··
N 70°	08:20	07:57	07:31	20:41	22:37	·· ··
68°	08:18	08:01	07:43	20:39	22:27	·· ··
66°	08:17	08:05	07:53	20:38	22:19	·· ··
64°	08:16	08:09	08:01	20:36	22:12	23:54
62°	08:15	08:12	08:08	20:35	22:06	23:42
60°	08:14	08:14	08:15	20:34	22:01	23:33
N 58°	08:13	08:17	08:20	20:33	21:57	23:24
56°	08:13	08:19	08:25	20:33	21:53	23:17
54°	08:12	08:20	08:30	20:32	21:50	23:10
52°	08:11	08:22	08:34	20:31	21:46	23:04
50°	08:11	08:24	08:38	20:31	21:44	22:59
45°	08:10	08:27	08:46	20:30	21:37	22:47
N 40°	08:09	08:30	08:53	20:29	21:32	22:38
35°	08:08	08:32	08:59	20:28	21:28	22:30
30°	08:07	08:35	09:04	20:27	21:24	22:23
20°	08:06	08:39	09:13	20:26	21:17	22:11
N 10°	08:05	08:42	09:21	20:25	21:11	22:00
0°	08:04	08:45	09:29	20:23	21:06	21:50
S 10°	08:03	08:49	09:36	20:22	21:00	21:41
20°	08:01	08:52	09:45	20:21	20:55	21:30
30°	08:00	08:56	09:54	20:20	20:48	21:18
35°	07:59	08:59	10:00	20:19	20:44	21:11
40°	07:59	09:01	10:06	20:18	20:40	21:04
45°	07:58	09:05	10:13	20:17	20:35	20:55
S 50°	07:57	09:08	10:22	20:16	20:29	20:44
52°	07:56	09:10	10:27	20:15	20:26	20:39
54°	07:55	09:12	10:31	20:15	20:23	20:34
56°	07:55	09:14	10:36	20:14	20:20	20:28
58°	07:54	09:17	10:42	20:13	20:17	20:21
S 60°	07:53	09:19	10:48	20:12	20:13	20:13

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 5-17%
09	14:09	14:10	12:14	14:14	01:53	
10	14:11	14:11	12:14	14:56	02:34	
11	14:12	14:12	12:14	15:39	03:17	

February 12, 13, 14 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	141°49.3	221°25.2	S21°13.9	344°29.5	N14°16.6	357°11.5	N15°12.2	130°33.0	N02°20.3
1	156°51.8	236°24.5	13.8	359°32.8	16.9	12°14.2	12.3	145°35.2	20.4
2	171°54.3	251°23.8	13.7	14°36.2	17.3	27°17.0	12.4	160°37.5	20.5
3	186°56.7	266°23.2	·· 13.7	29°39.5	·· 17.6	42°19.8	·· 12.5	175°39.7	·· 20.6
4	201°59.2	281°22.5	13.6	44°42.9	18.0	57°22.6	12.6	190°42.0	20.7
5	217°01.7	296°21.9	13.6	59°46.3	18.4	72°25.4	12.7	205°44.2	20.8
6	232°04.1	311°21.2	S21°13.5	74°49.6	N14°18.7	87°28.2	N15°12.8	220°46.5	N02°20.9
7	247°06.6	326°20.6	13.4	89°53.0	19.1	102°31.0	13.0	235°48.7	21.0
8	262°09.1	341°19.9	13.4	104°56.3	19.5	117°33.8	13.1	250°50.9	21.1
9	277°11.5	356°19.2	·· 13.3	119°59.7	·· 19.8	132°36.5	·· 13.2	265°53.2	·· 21.2
10	292°14.0	11°18.6	13.3	135°03.1	20.2	147°39.3	13.3	280°55.4	21.3
11	307°16.4	26°17.9	13.2	150°06.4	20.6	162°42.1	13.4	295°57.7	21.4
12	322°18.9	41°17.3	S21°13.1	165°09.8	N14°20.9	177°44.9	N15°13.5	310°59.9	N02°21.5
13	337°21.4	56°16.6	13.1	180°13.2	21.3	192°47.7	13.6	326°02.1	21.6
14	352°23.8	71°16.0	13.0	195°16.5	21.6	207°50.5	13.7	341°04.4	21.7
15	7°26.3	86°15.3	·· 12.9	210°19.9	·· 22.0	222°53.3	·· 13.8	356°06.6	·· 21.8
16	22°28.8	101°14.6	12.9	225°23.3	22.4	237°56.1	14.0	11°08.9	21.9
17	37°31.2	116°14.0	12.8	240°26.6	22.7	252°58.8	14.1	26°11.1	22.0
18	52°33.7	131°13.3	S21°12.7	255°30.0	N14°23.1	268°01.6	N15°14.2	41°13.3	N02°22.1
19	67°36.2	146°12.7	12.6	270°33.4	23.5	283°04.4	14.3	56°15.6	22.2
20	82°38.6	161°12.0	12.6	285°36.7	23.8	298°07.2	14.4	71°17.8	22.3
21	97°41.1	176°11.3	·· 12.5	300°40.1	·· 24.2	313°10.0	·· 14.5	86°20.1	·· 22.4
22	112°43.5	191°10.7	12.4	315°43.5	24.5	328°12.8	14.6	101°22.3	22.5
23	127°46.0	206°10.0	12.3	330°46.8	24.9	343°15.6	14.7	116°24.5	22.6
Mer.pass. 14:30		ν -0.7′	d 0.1′	m -4.18	ν 3.4′	d 0.4′	m -1.17	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	142°48.5	221°09.4	S21°12.3	345°50.2	N14°25.3	358°18.4	N15°14.8	131°26.8	N02°22.7
1	157°50.9	236°08.7	12.2	0°53.6	25.6	13°21.1	14.9	146°29.0	22.8
2	172°53.4	251°08.0	12.1	15°57.0	26.0	28°23.9	15.1	161°31.3	22.9
3	187°55.9	266°07.4	·· 12.0	31°00.3	·· 26.4	43°26.7	·· 15.2	176°33.5	·· 23.0
4	202°58.3	281°06.7	11.9	46°03.7	26.7	58°29.5	15.3	191°35.7	23.1
5	218°00.8	296°06.1	11.9	61°07.1	27.1	73°32.3	15.4	206°38.0	23.3
6	233°03.3	311°05.4	S21°11.8	76°10.5	N14°27.5	88°35.1	N15°15.5	221°40.2	N02°23.4
7	248°05.7	326°04.7	11.7	91°13.8	27.8	103°37.9	15.6	236°42.5	23.5
8	263°08.2	341°04.1	11.6	106°17.2	28.2	118°40.7	15.7	251°44.7	23.6
9	278°10.7	356°03.4	·· 11.5	121°20.6	·· 28.5	133°43.4	·· 15.8	266°46.9	·· 23.7
10	293°13.1	11°02.8	11.4	136°24.0	28.9	148°46.2	15.9	281°49.2	23.8
11	308°15.6	26°02.1	11.3	151°27.3	29.3	163°49.0	16.1	296°51.4	23.9
12	323°18.0	41°01.4	S21°11.2	166°30.7	N14°29.6	178°51.8	N15°16.2	311°53.6	N02°24.0
13	338°20.5	56°00.8	11.2	181°34.1	30.0	193°54.6	16.3	326°55.9	24.1
14	353°23.0	71°00.1	11.1	196°37.5	30.4	208°57.4	16.4	341°58.1	24.2
15	8°25.4	85°59.4	·· 11.0	211°40.9	·· 30.7	224°00.2	·· 16.5	357°00.4	·· 24.3
16	23°27.9	100°58.8	10.9	226°44.2	31.1	239°03.0	16.6	12°02.6	24.4
17	38°30.4	115°58.1	10.8	241°47.6	31.4	254°05.7	16.7	27°04.8	24.5
18	53°32.8	130°57.5	S21°10.7	256°51.0	N14°31.8	269°08.5	N15°16.8	42°07.1	N02°24.6
19	68°35.3	145°56.8	10.6	271°54.4	32.2	284°11.3	16.9	57°09.3	24.7
20	83°37.8	160°56.1	10.5	286°57.8	32.5	299°14.1	17.0	72°11.5	24.8
21	98°40.2	175°55.5	·· 10.4	302°01.2	·· 32.9	314°16.9	·· 17.2	87°13.8	·· 24.9
22	113°42.7	190°54.8	10.3	317°04.5	33.3	329°19.7	17.3	102°16.0	25.0
23	128°45.2	205°54.1	10.2	332°07.9	33.6	344°22.5	17.4	117°18.3	25.1
Mer.pass. 14:26		ν -0.7′	d 0.1′	m -4.18	ν 3.4′	d 0.4′	m -1.19	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	143°47.6	220°53.5	S21°10.1	347°11.3	N14°34.0	359°25.3	N15°17.5	132°20.5	N02°25.2
1	158°50.1	235°52.8	10.0	2°14.7	34.3	14°28.0	17.6	147°22.7	25.3
2	173°52.5	250°52.2	09.9	17°18.1	34.7	29°30.8	17.7	162°25.0	25.4
3	188°55.0	265°51.5	·· 09.8	32°21.5	·· 35.1	44°33.6	·· 17.8	177°27.2	·· 25.5
4	203°57.5	280°50.8	09.7	47°24.9	35.4	59°36.4	17.9	192°29.4	25.6
5	218°59.9	295°50.2	09.6	62°28.2	35.8	74°39.2	18.0	207°31.7	25.7
6	234°02.4	310°49.5	S21°09.4	77°31.6	N14°36.2	89°42.0	N15°18.2	222°33.9	N02°25.8
7	249°04.9	325°48.8	09.3	92°35.0	36.5	104°44.8	18.3	237°36.2	25.9
8	264°07.3	340°48.2	09.2	107°38.4	36.9	119°47.5	18.4	252°38.4	26.0
9	279°09.8	355°47.5	·· 09.1	122°41.8	·· 37.2	134°50.3	·· 18.5	267°40.6	·· 26.1
10	294°12.3	10°46.8	09.0	137°45.2	37.6	149°53.1	18.6	282°42.9	26.2
11	309°14.7	25°46.2	08.9	152°48.6	38.0	164°55.9	18.7	297°45.1	26.3
12	324°17.2	40°45.5	S21°08.8	167°52.0	N14°38.3	179°58.7	N15°18.8	312°47.3	N02°26.4
13	339°19.7	55°44.9	08.7	182°55.4	38.7	195°01.5	18.9	327°49.6	26.6
14	354°22.1	70°44.2	08.5	197°58.8	39.0	210°04.3	19.0	342°51.8	26.7
15	9°24.6	85°43.5	·· 08.4	213°02.1	·· 39.4	225°07.1	·· 19.1	357°54.0	·· 26.8
16	24°27.0	100°42.9	08.3	228°05.5	39.8	240°09.8	19.3	12°56.3	26.9
17	39°29.5	115°42.2	08.2	243°08.9	40.1	255°12.6	19.4	27°58.5	27.0
18	54°32.0	130°41.5	S21°08.1	258°12.3	N14°40.5	270°15.4	N15°19.5	43°00.7	N02°27.1
19	69°34.4	145°40.9	08.0	273°15.7	40.9	285°18.2	19.6	58°03.0	27.2
20	84°36.9	160°40.2	07.8	288°19.1	41.2	300°21.0	19.7	73°05.2	27.3
21	99°39.4	175°39.5	·· 07.7	303°22.5	·· 41.6	315°23.8	·· 19.8	88°07.5	·· 27.4
22	114°41.8	190°38.9	07.6	318°25.9	41.9	330°26.6	19.9	103°09.7	27.5
23	129°44.3	205°38.2	07.5	333°29.3	42.3	345°29.3	20.0	118°11.9	27.6
Mer.pass. 14:22		ν -0.7′	d 0.1′	m -4.17	ν 3.4′	d 0.4′	m -1.21	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.4	56°41.4
Diphda	348°45.8	-17°50.4
Achernar	335°19.2	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°09.3	89°23.0
Acamar	315°10.5	-40°12.0
Menkar	314°04.3	4°11.7
Mirfak	308°25.7	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.4
Capella	280°19.1	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.2	-52°42.8
Sirius	258°24.4	-16°45.4
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.9
Suhail	222°44.6	-43°32.7
Miaplacidus	221°37.0	-69°49.8
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.0
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°57.6	-63°14.9
Gacrux	171°49.3	-57°15.8
Alioth	166°11.1	55°48.4
Spica	158°20.3	-11°18.3
Alkaid	152°50.4	49°10.3
Hadar	148°33.3	-60°30.1
Menkent	147°55.4	-36°30.2
Arcturus	145°46.2	19°02.2
Rigil Kent.	139°37.7	-60°56.7
Kochab	137°19.7	74°02.2
Zuben'ubi	136°54.0	-16°09.3
Alphecca	126°02.3	26°37.1
Antares	112°13.8	-26°29.5
Atria	107°06.7	-69°04.3
Sabik	102°00.9	-15°45.5
Shaula	96°08.2	-37°07.3
Rasalhague	95°57.1	12°32.2
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°30.5	-34°22.2
Vega	80°32.3	38°48.3
Nunki	75°45.9	-26°15.7
Altair	61°58.6	8°56.3
Peacock	53°03.6	-56°38.8
Deneb	49°25.1	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.5	15°21.1

Feb 12 Fri	SHA	Mer.pass
Venus	79°35.8	09:15
Mars	202°40.1	01:02
Jupiter	215°22.1	00:11
Saturn	348°43.7	15:16

Feb 13 Sat	SHA	Mer.pass
Venus	78°20.9	09:16
Mars	203°01.7	00:56
Jupiter	215°29.9	00:07
Saturn	348°38.3	15:12

Feb 14 Sun	SHA	Mer.pass
Venus	77°05.9	09:17
Mars	203°23.7	00:51
Jupiter	215°37.6	00:02
Saturn	348°32.9	15:08

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°27.0	S13°50.3	121°16.6	12.9′	N13°45.8	13.4′	56.7′
1	191°27.1	49.5	135°48.5	12.8′	13°59.2	13.3′	56.8′
2	206°27.1	48.7	150°20.3	12.7′	14°12.5	13.3′	56.8′
3	221°27.1	·· 47.9	164°52.0	12.6′	14°25.8	13.2′	56.8′
4	236°27.1	47.0	179°23.6	12.5′	14°39.0	13.1′	56.8′
5	251°27.1	46.2	193°55.1	12.4′	14°52.1	13.1′	56.9′
6	266°27.1	S13°45.4	208°26.6	12.3′	N15°05.2	13.1′	56.9′
7	281°27.1	44.5	222°57.9	12.3′	15°18.3	12.9′	56.9′
8	296°27.1	43.7	237°29.2	12.2′	15°31.2	12.9′	56.9′
9	311°27.1	·· 42.9	252°00.3	12.1′	15°44.1	12.9′	57.0′
10	326°27.1	42.0	266°31.4	12.0′	15°57.0	12.8′	57.0′
11	341°27.1	41.2	281°02.4	11.9′	16°09.8	12.7′	57.0′
12	356°27.1	S13°40.4	295°33.3	11.8′	N16°22.5	12.6′	57.0′
13	11°27.1	39.5	310°04.1	11.7′	16°35.1	12.6′	57.1′
14	26°27.1	38.7	324°34.8	11.6′	16°47.7	12.5′	57.1′
15	41°27.1	·· 37.9	339°05.3	11.5′	17°00.2	12.4′	57.1′
16	56°27.1	37.0	353°35.8	11.4′	17°12.6	12.4′	57.2′
17	71°27.1	36.2	8°06.2	11.3′	17°25.0	12.3′	57.2′
18	86°27.1	S13°35.4	22°36.5	11.2′	N17°37.3	12.2′	57.2′
19	101°27.2	34.5	37°06.7	11.1′	17°49.5	12.1′	57.2′
20	116°27.2	33.7	51°36.8	11.0′	18°01.6	12.1′	57.3′
21	131°27.2	·· 32.9	66°06.8	10.9′	18°13.7	12.0′	57.3′
22	146°27.2	32.0	80°36.7	10.8′	18°25.7	11.9′	57.3′
23	161°27.2	31.2	95°06.4	10.7′	18°37.6	11.8′	57.3′
	SD = 16.2′	d = 0.8′		SD = 15.5′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.2	S13°30.4	109°36.1	10.6′	N18°49.4	11.7′	57.4′
1	191°27.2	29.5	124°05.7	10.5′	19°01.1	11.6′	57.4′
2	206°27.2	28.7	138°35.1	10.3′	19°12.7	11.6′	57.4′
3	221°27.2	·· 27.8	153°04.5	10.2′	19°24.3	11.4′	57.5′
4	236°27.3	27.0	167°33.7	10.1′	19°35.7	11.4′	57.5′
5	251°27.3	26.2	182°02.8	10.0′	19°47.1	11.3′	57.5′
6	266°27.3	S13°25.3	196°31.9	9.9′	N19°58.4	11.2′	57.5′
7	281°27.3	24.5	211°00.8	9.8′	20°09.6	11.0′	57.6′
8	296°27.3	23.7	225°29.6	9.7′	20°20.6	11.0′	57.6′
9	311°27.3	·· 22.8	239°58.2	9.6′	20°31.6	10.9′	57.6′
10	326°27.3	22.0	254°26.8	9.5′	20°42.5	10.8′	57.6′
11	341°27.3	21.1	268°55.3	9.3′	20°53.3	10.7′	57.7′
12	356°27.4	S13°20.3	283°23.6	9.2′	N21°04.0	10.6′	57.7′
13	11°27.4	19.4	297°51.9	9.1′	21°14.6	10.4′	57.7′
14	26°27.4	18.6	312°20.0	9.0′	21°25.0	10.4′	57.8′
15	41°27.4	·· 17.8	326°48.0	8.9′	21°35.4	10.3′	57.8′
16	56°27.4	16.9	341°15.9	8.8′	21°45.7	10.1′	57.8′
17	71°27.4	16.1	355°43.6	8.7′	21°55.8	10.1′	57.8′
18	86°27.5	S13°15.2	10°11.3	8.5′	N22°05.9	9.9′	57.9′
19	101°27.5	14.4	24°38.8	8.4′	22°15.8	9.8′	57.9′
20	116°27.5	13.5	39°06.2	8.3′	22°25.6	9.7′	57.9′
21	131°27.5	·· 12.7	53°33.5	8.2′	22°35.3	9.5′	58.0′
22	146°27.5	11.9	68°00.7	8.1′	22°44.8	9.5′	58.0′
23	161°27.5	11.0	82°27.8	8.0′	22°54.3	9.3′	58.0′
	SD = 16.2′	d = 0.8′		SD = 15.6′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.6	S13°10.2	96°54.8	7.8′	N23°03.6	9.2′	58.0′
1	191°27.6	09.3	111°21.6	7.7′	23°12.8	9.1′	58.1′
2	206°27.6	08.5	125°48.3	7.6′	23°21.9	9.0′	58.1′
3	221°27.6	·· 07.6	140°14.9	7.5′	23°30.9	8.8′	58.1′
4	236°27.6	06.8	154°41.4	7.4′	23°39.7	8.7′	58.2′
5	251°27.7	05.9	169°07.8	7.3′	23°48.4	8.6′	58.2′
6	266°27.7	S13°05.1	183°34.1	7.1′	N23°57.0	8.4′	58.2′
7	281°27.7	04.2	198°00.2	7.0′	24°05.4	8.3′	58.3′
8	296°27.7	03.4	212°26.2	6.9′	24°13.7	8.2′	58.3′
9	311°27.7	·· 02.5	226°52.1	6.8′	24°21.9	8.0′	58.3′
10	326°27.8	01.7	241°17.9	6.7′	24°29.9	7.9′	58.3′
11	341°27.8	00.8	255°43.6	6.6′	24°37.8	7.7′	58.4′
12	356°27.8	S13°00.0	270°09.2	6.5′	N24°45.5	7.6′	58.4′
13	11°27.8	12°59.1	284°34.6	6.3′	24°53.1	7.4′	58.4′
14	26°27.8	58.3	299°00.0	6.2′	25°00.5	7.4′	58.5′
15	41°27.9	·· 57.4	313°25.2	6.1′	25°07.9	7.1′	58.5′
16	56°27.9	56.6	327°50.3	6.0′	25°15.0	7.0′	58.5′
17	71°27.9	55.7	342°15.3	5.9′	25°22.0	6.9′	58.5′
18	86°27.9	S12°54.9	356°40.2	5.8′	N25°28.9	6.7′	58.6′
19	101°28.0	54.0	11°05.0	5.7′	25°35.6	6.5′	58.6′
20	116°28.0	53.2	25°29.7	5.6′	25°42.1	6.4′	58.6′
21	131°28.0	·· 52.3	39°54.3	5.5′	25°48.5	6.2′	58.7′
22	146°28.0	51.5	54°18.8	5.4′	25°54.7	6.1′	58.7′
23	161°28.1	50.6	68°43.1	5.3′	26°00.8	5.9′	58.7′
	SD = 16.2′	d = 0.8′		SD = 15.8′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:24	07:45	09:07	15:23	16:45	18:06
N 70°	06:21	07:34	08:45	15:45	16:56	18:09
68°	06:19	07:25	08:27	16:02	17:05	18:11
66°	06:17	07:17	08:14	16:16	17:13	18:13
64°	06:15	07:11	08:02	16:27	17:19	18:15
62°	06:13	07:05	07:53	16:37	17:25	18:17
60°	06:11	07:00	07:44	16:45	17:30	18:19
N 58°	06:09	06:55	07:37	16:52	17:34	18:20
56°	06:08	06:51	07:30	16:59	17:38	18:22
54°	06:06	06:48	07:25	17:05	17:42	18:23
52°	06:05	06:44	07:19	17:10	17:45	18:25
50°	06:03	06:41	07:15	17:14	17:48	18:26
45°	06:00	06:34	07:04	17:25	17:55	18:29
N 40°	05:56	06:28	06:56	17:33	18:01	18:33
35°	05:53	06:22	06:48	17:40	18:06	18:36
30°	05:49	06:17	06:42	17:47	18:11	18:40
20°	05:42	06:08	06:30	17:58	18:21	18:47
N 10°	05:34	05:59	06:20	18:08	18:30	18:55
0°	05:25	05:50	06:11	18:18	18:39	19:03
S 10°	05:14	05:39	06:01	18:27	18:49	19:14
20°	05:01	05:28	05:51	18:37	19:00	19:27
30°	04:44	05:13	05:39	18:49	19:14	19:44
35°	04:33	05:05	05:31	18:56	19:23	19:55
40°	04:20	04:55	05:23	19:04	19:33	20:08
45°	04:03	04:42	05:14	19:14	19:45	20:24
S 50°	03:42	04:27	05:02	19:25	20:00	20:45
52°	03:31	04:19	04:57	19:30	20:08	20:56
54°	03:19	04:11	04:51	19:36	20:16	21:08
56°	03:04	04:02	04:45	19:42	20:25	21:22
58°	02:47	03:51	04:37	19:50	20:36	21:39
S 60°	02:25	03:38	04:29	19:58	20:48	22:00

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	06:24	▭	▭	01:16	▭	▭
N 70°	06:55	05:30	▭	00:46	03:53	▭
68°	07:19	06:39	▭	00:25	02:46	▭
66°	07:38	07:16	06:14	00:08	02:10	05:04
64°	07:53	07:42	07:25	·· ··	01:45	03:53
62°	08:05	08:03	08:01	·· ··	01:26	03:18
60°	08:16	08:20	08:28	·· ··	01:10	02:52
N 58°	08:26	08:34	08:48	·· ··	00:56	02:32
56°	08:34	08:46	09:05	·· ··	00:45	02:16
54°	08:41	08:57	09:20	·· ··	00:34	02:02
52°	08:48	09:07	09:33	·· ··	00:25	01:49
50°	08:54	09:15	09:44	·· ··	00:17	01:39
45°	09:07	09:34	10:08	·· ··	00:01	01:16
N 40°	09:18	09:49	10:27	23:47	·· ··	00:58
35°	09:28	10:02	10:42	23:35	·· ··	00:43
30°	09:36	10:13	10:56	23:25	·· ··	00:30
20°	09:50	10:32	11:20	23:07	·· ··	00:08
N 10°	10:03	10:49	11:41	22:52	23:49	·· ··
0°	10:15	11:05	12:00	22:38	23:31	·· ··
S 10°	10:27	11:21	12:19	22:24	23:13	·· ··
20°	10:40	11:38	12:40	22:09	22:54	23:45
30°	10:55	11:58	13:05	21:52	22:32	23:20
35°	11:03	12:10	13:19	21:43	22:19	23:04
40°	11:13	12:24	13:36	21:31	22:05	22:47
45°	11:25	12:40	13:56	21:18	21:48	22:26
S 50°	11:40	13:00	14:21	21:02	21:26	22:00
52°	11:46	13:09	14:34	20:55	21:16	21:47
54°	11:54	13:20	14:48	20:47	21:05	21:33
56°	12:02	13:33	15:04	20:37	20:52	21:16
58°	12:12	13:47	15:24	20:27	20:37	20:56
S 60°	12:23	14:04	15:49	20:15	20:19	20:30

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 6-8 26-46%
12	14:12	14:12	12:14	16:26	04:03	
13	14:11	14:11	12:14	17:18	04:52	
14	14:10	14:09	12:14	18:14	05:45	

February 15, 16, 17 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	144°46.8	220°37.5	S21°07.3	348°32.7	N14°42.7	0°32.1	N15°20.1	133°14.2	N02°27.7
1	159°49.2	235°36.9	07.2	3°36.1	43.0	15°34.9	20.2	148°16.4	27.8
2	174°51.7	250°36.2	07.1	18°39.5	43.4	30°37.7	20.3	163°18.6	27.9
3	189°54.1	265°35.5	·· 06.9	33°42.9	·· 43.7	45°40.5	·· 20.5	178°20.9	·· 28.0
4	204°56.6	280°34.9	06.8	48°46.3	44.1	60°43.3	20.6	193°23.1	28.1
5	219°59.1	295°34.2	06.7	63°49.7	44.5	75°46.1	20.7	208°25.3	28.2
6	235°01.5	310°33.5	S21°06.6	78°53.1	N14°44.8	90°48.9	N15°20.8	223°27.6	N02°28.3
7	250°04.0	325°32.9	06.4	93°56.5	45.2	105°51.6	20.9	238°29.8	28.4
8	265°06.5	340°32.2	06.3	108°59.9	45.5	120°54.4	21.0	253°32.0	28.5
9	280°08.9	355°31.5	·· 06.1	124°03.3	·· 45.9	135°57.2	·· 21.1	268°34.3	·· 28.6
10	295°11.4	10°30.9	06.0	139°06.7	46.3	151°00.0	21.2	283°36.5	28.7
11	310°13.9	25°30.2	05.9	154°10.1	46.6	166°02.8	21.3	298°38.7	28.8
12	325°16.3	40°29.5	S21°05.7	169°13.5	N14°47.0	181°05.6	N15°21.4	313°41.0	N02°28.9
13	340°18.8	55°28.9	05.6	184°16.9	47.3	196°08.4	21.6	328°43.2	29.1
14	355°21.3	70°28.2	05.5	199°20.3	47.7	211°11.1	21.7	343°45.4	29.2
15	10°23.7	85°27.5	·· 05.3	214°23.7	·· 48.1	226°13.9	·· 21.8	358°47.7	·· 29.3
16	25°26.2	100°26.9	05.2	229°27.1	48.4	241°16.7	21.9	13°49.9	29.4
17	40°28.6	115°26.2	05.0	244°30.5	48.8	256°19.5	22.0	28°52.1	29.5
18	55°31.1	130°25.5	S21°04.9	259°33.9	N14°49.1	271°22.3	N15°22.1	43°54.4	N02°29.6
19	70°33.6	145°24.9	04.7	274°37.3	49.5	286°25.1	22.2	58°56.6	29.7
20	85°36.0	160°24.2	04.6	289°40.7	49.9	301°27.9	22.3	73°58.8	29.8
21	100°38.5	175°23.5	·· 04.4	304°44.1	·· 50.2	316°30.6	·· 22.4	89°01.1	·· 29.9
22	115°41.0	190°22.9	04.3	319°47.5	50.6	331°33.4	22.5	104°03.3	30.0
23	130°43.4	205°22.2	04.1	334°50.9	50.9	346°36.2	22.6	119°05.5	30.1
Mer.pass. 14:19		ν -0.7′	d 0.1′	m -4.16	ν 3.4′	d 0.4′	m -1.23	ν 2.8′	d 0.1′ m -2.56	ν 2.2′	d 0.1′ m 0.80

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	145°45.9	220°21.5	S21°04.0	349°54.4	N14°51.3	1°39.0	N15°22.7	134°07.8	N02°30.2
1	160°48.4	235°20.9	03.8	4°57.8	51.6	16°41.8	22.9	149°10.0	30.3
2	175°50.8	250°20.2	03.7	20°01.2	52.0	31°44.6	23.0	164°12.2	30.4
3	190°53.3	265°19.5	·· 03.5	35°04.6	·· 52.4	46°47.4	·· 23.1	179°14.5	·· 30.5
4	205°55.8	280°18.9	03.4	50°08.0	52.7	61°50.1	23.2	194°16.7	30.6
5	220°58.2	295°18.2	03.2	65°11.4	53.1	76°52.9	23.3	209°18.9	30.7
6	236°00.7	310°17.5	S21°03.1	80°14.8	N14°53.4	91°55.7	N15°23.4	224°21.2	N02°30.8
7	251°03.1	325°16.9	02.9	95°18.2	53.8	106°58.5	23.5	239°23.4	30.9
8	266°05.6	340°16.2	02.8	110°21.6	54.2	122°01.3	23.6	254°25.6	31.0
9	281°08.1	355°15.5	·· 02.6	125°25.0	·· 54.5	137°04.1	·· 23.7	269°27.8	·· 31.2
10	296°10.5	10°14.9	02.4	140°28.4	54.9	152°06.8	23.8	284°30.1	31.3
11	311°13.0	25°14.2	02.3	155°31.9	55.2	167°09.6	23.9	299°32.3	31.4
12	326°15.5	40°13.5	S21°02.1	170°35.3	N14°55.6	182°12.4	N15°24.1	314°34.5	N02°31.5
13	341°17.9	55°12.9	02.0	185°38.7	55.9	197°15.2	24.2	329°36.8	31.6
14	356°20.4	70°12.2	01.8	200°42.1	56.3	212°18.0	24.3	344°39.0	31.7
15	11°22.9	85°11.5	·· 01.6	215°45.5	·· 56.7	227°20.8	·· 24.4	359°41.2	·· 31.8
16	26°25.3	100°10.9	01.5	230°48.9	57.0	242°23.6	24.5	14°43.5	31.9
17	41°27.8	115°10.2	01.3	245°52.3	57.4	257°26.3	24.6	29°45.7	32.0
18	56°30.3	130°09.5	S21°01.1	260°55.7	N14°57.7	272°29.1	N15°24.7	44°47.9	N02°32.1
19	71°32.7	145°08.9	00.9	275°59.2	58.1	287°31.9	24.8	59°50.2	32.2
20	86°35.2	160°08.2	00.8	291°02.6	58.4	302°34.7	24.9	74°52.4	32.3
21	101°37.6	175°07.5	·· 00.6	306°06.0	·· 58.8	317°37.5	·· 25.0	89°54.6	·· 32.4
22	116°40.1	190°06.8	00.4	321°09.4	59.1	332°40.3	25.1	104°56.9	32.5
23	131°42.6	205°06.2	00.3	336°12.8	59.5	347°43.0	25.2	119°59.1	32.6
Mer.pass. 14:15		ν -0.7′	d 0.2′	m -4.15	ν 3.4′	d 0.4′	m -1.25	ν 2.8′	d 0.1′ m -2.55	ν 2.2′	d 0.1′ m 0.80

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	146°45.0	220°05.5	S21°00.1	351°16.2	N14°59.9	2°45.8	N15°25.4	135°01.3	N02°32.7
1	161°47.5	235°04.8	20°59.9	6°19.7	15°00.2	17°48.6	25.5	150°03.5	32.8
2	176°50.0	250°04.2	59.7	21°23.1	00.6	32°51.4	25.6	165°05.8	32.9
3	191°52.4	265°03.5	·· 59.6	36°26.5	·· 00.9	47°54.2	·· 25.7	180°08.0	·· 33.1
4	206°54.9	280°02.8	59.4	51°29.9	01.3	62°57.0	25.8	195°10.2	33.2
5	221°57.4	295°02.2	59.2	66°33.3	01.6	77°59.8	25.9	210°12.5	33.3
6	236°59.8	310°01.5	S20°59.0	81°36.7	N15°02.0	93°02.5	N15°26.0	225°14.7	N02°33.4
7	252°02.3	325°00.8	58.8	96°40.2	02.3	108°05.3	26.1	240°16.9	33.5
8	267°04.8	340°00.2	58.7	111°43.6	02.7	123°08.1	26.2	255°19.1	33.6
9	282°07.2	354°59.5	·· 58.5	126°47.0	·· 03.0	138°10.9	·· 26.3	270°21.4	·· 33.7
10	297°09.7	9°58.8	58.3	141°50.4	03.4	153°13.7	26.4	285°23.6	33.8
11	312°12.1	24°58.2	58.1	156°53.8	03.8	168°16.5	26.5	300°25.8	33.9
12	327°14.6	39°57.5	S20°57.9	171°57.2	N15°04.1	183°19.2	N15°26.6	315°28.1	N02°34.0
13	342°17.1	54°56.8	57.7	187°00.7	04.5	198°22.0	26.8	330°30.3	34.1
14	357°19.5	69°56.1	57.5	202°04.1	04.8	213°24.8	26.9	345°32.5	34.2
15	12°22.0	84°55.5	·· 57.3	217°07.5	·· 05.2	228°27.6	·· 27.0	0°34.8	·· 34.3
16	27°24.5	99°54.8	57.2	232°10.9	05.5	243°30.4	27.1	15°37.0	34.4
17	42°26.9	114°54.1	57.0	247°14.3	05.9	258°33.2	27.2	30°39.2	34.5
18	57°29.4	129°53.5	S20°56.8	262°17.8	N15°06.2	273°35.9	N15°27.3	45°41.4	N02°34.6
19	72°31.9	144°52.8	56.6	277°21.2	06.6	288°38.7	27.4	60°43.7	34.7
20	87°34.3	159°52.1	56.4	292°24.6	06.9	303°41.5	27.5	75°45.9	34.9
21	102°36.8	174°51.5	·· 56.2	307°28.0	·· 07.3	318°44.3	·· 27.6	90°48.1	·· 35.0
22	117°39.3	189°50.8	56.0	322°31.5	07.6	333°47.1	27.7	105°50.4	35.1
23	132°41.7	204°50.1	55.8	337°34.9	08.0	348°49.9	27.8	120°52.6	35.2
Mer.pass. 14:11		ν -0.7′	d 0.2′	m -4.15	ν 3.4′	d 0.4′	m -1.26	ν 2.8′	d 0.1′ m -2.55	ν 2.2′	d 0.1′ m 0.80

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.7
Schedar	349°29.4	56°41.4
Diphda	348°45.8	-17°50.4
Achernar	335°19.2	-57°06.2
Hamal	327°49.3	23°35.5
Polaris	313°10.6	89°23.0
Acamar	315°10.5	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.7	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.4
Capella	280°19.1	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.3	-52°42.8
Sirius	258°24.4	-16°45.4
Adhara	255°04.2	-29°00.7
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°35.9
Suhail	222°44.6	-43°32.7
Miaplacidus	221°37.0	-69°49.8
Alphard	217°45.7	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.0
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°57.6	-63°14.9
Gacrux	171°49.2	-57°15.9
Alioth	166°11.1	55°48.4
Spica	158°20.3	-11°18.3
Alkaid	152°50.4	49°10.3
Hadar	148°33.2	-60°30.1
Menkent	147°55.4	-36°30.2
Arcturus	145°46.2	19°02.2
Rigil Kent.	139°37.7	-60°56.7
Kochab	137°19.6	74°02.2
Zuben'ubi	136°54.0	-16°09.3
Alphecca	126°02.3	26°37.1
Antares	112°13.8	-26°29.5
Atria	107°06.6	-69°04.3
Sabik	102°00.9	-15°45.5
Shaula	96°08.2	-37°07.3
Rasalhague	95°57.1	12°32.2
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°30.4	-34°22.2
Vega	80°32.3	38°48.3
Nunki	75°45.9	-26°15.7
Altair	61°58.5	8°56.3
Peacock	53°03.5	-56°38.8
Deneb	49°25.0	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.5	15°21.1

Feb 15 Mon	SHA	Mer.pass
Venus	75°50.8	09:18
Mars	203°45.9	00:46
Jupiter	215°45.4	23:53
Saturn	348°27.4	15:05

Feb 16 Tue	SHA	Mer.pass
Venus	74°35.6	09:19
Mars	204°08.5	00:40
Jupiter	215°53.1	23:49
Saturn	348°21.9	15:01

Feb 17 Wed	SHA	Mer.pass
Venus	73°20.5	09:20
Mars	204°31.2	00:35
Jupiter	216°00.8	23:45
Saturn	348°16.3	14:58

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.1	S12°49.7	83°07.4	5.2′	N26°06.7	5.8′	58.7′
1	191°28.1	48.9	97°31.6	5.1′	26°12.5	5.6′	58.8′
2	206°28.1	48.0	111°55.6	5.0′	26°18.1	5.4′	58.8′
3	221°28.2	·· 47.2	126°19.6	4.9′	26°23.5	5.3′	58.8′
4	236°28.2	46.3	140°43.5	4.8′	26°28.8	5.0′	58.9′
5	251°28.2	45.5	155°07.2	4.7′	26°33.8	5.0′	58.9′
6	266°28.3	S12°44.6	169°30.9	4.6′	N26°38.8	4.7′	58.9′
7	281°28.3	43.8	183°54.5	4.5′	26°43.5	4.6′	58.9′
8	296°28.3	42.9	198°18.0	4.4′	26°48.1	4.4′	59.0′
9	311°28.3	·· 42.0	212°41.4	4.3′	26°52.5	4.2′	59.0′
10	326°28.4	41.2	227°04.7	4.2′	26°56.7	4.1′	59.0′
11	341°28.4	40.3	241°27.9	4.1′	27°00.8	3.8′	59.1′
12	356°28.4	S12°39.5	255°51.0	4.1′	N27°04.6	3.7′	59.1′
13	11°28.5	38.6	270°14.1	4.0′	27°08.3	3.5′	59.1′
14	26°28.5	37.7	284°37.0	3.9′	27°11.8	3.4′	59.1′
15	41°28.5	·· 36.9	298°59.9	3.8′	27°15.2	3.1′	59.2′
16	56°28.6	36.0	313°22.8	3.7′	27°18.3	3.0′	59.2′
17	71°28.6	35.2	327°45.5	3.7′	27°21.3	2.7′	59.2′
18	86°28.6	S12°34.3	342°08.2	3.6′	N27°24.0	2.6′	59.3′
19	101°28.7	33.4	356°30.8	3.5′	27°26.6	2.4′	59.3′
20	116°28.7	32.6	10°53.3	3.5′	27°29.0	2.3′	59.3′
21	131°28.7	·· 31.7	25°15.7	3.4′	27°31.3	2.0′	59.3′
22	146°28.8	30.9	39°38.1	3.3′	27°33.3	1.8′	59.4′
23	161°28.8	30.0	54°00.5	3.3′	27°35.1	1.7′	59.4′
	SD = 16.2′	d = 0.9′	SD = 16.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.8	S12°29.1	68°22.8	3.2′	N27°36.8	1.4′	59.4′
1	191°28.9	28.3	82°45.0	3.2′	27°38.2	1.3′	59.4′
2	206°28.9	27.4	97°07.1	3.1′	27°39.5	1.1′	59.5′
3	221°28.9	·· 26.5	111°29.2	3.1′	27°40.6	0.8′	59.5′
4	236°29.0	25.7	125°51.3	3.0′	27°41.4	0.7′	59.5′
5	251°29.0	24.8	140°13.3	3.0′	27°42.1	0.5′	59.5′
6	266°29.0	S12°23.9	154°35.3	2.9′	N27°42.6	0.3′	59.6′
7	281°29.1	23.1	168°57.2	2.9′	27°42.9	0.1′	59.6′
8	296°29.1	22.2	183°19.1	2.9′	27°43.0	0.1′	59.6′
9	311°29.1	·· 21.3	197°41.0	2.8′	27°42.9	0.3′	59.6′
10	326°29.2	20.5	212°02.8	2.8′	27°42.6	0.5′	59.7′
11	341°29.2	19.6	226°24.6	2.8′	27°42.1	0.7′	59.7′
12	356°29.3	S12°18.7	240°46.3	2.7′	N27°41.4	0.9′	59.7′
13	11°29.3	17.9	255°08.0	2.7′	27°40.5	1.1′	59.7′
14	26°29.3	17.0	269°29.8	2.7′	27°39.4	1.3′	59.8′
15	41°29.4	·· 16.1	283°51.4	2.7′	27°38.1	1.5′	59.8′
16	56°29.4	15.3	298°13.1	2.7′	27°36.6	1.7′	59.8′
17	71°29.4	14.4	312°34.8	2.6′	27°34.9	1.9′	59.8′
18	86°29.5	S12°13.5	326°56.4	2.6′	N27°33.0	2.1′	59.9′
19	101°29.5	12.7	341°18.0	2.6′	27°30.9	2.3′	59.9′
20	116°29.6	11.8	355°39.7	2.6′	27°28.6	2.5′	59.9′
21	131°29.6	·· 10.9	10°01.3	2.6′	27°26.1	2.7′	59.9′
22	146°29.7	10.1	24°22.9	2.6′	27°23.4	2.9′	60.0′
23	161°29.7	09.2	38°44.5	2.6′	27°20.5	3.1′	60.0′
	SD = 16.2′	d = 0.9′	SD = 16.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.7	S12°08.3	53°06.2	2.6′	N27°17.4	3.3′	60.0′
1	191°29.8	07.4	67°27.8	2.6′	27°14.1	3.5′	60.0′
2	206°29.8	06.6	81°49.4	2.7′	27°10.6	3.7′	60.0′
3	221°29.9	·· 05.7	96°11.1	2.7′	27°06.9	3.9′	60.1′
4	236°29.9	04.8	110°32.8	2.7′	27°03.0	4.1′	60.1′
5	251°29.9	03.9	124°54.4	2.7′	26°58.9	4.3′	60.1′
6	266°30.0	S12°03.1	139°16.1	2.7′	N26°54.6	4.5′	60.1′
7	281°30.0	02.2	153°37.9	2.8′	26°50.1	4.7′	60.1′
8	296°30.1	01.3	167°59.6	2.8′	26°45.4	4.9′	60.2′
9	311°30.1	12°00.5	182°21.4	2.8′	26°40.5	5.1′	60.2′
10	326°30.2	11°59.6	196°43.2	2.8′	26°35.4	5.2′	60.2′
11	341°30.2	58.7	211°05.1	2.9′	26°30.2	5.5′	60.2′
12	356°30.3	S11°57.8	225°27.0	2.9′	N26°24.7	5.7′	60.2′
13	11°30.3	57.0	239°48.9	3.0′	26°19.0	5.9′	60.3′
14	26°30.3	56.1	254°10.8	3.0′	26°13.1	6.0′	60.3′
15	41°30.4	·· 55.2	268°32.9	3.0′	26°07.1	6.3′	60.3′
16	56°30.4	54.3	282°54.9	3.1′	26°00.8	6.4′	60.3′
17	71°30.5	53.4	297°17.0	3.1′	25°54.4	6.6′	60.3′
18	86°30.5	S11°52.6	311°39.1	3.2′	N25°47.8	6.9′	60.3′
19	101°30.6	51.7	326°01.3	3.3′	25°40.9	7.0′	60.4′
20	116°30.6	50.8	340°23.6	3.3′	25°33.9	7.2′	60.4′
21	131°30.7	·· 49.9	354°45.9	3.4′	25°26.7	7.3′	60.4′
22	146°30.7	49.1	9°08.3	3.4′	25°19.4	7.6′	60.4′
23	161°30.8	48.2	23°30.7	3.5′	25°11.8	7.8′	60.4′
	SD = 16.2′	d = 0.9′	SD = 16.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:11	07:31	08:49	15:41	16:59	18:19
N 70°	06:10	07:22	08:30	16:00	17:08	18:20
68°	06:09	07:14	08:15	16:15	17:16	18:21
66°	06:07	07:07	08:03	16:27	17:22	18:22
64°	06:06	07:02	07:52	16:37	17:28	18:23
62°	06:05	06:57	07:44	16:46	17:33	18:25
60°	06:04	06:52	07:36	16:53	17:37	18:26
N 58°	06:03	06:48	07:29	17:00	17:41	18:27
56°	06:02	06:45	07:24	17:05	17:44	18:28
54°	06:00	06:42	07:18	17:11	17:47	18:29
52°	05:59	06:39	07:14	17:15	17:50	18:30
50°	05:58	06:36	07:09	17:20	17:53	18:31
45°	05:55	06:30	07:00	17:29	17:59	18:33
N 40°	05:53	06:24	06:52	17:37	18:04	18:36
35°	05:50	06:19	06:45	17:43	18:09	18:39
30°	05:47	06:15	06:39	17:49	18:14	18:42
20°	05:40	06:06	06:29	18:00	18:22	18:48
N 10°	05:33	05:58	06:19	18:09	18:30	18:55
0°	05:25	05:49	06:11	18:17	18:39	19:03
S 10°	05:15	05:40	06:02	18:26	18:48	19:13
20°	05:03	05:29	05:52	18:36	18:58	19:25
30°	04:46	05:16	05:41	18:47	19:12	19:41
35°	04:36	05:08	05:34	18:53	19:20	19:51
40°	04:24	04:58	05:27	19:00	19:29	20:03
45°	04:08	04:47	05:18	19:09	19:40	20:19
S 50°	03:48	04:32	05:08	19:19	19:54	20:38
52°	03:38	04:26	05:03	19:24	20:01	20:48
54°	03:27	04:18	04:57	19:29	20:09	20:59
56°	03:14	04:09	04:51	19:35	20:17	21:12
58°	02:58	03:59	04:45	19:42	20:27	21:27
S 60°	02:38	03:48	04:37	19:49	20:38	21:46

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°						
N 70°						
68°						
66°						
64°						
62°	08:04	08:32	10:18	05:17	07:00	07:29
60°	08:46	09:32	11:00	04:35	06:00	06:47
N 58°	09:15	10:06	11:28	04:07	05:27	06:18
56°	09:37	10:31	11:50	03:45	05:02	05:56
54°	09:56	10:51	12:08	03:27	04:42	05:38
52°	10:11	11:07	12:23	03:12	04:25	05:22
50°	10:25	11:22	12:36	02:58	04:11	05:09
45°	10:52	11:51	13:04	02:31	03:41	04:41
N 40°	11:14	12:14	13:25	02:10	03:18	04:19
35°	11:33	12:33	13:43	01:52	02:59	04:01
30°	11:48	12:49	13:58	01:37	02:43	03:45
20°	12:15	13:17	14:24	01:11	02:15	03:18
N 10°	12:38	13:41	14:46	00:49	01:52	02:55
0°	13:00	14:03	15:07	00:28	01:30	02:33
S 10°	13:21	14:25	15:28	00:07	01:07	02:12
20°	13:45	14:49	15:50	·· ··	00:44	01:48
30°	14:12	15:17	16:15	·· ··	00:16	01:21
35°	14:28	15:33	16:30	·· ··	00:00	01:05
40°	14:47	15:52	16:48	23:41	·· ··	00:46
45°	15:10	16:15	17:09	23:18	·· ··	00:23
S 50°	15:39	16:45	17:35	22:48	23:54	·· ··
52°	15:53	16:59	17:47	22:34	23:40	·· ··
54°	16:10	17:16	18:02	22:17	23:23	·· ··
56°	16:30	17:36	18:19	21:57	23:03	·· ··
58°	16:55	18:01	18:39	21:32	22:38	·· ··
S 60°	17:28	18:35	19:04	20:58	22:04	23:49

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 9-11 58-79%
15	14:08	14:06	12:14	19:15	06:44	
16	14:05	14:03	12:14	20:18	07:46	
17	14:01	13:59	12:14	21:22	08:50	

February 18, 19, 20 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	147°44.2	219°49.4	S20°55.6	352°38.3	N15°08.3	3°52.6	N15°27.9	135°54.8	N02°35.3
1	162°46.6	234°48.8	55.4	7°41.7	08.7	18°55.4	28.0	150°57.0	35.4
2	177°49.1	249°48.1	55.2	22°45.1	09.0	33°58.2	28.1	165°59.3	35.5
3	192°51.6	264°47.4	·· 55.0	37°48.6	·· 09.4	49°01.0	·· 28.3	181°01.5	·· 35.6
4	207°54.0	279°46.8	54.8	52°52.0	09.7	64°03.8	28.4	196°03.7	35.7
5	222°56.5	294°46.1	54.6	67°55.4	10.1	79°06.6	28.5	211°05.9	35.8
6	237°59.0	309°45.4	S20°54.4	82°58.8	N15°10.4	94°09.3	N15°28.6	226°08.2	N02°35.9
7	253°01.4	324°44.8	54.2	98°02.3	10.8	109°12.1	28.7	241°10.4	36.0
8	268°03.9	339°44.1	54.0	113°05.7	11.1	124°14.9	28.8	256°12.6	36.1
9	283°06.4	354°43.4	·· 53.8	128°09.1	·· 11.5	139°17.7	·· 28.9	271°14.9	·· 36.2
10	298°08.8	9°42.8	53.5	143°12.5	11.8	154°20.5	29.0	286°17.1	36.3
11	313°11.3	24°42.1	53.3	158°16.0	12.2	169°23.2	29.1	301°19.3	36.5
12	328°13.7	39°41.4	S20°53.1	173°19.4	N15°12.5	184°26.0	N15°29.2	316°21.5	N02°36.6
13	343°16.2	54°40.7	52.9	188°22.8	12.9	199°28.8	29.3	331°23.8	36.7
14	358°18.7	69°40.1	52.7	203°26.2	13.2	214°31.6	29.4	346°26.0	36.8
15	13°21.1	84°39.4	·· 52.5	218°29.7	·· 13.6	229°34.4	·· 29.5	1°28.2	·· 36.9
16	28°23.6	99°38.7	52.3	233°33.1	13.9	244°37.2	29.6	16°30.4	37.0
17	43°26.1	114°38.1	52.1	248°36.5	14.3	259°39.9	29.7	31°32.7	37.1
18	58°28.5	129°37.4	S20°51.8	263°39.9	N15°14.6	274°42.7	N15°29.9	46°34.9	N02°37.2
19	73°31.0	144°36.7	51.6	278°43.4	15.0	289°45.5	30.0	61°37.1	37.3
20	88°33.5	159°36.1	51.4	293°46.8	15.3	304°48.3	30.1	76°39.3	37.4
21	103°35.9	174°35.4	·· 51.2	308°50.2	·· 15.7	319°51.1	·· 30.2	91°41.6	·· 37.5
22	118°38.4	189°34.7	51.0	323°53.6	16.0	334°53.8	30.3	106°43.8	37.6
23	133°40.9	204°34.0	50.7	338°57.1	16.4	349°56.6	30.4	121°46.0	37.7
Mer.pass. 14:07		ν -0.7′	d 0.2′	ν 3.4′	d 0.4′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.14		m -1.27		m -2.55		m 0.79	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	148°43.3	219°33.4	S20°50.5	354°00.5	N15°16.7	4°59.4	N15°30.5	136°48.2	N02°37.8
1	163°45.8	234°32.7	50.3	9°03.9	17.1	20°02.2	30.6	151°50.5	38.0
2	178°48.2	249°32.0	50.1	24°07.4	17.4	35°05.0	30.7	166°52.7	38.1
3	193°50.7	264°31.4	·· 49.8	39°10.8	·· 17.8	50°07.7	·· 30.8	181°54.9	·· 38.2
4	208°53.2	279°30.7	49.6	54°14.2	18.1	65°10.5	30.9	196°57.2	38.3
5	223°55.6	294°30.0	49.4	69°17.6	18.5	80°13.3	31.0	211°59.4	38.4
6	238°58.1	309°29.4	S20°49.2	84°21.1	N15°18.8	95°16.1	N15°31.1	227°01.6	N02°38.5
7	254°00.6	324°28.7	48.9	99°24.5	19.1	110°18.9	31.2	242°03.8	38.6
8	269°03.0	339°28.0	48.7	114°27.9	19.5	125°21.7	31.3	257°06.1	38.7
9	284°05.5	354°27.3	·· 48.5	129°31.3	·· 19.8	140°24.4	·· 31.4	272°08.3	·· 38.8
10	299°08.0	9°26.7	48.2	144°34.8	20.2	155°27.2	31.6	287°10.5	38.9
11	314°10.4	24°26.0	48.0	159°38.2	20.5	170°30.0	31.7	302°12.7	39.0
12	329°12.9	39°25.3	S20°47.8	174°41.6	N15°20.9	185°32.8	N15°31.8	317°15.0	N02°39.1
13	344°15.4	54°24.7	47.5	189°45.1	21.2	200°35.6	31.9	332°17.2	39.2
14	359°17.8	69°24.0	47.3	204°48.5	21.6	215°38.3	32.0	347°19.4	39.3
15	14°20.3	84°23.3	·· 47.0	219°51.9	·· 21.9	230°41.1	·· 32.1	2°21.6	·· 39.5
16	29°22.7	99°22.7	46.8	234°55.4	22.2	245°43.9	32.2	17°23.8	39.6
17	44°25.2	114°22.0	46.6	249°58.8	22.6	260°46.7	32.3	32°26.1	39.7
18	59°27.7	129°21.3	S20°46.3	265°02.2	N15°22.9	275°49.5	N15°32.4	47°28.3	N02°39.8
19	74°30.1	144°20.6	46.1	280°05.6	23.3	290°52.2	32.5	62°30.5	39.9
20	89°32.6	159°20.0	45.8	295°09.1	23.6	305°55.0	32.6	77°32.7	40.0
21	104°35.1	174°19.3	·· 45.6	310°12.5	·· 24.0	320°57.8	·· 32.7	92°35.0	·· 40.1
22	119°37.5	189°18.6	45.3	325°15.9	24.3	336°00.6	32.8	107°37.2	40.2
23	134°40.0	204°18.0	45.1	340°19.4	24.6	351°03.4	32.9	122°39.4	40.3
Mer.pass. 14:03		ν -0.7′	d 0.2′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.13		m -1.28		m -2.55		m 0.79	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	149°42.5	219°17.3	S20°44.9	355°22.8	N15°25.0	6°06.1	N15°33.0	137°41.6	N02°40.4
1	164°44.9	234°16.6	44.6	10°26.2	25.3	21°08.9	33.1	152°43.9	40.5
2	179°47.4	249°16.0	44.4	25°29.7	25.7	36°11.7	33.2	167°46.1	40.6
3	194°49.9	264°15.3	·· 44.1	40°33.1	·· 26.0	51°14.5	·· 33.3	182°48.3	·· 40.8
4	209°52.3	279°14.6	43.9	55°36.5	26.4	66°17.2	33.5	197°50.5	40.9
5	224°54.8	294°13.9	43.6	70°39.9	26.7	81°20.0	33.6	212°52.8	41.0
6	239°57.2	309°13.3	S20°43.3	85°43.4	N15°27.0	96°22.8	N15°33.7	227°55.0	N02°41.1
7	254°59.7	324°12.6	43.1	100°46.8	27.4	111°25.6	33.8	242°57.2	41.2
8	270°02.2	339°11.9	42.8	115°50.2	27.7	126°28.4	33.9	257°59.4	41.3
9	285°04.6	354°11.3	·· 42.6	130°53.7	·· 28.1	141°31.1	·· 34.0	273°01.6	·· 41.4
10	300°07.1	9°10.6	42.3	145°57.1	28.4	156°33.9	34.1	288°03.9	41.5
11	315°09.6	24°09.9	42.1	161°00.5	28.7	171°36.7	34.2	303°06.1	41.6
12	330°12.0	39°09.3	S20°41.8	176°04.0	N15°29.1	186°39.5	N15°34.3	318°08.3	N02°41.7
13	345°14.5	54°08.6	41.5	191°07.4	29.4	201°42.3	34.4	333°10.5	41.8
14	0°17.0	69°07.9	41.3	206°10.8	29.8	216°45.0	34.5	348°12.8	41.9
15	15°19.4	84°07.2	·· 41.0	221°14.3	·· 30.1	231°47.8	·· 34.6	3°15.0	·· 42.0
16	30°21.9	99°06.6	40.8	236°17.7	30.4	246°50.6	34.7	18°17.2	42.2
17	45°24.3	114°05.9	40.5	251°21.1	30.8	261°53.4	34.8	33°19.4	42.3
18	60°26.8	129°05.2	S20°40.2	266°24.6	N15°31.1	276°56.1	N15°34.9	48°21.6	N02°42.4
19	75°29.3	144°04.6	40.0	281°28.0	31.4	291°58.9	35.0	63°23.9	42.5
20	90°31.7	159°03.9	39.7	296°31.4	31.8	307°01.7	35.1	78°26.1	42.6
21	105°34.2	174°03.2	·· 39.4	311°34.8	·· 32.1	322°04.5	·· 35.2	93°28.3	·· 42.7
22	120°36.7	189°02.6	39.2	326°38.3	32.5	337°07.3	35.3	108°30.5	42.8
23	135°39.1	204°01.9	38.9	341°41.7	32.8	352°10.0	35.4	123°32.8	42.9
Mer.pass. 13:59		ν -0.7′	d 0.2′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.13		m -1.28		m -2.55		m 0.79	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.7	-42°09.6
Schedar	349°29.4	56°41.4
Diphda	348°45.8	-17°50.4
Achernar	335°19.2	-57°06.1
Hamal	327°49.3	23°35.5
Polaris	313°11.9	89°23.0
Acamar	315°10.5	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.8	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.4
Capella	280°19.1	46°01.6
Bellatrix	278°20.8	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.3	-52°42.8
Sirius	258°24.5	-16°45.4
Adhara	255°04.2	-29°00.8
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.5
Avior	234°13.4	-59°36.0
Suhail	222°44.6	-43°32.7
Miaplacidus	221°37.0	-69°49.8
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.0
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°57.5	-63°14.9
Gacrux	171°49.2	-57°15.9
Alioth	166°11.0	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.4	49°10.3
Hadar	148°33.2	-60°30.1
Menkent	147°55.3	-36°30.2
Arcturus	145°46.2	19°02.2
Rigil Kent.	139°37.6	-60°56.7
Kochab	137°19.6	74°02.2
Zuben'ubi	136°54.0	-16°09.3
Alphecca	126°02.2	26°37.1
Antares	112°13.7	-26°29.5
Atria	107°06.5	-69°04.3
Sabik	102°00.9	-15°45.5
Shaula	96°08.1	-37°07.3
Rasalhague	95°57.1	12°32.2
Eltanin	90°41.6	51°28.8
Kaus Aust.	83°30.4	-34°22.2
Vega	80°32.3	38°48.3
Nunki	75°45.8	-26°15.7
Altair	61°58.5	8°56.3
Peacock	53°03.5	-56°38.8
Deneb	49°25.0	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.1

Feb 18 Thu	SHA	Mer.pass
Venus	72°05.3	09:21
Mars	204°54.1	00:29
Jupiter	216°08.5	23:40
Saturn	348°10.6	14:54

Feb 19 Fri	SHA	Mer.pass
Venus	70°50.1	09:22
Mars	205°17.2	00:24
Jupiter	216°16.1	23:36
Saturn	348°04.9	14:51

Feb 20 Sat	SHA	Mer.pass
Venus	69°34.8	09:23
Mars	205°40.3	00:18
Jupiter	216°23.7	23:31
Saturn	347°59.2	14:47

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°30.8	S11°47.3	37°53.2	3.6′	N25°04.0	7.9′	60.4′
1	191°30.9	46.4	52°15.7	3.6′	24°56.1	8.1′	60.4′
2	206°30.9	45.5	66°38.4	3.7′	24°48.0	8.3′	60.5′
3	221°31.0	·· 44.7	81°01.0	3.8′	24°39.7	8.5′	60.5′
4	236°31.0	43.8	95°23.8	3.8′	24°31.2	8.6′	60.5′
5	251°31.1	42.9	109°46.6	3.9′	24°22.6	8.8′	60.5′
6	266°31.1	S11°42.0	124°09.5	4.0′	N24°13.8	9.0′	60.5′
7	281°31.2	41.1	138°32.5	4.1′	24°04.8	9.2′	60.5′
8	296°31.2	40.3	152°55.6	4.1′	23°55.6	9.3′	60.5′
9	311°31.3	·· 39.4	167°18.7	4.2′	23°46.3	9.5′	60.5′
10	326°31.3	38.5	181°41.9	4.3′	23°36.8	9.7′	60.6′
11	341°31.4	37.6	196°05.2	4.4′	23°27.1	9.9′	60.6′
12	356°31.4	S11°36.7	210°28.6	4.5′	N23°17.2	10.0′	60.6′
13	11°31.5	35.8	224°52.0	4.5′	23°07.2	10.1′	60.6′
14	26°31.5	35.0	239°15.5	4.6′	22°57.1	10.4′	60.6′
15	41°31.6	·· 34.1	253°39.2	4.7′	22°46.7	10.5′	60.6′
16	56°31.6	33.2	268°02.9	4.8′	22°36.2	10.6′	60.6′
17	71°31.7	32.3	282°26.7	4.9′	22°25.6	10.8′	60.6′
18	86°31.8	S11°31.4	296°50.5	5.0′	N22°14.8	11.0′	60.6′
19	101°31.8	30.5	311°14.5	5.1′	22°03.8	11.1′	60.6′
20	116°31.9	29.7	325°38.6	5.2′	21°52.7	11.3′	60.6′
21	131°31.9	·· 28.8	340°02.7	5.2′	21°41.4	11.4′	60.6′
22	146°32.0	27.9	354°27.0	5.3′	21°30.0	11.5′	60.6′
23	161°32.0	27.0	8°51.3	5.4′	21°18.5	11.7′	60.6′
	SD = 16.2′	d = 0.9′	SD = 16.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°32.1	S11°26.1	23°15.8	5.5′	N21°06.8	11.9′	60.6′
1	191°32.1	25.2	37°40.3	5.6′	20°54.9	12.0′	60.6′
2	206°32.2	24.3	52°04.9	5.7′	20°42.9	12.1′	60.7′
3	221°32.3	·· 23.4	66°29.6	5.8′	20°30.8	12.3′	60.7′
4	236°32.3	22.6	80°54.4	5.9′	20°18.5	12.4′	60.7′
5	251°32.4	21.7	95°19.3	6.0′	20°06.1	12.5′	60.7′
6	266°32.4	S11°20.8	109°44.3	6.1′	N19°53.6	12.7′	60.7′
7	281°32.5	19.9	124°09.4	6.2′	19°40.9	12.8′	60.7′
8	296°32.6	19.0	138°34.6	6.3′	19°28.1	12.9′	60.7′
9	311°32.6	·· 18.1	152°59.9	6.4′	19°15.2	13.0′	60.7′
10	326°32.7	17.2	167°25.3	6.5′	19°02.2	13.2′	60.7′
11	341°32.7	16.3	181°50.8	6.6′	18°49.0	13.3′	60.7′
12	356°32.8	S11°15.4	196°16.4	6.7′	N18°35.7	13.4′	60.7′
13	11°32.8	14.6	210°42.1	6.8′	18°22.3	13.5′	60.7′
14	26°32.9	13.7	225°07.8	6.9′	18°08.8	13.7′	60.6′
15	41°33.0	·· 12.8	239°33.7	7.0′	17°55.1	13.7′	60.6′
16	56°33.0	11.9	253°59.7	7.1′	17°41.4	13.9′	60.6′
17	71°33.1	11.0	268°25.7	7.2′	17°27.5	13.9′	60.6′
18	86°33.2	S11°10.1	282°51.9	7.3′	N17°13.6	14.1′	60.6′
19	101°33.2	09.2	297°18.2	7.4′	16°59.5	14.2′	60.6′
20	116°33.3	08.3	311°44.5	7.5′	16°45.3	14.3′	60.6′
21	131°33.3	·· 07.4	326°11.0	7.5′	16°31.0	14.4′	60.6′
22	146°33.4	06.5	340°37.5	7.6′	16°16.6	14.4′	60.6′
23	161°33.5	05.6	355°04.2	7.7′	16°02.2	14.6′	60.6′
	SD = 16.2′	d = 0.9′	SD = 16.5′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°33.5	S11°04.7	9°30.9	7.8′	N15°47.6	14.7′	60.6′
1	191°33.6	03.8	23°57.7	7.9′	15°32.9	14.8′	60.6′
2	206°33.7	02.9	38°24.6	8.0′	15°18.1	14.8′	60.6′
3	221°33.7	·· 02.1	52°51.7	8.1′	15°03.3	14.9′	60.6′
4	236°33.8	01.2	67°18.8	8.2′	14°48.4	15.1′	60.6′
5	251°33.8	11°00.3	81°46.0	8.3′	14°33.3	15.1′	60.5′
6	266°33.9	S10°59.4	96°13.3	8.4′	N14°18.2	15.2′	60.5′
7	281°34.0	58.5	110°40.6	8.5′	14°03.0	15.2′	60.5′
8	296°34.0	57.6	125°08.1	8.6′	13°47.8	15.4′	60.5′
9	311°34.1	·· 56.7	139°35.7	8.7′	13°32.4	15.4′	60.5′
10	326°34.2	55.8	154°03.3	8.7′	13°17.0	15.5′	60.5′
11	341°34.2	54.9	168°31.1	8.8′	13°01.5	15.5′	60.5′
12	356°34.3	S10°54.0	182°58.9	8.9′	N12°46.0	15.7′	60.5′
13	11°34.4	53.1	197°26.8	9.0′	12°30.3	15.7′	60.5′
14	26°34.4	52.2	211°54.8	9.1′	12°14.6	15.7′	60.4′
15	41°34.5	·· 51.3	226°22.9	9.2′	11°58.9	15.8′	60.4′
16	56°34.6	50.4	240°51.0	9.2′	11°43.1	15.9′	60.4′
17	71°34.6	49.5	255°19.3	9.3′	11°27.2	15.9′	60.4′
18	86°34.7	S10°48.6	269°47.6	9.4′	N11°11.3	16.0′	60.4′
19	101°34.8	47.7	284°16.0	9.5′	10°55.3	16.1′	60.4′
20	116°34.9	46.8	298°44.5	9.6′	10°39.2	16.1′	60.3′
21	131°34.9	·· 45.9	313°13.1	9.6′	10°23.1	16.1′	60.3′
22	146°35.0	45.0	327°41.7	9.7′	10°07.0	16.2′	60.3′
23	161°35.1	44.1	342°10.5	9.8′	09°50.8	16.3′	60.3′
	SD = 16.2′	d = 0.9′	SD = 16.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:58	07:17	08:32	15:57	17:13	18:32
N 70°	05:58	07:09	08:16	16:14	17:20	18:32
68°	05:58	07:03	08:02	16:27	17:27	18:32
66°	05:58	06:57	07:51	16:37	17:32	18:32
64°	05:57	06:52	07:42	16:47	17:36	18:32
62°	05:57	06:48	07:35	16:54	17:41	18:32
60°	05:56	06:45	07:28	17:01	17:44	18:33
N 58°	05:56	06:41	07:22	17:07	17:47	18:33
56°	05:55	06:38	07:17	17:12	17:50	18:34
54°	05:54	06:36	07:12	17:17	17:53	18:34
52°	05:54	06:33	07:08	17:21	17:55	18:35
50°	05:53	06:31	07:04	17:25	17:58	18:35
45°	05:51	06:25	06:55	17:33	18:03	18:37
N 40°	05:49	06:21	06:48	17:40	18:08	18:39
35°	05:47	06:16	06:42	17:46	18:12	18:41
30°	05:44	06:12	06:36	17:52	18:16	18:44
20°	05:39	06:05	06:27	18:01	18:23	18:49
N 10°	05:32	05:57	06:19	18:09	18:31	18:55
0°	05:25	05:49	06:10	18:17	18:38	19:03
S 10°	05:16	05:41	06:02	18:25	18:47	19:12
20°	05:04	05:31	05:53	18:34	18:56	19:23
30°	04:49	05:19	05:43	18:44	19:09	19:38
35°	04:40	05:11	05:37	18:50	19:16	19:47
40°	04:28	05:02	05:31	18:56	19:25	19:59
45°	04:14	04:51	05:23	19:04	19:35	20:13
S 50°	03:55	04:38	05:13	19:14	19:48	20:31
52°	03:46	04:32	05:09	19:18	19:54	20:40
54°	03:35	04:25	05:04	19:23	20:01	20:50
56°	03:23	04:17	04:58	19:28	20:09	21:02
58°	03:09	04:08	04:52	19:34	20:18	21:16
S 60°	02:51	03:57	04:45	19:41	20:28	21:33

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°			15:16			08:50
N 70°		12:35	15:38		09:32	08:26
68°		13:22	15:55		08:44	08:07
66°	10:54	13:52	16:08	09:06	08:13	07:51
64°	11:53	14:14	16:19	08:06	07:49	07:39
62°	12:27	14:32	16:28	07:32	07:30	07:28
60°	12:51	14:46	16:36	07:06	07:15	07:19
N 58°	13:11	14:59	16:43	06:46	07:01	07:10
56°	13:27	15:09	16:49	06:30	06:50	07:03
54°	13:41	15:19	16:55	06:15	06:40	06:57
52°	13:53	15:27	17:00	06:03	06:31	06:51
50°	14:03	15:34	17:04	05:52	06:22	06:45
45°	14:25	15:50	17:14	05:28	06:05	06:34
N 40°	14:43	16:03	17:22	05:10	05:51	06:24
35°	14:58	16:14	17:28	04:54	05:38	06:16
30°	15:11	16:24	17:34	04:40	05:27	06:08
20°	15:32	16:40	17:44	04:16	05:09	05:56
N 10°	15:51	16:54	17:53	03:56	04:53	05:44
0°	16:09	17:07	18:02	03:37	04:37	05:33
S 10°	16:26	17:20	18:10	03:17	04:22	05:23
20°	16:45	17:34	18:19	02:56	04:05	05:11
30°	17:06	17:50	18:29	02:32	03:45	04:58
35°	17:19	18:00	18:34	02:18	03:34	04:50
40°	17:33	18:10	18:41	02:01	03:21	04:41
45°	17:50	18:22	18:48	01:41	03:05	04:30
S 50°	18:11	18:37	18:57	01:16	02:46	04:17
52°	18:21	18:44	19:01	01:04	02:37	04:11
54°	18:32	18:51	19:06	00:50	02:26	04:04
56°	18:44	19:00	19:11	00:33	02:15	03:57
58°	18:59	19:09	19:16	00:13	02:01	03:48
S 60°	19:16	19:20	19:22	·· ··	01:45	03:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 12-14 88-99%
18	13:57	13:54	12:14	22:23	09:53	
19	13:52	13:49	12:14	23:20	10:52	
20	13:46	13:43	12:14	–:–	11:48	

February 21, 22, 23 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	150°41.6	219°01.2	S20°38.6	356°45.1	N15°33.1	7°12.8	N15°35.5	138°35.0	N02°43.0
1	165°44.1	234°00.6	38.3	11°48.6	33.5	22°15.6	35.6	153°37.2	43.1
2	180°46.5	248°59.9	38.1	26°52.0	33.8	37°18.4	35.8	168°39.4	43.2
3	195°49.0	263°59.2	·· 37.8	41°55.4	·· 34.1	52°21.1	·· 35.9	183°41.6	·· 43.4
4	210°51.5	278°58.5	37.5	56°58.9	34.5	67°23.9	36.0	198°43.9	43.5
5	225°53.9	293°57.9	37.2	72°02.3	34.8	82°26.7	36.1	213°46.1	43.6
6	240°56.4	308°57.2	S20°37.0	87°05.7	N15°35.1	97°29.5	N15°36.2	228°48.3	N02°43.7
7	255°58.8	323°56.5	36.7	102°09.2	35.5	112°32.3	36.3	243°50.5	43.8
8	271°01.3	338°55.9	36.4	117°12.6	35.8	127°35.0	36.4	258°52.7	43.9
9	286°03.8	353°55.2	·· 36.1	132°16.0	·· 36.1	142°37.8	·· 36.5	273°55.0	·· 44.0
10	301°06.2	8°54.5	35.8	147°19.5	36.5	157°40.6	36.6	288°57.2	44.1
11	316°08.7	23°53.9	35.6	162°22.9	36.8	172°43.4	36.7	303°59.4	44.2
12	331°11.2	38°53.2	S20°35.3	177°26.3	N15°37.1	187°46.1	N15°36.8	319°01.6	N02°44.3
13	346°13.6	53°52.5	35.0	192°29.8	37.5	202°48.9	36.9	334°03.8	44.4
14	1°16.1	68°51.9	34.7	207°33.2	37.8	217°51.7	37.0	349°06.1	44.6
15	16°18.6	83°51.2	·· 34.4	222°36.6	·· 38.1	232°54.5	·· 37.1	4°08.3	·· 44.7
16	31°21.0	98°50.5	34.1	237°40.0	38.5	247°57.2	37.2	19°10.5	44.8
17	46°23.5	113°49.8	33.8	252°43.5	38.8	263°00.0	37.3	34°12.7	44.9
18	61°26.0	128°49.2	S20°33.5	267°46.9	N15°39.1	278°02.8	N15°37.4	49°14.9	N02°45.0
19	76°28.4	143°48.5	33.3	282°50.3	39.5	293°05.6	37.5	64°17.2	45.1
20	91°30.9	158°47.8	33.0	297°53.8	39.8	308°08.3	37.6	79°19.4	45.2
21	106°33.3	173°47.2	·· 32.7	312°57.2	·· 40.1	323°11.1	·· 37.7	94°21.6	·· 45.3
22	121°35.8	188°46.5	32.4	328°00.6	40.5	338°13.9	37.8	109°23.8	45.4
23	136°38.3	203°45.8	32.1	343°04.1	40.8	353°16.7	37.9	124°26.0	45.5
Mer.pass. 13:55		ν -0.7′	d 0.3′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.12		m -1.27		m -2.55		m 0.79	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	151°40.7	218°45.2	S20°31.8	358°07.5	N15°41.1	8°19.4	N15°38.0	139°28.3	N02°45.6
1	166°43.2	233°44.5	31.5	13°10.9	41.4	23°22.2	38.1	154°30.5	45.8
2	181°45.7	248°43.8	31.2	28°14.4	41.8	38°25.0	38.2	169°32.7	45.9
3	196°48.1	263°43.2	·· 30.9	43°17.8	·· 42.1	53°27.8	·· 38.3	184°34.9	·· 46.0
4	211°50.6	278°42.5	30.6	58°21.2	42.4	68°30.5	38.4	199°37.1	46.1
5	226°53.1	293°41.8	30.3	73°24.7	42.8	83°33.3	38.5	214°39.4	46.2
6	241°55.5	308°41.2	S20°30.0	88°28.1	N15°43.1	98°36.1	N15°38.6	229°41.6	N02°46.3
7	256°58.0	323°40.5	29.7	103°31.5	43.4	113°38.9	38.7	244°43.8	46.4
8	272°00.4	338°39.8	29.4	118°35.0	43.7	128°41.6	38.9	259°46.0	46.5
9	287°02.9	353°39.2	·· 29.1	133°38.4	·· 44.1	143°44.4	·· 39.0	274°48.2	·· 46.6
10	302°05.4	8°38.5	28.8	148°41.8	44.4	158°47.2	39.1	289°50.5	46.7
11	317°07.8	23°37.8	28.5	163°45.2	44.7	173°50.0	39.2	304°52.7	46.8
12	332°10.3	38°37.2	S20°28.2	178°48.7	N15°45.0	188°52.7	N15°39.3	319°54.9	N02°47.0
13	347°12.8	53°36.5	27.8	193°52.1	45.4	203°55.5	39.4	334°57.1	47.1
14	2°15.2	68°35.8	27.5	208°55.5	45.7	218°58.3	39.5	349°59.3	47.2
15	17°17.7	83°35.2	·· 27.2	223°59.0	·· 46.0	234°01.1	·· 39.6	5°01.5	·· 47.3
16	32°20.2	98°34.5	26.9	239°02.4	46.3	249°03.8	39.7	20°03.8	47.4
17	47°22.6	113°33.8	26.6	254°05.8	46.7	264°06.6	39.8	35°06.0	47.5
18	62°25.1	128°33.2	S20°26.3	269°09.3	N15°47.0	279°09.4	N15°39.9	50°08.2	N02°47.6
19	77°27.6	143°32.5	26.0	284°12.7	47.3	294°12.1	40.0	65°10.4	47.7
20	92°30.0	158°31.8	25.7	299°16.1	47.6	309°14.9	40.1	80°12.6	47.8
21	107°32.5	173°31.1	·· 25.3	314°19.5	·· 48.0	324°17.7	·· 40.2	95°14.9	·· 47.9
22	122°34.9	188°30.5	25.0	329°23.0	48.3	339°20.5	40.3	110°17.1	48.1
23	137°37.4	203°29.8	24.7	344°26.4	48.6	354°23.2	40.4	125°19.3	48.2
Mer.pass. 13:51		ν -0.7′	d 0.3′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.11		m -1.26		m -2.54		m 0.79	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	152°39.9	218°29.1	S20°24.4	359°29.8	N15°48.9	9°26.0	N15°40.5	140°21.5	N02°48.3
1	167°42.3	233°28.5	24.1	14°33.3	49.3	24°28.8	40.6	155°23.7	48.4
2	182°44.8	248°27.8	23.7	29°36.7	49.6	39°31.6	40.7	170°25.9	48.5
3	197°47.3	263°27.1	·· 23.4	44°40.1	·· 49.9	54°34.3	·· 40.8	185°28.2	·· 48.6
4	212°49.7	278°26.5	23.1	59°43.5	50.2	69°37.1	40.9	200°30.4	48.7
5	227°52.2	293°25.8	22.8	74°47.0	50.5	84°39.9	41.0	215°32.6	48.8
6	242°54.7	308°25.2	S20°22.4	89°50.4	N15°50.9	99°42.6	N15°41.1	230°34.8	N02°48.9
7	257°57.1	323°24.5	22.1	104°53.8	51.2	114°45.4	41.2	245°37.0	49.0
8	272°59.6	338°23.8	21.8	119°57.3	51.5	129°48.2	41.3	260°39.2	49.2
9	288°02.0	353°23.2	·· 21.4	135°00.7	·· 51.8	144°51.0	·· 41.4	275°41.5	·· 49.3
10	303°04.5	8°22.5	21.1	150°04.1	52.1	159°53.7	41.5	290°43.7	49.4
11	318°07.0	23°21.8	20.8	165°07.5	52.5	174°56.5	41.6	305°45.9	49.5
12	333°09.4	38°21.2	S20°20.5	180°11.0	N15°52.8	189°59.3	N15°41.7	320°48.1	N02°49.6
13	348°11.9	53°20.5	20.1	195°14.4	53.1	205°02.0	41.8	335°50.3	49.7
14	3°14.4	68°19.8	19.8	210°17.8	53.4	220°04.8	41.9	350°52.5	49.8
15	18°16.8	83°19.2	·· 19.5	225°21.3	·· 53.7	235°07.6	·· 42.0	5°54.8	·· 49.9
16	33°19.3	98°18.5	19.1	240°24.7	54.1	250°10.4	42.1	20°57.0	50.0
17	48°21.8	113°17.8	18.8	255°28.1	54.4	265°13.1	42.2	35°59.2	50.1
18	63°24.2	128°17.2	S20°18.4	270°31.5	N15°54.7	280°15.9	N15°42.3	51°01.4	N02°50.3
19	78°26.7	143°16.5	18.1	285°35.0	55.0	295°18.7	42.4	66°03.6	50.4
20	93°29.2	158°15.8	17.8	300°38.4	55.3	310°21.4	42.5	81°05.8	50.5
21	108°31.6	173°15.2	·· 17.4	315°41.8	·· 55.6	325°24.2	·· 42.6	96°08.1	·· 50.6
22	123°34.1	188°14.5	17.1	330°45.2	56.0	340°27.0	42.7	111°10.3	50.7
23	138°36.5	203°13.8	16.7	345°48.7	56.3	355°29.8	42.8	126°12.5	50.8
Mer.pass. 13:47		ν -0.7′	d 0.3′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.11		m -1.25		m -2.54		m 0.79	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.5
Ankaa	353°05.8	-42°09.6
Schedar	349°29.4	56°41.4
Diphda	348°45.8	-17°50.4
Achernar	335°19.2	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°13.5	89°23.0
Acamar	315°10.5	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.8	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.1	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.3	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.2	-29°00.8
Procyon	244°48.7	5°09.2
Pollux	243°14.8	27°57.6
Avior	234°13.4	-59°36.0
Suhail	222°44.6	-43°32.7
Miaplacidus	221°37.0	-69°49.8
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°57.5	-63°14.9
Gacrux	171°49.2	-57°15.9
Alioth	166°11.0	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.3	49°10.3
Hadar	148°33.1	-60°30.1
Menkent	147°55.3	-36°30.2
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.6	-60°56.7
Kochab	137°19.5	74°02.2
Zuben'ubi	136°53.9	-16°09.4
Alphecca	126°02.2	26°37.1
Antares	112°13.7	-26°29.5
Atria	107°06.5	-69°04.3
Sabik	102°00.8	-15°45.5
Shaula	96°08.1	-37°07.3
Rasalhague	95°57.0	12°32.2
Eltanin	90°41.6	51°28.8
Kaus Aust.	83°30.4	-34°22.2
Vega	80°32.3	38°48.3
Nunki	75°45.8	-26°15.7
Altair	61°58.5	8°56.3
Peacock	53°03.5	-56°38.7
Deneb	49°25.0	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.1

Feb 21 Sun	**SHA**	**Mer.pass**
Venus	68°19.6	09:24
Mars	206°03.5	00:13
Jupiter	216°31.2	23:27
Saturn	347°53.4	14:43

Feb 22 Mon	**SHA**	**Mer.pass**
Venus	67°04.4	09:25
Mars	206°26.8	00:07
Jupiter	216°38.7	23:22
Saturn	347°47.5	14:40

Feb 23 Tue	**SHA**	**Mer.pass**
Venus	65°49.3	09:26
Mars	206°50.0	00:02
Jupiter	216°46.1	23:18
Saturn	347°41.6	14:36

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h

Sun	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°35.1	S10°43.2	356°39.3	9.9′	N09°34.5	16.3′	60.3′
1	191°35.2	42.3	11°08.1	10.0′	09°18.2	16.3′	60.2′
2	206°35.3	41.4	25°37.1	10.0′	09°01.9	16.3′	60.2′
3	221°35.3	·· 40.5	40°06.1	10.1′	08°45.6	16.4′	60.2′
4	236°35.4	39.6	54°35.2	10.2′	08°29.2	16.5′	60.2′
5	251°35.5	38.7	69°04.4	10.2′	08°12.7	16.5′	60.2′
6	266°35.6	S10°37.8	83°33.6	10.3′	N07°56.2	16.5′	60.1′
7	281°35.6	36.9	98°02.9	10.4′	07°39.7	16.5′	60.1′
8	296°35.7	36.0	112°32.3	10.4′	07°23.2	16.5′	60.1′
9	311°35.8	·· 35.1	127°01.7	10.5′	07°06.7	16.6′	60.1′
10	326°35.8	34.2	141°31.2	10.6′	06°50.1	16.6′	60.1′
11	341°35.9	33.3	156°00.8	10.6′	06°33.5	16.7′	60.0′
12	356°36.0	S10°32.4	170°30.4	10.7′	N06°16.8	16.6′	60.0′
13	11°36.1	31.5	185°00.1	10.8′	06°00.2	16.7′	60.0′
14	26°36.1	30.5	199°29.9	10.8′	05°43.5	16.7′	60.0′
15	41°36.2	·· 29.6	213°59.7	10.9′	05°26.8	16.7′	59.9′
16	56°36.3	28.7	228°29.6	10.9′	05°10.1	16.7′	59.9′
17	71°36.4	27.8	242°59.5	11.0′	04°53.4	16.7′	59.9′
18	86°36.4	S10°26.9	257°29.5	11.0′	N04°36.7	16.8′	59.9′
19	101°36.5	26.0	271°59.5	11.1′	04°19.9	16.7′	59.8′
20	116°36.6	25.1	286°29.6	11.1′	04°03.2	16.8′	59.8′
21	131°36.7	·· 24.2	300°59.8	11.2′	03°46.4	16.7′	59.8′
22	146°36.7	23.3	315°30.0	11.2′	03°29.7	16.8′	59.7′
23	161°36.8	22.4	330°00.2	11.3′	03°12.9	16.7′	59.7′
	SD = 16.2′	d = 0.9′		SD = 16.4′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.9	S10°21.5	344°30.5	11.3′	N02°56.2	16.8′	59.7′
1	191°37.0	20.6	359°00.8	11.4′	02°39.4	16.7′	59.7′
2	206°37.1	19.7	13°31.2	11.4′	02°22.7	16.8′	59.6′
3	221°37.1	·· 18.8	28°01.7	11.5′	02°05.9	16.7′	59.6′
4	236°37.2	17.8	42°32.2	11.5′	01°49.2	16.7′	59.6′
5	251°37.3	16.9	57°02.7	11.6′	01°32.5	16.8′	59.5′
6	266°37.4	S10°16.0	71°33.3	11.6′	N01°15.7	16.7′	59.5′
7	281°37.4	15.1	86°03.9	11.6′	00°59.0	16.7′	59.5′
8	296°37.5	14.2	100°34.5	11.7′	00°42.3	16.7′	59.5′
9	311°37.6	·· 13.3	115°05.2	11.7′	00°25.6	16.6′	59.4′
10	326°37.7	12.4	129°35.9	11.8′	N00°09.0	16.7′	59.4′
11	341°37.8	11.5	144°06.7	11.8′	S00°07.7	16.6′	59.4′
12	356°37.8	S10°10.6	158°37.5	11.8′	S00°24.3	16.6′	59.3′
13	11°37.9	09.7	173°08.3	11.9′	00°40.9	16.6′	59.3′
14	26°38.0	08.7	187°39.2	11.9′	00°57.5	16.5′	59.3′
15	41°38.1	·· 07.8	202°10.0	11.9′	01°14.0	16.6′	59.2′
16	56°38.2	06.9	216°41.0	12.0′	01°30.6	16.5′	59.2′
17	71°38.2	06.0	231°11.9	12.0′	01°47.1	16.5′	59.2′
18	86°38.3	S10°05.1	245°42.9	12.0′	S02°03.6	16.4′	59.1′
19	101°38.4	04.2	260°13.9	12.0′	02°20.0	16.4′	59.1′
20	116°38.5	03.3	274°44.9	12.1′	02°36.4	16.4′	59.1′
21	131°38.6	·· 02.4	289°16.0	12.1′	02°52.8	16.4′	59.0′
22	146°38.7	01.4	303°47.1	12.1′	03°09.2	16.3′	59.0′
23	161°38.7	00.5	318°18.2	12.1′	03°25.5	16.3′	59.0′
	SD = 16.2′	d = 0.9′		SD = 16.3′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°38.8	S09°59.6	332°49.3	12.1′	S03°41.8	16.2′	58.9′
1	191°38.9	58.7	347°20.4	12.2′	03°58.0	16.2′	58.9′
2	206°39.0	57.8	1°51.6	12.2′	04°14.2	16.2′	58.9′
3	221°39.1	·· 56.9	16°22.8	12.2′	04°30.4	16.1′	58.8′
4	236°39.2	56.0	30°54.0	12.2′	04°46.5	16.0′	58.8′
5	251°39.2	55.0	45°25.2	12.2′	05°02.5	16.1′	58.7′
6	266°39.3	S09°54.1	59°56.4	12.2′	S05°18.6	16.0′	58.7′
7	281°39.4	53.2	74°27.6	12.2′	05°34.6	15.9′	58.7′
8	296°39.5	52.3	88°58.9	12.3′	05°50.5	15.9′	58.6′
9	311°39.6	·· 51.4	103°30.1	12.3′	06°06.4	15.8′	58.6′
10	326°39.7	50.5	118°01.4	12.3′	06°22.2	15.8′	58.6′
11	341°39.8	49.5	132°32.7	12.3′	06°38.0	15.7′	58.5′
12	356°39.8	S09°48.6	147°04.0	12.3′	S06°53.7	15.7′	58.5′
13	11°39.9	47.7	161°35.3	12.3′	07°09.4	15.6′	58.5′
14	26°40.0	46.8	176°06.6	12.3′	07°25.0	15.5′	58.4′
15	41°40.1	·· 45.9	190°37.9	12.3′	07°40.5	15.5′	58.4′
16	56°40.2	44.9	205°09.2	12.3′	07°56.0	15.5′	58.3′
17	71°40.3	44.0	219°40.5	12.3′	08°11.5	15.3′	58.3′
18	86°40.4	S09°43.1	234°11.8	12.3′	S08°26.8	15.4′	58.3′
19	101°40.5	42.2	248°43.1	12.3′	08°42.2	15.2′	58.2′
20	116°40.5	41.3	263°14.4	12.3′	08°57.4	15.2′	58.2′
21	131°40.6	·· 40.3	277°45.8	12.3′	09°12.6	15.1′	58.2′
22	146°40.7	39.4	292°17.1	12.3′	09°27.7	15.1′	58.1′
23	161°40.8	38.5	306°48.4	12.3′	09°42.8	15.0′	58.1′
	SD = 16.2′	d = 0.9′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:45	07:03	08:16	16:13	17:26	18:45
N 70°	05:46	06:57	08:01	16:27	17:32	18:43
68°	05:47	06:51	07:50	16:39	17:37	18:42
66°	05:48	06:47	07:40	16:48	17:42	18:41
64°	05:48	06:43	07:32	16:56	17:45	18:40
62°	05:48	06:40	07:25	17:03	17:49	18:40
60°	05:49	06:37	07:19	17:09	17:51	18:40
N 58°	05:49	06:34	07:14	17:14	17:54	18:40
56°	05:48	06:32	07:09	17:18	17:56	18:40
54°	05:48	06:29	07:05	17:23	17:59	18:40
52°	05:48	06:27	07:01	17:26	18:01	18:40
50°	05:48	06:25	06:58	17:30	18:03	18:40
45°	05:47	06:21	06:50	17:37	18:07	18:41
N 40°	05:45	06:17	06:44	17:44	18:11	18:43
35°	05:43	06:13	06:38	17:49	18:15	18:44
30°	05:41	06:09	06:34	17:54	18:18	18:46
20°	05:37	06:03	06:25	18:02	18:25	18:50
N 10°	05:31	05:56	06:17	18:10	18:31	18:56
0°	05:25	05:49	06:10	18:17	18:38	19:02
S 10°	05:16	05:41	06:03	18:24	18:45	19:10
20°	05:06	05:32	05:55	18:32	18:54	19:21
30°	04:52	05:21	05:46	18:41	19:05	19:34
35°	04:43	05:14	05:40	18:46	19:12	19:43
40°	04:32	05:06	05:34	18:52	19:20	19:54
45°	04:19	04:56	05:27	18:59	19:30	20:07
S 50°	04:01	04:44	05:18	19:08	19:42	20:24
52°	03:53	04:38	05:14	19:12	19:48	20:32
54°	03:43	04:32	05:10	19:16	19:54	20:42
56°	03:32	04:24	05:05	19:21	20:01	20:53
58°	03:19	04:16	04:59	19:26	20:09	21:05
S 60°	03:03	04:06	04:53	19:32	20:19	21:21

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	17:54	20:17	22:40	08:02	07:25	06:51
N 70°	18:01	20:13	22:24	07:51	07:24	06:58
68°	18:06	20:09	22:11	07:43	07:24	07:05
66°	18:11	20:06	22:00	07:36	07:23	07:10
64°	18:14	20:04	21:52	07:30	07:22	07:15
62°	18:18	20:02	21:44	07:25	07:22	07:19
60°	18:21	20:00	21:38	07:20	07:21	07:22
N 58°	18:23	19:59	21:32	07:16	07:21	07:25
56°	18:25	19:57	21:27	07:13	07:21	07:28
54°	18:27	19:56	21:23	07:09	07:20	07:30
52°	18:29	19:55	21:19	07:06	07:20	07:33
50°	18:31	19:54	21:15	07:04	07:20	07:35
45°	18:34	19:52	21:07	06:58	07:19	07:39
N 40°	18:37	19:50	21:01	06:53	07:19	07:43
35°	18:40	19:49	20:56	06:48	07:18	07:47
30°	18:42	19:47	20:51	06:45	07:18	07:50
20°	18:46	19:45	20:42	06:38	07:17	07:55
N 10°	18:49	19:43	20:35	06:32	07:16	07:59
0°	18:52	19:41	20:29	06:26	07:16	08:04
S 10°	18:56	19:39	20:22	06:20	07:15	08:08
20°	18:59	19:37	20:15	06:14	07:14	08:12
30°	19:03	19:35	20:07	06:07	07:13	08:18
35°	19:05	19:34	20:02	06:03	07:13	08:21
40°	19:08	19:33	19:57	05:58	07:12	08:24
45°	19:10	19:31	19:51	05:52	07:12	08:28
S 50°	19:14	19:29	19:44	05:46	07:11	08:33
52°	19:15	19:28	19:41	05:43	07:10	08:35
54°	19:17	19:27	19:38	05:39	07:10	08:38
56°	19:19	19:26	19:34	05:35	07:09	08:40
58°	19:21	19:25	19:30	05:31	07:09	08:43
S 60°	19:23	19:24	19:25	05:26	07:08	08:47

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 15-17 100-94%
21	13:39	13:36	12:14	00:14	12:39	
22	13:32	13:29	12:13	01:04	13:28	
23	13:25	13:21	12:13	01:52	14:16	

February 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	153°39.0	218°13.2	S20°16.4	0°52.1	N15°56.6	10°32.5	N15°42.9	141°14.7	N02°50.9
1	168°41.5	233°12.5	16.0	15°55.5	56.9	25°35.3	43.0	156°16.9	51.0
2	183°43.9	248°11.8	15.7	30°58.9	57.2	40°38.1	43.1	171°19.1	51.1
3	198°46.4	263°11.2	·· 15.4	46°02.4	·· 57.5	55°40.8	·· 43.2	186°21.3	·· 51.3
4	213°48.9	278°10.5	15.0	61°05.8	57.8	70°43.6	43.3	201°23.6	51.4
5	228°51.3	293°09.8	14.7	76°09.2	58.2	85°46.4	43.4	216°25.8	51.5
6	243°53.8	308°09.2	S20°14.3	91°12.6	N15°58.5	100°49.1	N15°43.5	231°28.0	N02°51.6
7	258°56.3	323°08.5	14.0	106°16.1	58.8	115°51.9	43.6	246°30.2	51.7
8	273°58.7	338°07.9	13.6	121°19.5	59.1	130°54.7	43.7	261°32.4	51.8
9	289°01.2	353°07.2	·· 13.2	136°22.9	·· 59.4	145°57.4	·· 43.8	276°34.6	·· 51.9
10	304°03.6	8°06.5	12.9	151°26.3	15°59.7	161°00.2	43.9	291°36.8	52.0
11	319°06.1	23°05.9	12.5	166°29.8	16°00.0	176°03.0	44.0	306°39.1	52.1
12	334°08.6	38°05.2	S20°12.2	181°33.2	N16°00.3	191°05.7	N15°44.1	321°41.3	N02°52.2
13	349°11.0	53°04.5	11.8	196°36.6	00.7	206°08.5	44.2	336°43.5	52.4
14	4°13.5	68°03.9	11.5	211°40.0	01.0	221°11.3	44.3	351°45.7	52.5
15	19°16.0	83°03.2	·· 11.1	226°43.4	·· 01.3	236°14.1	·· 44.4	6°47.9	·· 52.6
16	34°18.4	98°02.5	10.7	241°46.9	01.6	251°16.8	44.5	21°50.1	52.7
17	49°20.9	113°01.9	10.4	256°50.3	01.9	266°19.6	44.6	36°52.3	52.8
18	64°23.4	128°01.2	S20°10.0	271°53.7	N16°02.2	281°22.4	N15°44.7	51°54.6	N02°52.9
19	79°25.8	143°00.6	09.7	286°57.1	02.5	296°25.1	44.8	66°56.8	53.0
20	94°28.3	157°59.9	09.3	302°00.5	02.8	311°27.9	44.9	81°59.0	53.1
21	109°30.8	172°59.2	·· 08.9	317°04.0	·· 03.1	326°30.7	·· 45.0	97°01.2	·· 53.2
22	124°33.2	187°58.6	08.6	332°07.4	03.4	341°33.4	45.1	112°03.4	53.4
23	139°35.7	202°57.9	08.2	347°10.8	03.7	356°36.2	45.2	127°05.6	53.5
Mer.pass. 13:43		ν -0.7′	d 0.3′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.10		m -1.23		m -2.54		m 0.79	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	154°38.1	217°57.2	S20°07.8	2°14.2	N16°04.0	11°39.0	N15°45.3	142°07.8	N02°53.6
1	169°40.6	232°56.6	07.5	17°17.6	04.4	26°41.7	45.4	157°10.1	53.7
2	184°43.1	247°55.9	07.1	32°21.1	04.7	41°44.5	45.5	172°12.3	53.8
3	199°45.5	262°55.3	·· 06.7	47°24.5	·· 05.0	56°47.3	·· 45.6	187°14.5	·· 53.9
4	214°48.0	277°54.6	06.3	62°27.9	05.3	71°50.0	45.7	202°16.7	54.0
5	229°50.5	292°53.9	06.0	77°31.3	05.6	86°52.8	45.8	217°18.9	54.1
6	244°52.9	307°53.3	S20°05.6	92°34.7	N16°05.9	101°55.6	N15°45.9	232°21.1	N02°54.3
7	259°55.4	322°52.6	05.2	107°38.2	06.2	116°58.3	46.0	247°23.3	54.4
8	274°57.9	337°52.0	04.8	122°41.6	06.5	132°01.1	46.1	262°25.5	54.5
9	290°00.3	352°51.3	·· 04.5	137°45.0	·· 06.8	147°03.9	·· 46.2	277°27.8	·· 54.6
10	305°02.8	7°50.6	04.1	152°48.4	07.1	162°06.6	46.3	292°30.0	54.7
11	320°05.3	22°50.0	03.7	167°51.8	07.4	177°09.4	46.4	307°32.2	54.8
12	335°07.7	37°49.3	S20°03.3	182°55.2	N16°07.7	192°12.2	N15°46.5	322°34.4	N02°54.9
13	350°10.2	52°48.6	02.9	197°58.7	08.0	207°14.9	46.6	337°36.6	55.0
14	5°12.6	67°48.0	02.6	213°02.1	08.3	222°17.7	46.7	352°38.8	55.1
15	20°15.1	82°47.3	·· 02.2	228°05.5	·· 08.6	237°20.5	·· 46.8	7°41.0	·· 55.3
16	35°17.6	97°46.7	01.8	243°08.9	08.9	252°23.2	46.9	22°43.2	55.4
17	50°20.0	112°46.0	01.4	258°12.3	09.2	267°26.0	47.0	37°45.5	55.5
18	65°22.5	127°45.3	S20°01.0	273°15.7	N16°09.5	282°28.7	N15°47.1	52°47.7	N02°55.6
19	80°25.0	142°44.7	00.6	288°19.1	09.8	297°31.5	47.2	67°49.9	55.7
20	95°27.4	157°44.0	20°00.3	303°22.6	10.1	312°34.3	47.3	82°52.1	55.8
21	110°29.9	172°43.4	19°59.9	318°26.0	·· 10.4	327°37.0	·· 47.4	97°54.3	·· 55.9
22	125°32.4	187°42.7	59.5	333°29.4	10.7	342°39.8	47.5	112°56.5	56.0
23	140°34.8	202°42.0	59.1	348°32.8	11.0	357°42.6	47.6	127°58.7	56.1
Mer.pass. 13:39		ν -0.7′	d 0.4′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.09		m -1.21		m -2.54		m 0.79	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	155°37.3	217°41.4	S19°58.7	3°36.2	N16°11.3	12°45.3	N15°47.7	143°00.9	N02°56.3
1	170°39.7	232°40.7	58.3	18°39.6	11.6	27°48.1	47.8	158°03.2	56.4
2	185°42.2	247°40.1	57.9	33°43.0	11.9	42°50.9	47.9	173°05.4	56.5
3	200°44.7	262°39.4	·· 57.5	48°46.4	·· 12.2	57°53.6	·· 48.0	188°07.6	·· 56.6
4	215°47.1	277°38.8	57.1	63°49.8	12.5	72°56.4	48.1	203°09.8	56.7
5	230°49.6	292°38.1	56.7	78°53.3	12.8	87°59.1	48.2	218°12.0	56.8
6	245°52.1	307°37.4	S19°56.3	93°56.7	N16°13.1	103°01.9	N15°48.3	233°14.2	N02°56.9
7	260°54.5	322°36.8	55.9	109°00.1	13.4	118°04.7	48.4	248°16.4	57.0
8	275°57.0	337°36.1	55.5	124°03.5	13.7	133°07.4	48.5	263°18.6	57.2
9	290°59.5	352°35.5	·· 55.1	139°06.9	·· 14.0	148°10.2	·· 48.5	278°20.8	·· 57.3
10	306°01.9	7°34.8	54.7	154°10.3	14.3	163°13.0	48.6	293°23.1	57.4
11	321°04.4	22°34.1	54.3	169°13.7	14.6	178°15.7	48.7	308°25.3	57.5
12	336°06.9	37°33.5	S19°53.9	184°17.1	N16°14.9	193°18.5	N15°48.8	323°27.5	N02°57.6
13	351°09.3	52°32.8	53.5	199°20.5	15.1	208°21.2	48.9	338°29.7	57.7
14	6°11.8	67°32.2	53.1	214°23.9	15.4	223°24.0	49.0	353°31.9	57.8
15	21°14.2	82°31.5	·· 52.7	229°27.3	·· 15.7	238°26.8	·· 49.1	8°34.1	·· 57.9
16	36°16.7	97°30.9	52.3	244°30.7	16.0	253°29.5	49.2	23°36.3	58.1
17	51°19.2	112°30.2	51.9	259°34.2	16.3	268°32.3	49.3	38°38.5	58.2
18	66°21.6	127°29.5	S19°51.5	274°37.6	N16°16.6	283°35.1	N15°49.4	53°40.7	N02°58.3
19	81°24.1	142°28.9	51.1	289°41.0	16.9	298°37.8	49.5	68°42.9	58.4
20	96°26.6	157°28.2	50.6	304°44.4	17.2	313°40.6	49.6	83°45.2	58.5
21	111°29.0	172°27.6	·· 50.2	319°47.8	·· 17.5	328°43.3	·· 49.7	98°47.4	·· 58.6
22	126°31.5	187°26.9	49.8	334°51.2	17.8	343°46.1	49.8	113°49.6	58.7
23	141°34.0	202°26.3	49.4	349°54.6	18.1	358°48.9	49.9	128°51.8	58.8
Mer.pass. 13:35		ν -0.7′	d 0.4′	ν 3.4′	d 0.3′	ν 2.8′	d 0.1′	ν 2.2′	d 0.1′
		m -4.09		m -1.19		m -2.53		m 0.79	

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.5
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.4
Achernar	335°19.2	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°15.0	89°23.0
Acamar	315°10.6	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.8	49°57.6
Aldebaran	290°37.5	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.1	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.3	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.2	-29°00.8
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.5	-59°36.0
Suhail	222°44.6	-43°32.7
Miaplacidus	221°37.0	-69°49.9
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°57.5	-63°14.9
Gacrux	171°49.2	-57°15.9
Alioth	166°11.0	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.3	49°10.3
Hadar	148°33.1	-60°30.1
Menkent	147°55.3	-36°30.2
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.5	-60°56.7
Kochab	137°19.4	74°02.2
Zuben'ubi	136°53.9	-16°09.4
Alphecca	126°02.2	26°37.1
Antares	112°13.7	-26°29.5
Atria	107°06.4	-69°04.3
Sabik	102°00.8	-15°45.5
Shaula	96°08.1	-37°07.3
Rasalhague	95°57.0	12°32.2
Eltanin	90°41.6	51°28.8
Kaus Aust.	83°30.4	-34°22.2
Vega	80°32.3	38°48.3
Nunki	75°45.8	-26°15.7
Altair	61°58.5	8°56.3
Peacock	53°03.5	-56°38.7
Deneb	49°25.0	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.5	15°21.1

Feb 24 Wed	SHA	Mer.pass
Venus	64°34.2	09:28
Mars	207°13.1	23:51
Jupiter	216°53.5	23:14
Saturn	347°35.7	14:33

Feb 25 Thu	SHA	Mer.pass
Venus	63°19.1	09:29
Mars	207°36.1	23:46
Jupiter	217°00.8	23:09
Saturn	347°29.7	14:29

Feb 26 Fri	SHA	Mer.pass
Venus	62°04.1	09:30
Mars	207°58.9	23:40
Jupiter	217°08.0	23:05
Saturn	347°23.7	14:26

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°40.9	S09°37.6	321°19.7	12.3′	S09°57.8	14.9′	58.0′
1	191°41.0	36.7	335°51.0	12.3′	10°12.7	14.8′	58.0′
2	206°41.1	35.7	350°22.3	12.3′	10°27.5	14.8′	58.0′
3	221°41.2	·· 34.8	4°53.6	12.3′	10°42.3	14.7′	57.9′
4	236°41.3	33.9	19°24.8	12.3′	10°57.0	14.7′	57.9′
5	251°41.4	33.0	33°56.1	12.3′	11°11.7	14.5′	57.9′
6	266°41.4	S09°32.1	48°27.4	12.3′	S11°26.2	14.5′	57.8′
7	281°41.5	31.1	62°58.6	12.2′	11°40.7	14.4′	57.8′
8	296°41.6	30.2	77°29.9	12.2′	11°55.1	14.3′	57.7′
9	311°41.7	·· 29.3	92°01.1	12.2′	12°09.4	14.3′	57.7′
10	326°41.8	28.4	106°32.3	12.2′	12°23.7	14.2′	57.7′
11	341°41.9	27.4	121°03.5	12.2′	12°37.9	14.0′	57.6′
12	356°42.0	S09°26.5	135°34.7	12.2′	S12°51.9	14.1′	57.6′
13	11°42.1	25.6	150°05.9	12.2′	13°06.0	13.9′	57.6′
14	26°42.2	24.7	164°37.1	12.1′	13°19.9	13.8′	57.5′
15	41°42.3	·· 23.7	179°08.2	12.1′	13°33.7	13.8′	57.5′
16	56°42.4	22.8	193°39.3	12.1′	13°47.5	13.7′	57.4′
17	71°42.5	21.9	208°10.4	12.1′	14°01.2	13.5′	57.4′
18	86°42.6	S09°21.0	222°41.5	12.1′	S14°14.7	13.5′	57.4′
19	101°42.6	20.0	237°12.6	12.1′	14°28.2	13.5′	57.3′
20	116°42.7	19.1	251°43.7	12.0′	14°41.7	13.3′	57.3′
21	131°42.8	·· 18.2	266°14.7	12.0′	14°55.0	13.2′	57.3′
22	146°42.9	17.3	280°45.7	12.0′	15°08.2	13.2′	57.2′
23	161°43.0	16.3	295°16.7	12.0′	15°21.4	13.0′	57.2′
	SD = 16.2′	d = 0.9′	SD = 15.8′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°43.1	S09°15.4	309°47.7	11.9′	S15°34.4	13.0′	57.1′
1	191°43.2	14.5	324°18.6	11.9′	15°47.4	12.8′	57.1′
2	206°43.3	13.6	338°49.5	11.9′	16°00.2	12.8′	57.1′
3	221°43.4	·· 12.6	353°20.4	11.9′	16°13.0	12.7′	57.0′
4	236°43.5	11.7	7°51.3	11.8′	16°25.7	12.6′	57.0′
5	251°43.6	10.8	22°22.1	11.8′	16°38.3	12.4′	57.0′
6	266°43.7	S09°09.9	36°53.0	11.8′	S16°50.7	12.4′	56.9′
7	281°43.8	08.9	51°23.8	11.8′	17°03.1	12.3′	56.9′
8	296°43.9	08.0	65°54.5	11.7′	17°15.4	12.2′	56.8′
9	311°44.0	·· 07.1	80°25.3	11.7′	17°27.6	12.1′	56.8′
10	326°44.1	06.1	94°56.0	11.7′	17°39.7	12.0′	56.8′
11	341°44.2	05.2	109°26.7	11.7′	17°51.7	11.8′	56.7′
12	356°44.3	S09°04.3	123°57.3	11.6′	S18°03.5	11.8′	56.7′
13	11°44.4	03.3	138°28.0	11.6′	18°15.3	11.7′	56.7′
14	26°44.5	02.4	152°58.6	11.6′	18°27.0	11.6′	56.6′
15	41°44.6	·· 01.5	167°29.1	11.5′	18°38.6	11.4′	56.6′
16	56°44.7	09°00.6	181°59.7	11.5′	18°50.0	11.4′	56.6′
17	71°44.8	08°59.6	196°30.2	11.5′	19°01.4	11.2′	56.5′
18	86°44.9	S08°58.7	211°00.7	11.5′	S19°12.6	11.2′	56.5′
19	101°45.0	57.8	225°31.1	11.4′	19°23.8	11.0′	56.5′
20	116°45.1	56.8	240°01.5	11.4′	19°34.8	10.9′	56.4′
21	131°45.2	·· 55.9	254°31.9	11.4′	19°45.7	10.9′	56.4′
22	146°45.3	55.0	269°02.3	11.3′	19°56.6	10.7′	56.4′
23	161°45.4	54.0	283°32.6	11.3′	20°07.3	10.6′	56.3′
	SD = 16.2′	d = 0.9′	SD = 15.6′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°45.5	S08°53.1	298°02.9	11.3′	S20°17.9	10.5′	56.3′
1	191°45.6	52.2	312°33.2	11.2′	20°28.4	10.3′	56.3′
2	206°45.7	51.2	327°03.4	11.2′	20°38.7	10.3′	56.2′
3	221°45.8	·· 50.3	341°33.6	11.2′	20°49.0	10.1′	56.2′
4	236°45.9	49.4	356°03.8	11.1′	20°59.1	10.1′	56.1′
5	251°46.0	48.4	10°33.9	11.1′	21°09.2	9.9′	56.1′
6	266°46.1	S08°47.5	25°04.0	11.1′	S21°19.1	9.8′	56.1′
7	281°46.2	46.6	39°34.0	11.0′	21°28.9	9.7′	56.1′
8	296°46.3	45.6	54°04.1	11.0′	21°38.6	9.6′	56.0′
9	311°46.4	·· 44.7	68°34.1	11.0′	21°48.2	9.4′	56.0′
10	326°46.5	43.8	83°04.1	10.9′	21°57.6	9.4′	56.0′
11	341°46.6	42.8	97°34.0	10.9′	22°07.0	9.2′	55.9′
12	356°46.7	S08°41.9	112°03.9	10.9′	S22°16.2	9.1′	55.9′
13	11°46.8	41.0	126°33.8	10.8′	22°25.3	8.9′	55.9′
14	26°46.9	40.0	141°03.6	10.8′	22°34.2	8.9′	55.8′
15	41°47.0	·· 39.1	155°33.4	10.8′	22°43.1	8.7′	55.8′
16	56°47.1	38.2	170°03.2	10.7′	22°51.8	8.7′	55.8′
17	71°47.2	37.2	184°32.9	10.7′	23°00.5	8.4′	55.7′
18	86°47.4	S08°36.3	199°02.6	10.7′	S23°08.9	8.4′	55.7′
19	101°47.5	35.3	213°32.3	10.6′	23°17.3	8.3′	55.7′
20	116°47.6	34.4	228°02.0	10.6′	23°25.6	8.1′	55.6′
21	131°47.7	·· 33.5	242°31.6	10.6′	23°33.7	8.0′	55.6′
22	146°47.8	32.5	257°01.2	10.6′	23°41.7	7.9′	55.6′
23	161°47.9	31.6	271°30.7	10.5′	23°49.6	7.7′	55.6′
	SD = 16.1′	d = 0.9′	SD = 15.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:31	06:48	07:59	16:29	17:40	18:58
N 70°	05:33	06:44	07:47	16:41	17:44	18:55
68°	05:36	06:40	07:37	16:50	17:48	18:52
66°	05:37	06:36	07:29	16:59	17:51	18:51
64°	05:39	06:34	07:22	17:05	17:54	18:49
62°	05:40	06:31	07:16	17:11	17:57	18:48
60°	05:41	06:29	07:11	17:16	17:59	18:47
N 58°	05:41	06:26	07:06	17:21	18:01	18:46
56°	05:42	06:24	07:02	17:25	18:03	18:46
54°	05:42	06:23	06:58	17:29	18:04	18:45
52°	05:42	06:21	06:55	17:32	18:06	18:45
50°	05:42	06:19	06:52	17:35	18:08	18:45
45°	05:42	06:16	06:45	17:41	18:11	18:45
N 40°	05:41	06:12	06:40	17:47	18:14	18:46
35°	05:40	06:09	06:35	17:52	18:17	18:47
30°	05:39	06:06	06:31	17:56	18:20	18:48
20°	05:35	06:01	06:23	18:03	18:26	18:51
N 10°	05:30	05:55	06:16	18:10	18:31	18:56
0°	05:24	05:49	06:10	18:16	18:37	19:02
S 10°	05:17	05:42	06:03	18:23	18:44	19:09
20°	05:07	05:34	05:56	18:30	18:52	19:18
30°	04:54	05:23	05:48	18:38	19:02	19:31
35°	04:46	05:17	05:43	18:43	19:08	19:39
40°	04:36	05:10	05:38	18:48	19:16	19:49
45°	04:24	05:01	05:31	18:54	19:25	20:01
S 50°	04:08	04:49	05:23	19:02	19:36	20:17
52°	04:00	04:44	05:20	19:05	19:41	20:25
54°	03:51	04:38	05:16	19:09	19:46	20:33
56°	03:41	04:31	05:11	19:13	19:53	20:43
58°	03:29	04:24	05:07	19:18	20:00	20:55
S 60°	03:15	04:15	05:01	19:23	20:09	21:08

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	·· ··	01:33	▬	06:10	04:59	▬
N 70°	·· ··	00:48	▬	06:29	05:45	▬
68°	·· ··	00:19	02:58	06:44	06:16	05:18
66°	23:57	·· ··	02:06	06:56	06:39	06:12
64°	23:40	·· ··	01:34	07:06	06:57	06:45
62°	23:26	·· ··	01:10	07:15	07:12	07:09
60°	23:15	·· ··	00:52	07:23	07:25	07:29
N 58°	23:05	·· ··	00:36	07:30	07:36	07:45
56°	22:56	·· ··	00:23	07:36	07:46	07:59
54°	22:48	·· ··	00:12	07:41	07:54	08:10
52°	22:41	·· ··	00:02	07:46	08:02	08:21
50°	22:35	23:53	·· ··	07:51	08:09	08:30
45°	22:22	23:34	·· ··	08:00	08:24	08:50
N 40°	22:11	23:19	·· ··	08:09	08:36	09:07
35°	22:01	23:06	·· ··	08:16	08:46	09:21
30°	21:53	22:55	23:56	08:22	08:56	09:33
20°	21:39	22:36	23:33	08:33	09:12	09:53
N 10°	21:27	22:20	23:13	08:42	09:26	10:11
0°	21:16	22:04	22:54	08:51	09:39	10:28
S 10°	21:05	21:49	22:36	09:00	09:52	10:45
20°	20:53	21:33	22:16	09:10	10:07	11:03
30°	20:40	21:15	21:54	09:21	10:23	11:24
35°	20:32	21:04	21:40	09:27	10:33	11:37
40°	20:23	20:52	21:25	09:34	10:44	11:51
45°	20:13	20:38	21:07	09:43	10:56	12:08
S 50°	20:01	20:21	20:45	09:53	11:12	12:29
52°	19:55	20:13	20:35	09:58	11:20	12:39
54°	19:49	20:04	20:23	10:04	11:28	12:51
56°	19:42	19:54	20:09	10:09	11:37	13:04
58°	19:35	19:42	19:53	10:16	11:48	13:19
S 60°	19:26	19:29	19:35	10:24	12:01	13:37

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 88-71%
24	13:16	13:12	12:13	02:40	15:04	
25	13:08	13:03	12:13	03:28	15:52	
26	12:58	12:53	12:13	04:16	16:41	

February 27, 28, 01 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	156°36.4	217°25.6	S19°49.0	4°58.0	N16°18.3	13°51.6	N15°50.0	143°54.0	N02°59.0
1	171°38.9	232°25.0	48.6	20°01.4	18.6	28°54.4	50.1	158°56.2	59.1
2	186°41.4	247°24.3	48.1	35°04.8	18.9	43°57.1	50.2	173°58.4	59.2
3	201°43.8	262°23.6	·· 47.7	50°08.2	·· 19.2	58°59.9	·· 50.3	189°00.6	·· 59.3
4	216°46.3	277°23.0	47.3	65°11.6	19.5	74°02.7	50.4	204°02.8	59.4
5	231°48.7	292°22.3	46.9	80°15.0	19.8	89°05.4	50.5	219°05.0	59.5
6	246°51.2	307°21.7	S19°46.5	95°18.4	N16°20.1	104°08.2	N15°50.6	234°07.3	N02°59.6
7	261°53.7	322°21.0	46.0	110°21.8	20.4	119°10.9	50.7	249°09.5	59.7
8	276°56.1	337°20.4	45.6	125°25.2	20.6	134°13.7	50.8	264°11.7	02°59.9
9	291°58.6	352°19.7	·· 45.2	140°28.6	·· 20.9	149°16.5	·· 50.9	279°13.9	03°00.0
10	307°01.1	7°19.1	44.8	155°32.0	21.2	164°19.2	51.0	294°16.1	00.1
11	322°03.5	22°18.4	44.3	170°35.4	21.5	179°22.0	51.1	309°18.3	00.2
12	337°06.0	37°17.8	S19°43.9	185°38.8	N16°21.8	194°24.7	N15°51.2	324°20.5	N03°00.3
13	352°08.5	52°17.1	43.5	200°42.2	22.1	209°27.5	51.2	339°22.7	00.4
14	7°10.9	67°16.4	43.1	215°45.6	22.4	224°30.3	51.3	354°24.9	00.5
15	22°13.4	82°15.8	·· 42.6	230°49.0	·· 22.6	239°33.0	·· 51.4	9°27.1	·· 00.6
16	37°15.8	97°15.1	42.2	245°52.4	22.9	254°35.8	51.5	24°29.3	00.8
17	52°18.3	112°14.5	41.8	260°55.8	23.2	269°38.5	51.6	39°31.5	00.9
18	67°20.8	127°13.8	S19°41.3	275°59.2	N16°23.5	284°41.3	N15°51.7	54°33.8	N03°01.0
19	82°23.2	142°13.2	40.9	291°02.6	23.8	299°44.0	51.8	69°36.0	01.1
20	97°25.7	157°12.5	40.5	306°05.9	24.0	314°46.8	51.9	84°38.2	01.2
21	112°28.2	172°11.9	·· 40.0	321°09.3	·· 24.3	329°49.6	·· 52.0	99°40.4	·· 01.3
22	127°30.6	187°11.2	39.6	336°12.7	24.6	344°52.3	52.1	114°42.6	01.4
23	142°33.1	202°10.6	39.2	351°16.1	24.9	359°55.1	52.2	129°44.8	01.5
Mer.pass. 13:31		ν -0.7′	d 0.4′	m -4.08	ν 3.4′	d 0.3′	m -1.17	ν 2.8′	d 0.1′ m -2.53	ν 2.2′	d 0.1′ m 0.79

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	157°35.6	217°09.9	S19°38.7	6°19.5	N16°25.2	14°57.8	N15°52.3	144°47.0	N03°01.7
1	172°38.0	232°09.3	38.3	21°22.9	25.4	30°00.6	52.4	159°49.2	01.8
2	187°40.5	247°08.6	37.8	36°26.3	25.7	45°03.3	52.5	174°51.4	01.9
3	202°43.0	262°08.0	·· 37.4	51°29.7	·· 26.0	60°06.1	·· 52.6	189°53.6	·· 02.0
4	217°45.4	277°07.3	36.9	66°33.1	26.3	75°08.9	52.7	204°55.8	02.1
5	232°47.9	292°06.7	36.5	81°36.5	26.6	90°11.6	52.8	219°58.0	02.2
6	247°50.3	307°06.0	S19°36.1	96°39.9	N16°26.8	105°14.4	N15°52.9	235°00.3	N03°02.3
7	262°52.8	322°05.4	35.6	111°43.2	27.1	120°17.1	53.0	250°02.5	02.5
8	277°55.3	337°04.7	35.2	126°46.6	27.4	135°19.9	53.0	265°04.7	02.6
9	292°57.7	352°04.1	·· 34.7	141°50.0	·· 27.7	150°22.6	·· 53.1	280°06.9	·· 02.7
10	308°00.2	7°03.4	34.3	156°53.4	27.9	165°25.4	53.2	295°09.1	02.8
11	323°02.7	22°02.8	33.8	171°56.8	28.2	180°28.1	53.3	310°11.3	02.9
12	338°05.1	37°02.1	S19°33.4	187°00.2	N16°28.5	195°30.9	N15°53.4	325°13.5	N03°03.0
13	353°07.6	52°01.5	32.9	202°03.6	28.8	210°33.7	53.5	340°15.7	03.1
14	8°10.1	67°00.8	32.5	217°06.9	29.0	225°36.4	53.6	355°17.9	03.2
15	23°12.5	82°00.2	·· 32.0	232°10.3	·· 29.3	240°39.2	·· 53.7	10°20.1	·· 03.4
16	38°15.0	96°59.5	31.6	247°13.7	29.6	255°41.9	53.8	25°22.3	03.5
17	53°17.5	111°58.9	31.1	262°17.1	29.8	270°44.7	53.9	40°24.5	03.6
18	68°19.9	126°58.2	S19°30.6	277°20.5	N16°30.1	285°47.4	N15°54.0	55°26.7	N03°03.7
19	83°22.4	141°57.6	30.2	292°23.9	30.4	300°50.2	54.1	70°28.9	03.8
20	98°24.8	156°56.9	29.7	307°27.2	30.7	315°52.9	54.2	85°31.1	03.9
21	113°27.3	171°56.3	·· 29.3	322°30.6	·· 30.9	330°55.7	·· 54.3	100°33.4	·· 04.0
22	128°29.8	186°55.6	28.8	337°34.0	31.2	345°58.4	54.4	115°35.6	04.2
23	143°32.2	201°55.0	28.3	352°37.4	31.5	1°01.2	54.5	130°37.8	04.3
Mer.pass. 13:27		ν -0.7′	d 0.4′	m -4.07	ν 3.4′	d 0.3′	m -1.15	ν 2.8′	d 0.1′ m -2.53	ν 2.2′	d 0.1′ m 0.79

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	158°34.7	216°54.3	S19°27.9	7°40.8	N16°31.7	16°03.9	N15°54.5	145°40.0	N03°04.4
1	173°37.2	231°53.7	27.4	22°44.1	32.0	31°06.7	54.6	160°42.2	04.5
2	188°39.6	246°53.0	27.0	37°47.5	32.3	46°09.5	54.7	175°44.4	04.6
3	203°42.1	261°52.4	·· 26.5	52°50.9	·· 32.5	61°12.2	·· 54.8	190°46.6	·· 04.7
4	218°44.6	276°51.7	26.0	67°54.3	32.8	76°15.0	54.9	205°48.8	04.8
5	233°47.0	291°51.1	25.6	82°57.6	33.1	91°17.7	55.0	220°51.0	05.0
6	248°49.5	306°50.4	S19°25.1	98°01.0	N16°33.3	106°20.5	N15°55.1	235°53.2	N03°05.1
7	263°52.0	321°49.8	24.6	113°04.4	33.6	121°23.2	55.2	250°55.4	05.2
8	278°54.4	336°49.1	24.1	128°07.8	33.9	136°26.0	55.3	265°57.6	05.3
9	293°56.9	351°48.5	·· 23.7	143°11.1	·· 34.1	151°28.7	·· 55.4	280°59.8	·· 05.4
10	308°59.3	6°47.9	23.2	158°14.5	34.4	166°31.5	55.5	296°02.0	05.5
11	324°01.8	21°47.2	22.7	173°17.9	34.7	181°34.2	55.6	311°04.2	05.6
12	339°04.3	36°46.6	S19°22.3	188°21.3	N16°34.9	196°37.0	N15°55.7	326°06.4	N03°05.7
13	354°06.7	51°45.9	21.8	203°24.6	35.2	211°39.7	55.8	341°08.6	05.9
14	9°09.2	66°45.3	21.3	218°28.0	35.5	226°42.5	55.8	356°10.8	06.0
15	24°11.7	81°44.6	·· 20.8	233°31.4	·· 35.7	241°45.2	·· 55.9	11°13.1	·· 06.1
16	39°14.1	96°44.0	20.3	248°34.7	36.0	256°48.0	56.0	26°15.3	06.2
17	54°16.6	111°43.3	19.9	263°38.1	36.2	271°50.7	56.1	41°17.5	06.3
18	69°19.1	126°42.7	S19°19.4	278°41.5	N16°36.5	286°53.5	N15°56.2	56°19.7	N03°06.4
19	84°21.5	141°42.1	18.9	293°44.8	36.8	301°56.2	56.3	71°21.9	06.5
20	99°24.0	156°41.4	18.4	308°48.2	37.0	316°59.0	56.4	86°24.1	06.7
21	114°26.4	171°40.8	·· 17.9	323°51.6	·· 37.3	332°01.7	·· 56.5	101°26.3	·· 06.8
22	129°28.9	186°40.1	17.5	338°54.9	37.5	347°04.5	56.6	116°28.5	06.9
23	144°31.4	201°39.5	17.0	353°58.3	37.8	2°07.2	56.7	131°30.7	07.0
Mer.pass. 13:23		ν -0.6′	d 0.5′	m -4.07	ν 3.4′	d 0.3′	m -1.13	ν 2.8′	d 0.1′ m -2.52	ν 2.2′	d 0.1′ m 0.79

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.5
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.4
Achernar	335°19.3	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°16.2	89°23.0
Acamar	315°10.6	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.8	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.2	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.3	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.2	-29°00.8
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.5	-59°36.0
Suhail	222°44.6	-43°32.7
Miaplacidus	221°37.0	-69°49.9
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°57.5	-63°15.0
Gacrux	171°49.1	-57°15.9
Alioth	166°11.0	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.3	49°10.3
Hadar	148°33.1	-60°30.1
Menkent	147°55.3	-36°30.2
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.5	-60°56.7
Kochab	137°19.4	74°02.2
Zuben'ubi	136°53.9	-16°09.4
Alphecca	126°02.2	26°37.1
Antares	112°13.7	-26°29.5
Atria	107°06.3	-69°04.3
Sabik	102°00.8	-15°45.5
Shaula	96°08.1	-37°07.3
Rasalhague	95°57.0	12°32.2
Eltanin	90°41.5	51°28.8
Kaus Aust.	83°30.3	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°45.8	-26°15.7
Altair	61°58.5	8°56.3
Peacock	53°03.4	-56°38.7
Deneb	49°25.0	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.2	-46°49.8
Fomalhaut	15°12.9	-29°28.8
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.1

Feb 27 Sat	SHA	Mer.pass
Venus	60°49.2	09:31
Mars	208°21.6	23:35
Jupiter	217°15.2	23:00
Saturn	347°17.6	14:22

Feb 28 Sun	SHA	Mer.pass
Venus	59°34.4	09:32
Mars	208°44.0	23:29
Jupiter	217°22.3	22:56
Saturn	347°11.4	14:19

Mar 01 Mon	SHA	Mer.pass
Venus	58°19.6	09:33
Mars	209°06.1	23:24
Jupiter	217°29.2	22:52
Saturn	347°05.3	14:15

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°48.0	S08°30.7	286°00.3	10.5′	S23°57.3	7.6′	55.5′
1	191°48.1	29.7	300°29.8	10.5′	24°04.9	7.5′	55.5′
2	206°48.2	28.8	314°59.2	10.4′	24°12.4	7.4′	55.5′
3	221°48.3	·· 27.8	329°28.7	10.4′	24°19.8	7.3′	55.4′
4	236°48.4	26.9	343°58.1	10.4′	24°27.1	7.1′	55.4′
5	251°48.5	26.0	358°27.5	10.4′	24°34.2	7.0′	55.4′
6	266°48.6	S08°25.0	12°56.8	10.3′	S24°41.2	6.8′	55.4′
7	281°48.7	24.1	27°26.1	10.3′	24°48.0	6.8′	55.3′
8	296°48.9	23.1	41°55.4	10.3′	24°54.8	6.6′	55.3′
9	311°49.0	·· 22.2	56°24.7	10.2′	25°01.4	6.4′	55.3′
10	326°49.1	21.3	70°54.0	10.2′	25°07.8	6.4′	55.3′
11	341°49.2	20.3	85°23.2	10.2′	25°14.2	6.2′	55.2′
12	356°49.3	S08°19.4	99°52.4	10.2′	S25°20.4	6.1′	55.2′
13	11°49.4	18.4	114°21.5	10.1′	25°26.5	5.9′	55.2′
14	26°49.5	17.5	128°50.7	10.1′	25°32.4	5.9′	55.1′
15	41°49.6	·· 16.6	143°19.8	10.1′	25°38.3	5.6′	55.1′
16	56°49.7	15.6	157°48.9	10.1′	25°43.9	5.6′	55.1′
17	71°49.8	14.7	172°18.0	10.1′	25°49.5	5.4′	55.1′
18	86°50.0	S08°13.7	186°47.0	10.0′	S25°54.9	5.3′	55.0′
19	101°50.1	12.8	201°16.1	10.0′	26°00.2	5.2′	55.0′
20	116°50.2	11.9	215°45.1	10.0′	26°05.4	5.0′	55.0′
21	131°50.3	·· 10.9	230°14.1	10.0′	26°10.4	4.9′	55.0′
22	146°50.4	10.0	244°43.1	10.0′	26°15.3	4.8′	55.0′
23	161°50.5	09.0	259°12.0	9.9′	26°20.1	4.6′	54.9′
	SD = 16.1′	d = 0.9′	SD = 15.1′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°50.6	S08°08.1	273°41.0	9.9′	S26°24.7	4.5′	54.9′
1	191°50.7	07.1	288°09.9	9.9′	26°29.2	4.3′	54.9′
2	206°50.9	06.2	302°38.8	9.9′	26°33.5	4.3′	54.9′
3	221°51.0	·· 05.3	317°07.7	9.9′	26°37.8	4.1′	54.8′
4	236°51.1	04.3	331°36.6	9.9′	26°41.9	3.9′	54.8′
5	251°51.2	03.4	346°05.5	9.9′	26°45.8	3.8′	54.8′
6	266°51.3	S08°02.4	0°34.3	9.8′	S26°49.6	3.7′	54.8′
7	281°51.4	01.5	15°03.2	9.8′	26°53.3	3.6′	54.8′
8	296°51.5	08°00.5	29°32.0	9.8′	26°56.9	3.4′	54.7′
9	311°51.7	07°59.6	44°00.8	9.8′	27°00.3	3.3′	54.7′
10	326°51.8	58.6	58°29.6	9.8′	27°03.6	3.1′	54.7′
11	341°51.9	57.7	72°58.4	9.8′	27°06.7	3.0′	54.7′
12	356°52.0	S07°56.7	87°27.2	9.8′	S27°09.7	2.9′	54.7′
13	11°52.1	55.8	101°56.0	9.8′	27°12.6	2.7′	54.6′
14	26°52.2	54.9	116°24.8	9.8′	27°15.3	2.6′	54.6′
15	41°52.3	·· 53.9	130°53.6	9.8′	27°17.9	2.5′	54.6′
16	56°52.5	53.0	145°22.4	9.8′	27°20.4	2.3′	54.6′
17	71°52.6	52.0	159°51.1	9.8′	27°22.7	2.2′	54.6′
18	86°52.7	S07°51.1	174°19.9	9.8′	S27°24.9	2.1′	54.6′
19	101°52.8	50.1	188°48.7	9.8′	27°27.0	1.9′	54.5′
20	116°52.9	49.2	203°17.4	9.8′	27°28.9	1.7′	54.5′
21	131°53.0	·· 48.2	217°46.2	9.8′	27°30.6	1.7′	54.5′
22	146°53.2	47.3	232°15.0	9.8′	27°32.3	1.5′	54.5′
23	161°53.3	46.3	246°43.8	9.8′	27°33.8	1.4′	54.5′
	SD = 16.1′	d = 0.9′	SD = 15.0′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°53.4	S07°45.4	261°12.5	9.8′	S27°35.2	1.2′	54.5′
1	191°53.5	44.4	275°41.3	9.8′	27°36.4	1.1′	54.4′
2	206°53.6	43.5	290°10.1	9.8′	27°37.5	1.0′	54.4′
3	221°53.8	·· 42.5	304°38.9	9.8′	27°38.5	0.8′	54.4′
4	236°53.9	41.6	319°07.7	9.8′	27°39.3	0.7′	54.4′
5	251°54.0	40.6	333°36.5	9.8′	27°40.0	0.6′	54.4′
6	266°54.1	S07°39.7	348°05.4	9.8′	S27°40.6	0.4′	54.4′
7	281°54.2	38.7	2°34.2	9.8′	27°41.0	0.3′	54.4′
8	296°54.3	37.8	17°03.0	9.9′	27°41.3	0.1′	54.3′
9	311°54.5	·· 36.8	31°31.9	9.9′	27°41.4	0.0′	54.3′
10	326°54.6	35.9	46°00.8	9.9′	27°41.4	0.1′	54.3′
11	341°54.7	34.9	60°29.7	9.9′	27°41.3	0.2′	54.3′
12	356°54.8	S07°34.0	74°58.6	9.9′	S27°41.1	0.4′	54.3′
13	11°54.9	33.0	89°27.5	9.9′	27°40.7	0.6′	54.3′
14	26°55.1	32.1	103°56.4	10.0′	27°40.1	0.6′	54.3′
15	41°55.2	·· 31.1	118°25.4	10.0′	27°39.5	0.8′	54.3′
16	56°55.3	30.2	132°54.3	10.0′	27°38.7	0.9′	54.2′
17	71°55.4	29.2	147°23.3	10.0′	27°37.8	1.1′	54.2′
18	86°55.6	S07°28.3	161°52.4	10.0′	S27°36.7	1.2′	54.2′
19	101°55.7	27.3	176°21.4	10.1′	27°35.5	1.3′	54.2′
20	116°55.8	26.4	190°50.5	10.1′	27°34.2	1.5′	54.2′
21	131°55.9	·· 25.4	205°19.5	10.1′	27°32.7	1.5′	54.2′
22	146°56.0	24.5	219°48.6	10.1′	27°31.2	1.8′	54.2′
23	161°56.2	23.5	234°17.8	10.2′	27°29.4	1.8′	54.2′
	SD = 16.1′	d = 0.9′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:16	06:34	07:43	16:44	17:53	19:12
N 70°	05:21	06:31	07:33	16:54	17:56	19:07
68°	05:24	06:28	07:25	17:02	17:59	19:03
66°	05:27	06:26	07:18	17:09	18:01	19:00
64°	05:29	06:24	07:12	17:15	18:03	18:58
62°	05:31	06:22	07:07	17:20	18:05	18:56
60°	05:32	06:20	07:02	17:24	18:06	18:54
N 58°	05:33	06:19	06:58	17:28	18:08	18:53
56°	05:34	06:17	06:55	17:31	18:09	18:52
54°	05:35	06:16	06:52	17:34	18:10	18:51
52°	05:36	06:15	06:49	17:37	18:11	18:50
50°	05:36	06:14	06:46	17:40	18:12	18:50
45°	05:37	06:11	06:40	17:46	18:15	18:49
N 40°	05:37	06:08	06:35	17:50	18:18	18:49
35°	05:36	06:06	06:31	17:54	18:20	18:49
30°	05:36	06:03	06:27	17:58	18:22	18:50
20°	05:33	05:59	06:21	18:05	18:27	18:52
N 10°	05:29	05:54	06:15	18:10	18:31	18:56
0°	05:24	05:48	06:09	18:16	18:37	19:01
S 10°	05:17	05:42	06:03	18:21	18:43	19:07
20°	05:09	05:35	05:57	18:28	18:50	19:16
30°	04:57	05:26	05:50	18:35	18:59	19:28
35°	04:49	05:20	05:46	18:39	19:05	19:35
40°	04:40	05:13	05:41	18:43	19:11	19:44
45°	04:29	05:05	05:35	18:49	19:19	19:55
S 50°	04:14	04:55	05:28	18:56	19:29	20:10
52°	04:07	04:50	05:25	18:59	19:34	20:17
54°	03:58	04:45	05:22	19:02	19:39	20:25
56°	03:49	04:39	05:18	19:06	19:45	20:34
58°	03:38	04:32	05:14	19:10	19:52	20:44
S 60°	03:26	04:24	05:09	19:15	19:59	20:57

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	03:40	▬	▬	06:23	▬	▬
62°	02:57	04:44	06:16	07:07	07:07	07:22
60°	02:28	03:58	05:09	07:36	07:53	08:29
N 58°	02:06	03:28	04:34	07:59	08:23	09:04
56°	01:48	03:05	04:09	08:17	08:46	09:29
54°	01:33	02:46	03:49	08:33	09:05	09:50
52°	01:19	02:31	03:32	08:46	09:21	10:06
50°	01:08	02:17	03:17	08:58	09:34	10:21
45°	00:44	01:50	02:48	09:23	10:03	10:50
N 40°	00:25	01:28	02:25	09:43	10:25	11:13
35°	00:09	01:10	02:06	09:59	10:43	11:32
30°	·· ··	00:55	01:50	10:13	10:59	11:49
20°	·· ··	00:28	01:22	10:38	11:26	12:16
N 10°	·· ··	00:06	00:59	10:59	11:49	12:40
0°	23:45	·· ··	00:37	11:19	12:10	13:02
S 10°	23:24	·· ··	00:15	11:38	12:32	13:24
20°	23:02	23:51	·· ··	12:00	12:55	13:47
30°	22:37	23:24	·· ··	12:24	13:22	14:15
35°	22:22	23:08	·· ··	12:39	13:38	14:31
40°	22:04	22:49	23:41	12:56	13:56	14:50
45°	21:43	22:27	23:19	13:16	14:18	15:12
S 50°	21:17	21:58	22:50	13:42	14:47	15:41
52°	21:04	21:44	22:36	13:54	15:01	15:56
54°	20:50	21:28	22:19	14:09	15:17	16:12
56°	20:33	21:08	22:00	14:25	15:37	16:32
58°	20:12	20:44	21:35	14:45	16:00	16:57
S 60°	19:46	20:12	21:02	15:11	16:32	17:30

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 62-43%
27	12:48	12:43	12:13	05:06	17:32	
28	12:37	12:32	12:13	05:58	18:23	
01	12:26	12:21	12:12	06:49	19:15	

March 02, 03, 04 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	159°33.8	216°38.8	S19°16.5	9°01.7	N16°38.1	17°10.0	N15°56.8	146°32.9	N03°07.1
1	174°36.3	231°38.2	16.0	24°05.0	38.3	32°12.7	56.9	161°35.1	07.2
2	189°38.8	246°37.5	15.5	39°08.4	38.6	47°15.5	56.9	176°37.3	07.3
3	204°41.2	261°36.9	·· 15.0	54°11.8	·· 38.8	62°18.2	·· 57.0	191°39.5	·· 07.5
4	219°43.7	276°36.3	14.5	69°15.1	39.1	77°21.0	57.1	206°41.7	07.6
5	234°46.2	291°35.6	14.0	84°18.5	39.4	92°23.7	57.2	221°43.9	07.7
6	249°48.6	306°35.0	S19°13.6	99°21.9	N16°39.6	107°26.5	N15°57.3	236°46.1	N03°07.8
7	264°51.1	321°34.3	13.1	114°25.2	39.9	122°29.2	57.4	251°48.3	07.9
8	279°53.6	336°33.7	12.6	129°28.6	40.1	137°32.0	57.5	266°50.5	08.0
9	294°56.0	351°33.1	·· 12.1	144°31.9	·· 40.4	152°34.7	·· 57.6	281°52.7	·· 08.1
10	309°58.5	6°32.4	11.6	159°35.3	40.6	167°37.5	57.7	296°54.9	08.3
11	325°00.9	21°31.8	11.1	174°38.6	40.9	182°40.2	57.8	311°57.1	08.4
12	340°03.4	36°31.1	S19°10.6	189°42.0	N16°41.1	197°42.9	N15°57.9	326°59.3	N03°08.5
13	355°05.9	51°30.5	10.1	204°45.4	41.4	212°45.7	57.9	342°01.5	08.6
14	10°08.3	66°29.9	09.6	219°48.7	41.6	227°48.4	58.0	357°03.7	08.7
15	25°10.8	81°29.2	·· 09.1	234°52.1	·· 41.9	242°51.2	·· 58.1	12°06.0	·· 08.8
16	40°13.3	96°28.6	08.6	249°55.4	42.1	257°53.9	58.2	27°08.2	08.9
17	55°15.7	111°27.9	08.1	264°58.8	42.4	272°56.7	58.3	42°10.4	09.1
18	70°18.2	126°27.3	S19°07.6	280°02.1	N16°42.6	287°59.4	N15°58.4	57°12.6	N03°09.2
19	85°20.7	141°26.7	07.1	295°05.5	42.9	303°02.2	58.5	72°14.8	09.3
20	100°23.1	156°26.0	06.6	310°08.8	43.1	318°04.9	58.6	87°17.0	09.4
21	115°25.6	171°25.4	·· 06.1	325°12.2	·· 43.4	333°07.7	·· 58.7	102°19.2	·· 09.5
22	130°28.1	186°24.7	05.6	340°15.5	43.6	348°10.4	58.8	117°21.4	09.6
23	145°30.5	201°24.1	05.1	355°18.9	43.9	3°13.2	58.9	132°23.6	09.7
Mer.pass. 13:20		ν -0.6′	d 0.5′	ν 3.4′	d 0.3′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -4.06		m -1.11		m -2.52		m 0.78	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	160°33.0	216°23.5	S19°04.5	10°22.2	N16°44.1	18°15.9	N15°58.9	147°25.8	N03°09.9
1	175°35.4	231°22.8	04.0	25°25.6	44.4	33°18.6	59.0	162°28.0	10.0
2	190°37.9	246°22.2	03.5	40°28.9	44.6	48°21.4	59.1	177°30.2	10.1
3	205°40.4	261°21.6	·· 03.0	55°32.3	·· 44.9	63°24.1	·· 59.2	192°32.4	·· 10.2
4	220°42.8	276°20.9	02.5	70°35.6	45.1	78°26.9	59.3	207°34.6	10.3
5	235°45.3	291°20.3	02.0	85°39.0	45.4	93°29.6	59.4	222°36.8	10.4
6	250°47.8	306°19.6	S19°01.5	100°42.3	N16°45.6	108°32.4	N15°59.5	237°39.0	N03°10.6
7	265°50.2	321°19.0	01.0	115°45.6	45.9	123°35.1	59.6	252°41.2	10.7
8	280°52.7	336°18.4	19°00.4	130°49.0	46.1	138°37.9	59.7	267°43.4	10.8
9	295°55.2	351°17.7	18°59.9	145°52.3	·· 46.3	153°40.6	·· 59.7	282°45.6	·· 10.9
10	310°57.6	6°17.1	59.4	160°55.7	46.6	168°43.3	59.8	297°47.8	11.0
11	326°00.1	21°16.5	58.9	175°59.0	46.8	183°46.1	15°59.9	312°50.0	11.1
12	341°02.6	36°15.8	S18°58.4	191°02.4	N16°47.1	198°48.8	N16°00.0	327°52.2	N03°11.2
13	356°05.0	51°15.2	57.9	206°05.7	47.3	213°51.6	00.1	342°54.4	11.4
14	11°07.5	66°14.6	57.3	221°09.0	47.6	228°54.3	00.2	357°56.6	11.5
15	26°09.9	81°13.9	·· 56.8	236°12.4	·· 47.8	243°57.1	·· 00.3	12°58.8	·· 11.6
16	41°12.4	96°13.3	56.3	251°15.7	48.0	258°59.8	00.4	28°01.0	11.7
17	56°14.9	111°12.7	55.8	266°19.0	48.3	274°02.5	00.5	43°03.2	11.8
18	71°17.3	126°12.0	S18°55.2	281°22.4	N16°48.5	289°05.3	N16°00.5	58°05.4	N03°11.9
19	86°19.8	141°11.4	54.7	296°25.7	48.7	304°08.0	00.6	73°07.6	12.0
20	101°22.3	156°10.8	54.2	311°29.0	49.0	319°10.8	00.7	88°09.8	12.2
21	116°24.7	171°10.1	·· 53.7	326°32.4	·· 49.2	334°13.5	·· 00.8	103°12.0	·· 12.3
22	131°27.2	186°09.5	53.1	341°35.7	49.5	349°16.2	00.9	118°14.2	12.4
23	146°29.7	201°08.9	52.6	356°39.0	49.7	4°19.0	01.0	133°16.4	12.5
Mer.pass. 13:16		ν -0.6′	d 0.5′	ν 3.3′	d 0.2′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -4.06		m -1.09		m -2.51		m 0.78	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	161°32.1	216°08.2	S18°52.1	11°42.4	N16°49.9	19°21.7	N16°01.1	148°18.6	N03°12.6
1	176°34.6	231°07.6	51.5	26°45.7	50.2	34°24.5	01.2	163°20.8	12.7
2	191°37.0	246°07.0	51.0	41°49.0	50.4	49°27.2	01.3	178°23.0	12.9
3	206°39.5	261°06.3	·· 50.5	56°52.4	·· 50.6	64°29.9	·· 01.3	193°25.2	·· 13.0
4	221°42.0	276°05.7	49.9	71°55.7	50.9	79°32.7	01.4	208°27.4	13.1
5	236°44.4	291°05.1	49.4	86°59.0	51.1	94°35.4	01.5	223°29.6	13.2
6	251°46.9	306°04.4	S18°48.9	102°02.3	N16°51.3	109°38.2	N16°01.6	238°31.8	N03°13.3
7	266°49.4	321°03.8	48.3	117°05.7	51.6	124°40.9	01.7	253°34.0	13.4
8	281°51.8	336°03.2	47.8	132°09.0	51.8	139°43.6	01.8	268°36.2	13.5
9	296°54.3	351°02.5	·· 47.2	147°12.3	·· 52.0	154°46.4	·· 01.9	283°38.4	·· 13.7
10	311°56.8	6°01.9	46.7	162°15.6	52.3	169°49.1	02.0	298°40.6	13.8
11	326°59.2	21°01.3	46.2	177°19.0	52.5	184°51.9	02.0	313°42.8	13.9
12	342°01.7	36°00.7	S18°45.6	192°22.3	N16°52.7	199°54.6	N16°02.1	328°45.0	N03°14.0
13	357°04.2	51°00.0	45.1	207°25.6	53.0	214°57.3	02.2	343°47.2	14.1
14	12°06.6	65°59.4	44.5	222°28.9	53.2	230°00.1	02.3	358°49.4	14.2
15	27°09.1	80°58.8	·· 44.0	237°32.2	·· 53.4	245°02.8	·· 02.4	13°51.6	·· 14.4
16	42°11.5	95°58.1	43.4	252°35.6	53.7	260°05.5	02.5	28°53.8	14.5
17	57°14.0	110°57.5	42.9	267°38.9	53.9	275°08.3	02.6	43°56.0	14.6
18	72°16.5	125°56.9	S18°42.3	282°42.2	N16°54.1	290°11.0	N16°02.7	58°58.2	N03°14.7
19	87°18.9	140°56.3	41.8	297°45.5	54.3	305°13.8	02.7	74°00.4	14.8
20	102°21.4	155°55.6	41.2	312°48.8	54.6	320°16.5	02.8	89°02.6	14.9
21	117°23.9	170°55.0	·· 40.7	327°52.1	·· 54.8	335°19.2	·· 02.9	104°04.8	·· 15.0
22	132°26.3	185°54.4	40.1	342°55.5	55.0	350°22.0	03.0	119°07.0	15.2
23	147°28.8	200°53.8	39.6	357°58.8	55.2	5°24.7	03.1	134°09.2	15.3
Mer.pass. 13:12		ν -0.6′	d 0.5′	ν 3.3′	d 0.2′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -4.05		m -1.06		m -2.51		m 0.78	

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.4
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.3
Achernar	335°19.3	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°17.5	89°23.0
Acamar	315°10.6	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.8	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.2	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.0	7°24.6
Canopus	263°51.4	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.7	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.5	-59°36.0
Suhail	222°44.6	-43°32.8
Miaplacidus	221°37.0	-69°49.9
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.7
Acrux	172°57.4	-63°15.0
Gacrux	171°49.1	-57°15.9
Alioth	166°10.9	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.3	49°10.3
Hadar	148°33.0	-60°30.1
Menkent	147°55.3	-36°30.2
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.5	-60°56.7
Kochab	137°19.3	74°02.2
Zuben'ubi	136°53.9	-16°09.4
Alphecca	126°02.1	26°37.1
Antares	112°13.6	-26°29.5
Atria	107°06.3	-69°04.3
Sabik	102°00.8	-15°45.5
Shaula	96°08.0	-37°07.3
Rasalhague	95°57.0	12°32.2
Eltanin	90°41.5	51°28.8
Kaus Aust.	83°30.3	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°45.7	-26°15.7
Altair	61°58.5	8°56.3
Peacock	53°03.4	-56°38.7
Deneb	49°25.0	45°22.5
Enif	33°37.4	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.0

Mar 02 Tue	SHA	Mer.pass
Venus	57°05.0	09:34
Mars	209°27.8	23:19
Jupiter	217°36.1	22:47
Saturn	346°59.1	14:12

Mar 03 Wed	SHA	Mer.pass
Venus	55°50.5	09:35
Mars	209°49.2	23:13
Jupiter	217°42.9	22:43
Saturn	346°52.8	14:08

Mar 04 Thu	SHA	Mer.pass
Venus	54°36.1	09:36
Mars	210°10.3	23:08
Jupiter	217°49.6	22:38
Saturn	346°46.5	14:05

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.0959 sec ΔT = TT-UT1 = +69.2799 sec

2027 March 02 to Mar. 04 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°56.3	S07°22.6	248°46.9	10.2′	S27°27.6	2.0′	54.2′
1	191°56.4	21.6	263°16.1	10.2′	27°25.6	2.1′	54.2′
2	206°56.5	20.7	277°45.3	10.2′	27°23.5	2.3′	54.2′
3	221°56.7	·· 19.7	292°14.6	10.3′	27°21.2	2.3′	54.1′
4	236°56.8	18.8	306°43.9	10.3′	27°18.9	2.5′	54.1′
5	251°56.9	17.8	321°13.2	10.3′	27°16.4	2.7′	54.1′
6	266°57.0	S07°16.9	335°42.5	10.4′	S27°13.7	2.7′	54.1′
7	281°57.2	15.9	350°11.9	10.4′	27°11.0	2.9′	54.1′
8	296°57.3	14.9	4°41.3	10.4′	27°08.1	3.1′	54.1′
9	311°57.4	·· 14.0	19°10.7	10.5′	27°05.0	3.1′	54.1′
10	326°57.5	13.0	33°40.2	10.5′	27°01.9	3.3′	54.1′
11	341°57.7	12.1	48°09.7	10.5′	26°58.6	3.4′	54.1′
12	356°57.8	S07°11.1	62°39.3	10.6′	S26°55.2	3.5′	54.1′
13	11°57.9	10.2	77°08.9	10.6′	26°51.7	3.7′	54.1′
14	26°58.0	09.2	91°38.5	10.7′	26°48.0	3.8′	54.1′
15	41°58.2	·· 08.3	106°08.1	10.7′	26°44.2	3.9′	54.1′
16	56°58.3	07.3	120°37.8	10.7′	26°40.3	4.0′	54.1′
17	71°58.4	06.4	135°07.6	10.8′	26°36.3	4.2′	54.1′
18	86°58.5	S07°05.4	149°37.4	10.8′	S26°32.1	4.2′	54.1′
19	101°58.7	04.4	164°07.2	10.9′	26°27.9	4.4′	54.1′
20	116°58.8	03.5	178°37.0	10.9′	26°23.5	4.6′	54.1′
21	131°58.9	·· 02.5	193°07.0	11.0′	26°18.9	4.6′	54.1′
22	146°59.0	01.6	207°36.9	11.0′	26°14.3	4.8′	54.1′
23	161°59.2	00.6	222°06.9	11.0′	26°09.5	4.9′	54.1′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°59.3	S06°59.7	236°36.9	11.1′	S26°04.6	5.0′	54.1′
1	191°59.4	58.7	251°07.0	11.1′	25°59.6	5.1′	54.1′
2	206°59.6	57.7	265°37.1	11.2′	25°54.5	5.3′	54.1′
3	221°59.7	·· 56.8	280°07.3	11.2′	25°49.2	5.4′	54.1′
4	236°59.8	55.8	294°37.5	11.3′	25°43.8	5.4′	54.1′
5	251°59.9	54.9	309°07.8	11.3′	25°38.4	5.7′	54.0′
6	267°00.1	S06°53.9	323°38.1	11.4′	S25°32.7	5.7′	54.0′
7	282°00.2	53.0	338°08.5	11.4′	25°27.0	5.8′	54.1′
8	297°00.3	52.0	352°38.9	11.5′	25°21.2	6.0′	54.1′
9	312°00.5	·· 51.0	7°09.4	11.5′	25°15.2	6.0′	54.1′
10	327°00.6	50.1	21°39.9	11.6′	25°09.2	6.2′	54.1′
11	342°00.7	49.1	36°10.4	11.6′	25°03.0	6.3′	54.1′
12	357°00.9	S06°48.2	50°41.0	11.7′	S24°56.7	6.5′	54.1′
13	12°01.0	47.2	65°11.7	11.7′	24°50.2	6.5′	54.1′
14	27°01.1	46.2	79°42.4	11.8′	24°43.7	6.6′	54.1′
15	42°01.2	·· 45.3	94°13.2	11.8′	24°37.1	6.8′	54.1′
16	57°01.4	44.3	108°44.0	11.9′	24°30.3	6.8′	54.1′
17	72°01.5	43.4	123°14.8	11.9′	24°23.5	7.0′	54.1′
18	87°01.6	S06°42.4	137°45.7	12.0′	S24°16.5	7.1′	54.1′
19	102°01.8	41.4	152°16.7	12.0′	24°09.4	7.2′	54.1′
20	117°01.9	40.5	166°47.7	12.1′	24°02.2	7.3′	54.1′
21	132°02.0	·· 39.5	181°18.8	12.1′	23°54.9	7.4′	54.1′
22	147°02.2	38.6	195°49.9	12.2′	23°47.5	7.5′	54.1′
23	162°02.3	37.6	210°21.1	12.2′	23°40.0	7.6′	54.1′
	SD = 16.1′	d = 1.0′	SD = 14.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°02.4	S06°36.6	224°52.3	12.3′	S23°32.4	7.8′	54.1′
1	192°02.6	35.7	239°23.6	12.3′	23°24.6	7.8′	54.1′
2	207°02.7	34.7	253°54.9	12.4′	23°16.8	7.9′	54.1′
3	222°02.8	·· 33.8	268°26.3	12.4′	23°08.9	8.1′	54.1′
4	237°03.0	32.8	282°57.7	12.5′	23°00.8	8.1′	54.1′
5	252°03.1	31.8	297°29.2	12.5′	22°52.7	8.3′	54.1′
6	267°03.2	S06°30.9	312°00.8	12.6′	S22°44.4	8.3′	54.1′
7	282°03.4	29.9	326°32.4	12.6′	22°36.1	8.4′	54.1′
8	297°03.5	28.9	341°04.0	12.7′	22°27.7	8.6′	54.1′
9	312°03.6	·· 28.0	355°35.7	12.8′	22°19.1	8.6′	54.1′
10	327°03.8	27.0	10°07.5	12.8′	22°10.5	8.8′	54.1′
11	342°03.9	26.1	24°39.3	12.9′	22°01.7	8.8′	54.2′
12	357°04.0	S06°25.1	39°11.1	12.9′	S21°52.9	9.0′	54.2′
13	12°04.2	24.1	53°43.0	13.0′	21°43.9	9.0′	54.2′
14	27°04.3	23.2	68°15.0	13.0′	21°34.9	9.1′	54.2′
15	42°04.4	·· 22.2	82°47.0	13.1′	21°25.8	9.3′	54.2′
16	57°04.6	21.2	97°19.1	13.1′	21°16.5	9.3′	54.2′
17	72°04.7	20.3	111°51.2	13.2′	21°07.2	9.4′	54.2′
18	87°04.9	S06°19.3	126°23.4	13.2′	S20°57.8	9.5′	54.2′
19	102°05.0	18.4	140°55.6	13.3′	20°48.3	9.6′	54.2′
20	117°05.1	17.4	155°27.9	13.3′	20°38.7	9.7′	54.2′
21	132°05.3	·· 16.4	170°00.2	13.4′	20°29.0	9.8′	54.2′
22	147°05.4	15.5	184°32.6	13.4′	20°19.2	9.8′	54.2′
23	162°05.5	14.5	199°05.0	13.5′	20°09.4	10.0′	54.3′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:01	06:19	07:28	16:58	18:07	19:26
N 70°	05:07	06:18	07:19	17:07	18:08	19:19
68°	05:12	06:16	07:12	17:13	18:10	19:14
66°	05:16	06:15	07:06	17:19	18:11	19:10
64°	05:19	06:14	07:01	17:24	18:12	19:07
62°	05:22	06:13	06:57	17:28	18:13	19:04
60°	05:24	06:12	06:53	17:32	18:13	19:02
N 58°	05:26	06:11	06:50	17:35	18:14	19:00
56°	05:27	06:10	06:47	17:38	18:15	18:58
54°	05:28	06:09	06:45	17:40	18:16	18:57
52°	05:29	06:08	06:42	17:43	18:17	18:56
50°	05:30	06:08	06:40	17:45	18:17	18:55
45°	05:32	06:06	06:35	17:50	18:19	18:53
N 40°	05:32	06:04	06:31	17:54	18:21	18:52
35°	05:33	06:02	06:27	17:57	18:22	18:52
30°	05:32	06:00	06:24	18:00	18:24	18:52
20°	05:31	05:56	06:19	18:06	18:28	18:53
N 10°	05:28	05:52	06:13	18:11	18:32	18:56
0°	05:24	05:48	06:09	18:15	18:36	19:00
S 10°	05:18	05:43	06:04	18:20	18:41	19:06
20°	05:10	05:36	05:58	18:25	18:47	19:13
30°	04:59	05:28	05:52	18:31	18:56	19:24
35°	04:52	05:23	05:48	18:35	19:01	19:31
40°	04:44	05:17	05:44	18:39	19:06	19:39
45°	04:33	05:09	05:39	18:44	19:14	19:49
S 50°	04:20	05:00	05:34	18:49	19:23	20:03
52°	04:13	04:56	05:31	18:52	19:27	20:09
54°	04:06	04:51	05:28	18:55	19:31	20:16
56°	03:57	04:46	05:25	18:58	19:37	20:25
58°	03:47	04:39	05:21	19:02	19:43	20:34
S 60°	03:36	04:32	05:17	19:06	19:49	20:45

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°			07:51			10:58
64°		07:39	07:10		09:30	11:38
62°	06:42	06:43	06:41	08:43	10:25	12:06
60°	05:51	06:10	06:19	09:34	10:58	12:28
N 58°	05:19	05:46	06:01	10:05	11:22	12:45
56°	04:55	05:26	05:46	10:29	11:41	12:59
54°	04:36	05:10	05:33	10:48	11:57	13:12
52°	04:20	04:56	05:22	11:04	12:11	13:23
50°	04:06	04:43	05:12	11:18	12:23	13:33
45°	03:37	04:18	04:50	11:46	12:48	13:53
N 40°	03:15	03:57	04:33	12:08	13:08	14:09
35°	02:56	03:40	04:18	12:27	13:24	14:23
30°	02:40	03:26	04:06	12:42	13:38	14:35
20°	02:13	03:01	03:44	13:09	14:02	14:55
N 10°	01:50	02:39	03:25	13:32	14:23	15:13
0°	01:28	02:19	03:07	13:53	14:42	15:29
S 10°	01:07	01:58	02:49	14:14	15:01	15:46
20°	00:43	01:36	02:30	14:37	15:22	16:03
30°	00:16	01:11	02:08	15:03	15:45	16:23
35°	00:00	00:56	01:54	15:18	15:59	16:34
40°	·· ··	00:39	01:39	15:36	16:15	16:47
45°	·· ··	00:18	01:21	15:57	16:34	17:03
S 50°	23:51	·· ··	00:59	16:24	16:57	17:22
52°	23:38	·· ··	00:48	16:38	17:08	17:31
54°	23:23	·· ··	00:36	16:53	17:21	17:41
56°	23:06	·· ··	00:22	17:10	17:36	17:52
58°	22:45	·· ··	00:05	17:32	17:53	18:05
S 60°	22:18	23:45	·· ··	17:59	18:13	18:20

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 33-17%
02	12:15	12:09	12:12	07:41	20:06	
03	12:03	11:57	12:12	08:30	20:55	
04	11:50	11:44	12:12	09:18	21:41	

March 05, 06, 07 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162°31.3	215°53.1	S18°39.0	13°02.1	N16°55.5	20°27.4	N16°03.2	149°11.4	N03°15.4
1	177°33.7	230°52.5	38.5	28°05.4	55.7	35°30.2	03.3	164°13.6	15.5
2	192°36.2	245°51.9	37.9	43°08.7	55.9	50°32.9	03.3	179°15.8	15.6
3	207°38.7	260°51.2	·· 37.4	58°12.0	·· 56.1	65°35.6	·· 03.4	194°18.0	·· 15.7
4	222°41.1	275°50.6	36.8	73°15.3	56.4	80°38.4	03.5	209°20.2	15.9
5	237°43.6	290°50.0	36.3	88°18.6	56.6	95°41.1	03.6	224°22.4	16.0
6	252°46.0	305°49.4	S18°35.7	103°21.9	N16°56.8	110°43.9	N16°03.7	239°24.6	N03°16.1
7	267°48.5	320°48.7	35.1	118°25.2	57.0	125°46.6	03.8	254°26.8	16.2
8	282°51.0	335°48.1	34.6	133°28.5	57.2	140°49.3	03.9	269°29.0	16.3
9	297°53.4	350°47.5	·· 34.0	148°31.8	·· 57.5	155°52.1	·· 03.9	284°31.2	·· 16.4
10	312°55.9	5°46.9	33.4	163°35.1	57.7	170°54.8	04.0	299°33.4	16.6
11	327°58.4	20°46.3	32.9	178°38.5	57.9	185°57.5	04.1	314°35.6	16.7
12	343°00.8	35°45.6	S18°32.3	193°41.8	N16°58.1	201°00.3	N16°04.2	329°37.8	N03°16.8
13	358°03.3	50°45.0	31.8	208°45.1	58.3	216°03.0	04.3	344°40.0	16.9
14	13°05.8	65°44.4	31.2	223°48.4	58.6	231°05.7	04.4	359°42.2	17.0
15	28°08.2	80°43.8	·· 30.6	238°51.7	·· 58.8	246°08.5	·· 04.5	14°44.4	·· 17.1
16	43°10.7	95°43.1	30.1	253°55.0	59.0	261°11.2	04.5	29°46.6	17.2
17	58°13.1	110°42.5	29.5	268°58.2	59.2	276°13.9	04.6	44°48.8	17.4
18	73°15.6	125°41.9	S18°28.9	284°01.5	N16°59.4	291°16.7	N16°04.7	59°51.0	N03°17.5
19	88°18.1	140°41.3	28.3	299°04.8	59.6	306°19.4	04.8	74°53.2	17.6
20	103°20.5	155°40.7	27.8	314°08.1	16°59.9	321°22.1	04.9	89°55.4	17.7
21	118°23.0	170°40.0	·· 27.2	329°11.4	17°00.1	336°24.9	·· 05.0	104°57.6	·· 17.8
22	133°25.5	185°39.4	26.6	344°14.7	00.3	351°27.6	05.1	119°59.8	17.9
23	148°27.9	200°38.8	26.1	359°18.0	00.5	6°30.3	05.1	135°02.0	18.1
Mer.pass. 13:08		ν -0.6′	d 0.6′	m -4.04	ν 3.3′	d 0.2′	m -1.04	ν 2.7′	d 0.1′ m -2.51	ν 2.2′	d 0.1′ m 0.78

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	163°30.4	215°38.2	S18°25.5	14°21.3	N17°00.7	21°33.0	N16°05.2	150°04.2	N03°18.2
1	178°32.9	230°37.5	24.9	29°24.6	00.9	36°35.8	05.3	165°06.4	18.3
2	193°35.3	245°36.9	24.3	44°27.9	01.1	51°38.5	05.4	180°08.6	18.4
3	208°37.8	260°36.3	·· 23.7	59°31.2	·· 01.3	66°41.2	·· 05.5	195°10.8	·· 18.5
4	223°40.3	275°35.7	23.2	74°34.5	01.6	81°44.0	05.6	210°13.0	18.6
5	238°42.7	290°35.1	22.6	89°37.7	01.8	96°46.7	05.6	225°15.2	18.8
6	253°45.2	305°34.5	S18°22.0	104°41.0	N17°02.0	111°49.4	N16°05.7	240°17.4	N03°18.9
7	268°47.6	320°33.8	21.4	119°44.3	02.2	126°52.2	05.8	255°19.6	19.0
8	283°50.1	335°33.2	20.8	134°47.6	02.4	141°54.9	05.9	270°21.8	19.1
9	298°52.6	350°32.6	·· 20.3	149°50.9	·· 02.6	156°57.6	·· 06.0	285°24.0	·· 19.2
10	313°55.0	5°32.0	19.7	164°54.2	02.8	172°00.3	06.1	300°26.2	19.3
11	328°57.5	20°31.4	19.1	179°57.4	03.0	187°03.1	06.1	315°28.4	19.5
12	344°00.0	35°30.7	S18°18.5	195°00.7	N17°03.2	202°05.8	N16°06.2	330°30.6	N03°19.6
13	359°02.4	50°30.1	17.9	210°04.0	03.4	217°08.5	06.3	345°32.8	19.7
14	14°04.9	65°29.5	17.3	225°07.3	03.6	232°11.3	06.4	0°35.0	19.8
15	29°07.4	80°28.9	·· 16.7	240°10.6	·· 03.8	247°14.0	·· 06.5	15°37.1	·· 19.9
16	44°09.8	95°28.3	16.1	255°13.8	04.1	262°16.7	06.6	30°39.3	20.0
17	59°12.3	110°27.7	15.6	270°17.1	04.3	277°19.4	06.6	45°41.5	20.2
18	74°14.8	125°27.0	S18°15.0	285°20.4	N17°04.5	292°22.2	N16°06.7	60°43.7	N03°20.3
19	89°17.2	140°26.4	14.4	300°23.7	04.7	307°24.9	06.8	75°45.9	20.4
20	104°19.7	155°25.8	13.8	315°26.9	04.9	322°27.6	06.9	90°48.1	20.5
21	119°22.1	170°25.2	·· 13.2	330°30.2	·· 05.1	337°30.4	·· 07.0	105°50.3	·· 20.6
22	134°24.6	185°24.6	12.6	345°33.5	05.3	352°33.1	07.1	120°52.5	20.7
23	149°27.1	200°24.0	12.0	0°36.7	05.5	7°35.8	07.1	135°54.7	20.9
Mer.pass. 13:04		ν -0.6′	d 0.6′	m -4.04	ν 3.3′	d 0.2′	m -1.02	ν 2.7′	d 0.1′ m -2.50	ν 2.2′	d 0.1′ m 0.78

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	164°29.5	215°23.4	S18°11.4	15°40.0	N17°05.7	22°38.5	N16°07.2	150°56.9	N03°21.0
1	179°32.0	230°22.7	10.8	30°43.3	05.9	37°41.3	07.3	165°59.1	21.1
2	194°34.5	245°22.1	10.2	45°46.6	06.1	52°44.0	07.4	181°01.3	21.2
3	209°36.9	260°21.5	·· 09.6	60°49.8	·· 06.3	67°46.7	·· 07.5	196°03.5	·· 21.3
4	224°39.4	275°20.9	09.0	75°53.1	06.5	82°49.4	07.6	211°05.7	21.4
5	239°41.9	290°20.3	08.4	90°56.3	06.7	97°52.2	07.6	226°07.9	21.5
6	254°44.3	305°19.7	S18°07.8	105°59.6	N17°06.9	112°54.9	N16°07.7	241°10.1	N03°21.7
7	269°46.8	320°19.1	07.2	121°02.9	07.1	127°57.6	07.8	256°12.3	21.8
8	284°49.2	335°18.5	06.6	136°06.1	07.3	143°00.3	07.9	271°14.5	21.9
9	299°51.7	350°17.9	·· 06.0	151°09.4	·· 07.5	158°03.1	·· 08.0	286°16.7	·· 22.0
10	314°54.2	5°17.2	05.4	166°12.7	07.7	173°05.8	08.0	301°18.9	22.1
11	329°56.6	20°16.6	04.8	181°15.9	07.8	188°08.5	08.1	316°21.1	22.2
12	344°59.1	35°16.0	S18°04.2	196°19.2	N17°08.0	203°11.2	N16°08.2	331°23.3	N03°22.4
13	0°01.6	50°15.4	03.5	211°22.4	08.2	218°14.0	08.3	346°25.5	22.5
14	15°04.0	65°14.8	02.9	226°25.7	08.4	233°16.7	08.4	1°27.7	22.6
15	30°06.5	80°14.2	·· 02.3	241°28.9	·· 08.6	248°19.4	·· 08.5	16°29.9	·· 22.7
16	45°09.0	95°13.6	01.7	256°32.2	08.8	263°22.1	08.5	31°32.0	22.8
17	60°11.4	110°13.0	01.1	271°35.4	09.0	278°24.9	08.6	46°34.2	23.0
18	75°13.9	125°12.4	S18°00.5	286°38.7	N17°09.2	293°27.6	N16°08.7	61°36.4	N03°23.1
19	90°16.4	140°11.8	17°59.9	301°41.9	09.4	308°30.3	08.8	76°38.6	23.2
20	105°18.8	155°11.1	59.3	316°45.2	09.6	323°33.0	08.9	91°40.8	23.3
21	120°21.3	170°10.5	·· 58.6	331°48.4	·· 09.8	338°35.7	·· 08.9	106°43.0	·· 23.4
22	135°23.7	185°09.9	58.0	346°51.7	10.0	353°38.5	09.0	121°45.2	23.5
23	150°26.2	200°09.3	57.4	1°54.9	10.2	8°41.2	09.1	136°47.4	23.7
Mer.pass. 13:00		ν -0.6′	d 0.6′	m -4.03	ν 3.3′	d 0.2′	m -0.99	ν 2.7′	d 0.1′ m -2.50	ν 2.2′	d 0.1′ m 0.78

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.4
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.3
Achernar	335°19.3	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°18.9	89°23.0
Acamar	315°10.6	-40°12.0
Menkar	314°04.4	4°11.7
Mirfak	308°25.8	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.2	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.4	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.5	-59°36.0
Suhail	222°44.6	-43°32.8
Miaplacidus	221°37.1	-69°49.9
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.7
Acrux	172°57.4	-63°15.0
Gacrux	171°49.1	-57°16.0
Alioth	166°10.9	55°48.4
Spica	158°20.2	-11°18.4
Alkaid	152°50.2	49°10.3
Hadar	148°33.0	-60°30.1
Menkent	147°55.2	-36°30.2
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.4	-60°56.7
Kochab	137°19.3	74°02.2
Zuben'ubi	136°53.9	-16°09.4
Alphecca	126°02.1	26°37.1
Antares	112°13.6	-26°29.5
Atria	107°06.2	-69°04.3
Sabik	102°00.7	-15°45.5
Shaula	96°08.0	-37°07.3
Rasalhague	95°56.9	12°32.2
Eltanin	90°41.5	51°28.8
Kaus Aust.	83°30.3	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°45.7	-26°15.7
Altair	61°58.4	8°56.3
Peacock	53°03.4	-56°38.7
Deneb	49°25.0	45°22.5
Enif	33°37.3	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.0

Mar 05 Fri	SHA	Mer.pass
Venus	53°21.9	09:37
Mars	210°30.8	23:03
Jupiter	217°56.2	22:34
Saturn	346°40.2	14:01

Mar 06 Sat	SHA	Mer.pass
Venus	52°07.8	09:38
Mars	210°50.9	22:58
Jupiter	218°02.7	22:30
Saturn	346°33.8	13:58

Mar 07 Sun	SHA	Mer.pass
Venus	50°53.8	09:39
Mars	211°10.5	22:52
Jupiter	218°09.0	22:25
Saturn	346°27.4	13:54

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°05.7	S06°13.5	213°37.5	13.5′	S19°59.4	10.1′	54.3′
1	192°05.8	12.6	228°10.0	13.6′	19°49.3	10.1′	54.3′
2	207°05.9	11.6	242°42.6	13.6′	19°39.2	10.2′	54.3′
3	222°06.1	·· 10.6	257°15.2	13.7′	19°29.0	10.3′	54.3′
4	237°06.2	09.7	271°47.9	13.7′	19°18.7	10.4′	54.3′
5	252°06.4	08.7	286°20.6	13.8′	19°08.3	10.5′	54.3′
6	267°06.5	S06°07.7	300°53.3	13.8′	S18°57.8	10.6′	54.3′
7	282°06.6	06.8	315°26.2	13.9′	18°47.2	10.6′	54.3′
8	297°06.8	05.8	329°59.0	13.9′	18°36.6	10.7′	54.3′
9	312°06.9	·· 04.8	344°31.9	14.0′	18°25.9	10.8′	54.4′
10	327°07.1	03.9	359°04.9	14.0′	18°15.1	10.9′	54.4′
11	342°07.2	02.9	13°37.9	14.1′	18°04.2	11.0′	54.4′
12	357°07.3	S06°01.9	28°11.0	14.1′	S17°53.2	11.0′	54.4′
13	12°07.5	01.0	42°44.1	14.1′	17°42.2	11.2′	54.4′
14	27°07.6	06°00.0	57°17.2	14.2′	17°31.0	11.2′	54.4′
15	42°07.8	05°59.0	71°50.4	14.2′	17°19.8	11.2′	54.4′
16	57°07.9	58.1	86°23.6	14.3′	17°08.6	11.4′	54.4′
17	72°08.0	57.1	100°56.9	14.3′	16°57.2	11.4′	54.5′
18	87°08.2	S05°56.1	115°30.2	14.4′	S16°45.8	11.5′	54.5′
19	102°08.3	55.2	130°03.6	14.4′	16°34.3	11.6′	54.5′
20	117°08.5	54.2	144°37.0	14.4′	16°22.7	11.7′	54.5′
21	132°08.6	·· 53.2	159°10.4	14.5′	16°11.0	11.7′	54.5′
22	147°08.7	52.3	173°43.9	14.5′	15°59.3	11.8′	54.5′
23	162°08.9	51.3	188°17.4	14.6′	15°47.5	11.9′	54.5′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°09.0	S05°50.3	202°51.0	14.6′	S15°35.6	11.9′	54.6′
1	192°09.2	49.4	217°24.6	14.6′	15°23.7	12.0′	54.6′
2	207°09.3	48.4	231°58.2	14.7′	15°11.7	12.1′	54.6′
3	222°09.4	·· 47.4	246°31.9	14.7′	14°59.6	12.1′	54.6′
4	237°09.6	46.5	261°05.6	14.7′	14°47.5	12.2′	54.6′
5	252°09.7	45.5	275°39.3	14.8′	14°35.3	12.3′	54.6′
6	267°09.9	S05°44.5	290°13.1	14.8′	S14°23.0	12.3′	54.6′
7	282°10.0	43.5	304°46.9	14.9′	14°10.7	12.4′	54.7′
8	297°10.2	42.6	319°20.8	14.9′	13°58.3	12.5′	54.7′
9	312°10.3	·· 41.6	333°54.7	14.9′	13°45.8	12.5′	54.7′
10	327°10.4	40.6	348°28.6	15.0′	13°33.3	12.6′	54.7′
11	342°10.6	39.7	3°02.6	15.0′	13°20.7	12.6′	54.7′
12	357°10.7	S05°38.7	17°36.5	15.0′	S13°08.1	12.7′	54.7′
13	12°10.9	37.7	32°10.6	15.0′	12°55.4	12.8′	54.7′
14	27°11.0	36.8	46°44.6	15.1′	12°42.6	12.8′	54.8′
15	42°11.2	·· 35.8	61°18.7	15.1′	12°29.8	12.9′	54.8′
16	57°11.3	34.8	75°52.8	15.1′	12°16.9	13.0′	54.8′
17	72°11.5	33.8	90°26.9	15.2′	12°03.9	12.9′	54.8′
18	87°11.6	S05°32.9	105°01.1	15.2′	S11°51.0	13.1′	54.8′
19	102°11.7	31.9	119°35.3	15.2′	11°37.9	13.1′	54.8′
20	117°11.9	30.9	134°09.5	15.2′	11°24.8	13.2′	54.9′
21	132°12.0	·· 30.0	148°43.7	15.3′	11°11.6	13.2′	54.9′
22	147°12.2	29.0	163°18.0	15.3′	10°58.4	13.2′	54.9′
23	162°12.3	28.0	177°52.3	15.3′	10°45.2	13.3′	54.9′
	SD = 16.1′	d = 1.0′	SD = 14.9′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°12.5	S05°27.0	192°26.6	15.3′	S10°31.9	13.4′	54.9′
1	192°12.6	26.1	207°00.9	15.4′	10°18.5	13.4′	54.9′
2	207°12.8	25.1	221°35.3	15.4′	10°05.1	13.5′	55.0′
3	222°12.9	·· 24.1	236°09.6	15.4′	09°51.6	13.5′	55.0′
4	237°13.1	23.2	250°44.0	15.4′	09°38.1	13.5′	55.0′
5	252°13.2	22.2	265°18.4	15.4′	09°24.6	13.6′	55.0′
6	267°13.4	S05°21.2	279°52.9	15.4′	S09°11.0	13.7′	55.0′
7	282°13.5	20.2	294°27.3	15.5′	08°57.3	13.7′	55.0′
8	297°13.6	19.3	309°01.8	15.5′	08°43.6	13.7′	55.1′
9	312°13.8	·· 18.3	323°36.2	15.5′	08°29.9	13.8′	55.1′
10	327°13.9	17.3	338°10.7	15.5′	08°16.1	13.8′	55.1′
11	342°14.1	16.4	352°45.2	15.5′	08°02.3	13.9′	55.1′
12	357°14.2	S05°15.4	7°19.8	15.5′	S07°48.4	13.9′	55.1′
13	12°14.4	14.4	21°54.3	15.5′	07°34.5	13.9′	55.2′
14	27°14.5	13.4	36°28.8	15.5′	07°20.6	14.0′	55.2′
15	42°14.7	·· 12.5	51°03.4	15.6′	07°06.6	14.0′	55.2′
16	57°14.8	11.5	65°37.9	15.6′	06°52.6	14.0′	55.2′
17	72°15.0	10.5	80°12.5	15.6′	06°38.6	14.1′	55.2′
18	87°15.1	S05°09.5	94°47.1	15.6′	S06°24.5	14.1′	55.2′
19	102°15.3	08.6	109°21.6	15.6′	06°10.4	14.2′	55.3′
20	117°15.4	07.6	123°56.2	15.6′	05°56.2	14.2′	55.3′
21	132°15.6	·· 06.6	138°30.8	15.6′	05°42.0	14.2′	55.3′
22	147°15.7	05.6	153°05.4	15.6′	05°27.8	14.2′	55.3′
23	162°15.9	04.7	167°40.0	15.6′	05°13.6	14.3′	55.3′
	SD = 16.1′	d = 1.0′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:46	06:04	07:12	17:13	18:21	19:40
N 70°	04:53	06:04	07:05	17:19	18:20	19:32
68°	05:00	06:04	07:00	17:25	18:20	19:25
66°	05:05	06:04	06:55	17:29	18:20	19:20
64°	05:09	06:04	06:51	17:33	18:21	19:16
62°	05:12	06:03	06:48	17:36	18:21	19:12
60°	05:15	06:03	06:45	17:39	18:21	19:09
N 58°	05:17	06:03	06:42	17:42	18:21	19:07
56°	05:20	06:02	06:40	17:44	18:21	19:04
54°	05:21	06:02	06:37	17:46	18:22	19:03
52°	05:23	06:02	06:35	17:48	18:22	19:01
50°	05:24	06:01	06:34	17:50	18:22	19:00
45°	05:26	06:00	06:30	17:54	18:23	18:57
N 40°	05:28	05:59	06:26	17:57	18:24	18:55
35°	05:29	05:58	06:23	18:00	18:25	18:54
30°	05:29	05:57	06:21	18:02	18:26	18:54
20°	05:29	05:54	06:16	18:07	18:29	18:54
N 10°	05:27	05:51	06:12	18:11	18:32	18:56
0°	05:23	05:47	06:08	18:15	18:35	18:59
S 10°	05:18	05:43	06:04	18:19	18:40	19:04
20°	05:11	05:37	05:59	18:23	18:45	19:11
30°	05:02	05:30	05:54	18:28	18:52	19:20
35°	04:55	05:25	05:51	18:31	18:56	19:27
40°	04:48	05:20	05:48	18:34	19:02	19:34
45°	04:38	05:14	05:43	18:38	19:08	19:44
S 50°	04:26	05:05	05:39	18:43	19:16	19:56
52°	04:20	05:02	05:36	18:45	19:20	20:01
54°	04:13	04:57	05:34	18:48	19:24	20:08
56°	04:05	04:52	05:31	18:50	19:29	20:16
58°	03:56	04:47	05:28	18:53	19:34	20:24
S 60°	03:46	04:41	05:24	18:57	19:40	20:34

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▬	08:04	07:19	▬	13:55	16:10
N 70°	08:32	07:37	07:06	11:54	14:20	16:20
68°	07:48	07:17	06:55	12:37	14:39	16:29
66°	07:19	07:00	06:46	13:05	14:54	16:36
64°	06:56	06:47	06:39	13:26	15:06	16:42
62°	06:38	06:35	06:32	13:43	15:16	16:47
60°	06:24	06:26	06:26	13:57	15:25	16:51
N 58°	06:11	06:17	06:21	14:09	15:33	16:55
56°	06:00	06:09	06:17	14:19	15:39	16:59
54°	05:50	06:03	06:13	14:29	15:45	17:02
52°	05:41	05:56	06:09	14:37	15:51	17:04
50°	05:33	05:51	06:06	14:44	15:55	17:07
45°	05:17	05:39	05:58	14:59	16:06	17:12
N 40°	05:03	05:29	05:52	15:12	16:14	17:17
35°	04:51	05:20	05:47	15:23	16:22	17:21
30°	04:41	05:13	05:42	15:32	16:28	17:24
20°	04:23	05:00	05:34	15:48	16:39	17:30
N 10°	04:08	04:48	05:27	16:02	16:49	17:35
0°	03:53	04:37	05:20	16:14	16:58	17:40
S 10°	03:38	04:26	05:13	16:27	17:07	17:45
20°	03:23	04:14	05:06	16:41	17:16	17:50
30°	03:04	04:01	04:57	16:56	17:27	17:55
35°	02:54	03:53	04:52	17:05	17:33	17:58
40°	02:42	03:44	04:47	17:15	17:40	18:02
45°	02:27	03:34	04:40	17:27	17:48	18:06
S 50°	02:10	03:21	04:33	17:41	17:57	18:11
52°	02:01	03:15	04:29	17:48	18:02	18:13
54°	01:52	03:08	04:25	17:55	18:06	18:16
56°	01:41	03:01	04:21	18:03	18:12	18:19
58°	01:29	02:53	04:16	18:12	18:18	18:22
S 60°	01:15	02:43	04:10	18:23	18:24	18:25

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 27-29 11-2%
05	11:37	11:31	12:12	10:04	22:26	
06	11:24	11:17	12:11	10:47	23:09	
07	11:10	11:03	12:11	11:30	23:51	

March 08, 09, 10 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	165°28.7	215°08.7	S17°56.8	16°58.2	N17°10.3	23°43.9	N16°09.2	151°49.6	N03°23.8
1	180°31.1	230°08.1	56.2	32°01.4	10.5	38°46.6	09.3	166°51.8	23.9
2	195°33.6	245°07.5	55.5	47°04.7	10.7	53°49.3	09.3	181°54.0	24.0
3	210°36.1	260°06.9	·· 54.9	62°07.9	·· 10.9	68°52.1	·· 09.4	196°56.2	·· 24.1
4	225°38.5	275°06.3	54.3	77°11.2	11.1	83°54.8	09.5	211°58.4	24.2
5	240°41.0	290°05.7	53.7	92°14.4	11.3	98°57.5	09.6	227°00.6	24.4
6	255°43.5	305°05.1	S17°53.1	107°17.6	N17°11.5	114°00.2	N16°09.7	242°02.8	N03°24.5
7	270°45.9	320°04.5	52.4	122°20.9	11.6	129°02.9	09.7	257°05.0	24.6
8	285°48.4	335°03.9	51.8	137°24.1	11.8	144°05.7	09.8	272°07.2	24.7
9	300°50.8	350°03.3	·· 51.2	152°27.4	·· 12.0	159°08.4	·· 09.9	287°09.4	·· 24.8
10	315°53.3	5°02.7	50.6	167°30.6	12.2	174°11.1	10.0	302°11.6	24.9
11	330°55.8	20°02.1	49.9	182°33.8	12.4	189°13.8	10.1	317°13.7	25.1
12	345°58.2	35°01.5	S17°49.3	197°37.1	N17°12.6	204°16.5	N16°10.1	332°15.9	N03°25.2
13	1°00.7	50°00.9	48.7	212°40.3	12.7	219°19.3	10.2	347°18.1	25.3
14	16°03.2	65°00.3	48.0	227°43.5	12.9	234°22.0	10.3	2°20.3	25.4
15	31°05.6	79°59.7	·· 47.4	242°46.7	·· 13.1	249°24.7	·· 10.4	17°22.5	·· 25.5
16	46°08.1	94°59.0	46.8	257°50.0	13.3	264°27.4	10.5	32°24.7	25.6
17	61°10.6	109°58.4	46.1	272°53.2	13.5	279°30.1	10.5	47°26.9	25.8
18	76°13.0	124°57.8	S17°45.5	287°56.4	N17°13.6	294°32.8	N16°10.6	62°29.1	N03°25.9
19	91°15.5	139°57.2	44.9	302°59.7	13.8	309°35.6	10.7	77°31.3	26.0
20	106°18.0	154°56.6	44.2	318°02.9	14.0	324°38.3	10.8	92°33.5	26.1
21	121°20.4	169°56.0	·· 43.6	333°06.1	·· 14.2	339°41.0	·· 10.9	107°35.7	·· 26.2
22	136°22.9	184°55.4	42.9	348°09.3	14.4	354°43.7	10.9	122°37.9	26.3
23	151°25.3	199°54.8	42.3	3°12.6	14.5	9°46.4	11.0	137°40.1	26.5
Mer.pass. 12:56		ν -0.6′	d 0.6′	m -4.03	ν 3.2′	d 0.2′	m -0.97	ν 2.7′	d 0.1′ m -2.49	ν 2.2′	d 0.1′ m 0.77

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	166°27.8	214°54.2	S17°41.7	18°15.8	N17°14.7	24°49.1	N16°11.1	152°42.3	N03°26.6
1	181°30.3	229°53.6	41.0	33°19.0	14.9	39°51.9	11.2	167°44.5	26.7
2	196°32.7	244°53.0	40.4	48°22.2	15.1	54°54.6	11.3	182°46.7	26.8
3	211°35.2	259°52.4	·· 39.7	63°25.4	·· 15.2	69°57.3	·· 11.3	197°48.8	·· 26.9
4	226°37.7	274°51.8	39.1	78°28.7	15.4	85°00.0	11.4	212°51.0	27.0
5	241°40.1	289°51.2	38.5	93°31.9	15.6	100°02.7	11.5	227°53.2	27.2
6	256°42.6	304°50.6	S17°37.8	108°35.1	N17°15.8	115°05.4	N16°11.6	242°55.4	N03°27.3
7	271°45.1	319°50.1	37.2	123°38.3	15.9	130°08.1	11.6	257°57.6	27.4
8	286°47.5	334°49.5	36.5	138°41.5	16.1	145°10.9	11.7	272°59.8	27.5
9	301°50.0	349°48.9	·· 35.9	153°44.7	·· 16.3	160°13.6	·· 11.8	288°02.0	·· 27.6
10	316°52.4	4°48.3	35.2	168°47.9	16.4	175°16.3	11.9	303°04.2	27.8
11	331°54.9	19°47.7	34.6	183°51.1	16.6	190°19.0	12.0	318°06.4	27.9
12	346°57.4	34°47.1	S17°33.9	198°54.3	N17°16.8	205°21.7	N16°12.0	333°08.6	N03°28.0
13	1°59.8	49°46.5	33.3	213°57.6	17.0	220°24.4	12.1	348°10.8	28.1
14	17°02.3	64°45.9	32.6	229°00.8	17.1	235°27.1	12.2	3°13.0	28.2
15	32°04.8	79°45.3	·· 32.0	244°04.0	·· 17.3	250°29.9	·· 12.3	18°15.2	·· 28.3
16	47°07.2	94°44.7	31.3	259°07.2	17.5	265°32.6	12.3	33°17.4	28.5
17	62°09.7	109°44.1	30.7	274°10.4	17.6	280°35.3	12.4	48°19.5	28.6
18	77°12.2	124°43.5	S17°30.0	289°13.6	N17°17.8	295°38.0	N16°12.5	63°21.7	N03°28.7
19	92°14.6	139°42.9	29.3	304°16.8	18.0	310°40.7	12.6	78°23.9	28.8
20	107°17.1	154°42.3	28.7	319°20.0	18.1	325°43.4	12.7	93°26.1	28.9
21	122°19.6	169°41.7	·· 28.0	334°23.2	·· 18.3	340°46.1	·· 12.7	108°28.3	·· 29.0
22	137°22.0	184°41.1	27.4	349°26.4	18.5	355°48.8	12.8	123°30.5	29.2
23	152°24.5	199°40.5	26.7	4°29.6	18.6	10°51.5	12.9	138°32.7	29.3
Mer.pass. 12:52		ν -0.6′	d 0.6′	m -4.02	ν 3.2′	d 0.2′	m -0.94	ν 2.7′	d 0.1′ m -2.49	ν 2.2′	d 0.1′ m 0.77

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	167°26.9	214°39.9	S17°26.1	19°32.8	N17°18.8	25°54.3	N16°13.0	153°34.9	N03°29.4
1	182°29.4	229°39.3	25.4	34°36.0	18.9	40°57.0	13.0	168°37.1	29.5
2	197°31.9	244°38.8	24.7	49°39.2	19.1	55°59.7	13.1	183°39.3	29.6
3	212°34.3	259°38.2	·· 24.1	64°42.3	·· 19.3	71°02.4	·· 13.2	198°41.5	·· 29.8
4	227°36.8	274°37.6	23.4	79°45.5	19.4	86°05.1	13.3	213°43.7	29.9
5	242°39.3	289°37.0	22.7	94°48.7	19.6	101°07.8	13.3	228°45.9	30.0
6	257°41.7	304°36.4	S17°22.1	109°51.9	N17°19.8	116°10.5	N16°13.4	243°48.0	N03°30.1
7	272°44.2	319°35.8	21.4	124°55.1	19.9	131°13.2	13.5	258°50.2	30.2
8	287°46.7	334°35.2	20.7	139°58.3	20.1	146°15.9	13.6	273°52.4	30.3
9	302°49.1	349°34.6	·· 20.1	155°01.5	·· 20.2	161°18.6	·· 13.6	288°54.6	·· 30.5
10	317°51.6	4°34.0	19.4	170°04.7	20.4	176°21.3	13.7	303°56.8	30.6
11	332°54.0	19°33.4	18.7	185°07.8	20.5	191°24.1	13.8	318°59.0	30.7
12	347°56.5	34°32.9	S17°18.1	200°11.0	N17°20.7	206°26.8	N16°13.9	334°01.2	N03°30.8
13	2°59.0	49°32.3	17.4	215°14.2	20.9	221°29.5	13.9	349°03.4	30.9
14	18°01.4	64°31.7	16.7	230°17.4	21.0	236°32.2	14.0	4°05.6	31.0
15	33°03.9	79°31.1	·· 16.0	245°20.6	·· 21.2	251°34.9	·· 14.1	19°07.8	·· 31.2
16	48°06.4	94°30.5	15.4	260°23.7	21.3	266°37.6	14.2	34°10.0	31.3
17	63°08.8	109°29.9	14.7	275°26.9	21.5	281°40.3	14.2	49°12.1	31.4
18	78°11.3	124°29.3	S17°14.0	290°30.1	N17°21.6	296°43.0	N16°14.3	64°14.3	N03°31.5
19	93°13.8	139°28.7	13.3	305°33.3	21.8	311°45.7	14.4	79°16.5	31.6
20	108°16.2	154°28.2	12.7	320°36.4	21.9	326°48.4	14.5	94°18.7	31.8
21	123°18.7	169°27.6	·· 12.0	335°39.6	·· 22.1	341°51.1	·· 14.5	109°20.9	·· 31.9
22	138°21.2	184°27.0	11.3	350°42.8	22.2	356°53.8	14.6	124°23.1	32.0
23	153°23.6	199°26.4	10.6	5°46.0	22.4	11°56.5	14.7	139°25.3	32.1
Mer.pass. 12:48		ν -0.6′	d 0.7′	m -4.02	ν 3.2′	d 0.2′	m -0.92	ν 2.7′	d 0.1′ m -2.48	ν 2.2′	d 0.1′ m 0.77

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.4
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.3
Achernar	335°19.3	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°20.4	89°23.0
Acamar	315°10.6	-40°11.9
Menkar	314°04.4	4°11.7
Mirfak	308°25.9	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.2	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.4	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.5	-59°36.0
Suhail	222°44.6	-43°32.8
Miaplacidus	221°37.1	-69°49.9
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.7
Acrux	172°57.4	-63°15.0
Gacrux	171°49.1	-57°16.0
Alioth	166°10.9	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.2	49°10.3
Hadar	148°33.0	-60°30.2
Menkent	147°55.2	-36°30.2
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.4	-60°56.8
Kochab	137°19.2	74°02.2
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.1
Antares	112°13.6	-26°29.5
Atria	107°06.2	-69°04.3
Sabik	102°00.7	-15°45.6
Shaula	96°08.0	-37°07.3
Rasalhague	95°56.9	12°32.2
Eltanin	90°41.5	51°28.7
Kaus Aust.	83°30.3	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°45.7	-26°15.7
Altair	61°58.4	8°56.3
Peacock	53°03.4	-56°38.7
Deneb	49°24.9	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.0

Mar 08 Mon	SHA	Mer.pass
Venus	49°40.0	09:40
Mars	211°29.5	22:47
Jupiter	218°15.2	22:21
Saturn	346°20.9	13:51

Mar 09 Tue	SHA	Mer.pass
Venus	48°26.4	09:41
Mars	211°48.0	22:42
Jupiter	218°21.3	22:17
Saturn	346°14.5	13:47

Mar 10 Wed	SHA	Mer.pass
Venus	47°13.0	09:42
Mars	212°05.8	22:37
Jupiter	218°27.3	22:12
Saturn	346°07.9	13:44

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.0968 sec ΔT = TT-UT1 = +69.2808 sec

2027 March 08 to Mar. 10 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°16.0	S05°03.7	182°14.6	15.6′	S04°59.3	14.3′	55.4′
1	192°16.2	02.7	196°49.2	15.6′	04°45.0	14.4′	55.4′
2	207°16.3	01.7	211°23.8	15.6′	04°30.6	14.3′	55.4′
3	222°16.5	05°00.8	225°58.4	15.6′	04°16.3	14.4′	55.4′
4	237°16.6	04°59.8	240°33.0	15.6′	04°01.9	14.4′	55.4′
5	252°16.8	58.8	255°07.6	15.6′	03°47.5	14.5′	55.4′
6	267°16.9	S04°57.8	269°42.2	15.6′	S03°33.0	14.4′	55.5′
7	282°17.1	56.9	284°16.7	15.6′	03°18.6	14.5′	55.5′
8	297°17.2	55.9	298°51.3	15.6′	03°04.1	14.5′	55.5′
9	312°17.4	·· 54.9	313°25.9	15.6′	02°49.6	14.6′	55.5′
10	327°17.5	53.9	328°00.4	15.6′	02°35.0	14.5′	55.5′
11	342°17.7	53.0	342°35.0	15.5′	02°20.5	14.6′	55.6′
12	357°17.8	S04°52.0	357°09.5	15.5′	S02°05.9	14.6′	55.6′
13	12°18.0	51.0	11°44.1	15.5′	01°51.3	14.6′	55.6′
14	27°18.1	50.0	26°18.6	15.5′	01°36.7	14.6′	55.6′
15	42°18.3	·· 49.1	40°53.1	15.5′	01°22.1	14.6′	55.6′
16	57°18.4	48.1	55°27.6	15.5′	01°07.5	14.7′	55.7′
17	72°18.6	47.1	70°02.1	15.5′	00°52.8	14.7′	55.7′
18	87°18.7	S04°46.1	84°36.5	15.4′	S00°38.1	14.6′	55.7′
19	102°18.9	45.2	99°11.0	15.4′	00°23.5	14.7′	55.7′
20	117°19.1	44.2	113°45.4	15.4′	S00°08.8	14.7′	55.7′
21	132°19.2	·· 43.2	128°19.8	15.4′	N00°05.9	14.7′	55.8′
22	147°19.4	42.2	142°54.2	15.4′	00°20.6	14.8′	55.8′
23	162°19.5	41.3	157°28.5	15.3′	00°35.4	14.7′	55.8′
	SD = 16.1′	d = 1.0′	SD = 15.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°19.7	S04°40.3	172°02.9	15.3′	N00°50.1	14.7′	55.8′
1	192°19.8	39.3	186°37.2	15.3′	01°04.8	14.8′	55.8′
2	207°20.0	38.3	201°11.5	15.3′	01°19.6	14.7′	55.9′
3	222°20.1	·· 37.3	215°45.8	15.2′	01°34.3	14.8′	55.9′
4	237°20.3	36.4	230°20.0	15.2′	01°49.1	14.7′	55.9′
5	252°20.4	35.4	244°54.2	15.2′	02°03.8	14.8′	55.9′
6	267°20.6	S04°34.4	259°28.4	15.2′	N02°18.6	14.7′	55.9′
7	282°20.8	33.4	274°02.6	15.1′	02°33.3	14.8′	56.0′
8	297°20.9	32.5	288°36.7	15.1′	02°48.1	14.7′	56.0′
9	312°21.1	·· 31.5	303°10.8	15.1′	03°02.8	14.8′	56.0′
10	327°21.2	30.5	317°44.9	15.0′	03°17.6	14.7′	56.0′
11	342°21.4	29.5	332°18.9	15.0′	03°32.3	14.7′	56.0′
12	357°21.5	S04°28.5	346°52.9	15.0′	N03°47.0	14.8′	56.1′
13	12°21.7	27.6	1°26.8	14.9′	04°01.8	14.7′	56.1′
14	27°21.8	26.6	16°00.8	14.9′	04°16.5	14.7′	56.1′
15	42°22.0	·· 25.6	30°34.7	14.8′	04°31.2	14.7′	56.1′
16	57°22.2	24.6	45°08.5	14.8′	04°45.9	14.7′	56.1′
17	72°22.3	23.7	59°42.3	14.8′	05°00.6	14.7′	56.2′
18	87°22.5	S04°22.7	74°16.1	14.7′	N05°15.3	14.7′	56.2′
19	102°22.6	21.7	88°49.8	14.7′	05°30.0	14.7′	56.2′
20	117°22.8	20.7	103°23.5	14.6′	05°44.7	14.6′	56.2′
21	132°22.9	·· 19.7	117°57.1	14.6′	05°59.3	14.7′	56.2′
22	147°23.1	18.8	132°30.7	14.5′	06°14.0	14.6′	56.3′
23	162°23.3	17.8	147°04.2	14.5′	06°28.6	14.6′	56.3′
	SD = 16.1′	d = 1.0′	SD = 15.2′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°23.4	S04°16.8	161°37.7	14.4′	N06°43.2	14.6′	56.3′
1	192°23.6	15.8	176°11.2	14.4′	06°57.8	14.5′	56.3′
2	207°23.7	14.8	190°44.6	14.3′	07°12.3	14.6′	56.3′
3	222°23.9	·· 13.9	205°17.9	14.3′	07°26.9	14.5′	56.4′
4	237°24.0	12.9	219°51.2	14.2′	07°41.4	14.5′	56.4′
5	252°24.2	11.9	234°24.5	14.2′	07°55.9	14.5′	56.4′
6	267°24.4	S04°10.9	248°57.7	14.1′	N08°10.4	14.4′	56.4′
7	282°24.5	09.9	263°30.8	14.1′	08°24.8	14.4′	56.4′
8	297°24.7	09.0	278°03.9	14.0′	08°39.2	14.4′	56.5′
9	312°24.8	·· 08.0	292°36.9	14.0′	08°53.6	14.4′	56.5′
10	327°25.0	07.0	307°09.8	13.9′	09°08.0	14.3′	56.5′
11	342°25.2	06.0	321°42.7	13.8′	09°22.3	14.3′	56.5′
12	357°25.3	S04°05.0	336°15.6	13.8′	N09°36.6	14.3′	56.6′
13	12°25.5	04.1	350°48.4	13.7′	09°50.9	14.2′	56.6′
14	27°25.6	03.1	5°21.1	13.7′	10°05.1	14.2′	56.6′
15	42°25.8	·· 02.1	19°53.7	13.6′	10°19.3	14.2′	56.6′
16	57°25.9	01.1	34°26.3	13.5′	10°33.5	14.1′	56.6′
17	72°26.1	04°00.1	48°58.9	13.5′	10°47.6	14.1′	56.7′
18	87°26.3	S03°59.2	63°31.3	13.4′	N11°01.7	14.0′	56.7′
19	102°26.4	58.2	78°03.7	13.3′	11°15.7	14.0′	56.7′
20	117°26.6	57.2	92°36.0	13.3′	11°29.7	14.0′	56.7′
21	132°26.8	·· 56.2	107°08.3	13.2′	11°43.7	13.9′	56.7′
22	147°26.9	55.2	121°40.5	13.1′	11°57.6	13.8′	56.8′
23	162°27.1	54.2	136°12.6	13.0′	12°11.4	13.9′	56.8′
	SD = 16.1′	d = 1.0′	SD = 15.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:29	05:49	06:56	17:27	18:34	19:55
N 70°	04:39	05:51	06:51	17:32	18:33	19:45
68°	04:47	05:52	06:47	17:36	18:31	19:37
66°	04:53	05:53	06:44	17:39	18:30	19:30
64°	04:58	05:53	06:41	17:42	18:29	19:25
62°	05:02	05:54	06:38	17:45	18:29	19:21
60°	05:06	05:54	06:36	17:47	18:28	19:17
N 58°	05:09	05:55	06:34	17:49	18:28	19:13
56°	05:12	05:55	06:32	17:50	18:27	19:11
54°	05:14	05:55	06:30	17:52	18:27	19:08
52°	05:16	05:55	06:29	17:53	18:27	19:06
50°	05:18	05:55	06:27	17:55	18:27	19:04
45°	05:21	05:55	06:24	17:58	18:27	19:01
N 40°	05:23	05:55	06:22	18:00	18:27	18:59
35°	05:25	05:54	06:19	18:02	18:28	18:57
30°	05:26	05:53	06:17	18:04	18:28	18:56
20°	05:26	05:52	06:14	18:08	18:30	18:55
N 10°	05:25	05:49	06:10	18:11	18:32	18:56
0°	05:22	05:47	06:07	18:14	18:35	18:59
S 10°	05:18	05:43	06:04	18:17	18:38	19:03
20°	05:12	05:38	06:00	18:20	18:43	19:08
30°	05:04	05:32	05:56	18:24	18:48	19:17
35°	04:58	05:28	05:54	18:27	18:52	19:22
40°	04:51	05:24	05:51	18:30	18:57	19:29
45°	04:42	05:18	05:48	18:33	19:02	19:38
S 50°	04:31	05:11	05:44	18:37	19:09	19:49
52°	04:26	05:07	05:42	18:38	19:13	19:54
54°	04:20	05:03	05:40	18:40	19:16	20:00
56°	04:13	04:59	05:37	18:43	19:20	20:07
58°	04:05	04:54	05:35	18:45	19:25	20:14
S 60°	03:55	04:49	05:32	18:48	19:30	20:23

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	06:46	06:15	05:41	18:13	20:19	22:38
N 70°	06:41	06:18	05:53	18:14	20:10	22:15
68°	06:37	06:20	06:02	18:15	20:03	21:58
66°	06:34	06:22	06:10	18:16	19:57	21:44
64°	06:31	06:24	06:17	18:16	19:53	21:33
62°	06:29	06:26	06:22	18:17	19:48	21:24
60°	06:27	06:27	06:28	18:17	19:45	21:16
N 58°	06:25	06:28	06:32	18:18	19:42	21:09
56°	06:23	06:29	06:36	18:18	19:39	21:02
54°	06:22	06:30	06:40	18:18	19:36	20:57
52°	06:20	06:31	06:43	18:19	19:34	20:52
50°	06:19	06:32	06:46	18:19	19:32	20:47
45°	06:16	06:34	06:52	18:19	19:27	20:38
N 40°	06:14	06:35	06:58	18:20	19:24	20:30
35°	06:12	06:37	07:03	18:20	19:20	20:23
30°	06:10	06:38	07:07	18:20	19:18	20:17
20°	06:07	06:40	07:14	18:21	19:13	20:06
N 10°	06:04	06:42	07:21	18:21	19:08	19:57
0°	06:02	06:44	07:27	18:22	19:04	19:49
S 10°	05:59	06:46	07:34	18:22	19:00	19:40
20°	05:56	06:48	07:40	18:23	18:56	19:31
30°	05:53	06:50	07:48	18:23	18:51	19:21
35°	05:51	06:51	07:52	18:23	18:48	19:15
40°	05:49	06:53	07:58	18:23	18:45	19:09
45°	05:47	06:54	08:04	18:24	18:42	19:01
S 50°	05:44	06:57	08:11	18:24	18:37	18:52
52°	05:43	06:58	08:14	18:24	18:35	18:48
54°	05:41	06:59	08:18	18:24	18:33	18:43
56°	05:40	07:00	08:22	18:25	18:31	18:38
58°	05:38	07:01	08:27	18:25	18:28	18:32
S 60°	05:36	07:03	08:32	18:25	18:25	18:26

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 0-3%
08	10:56	10:49	12:11	12:12	–:–	
09	10:41	10:34	12:11	12:54	00:33	
10	10:26	10:19	12:10	13:38	01:16	

March 11, 12, 13 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	168°26.1	214°25.8	S17°09.9	20°49.1	N17°22.6	26°59.2	N16°14.8	154°27.5	N03°32.2
1	183°28.5	229°25.2	09.3	35°52.3	22.7	42°01.9	14.8	169°29.7	32.3
2	198°31.0	244°24.6	08.6	50°55.5	22.9	57°04.6	14.9	184°31.9	32.5
3	213°33.5	259°24.1	·· 07.9	65°58.6	·· 23.0	72°07.3	·· 15.0	199°34.1	·· 32.6
4	228°35.9	274°23.5	07.2	81°01.8	23.1	87°10.0	15.1	214°36.2	32.7
5	243°38.4	289°22.9	06.5	96°05.0	23.3	102°12.8	15.1	229°38.4	32.8
6	258°40.9	304°22.3	S17°05.8	111°08.1	N17°23.4	117°15.5	N16°15.2	244°40.6	N03°32.9
7	273°43.3	319°21.7	05.1	126°11.3	23.6	132°18.2	15.3	259°42.8	33.1
8	288°45.8	334°21.1	04.5	141°14.4	23.7	147°20.9	15.4	274°45.0	33.2
9	303°48.3	349°20.6	·· 03.8	156°17.6	·· 23.9	162°23.6	·· 15.4	289°47.2	·· 33.3
10	318°50.7	4°20.0	03.1	171°20.8	24.0	177°26.3	15.5	304°49.4	33.4
11	333°53.2	19°19.4	02.4	186°23.9	24.2	192°29.0	15.6	319°51.6	33.5
12	348°55.7	34°18.8	S17°01.7	201°27.1	N17°24.3	207°31.7	N16°15.7	334°53.8	N03°33.6
13	3°58.1	49°18.2	01.0	216°30.2	24.5	222°34.4	15.7	349°56.0	33.8
14	19°00.6	64°17.7	17°00.3	231°33.4	24.6	237°37.1	15.8	4°58.1	33.9
15	34°03.0	79°17.1	16°59.6	246°36.5	·· 24.8	252°39.8	·· 15.9	20°00.3	·· 34.0
16	49°05.5	94°16.5	58.9	261°39.7	24.9	267°42.5	16.0	35°02.5	34.1
17	64°08.0	109°15.9	58.2	276°42.8	25.0	282°45.2	16.0	50°04.7	34.2
18	79°10.4	124°15.3	S16°57.5	291°46.0	N17°25.2	297°47.9	N16°16.1	65°06.9	N03°34.4
19	94°12.9	139°14.8	56.8	306°49.1	25.3	312°50.6	16.2	80°09.1	34.5
20	109°15.4	154°14.2	56.1	321°52.3	25.5	327°53.3	16.2	95°11.3	34.6
21	124°17.8	169°13.6	·· 55.4	336°55.4	·· 25.6	342°56.0	·· 16.3	110°13.5	·· 34.7
22	139°20.3	184°13.0	54.7	351°58.6	25.7	357°58.7	16.4	125°15.7	34.8
23	154°22.8	199°12.5	54.0	7°01.7	25.9	13°01.4	16.5	140°17.9	34.9
Mer.pass. 12:44		ν -0.6′	d 0.7′	m -4.01	ν 3.2′	d 0.2′	m -0.89	ν 2.7′	d 0.1′ m -2.48	ν 2.2′	d 0.1′ m 0.77

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	169°25.2	214°11.9	S16°53.3	22°04.8	N17°26.0	28°04.1	N16°16.5	155°20.0	N03°35.1
1	184°27.7	229°11.3	52.6	37°08.0	26.2	43°06.8	16.6	170°22.2	35.2
2	199°30.1	244°10.7	51.9	52°11.1	26.3	58°09.5	16.7	185°24.4	35.3
3	214°32.6	259°10.1	·· 51.2	67°14.3	·· 26.4	73°12.2	·· 16.8	200°26.6	·· 35.4
4	229°35.1	274°09.6	50.5	82°17.4	26.6	88°14.9	16.8	215°28.8	35.5
5	244°37.5	289°09.0	49.8	97°20.5	26.7	103°17.6	16.9	230°31.0	35.7
6	259°40.0	304°08.4	S16°49.1	112°23.7	N17°26.8	118°20.3	N16°17.0	245°33.2	N03°35.8
7	274°42.5	319°07.8	48.4	127°26.8	27.0	133°23.0	17.0	260°35.4	35.9
8	289°44.9	334°07.3	47.7	142°29.9	27.1	148°25.7	17.1	275°37.6	36.0
9	304°47.4	349°06.7	·· 47.0	157°33.1	·· 27.2	163°28.4	·· 17.2	290°39.7	·· 36.1
10	319°49.9	4°06.1	46.3	172°36.2	27.4	178°31.0	17.3	305°41.9	36.2
11	334°52.3	19°05.5	45.6	187°39.3	27.5	193°33.7	17.3	320°44.1	36.4
12	349°54.8	34°05.0	S16°44.9	202°42.4	N17°27.6	208°36.4	N16°17.4	335°46.3	N03°36.5
13	4°57.3	49°04.4	44.1	217°45.6	27.8	223°39.1	17.5	350°48.5	36.6
14	19°59.7	64°03.8	43.4	232°48.7	27.9	238°41.8	17.5	5°50.7	36.7
15	35°02.2	79°03.3	·· 42.7	247°51.8	·· 28.0	253°44.5	·· 17.6	20°52.9	·· 36.8
16	50°04.6	94°02.7	42.0	262°54.9	28.2	268°47.2	17.7	35°55.1	37.0
17	65°07.1	109°02.1	41.3	277°58.1	28.3	283°49.9	17.8	50°57.3	37.1
18	80°09.6	124°01.5	S16°40.6	293°01.2	N17°28.4	298°52.6	N16°17.8	65°59.4	N03°37.2
19	95°12.0	139°01.0	39.8	308°04.3	28.5	313°55.3	17.9	81°01.6	37.3
20	110°14.5	154°00.4	39.1	323°07.4	28.7	328°58.0	18.0	96°03.8	37.4
21	125°17.0	168°59.8	·· 38.4	338°10.5	·· 28.8	344°00.7	·· 18.0	111°06.0	·· 37.6
22	140°19.4	183°59.3	37.7	353°13.6	28.9	359°03.4	18.1	126°08.2	37.7
23	155°21.9	198°58.7	37.0	8°16.8	29.0	14°06.1	18.2	141°10.4	37.8
Mer.pass. 12:40		ν -0.6′	d 0.7′	m -4.01	ν 3.1′	d 0.1′	m -0.87	ν 2.7′	d 0.1′ m -2.47	ν 2.2′	d 0.1′ m 0.77

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	170°24.4	213°58.1	S16°36.2	23°19.9	N17°29.2	29°08.8	N16°18.2	156°12.6	N03°37.9
1	185°26.8	228°57.6	35.5	38°23.0	29.3	44°11.5	18.3	171°14.8	38.0
2	200°29.3	243°57.0	34.8	53°26.1	29.4	59°14.2	18.4	186°17.0	38.1
3	215°31.8	258°56.4	·· 34.1	68°29.2	·· 29.5	74°16.8	·· 18.5	201°19.1	·· 38.3
4	230°34.2	273°55.8	33.4	83°32.3	29.7	89°19.5	18.5	216°21.3	38.4
5	245°36.7	288°55.3	32.6	98°35.4	29.8	104°22.2	18.6	231°23.5	38.5
6	260°39.1	303°54.7	S16°31.9	113°38.5	N17°29.9	119°24.9	N16°18.7	246°25.7	N03°38.6
7	275°41.6	318°54.1	31.2	128°41.6	30.0	134°27.6	18.7	261°27.9	38.7
8	290°44.1	333°53.6	30.5	143°44.7	30.2	149°30.3	18.8	276°30.1	38.9
9	305°46.5	348°53.0	·· 29.7	158°47.8	·· 30.3	164°33.0	·· 18.9	291°32.3	·· 39.0
10	320°49.0	3°52.4	29.0	173°50.9	30.4	179°35.7	18.9	306°34.5	39.1
11	335°51.5	18°51.9	28.3	188°54.0	30.5	194°38.4	19.0	321°36.6	39.2
12	350°53.9	33°51.3	S16°27.5	203°57.1	N17°30.6	209°41.1	N16°19.1	336°38.8	N03°39.3
13	5°56.4	48°50.8	26.8	219°00.2	30.8	224°43.8	19.2	351°41.0	39.5
14	20°58.9	63°50.2	26.1	234°03.3	30.9	239°46.4	19.2	6°43.2	39.6
15	36°01.3	78°49.6	·· 25.3	249°06.4	·· 31.0	254°49.1	·· 19.3	21°45.4	·· 39.7
16	51°03.8	93°49.1	24.6	264°09.5	31.1	269°51.8	19.4	36°47.6	39.8
17	66°06.2	108°48.5	23.9	279°12.6	31.2	284°54.5	19.4	51°49.8	39.9
18	81°08.7	123°47.9	S16°23.1	294°15.7	N17°31.3	299°57.2	N16°19.5	66°52.0	N03°40.0
19	96°11.2	138°47.4	22.4	309°18.8	31.5	314°59.9	19.6	81°54.1	40.2
20	111°13.6	153°46.8	21.7	324°21.9	31.6	330°02.6	19.6	96°56.3	40.3
21	126°16.1	168°46.2	·· 20.9	339°24.9	·· 31.7	345°05.3	·· 19.7	111°58.5	·· 40.4
22	141°18.6	183°45.7	20.2	354°28.0	31.8	0°08.0	19.8	127°00.7	40.5
23	156°21.0	198°45.1	19.4	9°31.1	31.9	15°10.6	19.8	142°02.9	40.6
Mer.pass. 12:36		ν -0.6′	d 0.7′	m -4.00	ν 3.1′	d 0.1′	m -0.84	ν 2.7′	d 0.1′ m -2.47	ν 2.2′	d 0.1′ m 0.77

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.4
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.3
Achernar	335°19.3	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°21.7	89°23.0
Acamar	315°10.6	-40°11.9
Menkar	314°04.4	4°11.7
Mirfak	308°25.9	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.1	-8°10.4
Capella	280°19.2	46°01.6
Bellatrix	278°20.9	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.5	-52°42.9
Sirius	258°24.5	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.6	-59°36.1
Suhail	222°44.6	-43°32.8
Miaplacidus	221°37.1	-69°49.9
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.0
Gacrux	171°49.1	-57°16.0
Alioth	166°10.9	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.2	49°10.3
Hadar	148°33.0	-60°30.2
Menkent	147°55.2	-36°30.3
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.4	-60°56.8
Kochab	137°19.2	74°02.2
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.1
Antares	112°13.6	-26°29.5
Atria	107°06.1	-69°04.3
Sabik	102°00.7	-15°45.6
Shaula	96°08.0	-37°07.3
Rasalhague	95°56.9	12°32.2
Eltanin	90°41.4	51°28.7
Kaus Aust.	83°30.2	-34°22.2
Vega	80°32.1	38°48.2
Nunki	75°45.7	-26°15.7
Altair	61°58.4	8°56.3
Peacock	53°03.3	-56°38.7
Deneb	49°24.9	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.0

Mar 11 Thu	SHA	Mer.pass
Venus	45°59.7	09:43
Mars	212°23.0	22:32
Jupiter	218°33.2	22:08
Saturn	346°01.4	13:40

Mar 12 Fri	SHA	Mer.pass
Venus	44°46.7	09:44
Mars	212°39.6	22:27
Jupiter	218°38.9	22:04
Saturn	345°54.8	13:37

Mar 13 Sat	SHA	Mer.pass
Venus	43°33.8	09:44
Mars	212°55.5	22:22
Jupiter	218°44.4	21:59
Saturn	345°48.2	13:33

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°27.2	S03°53.3	150°44.6	13.0′	N12°25.3	13.7′	56.8′
1	192°27.4	52.3	165°16.6	12.9′	12°39.0	13.8′	56.8′
2	207°27.6	51.3	179°48.5	12.8′	12°52.8	13.6′	56.8′
3	222°27.7	·· 50.3	194°20.3	12.7′	13°06.4	13.7′	56.9′
4	237°27.9	49.3	208°52.0	12.7′	13°20.1	13.5′	56.9′
5	252°28.0	48.4	223°23.7	12.6′	13°33.6	13.5′	56.9′
6	267°28.2	S03°47.4	237°55.3	12.5′	N13°47.1	13.5′	56.9′
7	282°28.4	46.4	252°26.8	12.4′	14°00.6	13.4′	56.9′
8	297°28.5	45.4	266°58.2	12.3′	14°14.0	13.3′	57.0′
9	312°28.7	·· 44.4	281°29.5	12.3′	14°27.3	13.3′	57.0′
10	327°28.9	43.4	296°00.8	12.2′	14°40.6	13.2′	57.0′
11	342°29.0	42.5	310°32.0	12.1′	14°53.8	13.2′	57.0′
12	357°29.2	S03°41.5	325°03.1	12.0′	N15°07.0	13.1′	57.0′
13	12°29.3	40.5	339°34.1	11.9′	15°20.1	13.0′	57.1′
14	27°29.5	39.5	354°05.0	11.8′	15°33.1	13.0′	57.1′
15	42°29.7	·· 38.5	8°35.8	11.7′	15°46.1	12.9′	57.1′
16	57°29.8	37.6	23°06.6	11.7′	15°59.0	12.8′	57.1′
17	72°30.0	36.6	37°37.2	11.6′	16°11.8	12.8′	57.1′
18	87°30.2	S03°35.6	52°07.8	11.5′	N16°24.6	12.6′	57.2′
19	102°30.3	34.6	66°38.3	11.4′	16°37.2	12.6′	57.2′
20	117°30.5	33.6	81°08.7	11.3′	16°49.8	12.6′	57.2′
21	132°30.6	·· 32.6	95°39.0	11.2′	17°02.4	12.4′	57.2′
22	147°30.8	31.7	110°09.2	11.1′	17°14.8	12.4′	57.2′
23	162°31.0	30.7	124°39.3	11.0′	17°27.2	12.3′	57.3′
	SD = 16.1′	d = 1.0′	SD = 15.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°31.1	S03°29.7	139°09.3	10.9′	N17°39.5	12.2′	57.3′
1	192°31.3	28.7	153°39.3	10.8′	17°51.7	12.1′	57.3′
2	207°31.5	27.7	168°09.1	10.7′	18°03.8	12.1′	57.3′
3	222°31.6	·· 26.7	182°38.8	10.6′	18°15.9	11.9′	57.3′
4	237°31.8	25.8	197°08.5	10.5′	18°27.8	11.9′	57.4′
5	252°32.0	24.8	211°38.0	10.5′	18°39.7	11.8′	57.4′
6	267°32.1	S03°23.8	226°07.5	10.4′	N18°51.5	11.7′	57.4′
7	282°32.3	22.8	240°36.8	10.3′	19°03.2	11.6′	57.4′
8	297°32.5	21.8	255°06.1	10.2′	19°14.8	11.5′	57.4′
9	312°32.6	·· 20.8	269°35.3	10.1′	19°26.3	11.4′	57.5′
10	327°32.8	19.9	284°04.3	10.0′	19°37.7	11.3′	57.5′
11	342°33.0	18.9	298°33.3	9.9′	19°49.0	11.3′	57.5′
12	357°33.1	S03°17.9	313°02.1	9.8′	N20°00.3	11.1′	57.5′
13	12°33.3	16.9	327°30.9	9.7′	20°11.4	11.0′	57.5′
14	27°33.5	15.9	341°59.6	9.6′	20°22.4	10.9′	57.6′
15	42°33.6	·· 14.9	356°28.1	9.5′	20°33.3	10.8′	57.6′
16	57°33.8	13.9	10°56.6	9.4′	20°44.1	10.7′	57.6′
17	72°34.0	13.0	25°24.9	9.3′	20°54.8	10.6′	57.6′
18	87°34.1	S03°12.0	39°53.2	9.2′	N21°05.4	10.5′	57.6′
19	102°34.3	11.0	54°21.3	9.0′	21°15.9	10.4′	57.7′
20	117°34.5	10.0	68°49.4	8.9′	21°26.3	10.3′	57.7′
21	132°34.6	·· 09.0	83°17.3	8.8′	21°36.6	10.1′	57.7′
22	147°34.8	08.0	97°45.2	8.7′	21°46.7	10.1′	57.7′
23	162°35.0	07.1	112°12.9	8.6′	21°56.8	9.9′	57.7′
	SD = 16.1′	d = 1.0′	SD = 15.6′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°35.1	S03°06.1	126°40.5	8.5′	N22°06.7	9.8′	57.8′
1	192°35.3	05.1	141°08.1	8.4′	22°16.5	9.7′	57.8′
2	207°35.5	04.1	155°35.5	8.3′	22°26.2	9.6′	57.8′
3	222°35.6	·· 03.1	170°02.8	8.2′	22°35.8	9.4′	57.8′
4	237°35.8	02.1	184°30.1	8.1′	22°45.2	9.4′	57.8′
5	252°36.0	01.1	198°57.2	8.0′	22°54.6	9.2′	57.9′
6	267°36.1	S03°00.2	213°24.2	7.9′	N23°03.8	9.0′	57.9′
7	282°36.3	02°59.2	227°51.2	7.8′	23°12.8	9.0′	57.9′
8	297°36.5	58.2	242°18.0	7.7′	23°21.8	8.8′	57.9′
9	312°36.6	·· 57.2	256°44.7	7.6′	23°30.6	8.7′	57.9′
10	327°36.8	56.2	271°11.3	7.5′	23°39.3	8.5′	57.9′
11	342°37.0	55.2	285°37.8	7.4′	23°47.8	8.5′	58.0′
12	357°37.2	S02°54.2	300°04.3	7.3′	N23°56.3	8.2′	58.0′
13	12°37.3	53.3	314°30.6	7.2′	24°04.5	8.2′	58.0′
14	27°37.5	52.3	328°56.8	7.1′	24°12.7	8.0′	58.0′
15	42°37.7	·· 51.3	343°22.9	7.0′	24°20.7	7.9′	58.0′
16	57°37.8	50.3	357°48.9	6.9′	24°28.6	7.7′	58.1′
17	72°38.0	49.3	12°14.9	6.8′	24°36.3	7.6′	58.1′
18	87°38.2	S02°48.3	26°40.7	6.7′	N24°43.9	7.4′	58.1′
19	102°38.3	47.3	41°06.4	6.6′	24°51.3	7.3′	58.1′
20	117°38.5	46.4	55°32.1	6.5′	24°58.6	7.1′	58.1′
21	132°38.7	·· 45.4	69°57.6	6.5′	25°05.7	7.0′	58.2′
22	147°38.8	44.4	84°23.1	6.4′	25°12.7	6.9′	58.2′
23	162°39.0	43.4	98°48.4	6.3′	25°19.6	6.7′	58.2′
	SD = 16.1′	d = 1.0′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:13	05:34	06:41	17:41	18:48	20:11
N 70°	04:24	05:37	06:37	17:44	18:45	19:58
68°	04:34	05:39	06:35	17:47	18:42	19:49
66°	04:41	05:41	06:32	17:49	18:40	19:41
64°	04:47	05:43	06:30	17:51	18:38	19:34
62°	04:52	05:44	06:28	17:53	18:37	19:29
60°	04:57	05:45	06:27	17:54	18:36	19:24
N 58°	05:01	05:46	06:25	17:55	18:35	19:21
56°	05:04	05:47	06:24	17:57	18:34	19:17
54°	05:07	05:48	06:23	17:58	18:33	19:14
52°	05:09	05:48	06:22	17:59	18:32	19:12
50°	05:11	05:49	06:21	18:00	18:32	19:09
45°	05:16	05:50	06:19	18:02	18:31	19:05
N 40°	05:19	05:50	06:17	18:03	18:30	19:02
35°	05:21	05:50	06:15	18:05	18:30	18:59
30°	05:22	05:50	06:14	18:06	18:30	18:58
20°	05:24	05:49	06:11	18:09	18:31	18:56
N 10°	05:23	05:48	06:09	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:13	18:34	18:58
S 10°	05:19	05:43	06:04	18:15	18:36	19:01
20°	05:14	05:39	06:01	18:18	18:40	19:06
30°	05:06	05:34	05:58	18:21	18:45	19:13
35°	05:01	05:31	05:56	18:23	18:48	19:18
40°	04:55	05:27	05:54	18:25	18:52	19:24
45°	04:47	05:22	05:52	18:27	18:57	19:32
S 50°	04:37	05:16	05:48	18:30	19:03	19:42
52°	04:32	05:13	05:47	18:32	19:06	19:46
54°	04:26	05:10	05:45	18:33	19:09	19:52
56°	04:20	05:06	05:44	18:35	19:12	19:58
58°	04:13	05:02	05:42	18:36	19:16	20:05
S 60°	04:04	04:57	05:40	18:39	19:21	20:13

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	04:57	▭	▭	▭	▭	▭
N 70°	05:22	04:27	▭	·· ··	00:50	▭
68°	05:41	05:09	▭	·· ··	00:10	▭
66°	05:56	05:38	05:02	23:43	·· ··	02:07
64°	06:09	05:59	05:46	23:22	·· ··	01:24
62°	06:20	06:17	06:16	23:05	·· ··	00:55
60°	06:29	06:32	06:38	22:52	·· ··	00:33
N 58°	06:37	06:44	06:57	22:40	·· ··	00:15
56°	06:44	06:55	07:12	22:30	·· ··	00:00
54°	06:51	07:05	07:26	22:21	23:47	·· ··
52°	06:57	07:14	07:37	22:13	23:36	·· ··
50°	07:02	07:22	07:48	22:06	23:26	·· ··
45°	07:13	07:38	08:10	21:50	23:06	·· ··
N 40°	07:23	07:52	08:27	21:38	22:49	·· ··
35°	07:31	08:04	08:42	21:28	22:35	23:43
30°	07:39	08:14	08:55	21:18	22:23	23:29
20°	07:51	08:32	09:18	21:03	22:02	23:04
N 10°	08:02	08:48	09:37	20:49	21:44	22:43
0°	08:13	09:02	09:56	20:36	21:27	22:23
S 10°	08:24	09:17	10:14	20:23	21:11	22:03
20°	08:35	09:33	10:34	20:10	20:53	21:42
30°	08:48	09:52	10:57	19:54	20:33	21:17
35°	08:56	10:02	11:11	19:46	20:21	21:03
40°	09:05	10:15	11:26	19:35	20:07	20:46
45°	09:15	10:30	11:45	19:24	19:51	20:27
S 50°	09:28	10:48	12:09	19:09	19:32	20:02
52°	09:34	10:56	12:21	19:03	19:22	19:50
54°	09:40	11:06	12:34	18:55	19:12	19:37
56°	09:48	11:17	12:49	18:47	19:00	19:21
58°	09:56	11:30	13:07	18:38	18:47	19:03
S 60°	10:05	11:45	13:29	18:28	18:31	18:40

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 7-22%
11	10:11	10:03	12:10	14:24	02:01	
12	09:55	09:47	12:10	15:15	02:49	
13	09:39	09:31	12:10	16:09	03:41	

March 14, 15, 16 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	171°23.5	213°44.6	S16°18.7	24°34.2	N17°32.0	30°13.3	N16°19.9	157°05.1	N03°40.8
1	186°26.0	228°44.0	18.0	39°37.3	32.1	45°16.0	20.0	172°07.3	40.9
2	201°28.4	243°43.4	17.2	54°40.4	32.3	60°18.7	20.0	187°09.5	41.0
3	216°30.9	258°42.9	·· 16.5	69°43.4	·· 32.4	75°21.4	·· 20.1	202°11.6	·· 41.1
4	231°33.4	273°42.3	15.7	84°46.5	32.5	90°24.1	20.2	217°13.8	41.2
5	246°35.8	288°41.8	15.0	99°49.6	32.6	105°26.8	20.2	232°16.0	41.4
6	261°38.3	303°41.2	S16°14.2	114°52.7	N17°32.7	120°29.4	N16°20.3	247°18.2	N03°41.5
7	276°40.7	318°40.6	13.5	129°55.7	32.8	135°32.1	20.4	262°20.4	41.6
8	291°43.2	333°40.1	12.7	144°58.8	32.9	150°34.8	20.4	277°22.6	41.7
9	306°45.7	348°39.5	·· 12.0	160°01.9	·· 33.0	165°37.5	·· 20.5	292°24.8	·· 41.8
10	321°48.1	3°39.0	11.2	175°05.0	33.1	180°40.2	20.6	307°26.9	41.9
11	336°50.6	18°38.4	10.5	190°08.0	33.2	195°42.9	20.6	322°29.1	42.1
12	351°53.1	33°37.9	S16°09.7	205°11.1	N17°33.3	210°45.5	N16°20.7	337°31.3	N03°42.2
13	6°55.5	48°37.3	09.0	220°14.2	33.4	225°48.2	20.8	352°33.5	42.3
14	21°58.0	63°36.7	08.2	235°17.2	33.6	240°50.9	20.8	7°35.7	42.4
15	37°00.5	78°36.2	·· 07.5	250°20.3	·· 33.7	255°53.6	·· 20.9	22°37.9	·· 42.5
16	52°02.9	93°35.6	06.7	265°23.4	33.8	270°56.3	21.0	37°40.1	42.7
17	67°05.4	108°35.1	06.0	280°26.4	33.9	285°59.0	21.0	52°42.2	42.8
18	82°07.9	123°34.5	S16°05.2	295°29.5	N17°34.0	301°01.6	N16°21.1	67°44.4	N03°42.9
19	97°10.3	138°34.0	04.5	310°32.5	34.1	316°04.3	21.2	82°46.6	43.0
20	112°12.8	153°33.4	03.7	325°35.6	34.2	331°07.0	21.2	97°48.8	43.1
21	127°15.2	168°32.9	·· 03.0	340°38.7	·· 34.3	346°09.7	·· 21.3	112°51.0	·· 43.3
22	142°17.7	183°32.3	02.2	355°41.7	34.4	1°12.4	21.4	127°53.2	43.4
23	157°20.2	198°31.7	01.4	10°44.8	34.5	16°15.0	21.4	142°55.4	43.5
Mer.pass. 12:32		ν -0.6′	d 0.7′	ν 3.1′	d 0.1′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -4.00		m -0.82		m -2.46		m 0.76	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	172°22.6	213°31.2	S16°00.7	25°47.8	N17°34.6	31°17.7	N16°21.5	157°57.6	N03°43.6
1	187°25.1	228°30.6	15°59.9	40°50.9	34.7	46°20.4	21.6	172°59.7	43.7
2	202°27.6	243°30.1	59.2	55°53.9	34.8	61°23.1	21.6	188°01.9	43.9
3	217°30.0	258°29.5	·· 58.4	70°57.0	·· 34.9	76°25.8	·· 21.7	203°04.1	·· 44.0
4	232°32.5	273°29.0	57.6	86°00.0	35.0	91°28.4	21.8	218°06.3	44.1
5	247°35.0	288°28.4	56.9	101°03.1	35.1	106°31.1	21.8	233°08.5	44.2
6	262°37.4	303°27.9	S15°56.1	116°06.1	N17°35.2	121°33.8	N16°21.9	248°10.7	N03°44.3
7	277°39.9	318°27.3	55.3	131°09.2	35.3	136°36.5	22.0	263°12.9	44.5
8	292°42.4	333°26.8	54.6	146°12.2	35.4	151°39.2	22.0	278°15.0	44.6
9	307°44.8	348°26.2	·· 53.8	161°15.2	·· 35.5	166°41.8	·· 22.1	293°17.2	·· 44.7
10	322°47.3	3°25.7	53.0	176°18.3	35.6	181°44.5	22.2	308°19.4	44.8
11	337°49.7	18°25.1	52.3	191°21.3	35.7	196°47.2	22.2	323°21.6	44.9
12	352°52.2	33°24.6	S15°51.5	206°24.4	N17°35.7	211°49.9	N16°22.3	338°23.8	N03°45.0
13	7°54.7	48°24.0	50.7	221°27.4	35.8	226°52.6	22.4	353°26.0	45.2
14	22°57.1	63°23.5	50.0	236°30.4	35.9	241°55.2	22.4	8°28.1	45.3
15	37°59.6	78°22.9	·· 49.2	251°33.5	·· 36.0	256°57.9	·· 22.5	23°30.3	·· 45.4
16	53°02.1	93°22.4	48.4	266°36.5	36.1	272°00.6	22.6	38°32.5	45.5
17	68°04.5	108°21.8	47.6	281°39.5	36.2	287°03.3	22.6	53°34.7	45.6
18	83°07.0	123°21.3	S15°46.9	296°42.6	N17°36.3	302°05.9	N16°22.7	68°36.9	N03°45.8
19	98°09.5	138°20.8	46.1	311°45.6	36.4	317°08.6	22.7	83°39.1	45.9
20	113°11.9	153°20.2	45.3	326°48.6	36.5	332°11.3	22.8	98°41.3	46.0
21	128°14.4	168°19.7	·· 44.5	341°51.7	·· 36.6	347°14.0	·· 22.9	113°43.4	·· 46.1
22	143°16.8	183°19.1	43.8	356°54.7	36.7	2°16.6	22.9	128°45.6	46.2
23	158°19.3	198°18.6	43.0	11°57.7	36.7	17°19.3	23.0	143°47.8	46.4
Mer.pass. 12:28		ν -0.6′	d 0.8′	ν 3.1′	d 0.1′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -3.99		m -0.79		m -2.45		m 0.76	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	173°21.8	213°18.0	S15°42.2	27°00.7	N17°36.8	32°22.0	N16°23.1	158°50.0	N03°46.5
1	188°24.2	228°17.5	41.4	42°03.7	36.9	47°24.7	23.1	173°52.2	46.6
2	203°26.7	243°16.9	40.7	57°06.8	37.0	62°27.3	23.2	188°54.4	46.7
3	218°29.2	258°16.4	·· 39.9	72°09.8	·· 37.1	77°30.0	·· 23.3	203°56.6	·· 46.8
4	233°31.6	273°15.8	39.1	87°12.8	37.2	92°32.7	23.3	218°58.7	47.0
5	248°34.1	288°15.3	38.3	102°15.8	37.3	107°35.3	23.4	234°00.9	47.1
6	263°36.6	303°14.8	S15°37.5	117°18.8	N17°37.3	122°38.0	N16°23.4	249°03.1	N03°47.2
7	278°39.0	318°14.2	36.7	132°21.8	37.4	137°40.7	23.5	264°05.3	47.3
8	293°41.5	333°13.7	36.0	147°24.9	37.5	152°43.4	23.6	279°07.5	47.4
9	308°44.0	348°13.1	·· 35.2	162°27.9	·· 37.6	167°46.0	·· 23.6	294°09.7	·· 47.6
10	323°46.4	3°12.6	34.4	177°30.9	37.7	182°48.7	23.7	309°11.8	47.7
11	338°48.9	18°12.1	33.6	192°33.9	37.8	197°51.4	23.8	324°14.0	47.8
12	353°51.3	33°11.5	S15°32.8	207°36.9	N17°37.8	212°54.0	N16°23.8	339°16.2	N03°47.9
13	8°53.8	48°11.0	32.0	222°39.9	37.9	227°56.7	23.9	354°18.4	48.0
14	23°56.3	63°10.4	31.2	237°42.9	38.0	242°59.4	23.9	9°20.6	48.2
15	38°58.7	78°09.9	·· 30.4	252°45.9	·· 38.1	258°02.1	·· 24.0	24°22.8	·· 48.3
16	54°01.2	93°09.4	29.7	267°48.9	38.2	273°04.7	24.1	39°24.9	48.4
17	69°03.7	108°08.8	28.9	282°51.9	38.2	288°07.4	24.1	54°27.1	48.5
18	84°06.1	123°08.3	S15°28.1	297°54.9	N17°38.3	303°10.1	N16°24.2	69°29.3	N03°48.6
19	99°08.6	138°07.7	27.3	312°57.9	38.4	318°12.7	24.3	84°31.5	48.8
20	114°11.1	153°07.2	26.5	328°00.9	38.5	333°15.4	24.3	99°33.7	48.9
21	129°13.5	168°06.7	·· 25.7	343°03.9	·· 38.6	348°18.1	·· 24.4	114°35.9	·· 49.0
22	144°16.0	183°06.1	24.9	358°06.9	38.6	3°20.7	24.4	129°38.1	49.1
23	159°18.5	198°05.6	24.1	13°09.9	38.7	18°23.4	24.5	144°40.2	49.2
Mer.pass. 12:25		ν -0.5′	d 0.8′	ν 3.0′	d 0.1′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -3.99		m -0.77		m -2.45		m 0.76	

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.4
Ankaa	353°05.8	-42°09.6
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.1
Hamal	327°49.4	23°35.5
Polaris	313°22.6	89°23.0
Acamar	315°10.7	-40°11.9
Menkar	314°04.4	4°11.7
Mirfak	308°25.9	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.2	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.5	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.6	-59°36.1
Suhail	222°44.6	-43°32.8
Miaplacidus	221°37.2	-69°50.0
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.1
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.1
Gacrux	171°49.1	-57°16.0
Alioth	166°10.9	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.2	49°10.3
Hadar	148°32.9	-60°30.2
Menkent	147°55.2	-36°30.3
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.3	-60°56.8
Kochab	137°19.1	74°02.2
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.5	-26°29.5
Atria	107°06.0	-69°04.3
Sabik	102°00.7	-15°45.6
Shaula	96°07.9	-37°07.3
Rasalhague	95°56.9	12°32.2
Eltanin	90°41.4	51°28.7
Kaus Aust.	83°30.2	-34°22.2
Vega	80°32.1	38°48.2
Nunki	75°45.7	-26°15.7
Altair	61°58.4	8°56.3
Peacock	53°03.3	-56°38.7
Deneb	49°24.9	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.0

Mar 14 Sun	**SHA**	**Mer.pass**
Venus	42°21.1	09:45
Mars	213°10.7	22:17
Jupiter	218°49.8	21:55
Saturn	345°41.6	13:30

Mar 15 Mon	**SHA**	**Mer.pass**
Venus	41°08.6	09:46
Mars	213°25.2	22:12
Jupiter	218°55.1	21:51
Saturn	345°34.9	13:26

Mar 16 Tue	**SHA**	**Mer.pass**
Venus	39°56.2	09:47
Mars	213°38.9	22:08
Jupiter	219°00.2	21:47
Saturn	345°28.2	13:23

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°39.2	S02°42.4	113°13.7	6.2′	N25°26.3	6.5′	58.2′
1	192°39.4	41.4	127°38.9	6.1′	25°32.8	6.4′	58.2′
2	207°39.5	40.4	142°04.0	6.0′	25°39.2	6.2′	58.3′
3	222°39.7	·· 39.5	156°29.0	5.9′	25°45.4	6.1′	58.3′
4	237°39.9	38.5	170°53.9	5.8′	25°51.5	5.9′	58.3′
5	252°40.0	37.5	185°18.7	5.7′	25°57.4	5.8′	58.3′
6	267°40.2	S02°36.5	199°43.5	5.7′	N26°03.2	5.6′	58.3′
7	282°40.4	35.5	214°08.1	5.6′	26°08.8	5.4′	58.3′
8	297°40.6	34.5	228°32.7	5.5′	26°14.2	5.3′	58.4′
9	312°40.7	·· 33.5	242°57.2	5.4′	26°19.5	5.1′	58.4′
10	327°40.9	32.6	257°21.6	5.3′	26°24.6	5.0′	58.4′
11	342°41.1	31.6	271°46.0	5.3′	26°29.6	4.7′	58.4′
12	357°41.2	S02°30.6	286°10.2	5.2′	N26°34.3	4.7′	58.4′
13	12°41.4	29.6	300°34.4	5.1′	26°39.0	4.4′	58.5′
14	27°41.6	28.6	314°58.5	5.0′	26°43.4	4.3′	58.5′
15	42°41.8	·· 27.6	329°22.6	5.0′	26°47.7	4.1′	58.5′
16	57°41.9	26.6	343°46.6	4.9′	26°51.8	3.9′	58.5′
17	72°42.1	25.6	358°10.5	4.8′	26°55.7	3.8′	58.5′
18	87°42.3	S02°24.7	12°34.3	4.8′	N26°59.5	3.6′	58.5′
19	102°42.5	23.7	26°58.1	4.7′	27°03.1	3.4′	58.6′
20	117°42.6	22.7	41°21.8	4.7′	27°06.5	3.2′	58.6′
21	132°42.8	·· 21.7	55°45.4	4.6′	27°09.7	3.1′	58.6′
22	147°43.0	20.7	70°09.0	4.5′	27°12.8	2.8′	58.6′
23	162°43.1	19.7	84°32.6	4.5′	27°15.6	2.7′	58.6′
	SD = 16.1′	d = 1.0′	SD = 15.9′				

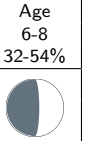
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°43.3	S02°18.7	98°56.0	4.4′	N27°18.3	2.6′	58.7′
1	192°43.5	17.8	113°19.5	4.4′	27°20.9	2.3′	58.7′
2	207°43.7	16.8	127°42.8	4.3′	27°23.2	2.2′	58.7′
3	222°43.8	·· 15.8	142°06.2	4.3′	27°25.4	2.0′	58.7′
4	237°44.0	14.8	156°29.4	4.2′	27°27.4	1.8′	58.7′
5	252°44.2	13.8	170°52.7	4.2′	27°29.2	1.6′	58.7′
6	267°44.4	S02°12.8	185°15.9	4.1′	N27°30.8	1.4′	58.8′
7	282°44.5	11.8	199°39.0	4.1′	27°32.2	1.3′	58.8′
8	297°44.7	10.8	214°02.1	4.1′	27°33.5	1.0′	58.8′
9	312°44.9	·· 09.9	228°25.2	4.0′	27°34.5	0.9′	58.8′
10	327°45.1	08.9	242°48.2	4.0′	27°35.4	0.7′	58.8′
11	342°45.2	07.9	257°11.3	4.0′	27°36.1	0.5′	58.8′
12	357°45.4	S02°06.9	271°34.2	4.0′	N27°36.6	0.3′	58.9′
13	12°45.6	05.9	285°57.2	3.9′	27°36.9	0.2′	58.9′
14	27°45.8	04.9	300°20.1	3.9′	27°37.1	0.1′	58.9′
15	42°45.9	·· 03.9	314°43.0	3.9′	27°37.0	0.2′	58.9′
16	57°46.1	02.9	329°05.9	3.9′	27°36.8	0.4′	58.9′
17	72°46.3	02.0	343°28.8	3.8′	27°36.4	0.6′	58.9′
18	87°46.5	S02°01.0	357°51.6	3.8′	N27°35.8	0.8′	59.0′
19	102°46.6	02°00.0	12°14.4	3.8′	27°35.0	1.0′	59.0′
20	117°46.8	01°59.0	26°37.3	3.8′	27°34.0	1.2′	59.0′
21	132°47.0	·· 58.0	41°00.1	3.8′	27°32.8	1.4′	59.0′
22	147°47.2	57.0	55°22.9	3.8′	27°31.4	1.5′	59.0′
23	162°47.3	56.0	69°45.7	3.8′	27°29.9	1.8′	59.0′
	SD = 16.1′	d = 1.0′	SD = 16.0′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°47.5	S01°55.0	84°08.5	3.8′	N27°28.1	1.9′	59.1′
1	192°47.7	54.1	98°31.3	3.8′	27°26.2	2.1′	59.1′
2	207°47.9	53.1	112°54.1	3.8′	27°24.1	2.3′	59.1′
3	222°48.0	·· 52.1	127°16.9	3.8′	27°21.8	2.5′	59.1′
4	237°48.2	51.1	141°39.7	3.8′	27°19.3	2.7′	59.1′
5	252°48.4	50.1	156°02.6	3.8′	27°16.6	2.8′	59.1′
6	267°48.6	S01°49.1	170°25.4	3.9′	N27°13.8	3.1′	59.2′
7	282°48.8	48.1	184°48.3	3.9′	27°10.7	3.2′	59.2′
8	297°48.9	47.1	199°11.1	3.9′	27°07.5	3.5′	59.2′
9	312°49.1	·· 46.1	213°34.0	3.9′	27°04.0	3.6′	59.2′
10	327°49.3	45.2	227°56.9	3.9′	27°00.4	3.8′	59.2′
11	342°49.5	44.2	242°19.9	4.0′	26°56.6	4.0′	59.2′
12	357°49.6	S01°43.2	256°42.8	4.0′	N26°52.6	4.1′	59.2′
13	12°49.8	42.2	271°05.8	4.0′	26°48.5	4.4′	59.3′
14	27°50.0	41.2	285°28.8	4.0′	26°44.1	4.5′	59.3′
15	42°50.2	·· 40.2	299°51.9	4.1′	26°39.6	4.8′	59.3′
16	57°50.3	39.2	314°15.0	4.1′	26°34.8	4.9′	59.3′
17	72°50.5	38.2	328°38.1	4.2′	26°29.9	5.1′	59.3′
18	87°50.7	S01°37.3	343°01.2	4.2′	N26°24.8	5.2′	59.3′
19	102°50.9	36.3	357°24.4	4.2′	26°19.6	5.5′	59.3′
20	117°51.1	35.3	11°47.7	4.3′	26°14.1	5.6′	59.3′
21	132°51.2	·· 34.3	26°10.9	4.3′	26°08.5	5.8′	59.4′
22	147°51.4	33.3	40°34.3	4.4′	26°02.7	6.0′	59.4′
23	162°51.6	32.3	54°57.6	4.4′	25°56.7	6.2′	59.4′
	SD = 16.1′	d = 1.0′	SD = 16.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:55	05:18	06:25	17:55	19:02	20:27
N 70°	04:09	05:23	06:24	17:56	18:57	20:12
68°	04:20	05:27	06:22	17:58	18:53	20:01
66°	04:29	05:30	06:21	17:59	18:50	19:52
64°	04:36	05:32	06:20	18:00	18:47	19:44
62°	04:42	05:35	06:19	18:01	18:45	19:38
60°	04:47	05:36	06:18	18:02	18:43	19:32
N 58°	04:52	05:38	06:17	18:02	18:41	19:28
56°	04:56	05:39	06:16	18:03	18:40	19:24
54°	04:59	05:40	06:16	18:03	18:39	19:20
52°	05:02	05:41	06:15	18:04	18:38	19:17
50°	05:05	05:42	06:14	18:04	18:37	19:14
45°	05:10	05:44	06:13	18:06	18:35	19:09
N 40°	05:14	05:45	06:12	18:06	18:33	19:05
35°	05:17	05:46	06:11	18:07	18:33	19:02
30°	05:19	05:46	06:10	18:08	18:32	19:00
20°	05:21	05:47	06:09	18:10	18:32	18:57
N 10°	05:22	05:46	06:07	18:11	18:32	18:56
0°	05:21	05:45	06:06	18:12	18:33	18:57
S 10°	05:19	05:43	06:04	18:14	18:35	18:59
20°	05:15	05:40	06:02	18:15	18:37	19:03
30°	05:08	05:36	06:00	18:17	18:41	19:09
35°	05:04	05:33	05:59	18:19	18:44	19:14
40°	04:58	05:30	05:57	18:20	18:47	19:19
45°	04:51	05:26	05:55	18:22	18:51	19:26
S 50°	04:42	05:21	05:53	18:24	18:56	19:35
52°	04:38	05:18	05:52	18:25	18:58	19:39
54°	04:33	05:16	05:51	18:26	19:01	19:44
56°	04:27	05:12	05:50	18:27	19:04	19:49
58°	04:21	05:09	05:49	18:28	19:08	19:55
S 60°	04:13	05:05	05:47	18:29	19:11	20:03

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	05:07	▭	▭	04:00	▭	▭
62°	06:17	06:33	07:50	02:51	04:41	05:34
60°	06:53	07:27	08:38	02:16	03:47	04:46
N 58°	07:19	08:00	09:09	01:50	03:15	04:15
56°	07:39	08:24	09:32	01:30	02:50	03:51
54°	07:56	08:43	09:51	01:13	02:31	03:32
52°	08:11	09:00	10:07	00:59	02:15	03:16
50°	08:24	09:14	10:21	00:46	02:00	03:02
45°	08:50	09:43	10:49	00:21	01:32	02:33
N 40°	09:11	10:06	11:11	00:00	01:09	02:11
35°	09:29	10:25	11:30	·· ··	00:50	01:52
30°	09:44	10:41	11:45	·· ··	00:34	01:36
20°	10:10	11:08	12:12	·· ··	00:07	01:09
N 10°	10:32	11:32	12:35	23:44	·· ··	00:46
0°	10:53	11:54	12:56	23:22	·· ··	00:24
S 10°	11:14	12:16	13:17	23:00	·· ··	00:02
20°	11:37	12:40	13:40	22:37	23:38	·· ··
30°	12:03	13:08	14:07	22:10	23:11	·· ··
35°	12:19	13:24	14:22	21:54	22:54	·· ··
40°	12:37	13:43	14:40	21:35	22:35	23:45
45°	12:59	14:06	15:02	21:13	22:12	23:24
S 50°	13:27	14:36	15:30	20:44	21:43	22:57
52°	13:41	14:50	15:43	20:30	21:28	22:44
54°	13:57	15:07	15:59	20:14	21:11	22:29
56°	14:16	15:28	16:17	19:55	20:51	22:11
58°	14:39	15:53	16:39	19:32	20:26	21:49
S 60°	15:10	16:28	17:07	19:01	19:51	21:21

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 32-54%
14	09:23	09:15	12:09	17:08	04:38	
15	09:07	08:58	12:09	18:09	05:38	
16	08:50	08:41	12:09	19:11	06:40	



March 17, 18, 19 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	174°20.9	213°05.1	S15°23.3	28°12.9	N17°38.8	33°26.1	N16°24.6	159°42.4	N03°49.3
1	189°23.4	228°04.5	22.5	43°15.9	38.9	48°28.7	24.6	174°44.6	49.5
2	204°25.8	243°04.0	21.7	58°18.9	38.9	63°31.4	24.7	189°46.8	49.6
3	219°28.3	258°03.4	·· 20.9	73°21.9	·· 39.0	78°34.1	·· 24.7	204°49.0	·· 49.7
4	234°30.8	273°02.9	20.1	88°24.8	39.1	93°36.7	24.8	219°51.2	49.8
5	249°33.2	288°02.4	19.3	103°27.8	39.2	108°39.4	24.9	234°53.3	49.9
6	264°35.7	303°01.8	S15°18.5	118°30.8	N17°39.2	123°42.1	N16°24.9	249°55.5	N03°50.1
7	279°38.2	318°01.3	17.7	133°33.8	39.3	138°44.7	25.0	264°57.7	50.2
8	294°40.6	333°00.8	16.9	148°36.8	39.4	153°47.4	25.1	279°59.9	50.3
9	309°43.1	348°00.2	·· 16.1	163°39.8	·· 39.4	168°50.1	·· 25.1	295°02.1	·· 50.4
10	324°45.6	2°59.7	15.3	178°42.7	39.5	183°52.7	25.2	310°04.3	50.5
11	339°48.0	17°59.2	14.5	193°45.7	39.6	198°55.4	25.2	325°06.4	50.7
12	354°50.5	32°58.6	S15°13.7	208°48.7	N17°39.6	213°58.1	N16°25.3	340°08.6	N03°50.8
13	9°53.0	47°58.1	12.9	223°51.7	39.7	229°00.7	25.4	355°10.8	50.9
14	24°55.4	62°57.6	12.1	238°54.6	39.8	244°03.4	25.4	10°13.0	51.0
15	39°57.9	77°57.0	·· 11.3	253°57.6	·· 39.9	259°06.1	·· 25.5	25°15.2	·· 51.1
16	55°00.3	92°56.5	10.5	269°00.6	39.9	274°08.7	25.5	40°17.4	51.3
17	70°02.8	107°56.0	09.6	284°03.5	40.0	289°11.4	25.6	55°19.5	51.4
18	85°05.3	122°55.5	S15°08.8	299°06.5	N17°40.1	304°14.0	N16°25.7	70°21.7	N03°51.5
19	100°07.7	137°54.9	08.0	314°09.5	40.1	319°16.7	25.7	85°23.9	51.6
20	115°10.2	152°54.4	07.2	329°12.4	40.2	334°19.4	25.8	100°26.1	51.7
21	130°12.7	167°53.9	·· 06.4	344°15.4	·· 40.2	349°22.0	·· 25.8	115°28.3	·· 51.9
22	145°15.1	182°53.3	05.6	359°18.4	40.3	4°24.7	25.9	130°30.5	52.0
23	160°17.6	197°52.8	04.8	14°21.3	40.4	19°27.4	25.9	145°32.6	52.1
Mer.pass. 12:21		ν -0.5′	d 0.8′	ν 3.0′	d 0.1′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -3.98		m -0.74		m -2.44		m 0.76	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	175°20.1	212°52.3	S15°04.0	29°24.3	N17°40.4	34°30.0	N16°26.0	160°34.8	N03°52.2
1	190°22.5	227°51.8	03.1	44°27.3	40.5	49°32.7	26.1	175°37.0	52.3
2	205°25.0	242°51.2	02.3	59°30.2	40.6	64°35.3	26.1	190°39.2	52.5
3	220°27.5	257°50.7	·· 01.5	74°33.2	·· 40.6	79°38.0	·· 26.2	205°41.4	·· 52.6
4	235°29.9	272°50.2	15°00.7	89°36.1	40.7	94°40.7	26.2	220°43.5	52.7
5	250°32.4	287°49.6	14°59.9	104°39.1	40.7	109°43.3	26.3	235°45.7	52.8
6	265°34.8	302°49.1	S14°59.1	119°42.0	N17°40.8	124°46.0	N16°26.4	250°47.9	N03°52.9
7	280°37.3	317°48.6	58.2	134°45.0	40.9	139°48.6	26.4	265°50.1	53.1
8	295°39.8	332°48.1	57.4	149°47.9	40.9	154°51.3	26.5	280°52.3	53.2
9	310°42.2	347°47.5	·· 56.6	164°50.9	·· 41.0	169°54.0	·· 26.5	295°54.5	·· 53.3
10	325°44.7	2°47.0	55.8	179°53.8	41.0	184°56.6	26.6	310°56.6	53.4
11	340°47.2	17°46.5	54.9	194°56.8	41.1	199°59.3	26.7	325°58.8	53.5
12	355°49.6	32°46.0	S14°54.1	209°59.7	N17°41.2	215°01.9	N16°26.7	341°01.0	N03°53.7
13	10°52.1	47°45.4	53.3	225°02.7	41.2	230°04.6	26.8	356°03.2	53.8
14	25°54.6	62°44.9	52.5	240°05.6	41.3	245°07.2	26.8	11°05.4	53.9
15	40°57.0	77°44.4	·· 51.7	255°08.5	·· 41.3	260°09.9	·· 26.9	26°07.6	·· 54.0
16	55°59.5	92°43.9	50.8	270°11.5	41.4	275°12.6	26.9	41°09.7	54.1
17	71°01.9	107°43.4	50.0	285°14.4	41.4	290°15.2	27.0	56°11.9	54.3
18	86°04.4	122°42.8	S14°49.2	300°17.4	N17°41.5	305°17.9	N16°27.1	71°14.1	N03°54.4
19	101°06.9	137°42.3	48.3	315°20.3	41.5	320°20.5	27.1	86°16.3	54.5
20	116°09.3	152°41.8	47.5	330°23.2	41.6	335°23.2	27.2	101°18.5	54.6
21	131°11.8	167°41.3	·· 46.7	345°26.2	·· 41.6	350°25.8	·· 27.2	116°20.6	·· 54.7
22	146°14.3	182°40.7	45.9	0°29.1	41.7	5°28.5	27.3	131°22.8	54.9
23	161°16.7	197°40.2	45.0	15°32.0	41.8	20°31.1	27.3	146°25.0	55.0
Mer.pass. 12:17		ν -0.5′	d 0.8′	ν 3.0′	d 0.1′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -3.98		m -0.72		m -2.44		m 0.75	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°19.2	212°39.7	S14°44.2	30°35.0	N17°41.8	35°33.8	N16°27.4	161°27.2	N03°55.1
1	191°21.7	227°39.2	43.4	45°37.9	41.9	50°36.5	27.5	176°29.4	55.2
2	206°24.1	242°38.7	42.5	60°40.8	41.9	65°39.1	27.5	191°31.6	55.3
3	221°26.6	257°38.2	·· 41.7	75°43.7	·· 42.0	80°41.8	·· 27.6	206°33.7	·· 55.5
4	236°29.1	272°37.6	40.9	90°46.7	42.0	95°44.4	27.6	221°35.9	55.6
5	251°31.5	287°37.1	40.0	105°49.6	42.1	110°47.1	27.7	236°38.1	55.7
6	266°34.0	302°36.6	S14°39.2	120°52.5	N17°42.1	125°49.7	N16°27.7	251°40.3	N03°55.8
7	281°36.4	317°36.1	38.3	135°55.4	42.1	140°52.4	27.8	266°42.5	55.9
8	296°38.9	332°35.6	37.5	150°58.3	42.2	155°55.0	27.8	281°44.6	56.1
9	311°41.4	347°35.0	·· 36.7	166°01.3	·· 42.2	170°57.7	·· 27.9	296°46.8	·· 56.2
10	326°43.8	2°34.5	35.8	181°04.2	42.3	186°00.3	28.0	311°49.0	56.3
11	341°46.3	17°34.0	35.0	196°07.1	42.3	201°03.0	28.0	326°51.2	56.4
12	356°48.8	32°33.5	S14°34.1	211°10.0	N17°42.4	216°05.6	N16°28.1	341°53.4	N03°56.5
13	11°51.2	47°33.0	33.3	226°12.9	42.4	231°08.3	28.1	356°55.6	56.7
14	26°53.7	62°32.5	32.5	241°15.8	42.5	246°10.9	28.2	11°57.7	56.8
15	41°56.2	77°32.0	·· 31.6	256°18.7	·· 42.5	261°13.6	·· 28.2	26°59.9	·· 56.9
16	56°58.6	92°31.4	30.8	271°21.6	42.6	276°16.2	28.3	42°02.1	57.0
17	72°01.1	107°30.9	29.9	286°24.5	42.6	291°18.9	28.4	57°04.3	57.1
18	87°03.6	122°30.4	S14°29.1	301°27.5	N17°42.6	306°21.5	N16°28.4	72°06.5	N03°57.3
19	102°06.0	137°29.9	28.2	316°30.4	42.7	321°24.2	28.5	87°08.6	57.4
20	117°08.5	152°29.4	27.4	331°33.3	42.7	336°26.8	28.5	102°10.8	57.5
21	132°10.9	167°28.9	·· 26.5	346°36.2	·· 42.8	351°29.5	·· 28.6	117°13.0	·· 57.6
22	147°13.4	182°28.4	25.7	1°39.1	42.8	6°32.1	28.6	132°15.2	57.7
23	162°15.9	197°27.8	24.9	16°42.0	42.8	21°34.8	28.7	147°17.4	57.9
Mer.pass. 12:13		ν -0.5′	d 0.8′	ν 2.9′	d 0.1′	ν 2.7′	d 0.1′	ν 2.2′	d 0.1′
		m -3.97		m -0.69		m -2.43		m 0.75	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.3
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.0
Hamal	327°49.4	23°35.5
Polaris	313°23.6	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°25.9	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.3	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.5	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.6	-59°36.1
Suhail	222°44.6	-43°32.8
Miaplacidus	221°37.2	-69°50.0
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.1
Gacrux	171°49.0	-57°16.0
Alioth	166°10.9	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.2	49°10.4
Hadar	148°32.9	-60°30.2
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.3	-60°56.8
Kochab	137°19.1	74°02.3
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.5	-26°29.5
Atria	107°06.0	-69°04.3
Sabik	102°00.7	-15°45.6
Shaula	96°07.9	-37°07.3
Rasalhague	95°56.9	12°32.2
Eltanin	90°41.4	51°28.7
Kaus Aust.	83°30.2	-34°22.2
Vega	80°32.1	38°48.2
Nunki	75°45.6	-26°15.7
Altair	61°58.4	8°56.3
Peacock	53°03.3	-56°38.6
Deneb	49°24.9	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.8
Markab	13°28.4	15°21.0

Mar 17 Wed	SHA	Mer.pass
Venus	38°44.1	09:48
Mars	213°52.0	22:03
Jupiter	219°05.2	21:42
Saturn	345°21.5	13:19

Mar 18 Thu	SHA	Mer.pass
Venus	37°32.2	09:49
Mars	214°04.2	21:58
Jupiter	219°10.0	21:38
Saturn	345°14.8	13:16

Mar 19 Fri	SHA	Mer.pass
Venus	36°20.5	09:50
Mars	214°15.8	21:53
Jupiter	219°14.6	21:34
Saturn	345°08.0	13:12

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.8	S01°31.3	69°21.0	4.5′	N25°50.5	6.3′	59.4′
1	192°52.0	30.3	83°44.5	4.5′	25°44.2	6.5′	59.4′
2	207°52.1	29.3	98°08.0	4.6′	25°37.7	6.7′	59.4′
3	222°52.3	·· 28.4	112°31.6	4.6′	25°31.0	6.9′	59.4′
4	237°52.5	27.4	126°55.3	4.7′	25°24.1	7.0′	59.4′
5	252°52.7	26.4	141°18.9	4.7′	25°17.1	7.2′	59.5′
6	267°52.8	S01°25.4	155°42.7	4.8′	N25°09.9	7.4′	59.5′
7	282°53.0	24.4	170°06.5	4.9′	25°02.5	7.6′	59.5′
8	297°53.2	23.4	184°30.4	4.9′	24°54.9	7.7′	59.5′
9	312°53.4	·· 22.4	198°54.3	5.0′	24°47.2	7.9′	59.5′
10	327°53.6	21.4	213°18.3	5.1′	24°39.3	8.0′	59.5′
11	342°53.7	20.5	227°42.4	5.1′	24°31.3	8.2′	59.5′
12	357°53.9	S01°19.5	242°06.5	5.2′	N24°23.1	8.4′	59.5′
13	12°54.1	18.5	256°30.7	5.3′	24°14.7	8.5′	59.5′
14	27°54.3	17.5	270°55.0	5.3′	24°06.2	8.7′	59.6′
15	42°54.5	·· 16.5	285°19.3	5.4′	23°57.5	8.9′	59.6′
16	57°54.6	15.5	299°43.7	5.5′	23°48.6	9.0′	59.6′
17	72°54.8	14.5	314°08.2	5.6′	23°39.6	9.2′	59.6′
18	87°55.0	S01°13.5	328°32.8	5.6′	N23°30.4	9.3′	59.6′
19	102°55.2	12.5	342°57.4	5.7′	23°21.1	9.5′	59.6′
20	117°55.4	11.6	357°22.1	5.8′	23°11.6	9.7′	59.6′
21	132°55.5	·· 10.6	11°46.9	5.9′	23°01.9	9.8′	59.6′
22	147°55.7	09.6	26°11.8	5.9′	22°52.1	9.9′	59.6′
23	162°55.9	08.6	40°36.7	6.0′	22°42.2	10.1′	59.6′
	SD = 16.1′	d = 1.0′		SD = 16.2′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°56.1	S01°07.6	55°01.7	6.1′	N22°32.1	10.2′	59.6′
1	192°56.3	06.6	69°26.8	6.2′	22°21.9	10.4′	59.7′
2	207°56.4	05.6	83°52.0	6.3′	22°11.5	10.6′	59.7′
3	222°56.6	·· 04.6	98°17.3	6.3′	22°00.9	10.6′	59.7′
4	237°56.8	03.7	112°42.6	6.4′	21°50.3	10.8′	59.7′
5	252°57.0	02.7	127°08.0	6.5′	21°39.5	11.0′	59.7′
6	267°57.2	S01°01.7	141°33.6	6.6′	N21°28.5	11.1′	59.7′
7	282°57.4	01°00.7	155°59.1	6.7′	21°17.4	11.2′	59.7′
8	297°57.5	00°59.7	170°24.8	6.8′	21°06.2	11.4′	59.7′
9	312°57.7	·· 58.7	184°50.6	6.8′	20°54.8	11.5′	59.7′
10	327°57.9	57.7	199°16.4	6.9′	20°43.3	11.6′	59.7′
11	342°58.1	56.7	213°42.3	7.0′	20°31.7	11.7′	59.7′
12	357°58.3	S00°55.7	228°08.4	7.1′	N20°20.0	11.9′	59.7′
13	12°58.4	54.8	242°34.5	7.2′	20°08.1	12.0′	59.7′
14	27°58.6	53.8	257°00.6	7.3′	19°56.1	12.2′	59.7′
15	42°58.8	·· 52.8	271°26.9	7.3′	19°43.9	12.2′	59.7′
16	57°59.0	51.8	285°53.2	7.4′	19°31.7	12.4′	59.7′
17	72°59.2	50.8	300°19.7	7.5′	19°19.3	12.5′	59.7′
18	87°59.4	S00°49.8	314°46.2	7.6′	N19°06.8	12.6′	59.7′
19	102°59.5	48.8	329°12.8	7.7′	18°54.2	12.8′	59.7′
20	117°59.7	47.8	343°39.5	7.8′	18°41.4	12.8′	59.7′
21	132°59.9	·· 46.8	358°06.3	7.9′	18°28.6	13.0′	59.8′
22	148°00.1	45.9	12°33.1	7.9′	18°15.6	13.1′	59.8′
23	163°00.3	44.9	27°00.0	8.0′	18°02.5	13.1′	59.8′
	SD = 16.1′	d = 1.0′		SD = 16.3′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°00.4	S00°43.9	41°27.1	8.1′	N17°49.4	13.3′	59.8′
1	193°00.6	42.9	55°54.2	8.2′	17°36.1	13.4′	59.8′
2	208°00.8	41.9	70°21.4	8.3′	17°22.7	13.5′	59.8′
3	223°01.0	·· 40.9	84°48.6	8.4′	17°09.2	13.6′	59.8′
4	238°01.2	39.9	99°16.0	8.4′	16°55.6	13.7′	59.8′
5	253°01.4	38.9	113°43.4	8.5′	16°41.9	13.8′	59.8′
6	268°01.5	S00°38.0	128°10.9	8.6′	N16°28.1	13.9′	59.8′
7	283°01.7	37.0	142°38.5	8.7′	16°14.2	14.0′	59.8′
8	298°01.9	36.0	157°06.2	8.8′	16°00.2	14.1′	59.8′
9	313°02.1	·· 35.0	171°34.0	8.8′	15°46.1	14.2′	59.8′
10	328°02.3	34.0	186°01.8	8.9′	15°31.9	14.2′	59.8′
11	343°02.5	33.0	200°29.7	9.0′	15°17.7	14.4′	59.8′
12	358°02.6	S00°32.0	214°57.7	9.1′	N15°03.3	14.4′	59.8′
13	13°02.8	31.0	229°25.8	9.2′	14°48.9	14.6′	59.7′
14	28°03.0	30.0	243°54.0	9.2′	14°34.3	14.6′	59.7′
15	43°03.2	·· 29.1	258°22.2	9.3′	14°19.7	14.7′	59.7′
16	58°03.4	28.1	272°50.5	9.4′	14°05.0	14.7′	59.7′
17	73°03.6	27.1	287°18.9	9.5′	13°50.3	14.9′	59.7′
18	88°03.7	S00°26.1	301°47.3	9.5′	N13°35.4	14.9′	59.7′
19	103°03.9	25.1	316°15.8	9.6′	13°20.5	15.0′	59.7′
20	118°04.1	24.1	330°44.4	9.7′	13°05.5	15.1′	59.7′
21	133°04.3	·· 23.1	345°13.1	9.7′	12°50.4	15.1′	59.7′
22	148°04.5	22.1	359°41.9	9.8′	12°35.3	15.2′	59.7′
23	163°04.7	21.2	14°10.7	9.9′	12°20.1	15.3′	59.7′
	SD = 16.1′	d = 1.0′		SD = 16.3′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:36	05:03	06:10	18:09	19:17	20:44
N 70°	03:53	05:09	06:10	18:09	19:10	20:27
68°	04:06	05:14	06:09	18:09	19:04	20:14
66°	04:16	05:18	06:09	18:09	19:00	20:03
64°	04:25	05:22	06:09	18:09	18:56	19:54
62°	04:32	05:25	06:09	18:09	18:53	19:46
60°	04:38	05:27	06:09	18:09	18:51	19:40
N 58°	04:43	05:29	06:08	18:09	18:48	19:35
56°	04:48	05:31	06:08	18:09	18:46	19:30
54°	04:51	05:33	06:08	18:09	18:44	19:26
52°	04:55	05:34	06:08	18:09	18:43	19:23
50°	04:58	05:36	06:08	18:09	18:42	19:19
45°	05:04	05:38	06:08	18:09	18:39	19:13
N 40°	05:09	05:40	06:07	18:10	18:37	19:08
35°	05:12	05:42	06:07	18:10	18:35	19:04
30°	05:15	05:43	06:07	18:10	18:34	19:02
20°	05:19	05:44	06:06	18:10	18:32	18:58
N 10°	05:20	05:45	06:06	18:11	18:32	18:56
0°	05:20	05:44	06:05	18:11	18:32	18:56
S 10°	05:19	05:43	06:04	18:12	18:33	18:57
20°	05:16	05:41	06:03	18:13	18:35	19:00
30°	05:10	05:38	06:02	18:14	18:38	19:06
35°	05:06	05:36	06:01	18:14	18:40	19:09
40°	05:02	05:33	06:00	18:15	18:42	19:14
45°	04:55	05:30	05:59	18:16	18:45	19:20
S 50°	04:47	05:26	05:58	18:17	18:49	19:28
52°	04:44	05:24	05:58	18:18	18:51	19:31
54°	04:39	05:21	05:57	18:18	18:54	19:36
56°	04:34	05:19	05:56	18:19	18:56	19:40
58°	04:28	05:16	05:55	18:20	18:59	19:46
S 60°	04:22	05:13	05:54	18:20	19:02	19:52

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°			12:00			07:37
N 70°			12:36			06:59
68°		10:12	13:01		07:26	06:32
66°		10:59	13:20		06:38	06:11
64°	09:05	11:29	13:35	06:29	06:06	05:55
62°	09:50	11:52	13:48	05:42	05:43	05:41
60°	10:20	12:10	13:59	05:12	05:24	05:29
N 58°	10:42	12:25	14:08	04:49	05:08	05:19
56°	11:01	12:38	14:16	04:30	04:54	05:10
54°	11:16	12:49	14:23	04:14	04:42	05:01
52°	11:29	12:59	14:30	04:01	04:32	04:54
50°	11:41	13:08	14:35	03:49	04:23	04:48
45°	12:05	13:26	14:48	03:24	04:03	04:33
N 40°	12:24	13:41	14:58	03:03	03:46	04:22
35°	12:40	13:54	15:06	02:47	03:33	04:12
30°	12:54	14:05	15:14	02:32	03:21	04:03
20°	13:18	14:23	15:27	02:07	03:00	03:47
N 10°	13:38	14:40	15:38	01:46	02:42	03:34
0°	13:57	14:55	15:49	01:25	02:25	03:21
S 10°	14:16	15:10	15:59	01:05	02:08	03:08
20°	14:36	15:26	16:11	00:43	01:49	02:54
30°	14:59	15:44	16:23	00:18	01:28	02:38
35°	15:12	15:55	16:31	00:03	01:15	02:28
40°	15:28	16:07	16:39	·· ··	01:01	02:18
45°	15:47	16:21	16:49	·· ··	00:43	02:05
S 50°	16:09	16:38	17:00	·· ··	00:21	01:49
52°	16:20	16:46	17:05	·· ··	00:11	01:42
54°	16:33	16:55	17:11	23:59	·· ··	01:34
56°	16:47	17:05	17:18	23:46	·· ··	01:24
58°	17:03	17:17	17:25	23:30	·· ··	01:14
S 60°	17:23	17:30	17:33	23:11	·· ··	01:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 9-11 65-85%
17	08:33	08:24	12:08	20:11	07:41	
18	08:16	08:07	12:08	21:08	08:40	
19	07:58	07:49	12:08	22:01	09:35	

March 20, 21, 22 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	177°18.3	212°27.3	S14°24.0	31°44.9	N17°42.9	36°37.4	N16°28.7	162°19.5	N03°58.0
1	192°20.8	227°26.8	23.2	46°47.7	42.9	51°40.1	28.8	177°21.7	58.1
2	207°23.3	242°26.3	22.3	61°50.6	43.0	66°42.7	28.8	192°23.9	58.2
3	222°25.7	257°25.8	·· 21.4	76°53.5	·· 43.0	81°45.4	·· 28.9	207°26.1	·· 58.3
4	237°28.2	272°25.3	20.6	91°56.4	43.0	96°48.0	29.0	222°28.3	58.5
5	252°30.7	287°24.8	19.7	106°59.3	43.1	111°50.7	29.0	237°30.4	58.6
6	267°33.1	302°24.3	S14°18.9	122°02.2	N17°43.1	126°53.3	N16°29.1	252°32.6	N03°58.7
7	282°35.6	317°23.8	18.0	137°05.1	43.1	141°55.9	29.1	267°34.8	58.8
8	297°38.0	332°23.3	17.2	152°08.0	43.2	156°58.6	29.2	282°37.0	58.9
9	312°40.5	347°22.7	·· 16.3	167°10.9	·· 43.2	172°01.2	·· 29.2	297°39.2	·· 59.1
10	327°43.0	2°22.2	15.5	182°13.8	43.2	187°03.9	29.3	312°41.4	59.2
11	342°45.4	17°21.7	14.6	197°16.6	43.3	202°06.5	29.3	327°43.5	59.3
12	357°47.9	32°21.2	S14°13.8	212°19.5	N17°43.3	217°09.2	N16°29.4	342°45.7	N03°59.4
13	12°50.4	47°20.7	12.9	227°22.4	43.3	232°11.8	29.4	357°47.9	59.5
14	27°52.8	62°20.2	12.0	242°25.3	43.4	247°14.5	29.5	12°50.1	59.7
15	42°55.3	77°19.7	·· 11.2	257°28.2	·· 43.4	262°17.1	·· 29.5	27°52.3	·· 59.8
16	57°57.8	92°19.2	10.3	272°31.0	43.4	277°19.7	29.6	42°54.4	03°59.9
17	73°00.2	107°18.7	09.5	287°33.9	43.5	292°22.4	29.6	57°56.6	04°00.0
18	88°02.7	122°18.2	S14°08.6	302°36.8	N17°43.5	307°25.0	N16°29.7	72°58.8	N04°00.1
19	103°05.2	137°17.7	07.7	317°39.6	43.5	322°27.7	29.8	88°01.0	00.3
20	118°07.6	152°17.2	06.9	332°42.5	43.6	337°30.3	29.8	103°03.2	00.4
21	133°10.1	167°16.7	·· 06.0	347°45.4	·· 43.6	352°33.0	·· 29.9	118°05.3	·· 00.5
22	148°12.5	182°16.2	05.1	2°48.3	43.6	7°35.6	29.9	133°07.5	00.6
23	163°15.0	197°15.7	04.3	17°51.1	43.6	22°38.2	30.0	148°09.7	00.7
Mer.pass. 12:09		ν -0.5′	d 0.8′	m -3.97	ν 2.9′	d 0.0′	m -0.66	ν 2.6′	d 0.1′ m -2.42	ν 2.2′	d 0.1′ m 0.75

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	178°17.5	212°15.2	S14°03.4	32°54.0	N17°43.7	37°40.9	N16°30.0	163°11.9	N04°00.9
1	193°19.9	227°14.7	02.5	47°56.9	43.7	52°43.5	30.1	178°14.1	01.0
2	208°22.4	242°14.2	01.7	62°59.7	43.7	67°46.2	30.1	193°16.2	01.1
3	223°24.9	257°13.7	14°00.8	78°02.6	·· 43.7	82°48.8	·· 30.2	208°18.4	·· 01.2
4	238°27.3	272°13.1	13°59.9	93°05.4	43.8	97°51.4	30.2	223°20.6	01.3
5	253°29.8	287°12.6	59.1	108°08.3	43.8	112°54.1	30.3	238°22.8	01.5
6	268°32.3	302°12.1	S13°58.2	123°11.1	N17°43.8	127°56.7	N16°30.3	253°25.0	N04°01.6
7	283°34.7	317°11.6	57.3	138°14.0	43.8	142°59.4	30.4	268°27.1	01.7
8	298°37.2	332°11.1	56.5	153°16.9	43.9	158°02.0	30.4	283°29.3	01.8
9	313°39.6	347°10.6	·· 55.6	168°19.7	·· 43.9	173°04.6	·· 30.5	298°31.5	·· 02.0
10	328°42.1	2°10.1	54.7	183°22.6	43.9	188°07.3	30.5	313°33.7	02.1
11	343°44.6	17°09.6	53.8	198°25.4	43.9	203°09.9	30.6	328°35.9	02.2
12	358°47.0	32°09.1	S13°53.0	213°28.3	N17°44.0	218°12.5	N16°30.6	343°38.0	N04°02.3
13	13°49.5	47°08.6	52.1	228°31.1	44.0	233°15.2	30.7	358°40.2	02.4
14	28°52.0	62°08.1	51.2	243°34.0	44.0	248°17.8	30.7	13°42.4	02.6
15	43°54.4	77°07.7	·· 50.3	258°36.8	·· 44.0	263°20.5	·· 30.8	28°44.6	·· 02.7
16	58°56.9	92°07.2	49.5	273°39.6	44.0	278°23.1	30.8	43°46.8	02.8
17	73°59.4	107°06.7	48.6	288°42.5	44.1	293°25.7	30.9	58°48.9	02.9
18	89°01.8	122°06.2	S13°47.7	303°45.3	N17°44.1	308°28.4	N16°30.9	73°51.1	N04°03.0
19	104°04.3	137°05.7	46.8	318°48.2	44.1	323°31.0	31.0	88°53.3	03.2
20	119°06.8	152°05.2	45.9	333°51.0	44.1	338°33.6	31.0	103°55.5	03.3
21	134°09.2	167°04.7	·· 45.1	348°53.8	·· 44.1	353°36.3	·· 31.1	118°57.6	·· 03.4
22	149°11.7	182°04.2	44.2	3°56.7	44.1	8°38.9	31.1	133°59.8	03.5
23	164°14.1	197°03.7	43.3	18°59.5	44.2	23°41.5	31.2	149°02.0	03.6
Mer.pass. 12:05		ν -0.5′	d 0.9′	m -3.97	ν 2.9′	d 0.0′	m -0.64	ν 2.6′	d 0.1′ m -2.42	ν 2.2′	d 0.1′ m 0.75

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	179°16.6	212°03.2	S13°42.4	34°02.4	N17°44.2	38°44.2	N16°31.2	164°04.2	N04°03.8
1	194°19.1	227°02.7	41.5	49°05.2	44.2	53°46.8	31.3	179°06.4	03.9
2	209°21.5	242°02.2	40.7	64°08.0	44.2	68°49.4	31.3	194°08.5	04.0
3	224°24.0	257°01.7	·· 39.8	79°10.8	·· 44.2	83°52.1	·· 31.4	209°10.7	·· 04.1
4	239°26.5	272°01.2	38.9	94°13.7	44.2	98°54.7	31.4	224°12.9	04.2
5	254°28.9	287°00.7	38.0	109°16.5	44.3	113°57.3	31.5	239°15.1	04.4
6	269°31.4	302°00.2	S13°37.1	124°19.3	N17°44.3	129°00.0	N16°31.5	254°17.3	N04°04.5
7	284°33.9	316°59.7	36.2	139°22.1	44.3	144°02.6	31.6	269°19.4	04.6
8	299°36.3	331°59.2	35.3	154°25.0	44.3	159°05.2	31.6	284°21.6	04.7
9	314°38.8	346°58.7	·· 34.4	169°27.8	·· 44.3	174°07.9	·· 31.7	299°23.8	·· 04.8
10	329°41.2	1°58.2	33.6	184°30.6	44.3	189°10.5	31.7	314°26.0	05.0
11	344°43.7	16°57.8	32.7	199°33.4	44.3	204°13.1	31.8	329°28.2	05.1
12	359°46.2	31°57.3	S13°31.8	214°36.2	N17°44.3	219°15.7	N16°31.8	344°30.3	N04°05.2
13	14°48.6	46°56.8	30.9	229°39.1	44.3	234°18.4	31.9	359°32.5	05.3
14	29°51.1	61°56.3	30.0	244°41.9	44.3	249°21.0	31.9	14°34.7	05.4
15	44°53.6	76°55.8	·· 29.1	259°44.7	·· 44.4	264°23.6	·· 32.0	29°36.9	·· 05.6
16	59°56.0	91°55.3	28.2	274°47.5	44.4	279°26.3	32.0	44°39.0	05.7
17	74°58.5	106°54.8	27.3	289°50.3	44.4	294°28.9	32.1	59°41.2	05.8
18	90°01.0	121°54.3	S13°26.4	304°53.1	N17°44.4	309°31.5	N16°32.1	74°43.4	N04°05.9
19	105°03.4	136°53.8	25.5	319°55.9	44.4	324°34.2	32.2	89°45.6	06.0
20	120°05.9	151°53.4	24.6	334°58.7	44.4	339°36.8	32.2	104°47.8	06.2
21	135°08.4	166°52.9	·· 23.7	350°01.5	·· 44.4	354°39.4	·· 32.3	119°49.9	·· 06.3
22	150°10.8	181°52.4	22.8	5°04.3	44.4	9°42.0	32.3	134°52.1	06.4
23	165°13.3	196°51.9	21.9	20°07.1	44.4	24°44.7	32.4	149°54.3	06.5
Mer.pass. 12:01		ν -0.5′	d 0.9′	m -3.96	ν 2.8′	d 0.0′	m -0.61	ν 2.6′	d 0.0′ m -2.41	ν 2.2′	d 0.1′ m 0.74

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.0
Hamal	327°49.4	23°35.5
Polaris	313°24.8	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°25.9	49°57.6
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.3	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.5	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.3	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°14.9	27°57.6
Avior	234°13.6	-59°36.1
Suhail	222°44.7	-43°32.8
Miaplacidus	221°37.2	-69°50.0
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.1
Gacrux	171°49.0	-57°16.0
Alioth	166°10.8	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.2	49°10.4
Hadar	148°32.9	-60°30.2
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.3	-60°56.8
Kochab	137°19.0	74°02.3
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.5	-26°29.5
Atria	107°05.9	-69°04.3
Sabik	102°00.6	-15°45.6
Shaula	96°07.9	-37°07.3
Rasalhague	95°56.8	12°32.2
Eltanin	90°41.3	51°28.7
Kaus Aust.	83°30.1	-34°22.2
Vega	80°32.1	38°48.2
Nunki	75°45.6	-26°15.7
Altair	61°58.3	8°56.3
Peacock	53°03.2	-56°38.6
Deneb	49°24.9	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.7
Markab	13°28.4	15°21.0

Mar 20 Sat	SHA	Mer.pass
Venus	35°09.0	09:51
Mars	214°26.5	21:49
Jupiter	219°19.1	21:30
Saturn	345°01.2	13:09

Mar 21 Sun	SHA	Mer.pass
Venus	33°57.7	09:51
Mars	214°36.5	21:44
Jupiter	219°23.4	21:26
Saturn	344°54.4	13:05

Mar 22 Mon	SHA	Mer.pass
Venus	32°46.6	09:52
Mars	214°45.7	21:40
Jupiter	219°27.6	21:21
Saturn	344°47.6	13:02

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.1048 sec ΔT = TT-UT1 = +69.2888 sec

2027 March 20 to Mar. 22 UT

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Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°04.9	S00°20.2	28°39.5	9.9′	N12°04.8	15.3′	59.7′
1	193°05.0	19.2	43°08.5	10.0′	11°49.5	15.4′	59.7′
2	208°05.2	18.2	57°37.5	10.1′	11°34.1	15.5′	59.7′
3	223°05.4	·· 17.2	72°06.6	10.1′	11°18.6	15.5′	59.7′
4	238°05.6	16.2	86°35.7	10.2′	11°03.1	15.6′	59.7′
5	253°05.8	15.2	101°05.0	10.3′	10°47.5	15.6′	59.7′
6	268°06.0	S00°14.2	115°34.2	10.3′	N10°31.9	15.7′	59.7′
7	283°06.1	13.3	130°03.6	10.4′	10°16.2	15.7′	59.7′
8	298°06.3	12.3	144°33.0	10.5′	10°00.5	15.8′	59.6′
9	313°06.5	·· 11.3	159°02.4	10.5′	09°44.7	15.8′	59.6′
10	328°06.7	10.3	173°32.0	10.6′	09°28.9	15.9′	59.6′
11	343°06.9	09.3	188°01.6	10.6′	09°13.0	16.0′	59.6′
12	358°07.1	S00°08.3	202°31.2	10.7′	N08°57.0	15.9′	59.6′
13	13°07.3	07.3	217°00.9	10.8′	08°41.1	16.0′	59.6′
14	28°07.4	06.3	231°30.6	10.8′	08°25.1	16.1′	59.6′
15	43°07.6	·· 05.3	246°00.5	10.9′	08°09.0	16.1′	59.6′
16	58°07.8	04.4	260°30.3	10.9′	07°52.9	16.1′	59.6′
17	73°08.0	03.4	275°00.2	11.0′	07°36.8	16.2′	59.5′
18	88°08.2	S00°02.4	289°30.2	11.0′	N07°20.6	16.2′	59.5′
19	103°08.4	01.4	304°00.2	11.1′	07°04.4	16.2′	59.5′
20	118°08.6	S00°00.4	318°30.3	11.1′	06°48.2	16.3′	59.5′
21	133°08.7	N00°00.6	333°00.4	11.2′	06°31.9	16.2′	59.5′
22	148°08.9	01.6	347°30.6	11.2′	06°15.7	16.4′	59.5′
23	163°09.1	02.6	2°00.8	11.3′	05°59.3	16.3′	59.5′
	SD = 16.1′	d = 1.0′		SD = 16.3′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°09.3	N00°03.5	16°31.0	11.3′	N05°43.0	16.3′	59.5′
1	193°09.5	04.5	31°01.4	11.3′	05°26.7	16.4′	59.4′
2	208°09.7	05.5	45°31.7	11.4′	05°10.3	16.4′	59.4′
3	223°09.9	·· 06.5	60°02.1	11.4′	04°53.9	16.4′	59.4′
4	238°10.0	07.5	74°32.5	11.5′	04°37.5	16.5′	59.4′
5	253°10.2	08.5	89°03.0	11.5′	04°21.0	16.4′	59.4′
6	268°10.4	N00°09.5	103°33.5	11.5′	N04°04.6	16.5′	59.4′
7	283°10.6	10.5	118°04.0	11.6′	03°48.1	16.4′	59.4′
8	298°10.8	11.4	132°34.6	11.6′	03°31.7	16.5′	59.3′
9	313°11.0	·· 12.4	147°05.2	11.7′	03°15.2	16.5′	59.3′
10	328°11.2	13.4	161°35.9	11.7′	02°58.7	16.5′	59.3′
11	343°11.3	14.4	176°06.6	11.7′	02°42.2	16.5′	59.3′
12	358°11.5	N00°15.4	190°37.3	11.7′	N02°25.7	16.5′	59.3′
13	13°11.7	16.4	205°08.0	11.8′	02°09.2	16.5′	59.2′
14	28°11.9	17.4	219°38.8	11.8′	01°52.7	16.5′	59.2′
15	43°12.1	·· 18.4	234°09.6	11.8′	01°36.2	16.5′	59.2′
16	58°12.3	19.3	248°40.4	11.9′	01°19.7	16.5′	59.2′
17	73°12.5	20.3	263°11.3	11.9′	01°03.2	16.5′	59.2′
18	88°12.6	N00°21.3	277°42.2	11.9′	N00°46.7	16.4′	59.2′
19	103°12.8	22.3	292°13.1	11.9′	00°30.3	16.5′	59.1′
20	118°13.0	23.3	306°44.0	12.0′	N00°13.8	16.5′	59.1′
21	133°13.2	·· 24.3	321°15.0	12.0′	S00°02.7	16.4′	59.1′
22	148°13.4	25.3	335°46.0	12.0′	00°19.1	16.5′	59.1′
23	163°13.6	26.2	350°16.9	12.0′	00°35.6	16.4′	59.1′
	SD = 16.1′	d = 1.0′		SD = 16.2′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°13.8	N00°27.2	4°48.0	12.0′	S00°52.0	16.4′	59.0′
1	193°14.0	28.2	19°19.0	12.0′	01°08.4	16.4′	59.0′
2	208°14.1	29.2	33°50.0	12.1′	01°24.8	16.3′	59.0′
3	223°14.3	·· 30.2	48°21.1	12.1′	01°41.1	16.4′	59.0′
4	238°14.5	31.2	62°52.2	12.1′	01°57.5	16.3′	58.9′
5	253°14.7	32.2	77°23.3	12.1′	02°13.8	16.3′	58.9′
6	268°14.9	N00°33.2	91°54.4	12.1′	S02°30.1	16.3′	58.9′
7	283°15.1	34.1	106°25.5	12.1′	02°46.4	16.2′	58.9′
8	298°15.3	35.1	120°56.6	12.1′	03°02.6	16.2′	58.9′
9	313°15.5	·· 36.1	135°27.8	12.1′	03°18.8	16.2′	58.8′
10	328°15.6	37.1	149°58.9	12.1′	03°35.0	16.2′	58.8′
11	343°15.8	38.1	164°30.0	12.2′	03°51.2	16.1′	58.8′
12	358°16.0	N00°39.1	179°01.2	12.2′	S04°07.3	16.1′	58.8′
13	13°16.2	40.1	193°32.4	12.2′	04°23.4	16.1′	58.7′
14	28°16.4	41.0	208°03.5	12.2′	04°39.5	16.0′	58.7′
15	43°16.6	·· 42.0	222°34.7	12.2′	04°55.5	16.0′	58.7′
16	58°16.8	43.0	237°05.9	12.2′	05°11.5	15.9′	58.7′
17	73°17.0	44.0	251°37.0	12.2′	05°27.4	15.9′	58.6′
18	88°17.1	N00°45.0	266°08.2	12.2′	S05°43.3	15.9′	58.6′
19	103°17.3	46.0	280°39.4	12.2′	05°59.2	15.8′	58.6′
20	118°17.5	47.0	295°10.5	12.2′	06°15.0	15.7′	58.6′
21	133°17.7	·· 47.9	309°41.7	12.2′	06°30.7	15.8′	58.5′
22	148°17.9	48.9	324°12.9	12.2′	06°46.5	15.6′	58.5′
23	163°18.1	49.9	338°44.0	12.2′	07°02.1	15.7′	58.5′
	SD = 16.0′	d = 1.0′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:16	04:46	05:55	18:22	19:31	21:03
N 70°	03:36	04:55	05:56	18:21	19:23	20:42
68°	03:51	05:01	05:57	18:20	19:16	20:27
66°	04:03	05:06	05:58	18:19	19:10	20:14
64°	04:13	05:11	05:58	18:18	19:05	20:04
62°	04:21	05:15	05:59	18:17	19:01	19:56
60°	04:28	05:18	06:00	18:16	18:58	19:48
N 58°	04:34	05:21	06:00	18:16	18:55	19:42
56°	04:39	05:23	06:00	18:15	18:52	19:37
54°	04:44	05:26	06:01	18:15	18:50	19:32
52°	04:48	05:27	06:01	18:14	18:48	19:28
50°	04:51	05:29	06:01	18:14	18:46	19:25
45°	04:58	05:33	06:02	18:13	18:43	19:17
N 40°	05:04	05:35	06:02	18:13	18:40	19:11
35°	05:08	05:38	06:03	18:12	18:37	19:07
30°	05:11	05:39	06:03	18:12	18:36	19:04
20°	05:16	05:42	06:04	18:11	18:33	18:59
N 10°	05:18	05:43	06:04	18:11	18:32	18:56
0°	05:19	05:43	06:04	18:10	18:31	18:55
S 10°	05:19	05:43	06:04	18:10	18:31	18:56
20°	05:16	05:42	06:04	18:10	18:32	18:58
30°	05:12	05:40	06:04	18:10	18:34	19:02
35°	05:09	05:38	06:04	18:10	18:35	19:05
40°	05:05	05:36	06:03	18:10	18:37	19:09
45°	05:00	05:34	06:03	18:10	18:40	19:14
S 50°	04:53	05:31	06:03	18:11	18:43	19:21
52°	04:49	05:29	06:03	18:11	18:44	19:24
54°	04:45	05:27	06:03	18:11	18:46	19:28
56°	04:41	05:25	06:02	18:11	18:48	19:32
58°	04:36	05:23	06:02	18:11	18:50	19:37
S 60°	04:30	05:20	06:02	18:11	18:53	19:42

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	14:53	17:18	19:38	06:34	05:55	05:21
N 70°	15:06	17:19	19:28	06:18	05:49	05:24
68°	15:16	17:20	19:21	06:05	05:45	05:26
66°	15:24	17:21	19:14	05:55	05:41	05:29
64°	15:31	17:21	19:09	05:46	05:38	05:31
62°	15:37	17:22	19:04	05:38	05:35	05:32
60°	15:43	17:23	19:00	05:31	05:33	05:34
N 58°	15:47	17:23	18:57	05:26	05:31	05:35
56°	15:51	17:23	18:54	05:20	05:29	05:36
54°	15:55	17:24	18:51	05:16	05:27	05:37
52°	15:58	17:24	18:49	05:11	05:25	05:38
50°	16:01	17:24	18:46	05:07	05:24	05:39
45°	16:07	17:25	18:41	04:59	05:21	05:41
N 40°	16:13	17:26	18:37	04:51	05:18	05:43
35°	16:17	17:26	18:34	04:45	05:16	05:44
30°	16:21	17:27	18:31	04:40	05:13	05:46
20°	16:28	17:27	18:25	04:30	05:10	05:48
N 10°	16:34	17:28	18:21	04:22	05:06	05:50
0°	16:40	17:29	18:17	04:13	05:03	05:52
S 10°	16:46	17:29	18:12	04:05	05:00	05:53
20°	16:52	17:30	18:08	03:56	04:57	05:55
30°	16:58	17:31	18:03	03:46	04:53	05:57
35°	17:02	17:32	18:00	03:40	04:50	05:59
40°	17:07	17:32	17:57	03:34	04:48	06:00
45°	17:12	17:33	17:53	03:26	04:45	06:02
S 50°	17:18	17:34	17:49	03:16	04:41	06:04
52°	17:21	17:34	17:47	03:12	04:39	06:04
54°	17:24	17:34	17:45	03:07	04:37	06:05
56°	17:27	17:35	17:42	03:01	04:35	06:07
58°	17:31	17:35	17:40	02:55	04:33	06:08
S 60°	17:35	17:36	17:37	02:48	04:30	06:09

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 12-14 92-100%
20	07:41	07:32	12:08	22:52	10:27	
21	07:23	07:14	12:07	23:40	11:16	
22	07:05	06:56	12:07	–:–	12:04	

March 23, 24, 25 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	180°15.7	211°51.4	S13°21.0	35°09.9	N17°44.4	39°47.3	N16°32.4	164°56.5	N04°06.6
1	195°18.2	226°50.9	20.1	50°12.7	44.4	54°49.9	32.5	179°58.7	06.8
2	210°20.7	241°50.4	19.2	65°15.5	44.4	69°52.5	32.5	195°00.8	06.9
3	225°23.1	256°49.9	·· 18.3	80°18.3	·· 44.4	84°55.2	·· 32.5	210°03.0	·· 07.0
4	240°25.6	271°49.5	17.4	95°21.1	44.4	99°57.8	32.6	225°05.2	07.1
5	255°28.1	286°49.0	16.5	110°23.9	44.4	115°00.4	32.6	240°07.4	07.2
6	270°30.5	301°48.5	S13°15.6	125°26.7	N17°44.4	130°03.0	N16°32.7	255°09.5	N04°07.4
7	285°33.0	316°48.0	14.7	140°29.5	44.4	145°05.7	32.7	270°11.7	07.5
8	300°35.5	331°47.5	13.8	155°32.3	44.4	160°08.3	32.8	285°13.9	07.6
9	315°37.9	346°47.0	·· 12.9	170°35.1	·· 44.4	175°10.9	·· 32.8	300°16.1	·· 07.7
10	330°40.4	1°46.5	12.0	185°37.9	44.4	190°13.5	32.9	315°18.3	07.9
11	345°42.8	16°46.1	11.1	200°40.7	44.4	205°16.2	32.9	330°20.4	08.0
12	0°45.3	31°45.6	S13°10.2	215°43.5	N17°44.4	220°18.8	N16°33.0	345°22.6	N04°08.1
13	15°47.8	46°45.1	09.3	230°46.2	44.4	235°21.4	33.0	0°24.8	08.2
14	30°50.2	61°44.6	08.4	245°49.0	44.4	250°24.0	33.1	15°27.0	08.3
15	45°52.7	76°44.1	·· 07.5	260°51.8	·· 44.4	265°26.7	·· 33.1	30°29.1	·· 08.5
16	60°55.2	91°43.7	06.6	275°54.6	44.4	280°29.3	33.2	45°31.3	08.6
17	75°57.6	106°43.2	05.7	290°57.4	44.4	295°31.9	33.2	60°33.5	08.7
18	91°00.1	121°42.7	S13°04.8	306°00.1	N17°44.4	310°34.5	N16°33.2	75°35.7	N04°08.8
19	106°02.6	136°42.2	03.8	321°02.9	44.4	325°37.1	33.3	90°37.9	08.9
20	121°05.0	151°41.7	02.9	336°05.7	44.4	340°39.8	33.3	105°40.0	09.1
21	136°07.5	166°41.2	·· 02.0	351°08.5	·· 44.4	355°42.4	·· 33.4	120°42.2	·· 09.2
22	151°10.0	181°40.8	01.1	6°11.2	44.4	10°45.0	33.4	135°44.4	09.3
23	166°12.4	196°40.3	00.2	21°14.0	44.4	25°47.6	33.5	150°46.6	09.4
Mer.pass. 11:57		ν -0.5′	d 0.9′	ν 2.8′	d 0.0′	ν 2.6′	d 0.0′	ν 2.2′	d 0.1′
		m -3.96		m -0.59		m -2.40		m 0.74	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	181°14.9	211°39.8	S12°59.3	36°16.8	N17°44.4	40°50.2	N16°33.5	165°48.7	N04°09.5
1	196°17.3	226°39.3	58.4	51°19.5	44.4	55°52.9	33.6	180°50.9	09.7
2	211°19.8	241°38.9	57.5	66°22.3	44.4	70°55.5	33.6	195°53.1	09.8
3	226°22.3	256°38.4	·· 56.5	81°25.1	·· 44.4	85°58.1	·· 33.6	210°55.3	·· 09.9
4	241°24.7	271°37.9	55.6	96°27.8	44.3	101°00.7	33.7	225°57.5	10.0
5	256°27.2	286°37.4	54.7	111°30.6	44.3	116°03.3	33.7	240°59.6	10.1
6	271°29.7	301°36.9	S12°53.8	126°33.4	N17°44.3	131°06.0	N16°33.8	256°01.8	N04°10.3
7	286°32.1	316°36.5	52.9	141°36.1	44.3	146°08.6	33.8	271°04.0	10.4
8	301°34.6	331°36.0	51.9	156°38.9	44.3	161°11.2	33.9	286°06.2	10.5
9	316°37.1	346°35.5	·· 51.0	171°41.6	·· 44.3	176°13.8	·· 33.9	301°08.3	·· 10.6
10	331°39.5	1°35.0	50.1	186°44.4	44.3	191°16.4	34.0	316°10.5	10.7
11	346°42.0	16°34.6	49.2	201°47.2	44.3	206°19.0	34.0	331°12.7	10.9
12	1°44.5	31°34.1	S12°48.3	216°49.9	N17°44.3	221°21.7	N16°34.0	346°14.9	N04°11.0
13	16°46.9	46°33.6	47.3	231°52.7	44.2	236°24.3	34.1	1°17.1	11.1
14	31°49.4	61°33.1	46.4	246°55.4	44.2	251°26.9	34.1	16°19.2	11.2
15	46°51.8	76°32.7	·· 45.5	261°58.2	·· 44.2	266°29.5	·· 34.2	31°21.4	·· 11.3
16	61°54.3	91°32.2	44.6	277°00.9	44.2	281°32.1	34.2	46°23.6	11.5
17	76°56.8	106°31.7	43.6	292°03.7	44.2	296°34.7	34.3	61°25.8	11.6
18	91°59.2	121°31.2	S12°42.7	307°06.4	N17°44.2	311°37.3	N16°34.3	76°27.9	N04°11.7
19	107°01.7	136°30.8	41.8	322°09.1	44.2	326°40.0	34.4	91°30.1	11.8
20	122°04.2	151°30.3	40.9	337°11.9	44.1	341°42.6	34.4	106°32.3	12.0
21	137°06.6	166°29.8	·· 39.9	352°14.6	·· 44.1	356°45.2	·· 34.4	121°34.5	·· 12.1
22	152°09.1	181°29.4	39.0	7°17.4	44.1	11°47.8	34.5	136°36.6	12.2
23	167°11.6	196°28.9	38.1	22°20.1	44.1	26°50.4	34.5	151°38.8	12.3
Mer.pass. 11:53		ν -0.5′	d 0.9′	ν 2.8′	d 0.0′	ν 2.6′	d 0.0′	ν 2.2′	d 0.1′
		m -3.95		m -0.56		m -2.40		m 0.74	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	182°14.0	211°28.4	S12°37.2	37°22.8	N17°44.1	41°53.0	N16°34.6	166°41.0	N04°12.4
1	197°16.5	226°27.9	36.2	52°25.6	44.1	56°55.6	34.6	181°43.2	12.6
2	212°18.9	241°27.5	35.3	67°28.3	44.0	71°58.2	34.7	196°45.4	12.7
3	227°21.4	256°27.0	·· 34.4	82°31.0	·· 44.0	87°00.9	·· 34.7	211°47.5	·· 12.8
4	242°23.9	271°26.5	33.4	97°33.8	44.0	102°03.5	34.7	226°49.7	12.9
5	257°26.3	286°26.1	32.5	112°36.5	44.0	117°06.1	34.8	241°51.9	13.0
6	272°28.8	301°25.6	S12°31.6	127°39.2	N17°44.0	132°08.7	N16°34.8	256°54.1	N04°13.2
7	287°31.3	316°25.1	30.6	142°42.0	43.9	147°11.3	34.9	271°56.2	13.3
8	302°33.7	331°24.7	29.7	157°44.7	43.9	162°13.9	34.9	286°58.4	13.4
9	317°36.2	346°24.2	·· 28.8	172°47.4	·· 43.9	177°16.5	·· 34.9	302°00.6	·· 13.5
10	332°38.7	1°23.7	27.8	187°50.1	43.9	192°19.1	35.0	317°02.8	13.6
11	347°41.1	16°23.3	26.9	202°52.9	43.8	207°21.7	35.0	332°04.9	13.8
12	2°43.6	31°22.8	S12°26.0	217°55.6	N17°43.8	222°24.3	N16°35.1	347°07.1	N04°13.9
13	17°46.1	46°22.3	25.0	232°58.3	43.8	237°27.0	35.1	2°09.3	14.0
14	32°48.5	61°21.9	24.1	248°01.0	43.8	252°29.6	35.2	17°11.5	14.1
15	47°51.0	76°21.4	·· 23.1	263°03.7	·· 43.7	267°32.2	·· 35.2	32°13.7	·· 14.2
16	62°53.4	91°20.9	22.2	278°06.5	43.7	282°34.8	35.2	47°15.8	14.4
17	77°55.9	106°20.5	21.3	293°09.2	43.7	297°37.4	35.3	62°18.0	14.5
18	92°58.4	121°20.0	S12°20.3	308°11.9	N17°43.7	312°40.0	N16°35.3	77°20.2	N04°14.6
19	108°00.8	136°19.5	19.4	323°14.6	43.6	327°42.6	35.4	92°22.4	14.7
20	123°03.3	151°19.1	18.4	338°17.3	43.6	342°45.2	35.4	107°24.5	14.8
21	138°05.8	166°18.6	·· 17.5	353°20.0	·· 43.6	357°47.8	·· 35.4	122°26.7	·· 15.0
22	153°08.2	181°18.1	16.6	8°22.7	43.6	12°50.4	35.5	137°28.9	15.1
23	168°10.7	196°17.7	15.6	23°25.4	43.5	27°53.0	35.5	152°31.1	15.2
Mer.pass. 11:49		ν -0.5′	d 0.9′	ν 2.7′	d 0.0′	ν 2.6′	d 0.0′	ν 2.2′	d 0.1′
		m -3.95		m -0.54		m -2.39		m 0.73	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.0
Hamal	327°49.4	23°35.5
Polaris	313°25.9	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.6
Aldebaran	290°37.7	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.3	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.1	7°24.6
Canopus	263°51.6	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.4	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.7	-59°36.1
Suhail	222°44.7	-43°32.8
Miaplacidus	221°37.3	-69°50.0
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.1
Gacrux	171°49.0	-57°16.1
Alioth	166°10.8	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.1	49°10.4
Hadar	148°32.8	-60°30.2
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.2	-60°56.8
Kochab	137°19.0	74°02.3
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.5	-26°29.5
Atria	107°05.9	-69°04.3
Sabik	102°00.6	-15°45.6
Shaula	96°07.8	-37°07.3
Rasalhague	95°56.8	12°32.2
Eltanin	90°41.3	51°28.7
Kaus Aust.	83°30.1	-34°22.2
Vega	80°32.0	38°48.2
Nunki	75°45.6	-26°15.7
Altair	61°58.3	8°56.3
Peacock	53°03.2	-56°38.6
Deneb	49°24.8	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.0	-46°49.6
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.7
Markab	13°28.4	15°21.0

Mar 23 Tue	SHA	Mer.pass
Venus	31°35.7	09:53
Mars	214°54.2	21:35
Jupiter	219°31.5	21:17
Saturn	344°40.7	12:58

Mar 24 Wed	SHA	Mer.pass
Venus	30°24.9	09:54
Mars	215°01.9	21:31
Jupiter	219°35.4	21:13
Saturn	344°33.9	12:55

Mar 25 Thu	SHA	Mer.pass
Venus	29°14.4	09:54
Mars	215°08.8	21:27
Jupiter	219°39.0	21:09
Saturn	344°27.0	12:51

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°18.3	N00°50.9	353°15.2	12.1′	S07°17.8	15.5′	58.4′
1	193°18.5	51.9	7°46.3	12.1′	07°33.3	15.5′	58.4′
2	208°18.6	52.9	22°17.5	12.1′	07°48.8	15.5′	58.4′
3	223°18.8	·· 53.9	36°48.6	12.1′	08°04.3	15.4′	58.4′
4	238°19.0	54.8	51°19.7	12.1′	08°19.7	15.4′	58.3′
5	253°19.2	55.8	65°50.8	12.1′	08°35.1	15.3′	58.3′
6	268°19.4	N00°56.8	80°21.9	12.1′	S08°50.4	15.2′	58.3′
7	283°19.6	57.8	94°53.0	12.1′	09°05.6	15.2′	58.3′
8	298°19.8	58.8	109°24.1	12.1′	09°20.8	15.1′	58.2′
9	313°20.0	00°59.8	123°55.1	12.0′	09°35.9	15.0′	58.2′
10	328°20.2	01°00.8	138°26.2	12.0′	09°50.9	15.0′	58.2′
11	343°20.3	01.7	152°57.2	12.0′	10°05.9	15.0′	58.1′
12	358°20.5	N01°02.7	167°28.2	12.0′	S10°20.9	14.8′	58.1′
13	13°20.7	03.7	181°59.2	12.0′	10°35.7	14.8′	58.1′
14	28°20.9	04.7	196°30.2	12.0′	10°50.5	14.7′	58.0′
15	43°21.1	·· 05.7	211°01.1	11.9′	11°05.2	14.7′	58.0′
16	58°21.3	06.7	225°32.1	11.9′	11°19.9	14.5′	58.0′
17	73°21.5	07.7	240°03.0	11.9′	11°34.4	14.5′	58.0′
18	88°21.7	N01°08.6	254°33.9	11.9′	S11°48.9	14.5′	57.9′
19	103°21.8	09.6	269°04.8	11.9′	12°03.4	14.3′	57.9′
20	118°22.0	10.6	283°35.6	11.8′	12°17.7	14.3′	57.9′
21	133°22.2	·· 11.6	298°06.5	11.8′	12°32.0	14.2′	57.8′
22	148°22.4	12.6	312°37.3	11.8′	12°46.2	14.1′	57.8′
23	163°22.6	13.6	327°08.0	11.8′	13°00.3	14.1′	57.8′
	SD = 16.0′	d = 1.0′	SD = 15.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°22.8	N01°14.6	341°38.8	11.7′	S13°14.4	13.9′	57.7′
1	193°23.0	15.5	356°09.5	11.7′	13°28.3	13.9′	57.7′
2	208°23.2	16.5	10°40.2	11.7′	13°42.2	13.8′	57.7′
3	223°23.4	·· 17.5	25°10.9	11.7′	13°56.0	13.7′	57.7′
4	238°23.5	18.5	39°41.6	11.6′	14°09.7	13.6′	57.6′
5	253°23.7	19.5	54°12.2	11.6′	14°23.3	13.5′	57.6′
6	268°23.9	N01°20.5	68°42.8	11.6′	S14°36.8	13.5′	57.6′
7	283°24.1	21.4	83°13.4	11.5′	14°50.3	13.4′	57.5′
8	298°24.3	22.4	97°43.9	11.5′	15°03.7	13.2′	57.5′
9	313°24.5	·· 23.4	112°14.4	11.5′	15°16.9	13.2′	57.5′
10	328°24.7	24.4	126°44.9	11.4′	15°30.1	13.1′	57.4′
11	343°24.9	25.4	141°15.4	11.4′	15°43.2	13.0′	57.4′
12	358°25.1	N01°26.4	155°45.8	11.4′	S15°56.2	12.9′	57.4′
13	13°25.2	27.4	170°16.2	11.4′	16°09.1	12.8′	57.3′
14	28°25.4	28.3	184°46.5	11.3′	16°21.9	12.7′	57.3′
15	43°25.6	·· 29.3	199°16.8	11.3′	16°34.6	12.6′	57.3′
16	58°25.8	30.3	213°47.1	11.3′	16°47.2	12.5′	57.2′
17	73°26.0	31.3	228°17.4	11.2′	16°59.7	12.4′	57.2′
18	88°26.2	N01°32.3	242°47.6	11.2′	S17°12.1	12.3′	57.2′
19	103°26.4	33.3	257°17.8	11.2′	17°24.4	12.2′	57.1′
20	118°26.6	34.2	271°47.9	11.1′	17°36.6	12.1′	57.1′
21	133°26.8	·· 35.2	286°18.1	11.1′	17°48.7	12.0′	57.1′
22	148°26.9	36.2	300°48.1	11.0′	18°00.7	11.9′	57.1′
23	163°27.1	37.2	315°18.2	11.0′	18°12.6	11.8′	57.0′
	SD = 16.0′	d = 1.0′	SD = 15.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°27.3	N01°38.2	329°48.2	11.0′	S18°24.4	11.7′	57.0′
1	193°27.5	39.2	344°18.2	10.9′	18°36.1	11.6′	57.0′
2	208°27.7	40.1	358°48.1	10.9′	18°47.7	11.5′	56.9′
3	223°27.9	·· 41.1	13°18.0	10.9′	18°59.2	11.3′	56.9′
4	238°28.1	42.1	27°47.9	10.8′	19°10.5	11.3′	56.9′
5	253°28.3	43.1	42°17.8	10.8′	19°21.8	11.1′	56.8′
6	268°28.5	N01°44.1	56°47.6	10.8′	S19°32.9	11.1′	56.8′
7	283°28.6	45.1	71°17.3	10.7′	19°44.0	10.9′	56.8′
8	298°28.8	46.0	85°47.0	10.7′	19°54.9	10.8′	56.7′
9	313°29.0	·· 47.0	100°16.7	10.7′	20°05.7	10.7′	56.7′
10	328°29.2	48.0	114°46.4	10.6′	20°16.4	10.6′	56.7′
11	343°29.4	49.0	129°16.0	10.6′	20°27.0	10.4′	56.6′
12	358°29.6	N01°50.0	143°45.6	10.5′	S20°37.4	10.4′	56.6′
13	13°29.8	50.9	158°15.2	10.5′	20°47.8	10.2′	56.6′
14	28°30.0	51.9	172°44.7	10.5′	20°58.0	10.1′	56.5′
15	43°30.2	·· 52.9	187°14.1	10.4′	21°08.1	10.0′	56.5′
16	58°30.3	53.9	201°43.6	10.4′	21°18.1	9.9′	56.5′
17	73°30.5	54.9	216°13.0	10.4′	21°28.0	9.7′	56.5′
18	88°30.7	N01°55.9	230°42.4	10.3′	S21°37.7	9.7′	56.4′
19	103°30.9	56.8	245°11.7	10.3′	21°47.4	9.5′	56.4′
20	118°31.1	57.8	259°41.0	10.3′	21°56.9	9.4′	56.4′
21	133°31.3	·· 58.8	274°10.3	10.2′	22°06.3	9.2′	56.3′
22	148°31.5	01°59.8	288°39.5	10.2′	22°15.5	9.2′	56.3′
23	163°31.7	02°00.8	303°08.7	10.2′	22°24.7	9.0′	56.3′
	SD = 16.0′	d = 1.0′	SD = 15.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:55	04:30	05:39	18:36	19:46	21:24
N 70°	03:18	04:40	05:42	18:33	19:36	20:59
68°	03:36	04:48	05:44	18:30	19:27	20:40
66°	03:50	04:54	05:46	18:28	19:20	20:26
64°	04:01	05:00	05:48	18:27	19:15	20:14
62°	04:10	05:05	05:49	18:25	19:10	20:05
60°	04:18	05:09	05:50	18:24	19:06	19:57
N 58°	04:25	05:12	05:52	18:22	19:02	19:50
56°	04:31	05:15	05:53	18:21	18:59	19:44
54°	04:36	05:18	05:53	18:20	18:56	19:38
52°	04:40	05:20	05:54	18:20	18:53	19:34
50°	04:44	05:23	05:55	18:19	18:51	19:30
45°	04:52	05:27	05:56	18:17	18:47	19:21
N 40°	04:59	05:31	05:58	18:16	18:43	19:15
35°	05:04	05:33	05:59	18:15	18:40	19:10
30°	05:08	05:36	05:59	18:14	18:38	19:06
20°	05:13	05:39	06:01	18:12	18:34	19:00
N 10°	05:17	05:41	06:02	18:11	18:32	18:56
0°	05:18	05:42	06:03	18:10	18:30	18:54
S 10°	05:19	05:43	06:04	18:09	18:30	18:54
20°	05:17	05:43	06:05	18:08	18:30	18:55
30°	05:14	05:42	06:06	18:07	18:30	18:58
35°	05:11	05:41	06:06	18:06	18:31	19:01
40°	05:08	05:40	06:07	18:05	18:32	19:04
45°	05:04	05:38	06:07	18:05	18:34	19:08
S 50°	04:58	05:35	06:08	18:04	18:36	19:14
52°	04:55	05:34	06:08	18:04	18:37	19:17
54°	04:51	05:33	06:08	18:03	18:39	19:20
56°	04:47	05:31	06:08	18:03	18:40	19:24
58°	04:43	05:30	06:09	18:03	18:42	19:28
S 60°	04:38	05:28	06:09	18:02	18:44	19:33

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	22:10	▬	▬	04:44	03:55	▬
N 70°	21:44	·· ··	00:34	04:57	04:23	03:17
68°	21:25	23:43	▬	05:07	04:44	04:08
66°	21:10	23:12	·· ··	05:16	05:01	04:41
64°	20:57	22:49	·· ··	05:23	05:15	05:05
62°	20:47	22:31	·· ··	05:29	05:26	05:24
60°	20:38	22:16	23:55	05:35	05:37	05:40
N 58°	20:30	22:04	23:36	05:40	05:45	05:53
56°	20:23	21:53	23:20	05:44	05:53	06:05
54°	20:17	21:43	23:07	05:48	06:00	06:15
52°	20:12	21:35	22:56	05:52	06:06	06:24
50°	20:07	21:27	22:45	05:55	06:12	06:32
45°	19:57	21:11	22:24	06:02	06:24	06:50
N 40°	19:48	20:58	22:07	06:08	06:35	07:04
35°	19:41	20:47	21:52	06:13	06:43	07:16
30°	19:34	20:37	21:40	06:18	06:51	07:27
20°	19:23	20:21	21:19	06:26	07:05	07:46
N 10°	19:13	20:06	21:00	06:33	07:16	08:02
0°	19:04	19:53	20:43	06:39	07:27	08:17
S 10°	18:55	19:40	20:26	06:46	07:39	08:32
20°	18:46	19:26	20:08	06:53	07:51	08:48
30°	18:35	19:10	19:48	07:01	08:04	09:07
35°	18:29	19:01	19:36	07:06	08:12	09:18
40°	18:22	18:50	19:22	07:11	08:22	09:31
45°	18:14	18:38	19:06	07:17	08:32	09:46
S 50°	18:05	18:23	18:46	07:25	08:45	10:05
52°	18:01	18:17	18:37	07:28	08:52	10:14
54°	17:56	18:09	18:26	07:32	08:58	10:23
56°	17:50	18:01	18:14	07:36	09:06	10:35
58°	17:45	17:51	18:01	07:41	09:15	10:48
S 60°	17:38	17:40	17:45	07:47	09:24	11:03

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 15-17 99-92%
23	06:47	06:38	12:07	00:28	12:52	
24	06:29	06:20	12:06	01:16	13:40	
25	06:11	06:02	12:06	02:05	14:30	

March 26, 27, 28 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	183°13.2	211°17.2	S12°14.7	38°28.1	N17°43.5	42°55.6	N16°35.6	167°33.2	N04°15.3
1	198°15.6	226°16.7	13.7	53°30.8	43.5	57°58.2	35.6	182°35.4	15.5
2	213°18.1	241°16.3	12.8	68°33.5	43.4	73°00.8	35.6	197°37.6	15.6
3	228°20.6	256°15.8	·· 11.8	83°36.2	·· 43.4	88°03.4	·· 35.7	212°39.8	·· 15.7
4	243°23.0	271°15.4	10.9	98°38.9	43.4	103°06.0	35.7	227°41.9	15.8
5	258°25.5	286°14.9	09.9	113°41.6	43.4	118°08.6	35.8	242°44.1	15.9
6	273°27.9	301°14.4	S12°09.0	128°44.3	N17°43.3	133°11.2	N16°35.8	257°46.3	N04°16.1
7	288°30.4	316°14.0	08.1	143°47.0	43.3	148°13.9	35.8	272°48.5	16.2
8	303°32.9	331°13.5	07.1	158°49.7	43.3	163°16.5	35.9	287°50.6	16.3
9	318°35.3	346°13.1	·· 06.2	173°52.4	·· 43.2	178°19.1	·· 35.9	302°52.8	·· 16.4
10	333°37.8	1°12.6	05.2	188°55.1	43.2	193°21.7	36.0	317°55.0	16.5
11	348°40.3	16°12.1	04.3	203°57.8	43.2	208°24.3	36.0	332°57.2	16.7
12	3°42.7	31°11.7	S12°03.3	219°00.5	N17°43.1	223°26.9	N16°36.0	347°59.4	N04°16.8
13	18°45.2	46°11.2	02.4	234°03.2	43.1	238°29.5	36.1	3°01.5	16.9
14	33°47.7	61°10.8	01.4	249°05.9	43.1	253°32.1	36.1	18°03.7	17.0
15	48°50.1	76°10.3	12°00.4	264°08.6	·· 43.0	268°34.7	·· 36.2	33°05.9	·· 17.1
16	63°52.6	91°09.8	11°59.5	279°11.2	43.0	283°37.3	36.2	48°08.1	17.3
17	78°55.0	106°09.4	58.5	294°13.9	42.9	298°39.9	36.2	63°10.2	17.4
18	93°57.5	121°08.9	S11°57.6	309°16.6	N17°42.9	313°42.5	N16°36.3	78°12.4	N04°17.5
19	109°00.0	136°08.5	56.6	324°19.3	42.9	328°45.1	36.3	93°14.6	17.6
20	124°02.4	151°08.0	55.7	339°22.0	42.8	343°47.7	36.3	108°16.8	17.7
21	139°04.9	166°07.6	·· 54.7	354°24.6	·· 42.8	358°50.3	·· 36.4	123°18.9	·· 17.9
22	154°07.4	181°07.1	53.8	9°27.3	42.8	13°52.9	36.4	138°21.1	18.0
23	169°09.8	196°06.6	52.8	24°30.0	42.7	28°55.5	36.5	153°23.3	18.1
Mer.pass. 11:45		ν -0.5′ d 0.9′	m -3.95	ν 2.7′ d 0.0′	m -0.51	ν 2.6′ d 0.0′	m -2.38	ν 2.2′ d 0.1′	m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	184°12.3	211°06.2	S11°51.8	39°32.7	N17°42.7	43°58.1	N16°36.5	168°25.5	N04°18.2
1	199°14.8	226°05.7	50.9	54°35.3	42.6	59°00.7	36.5	183°27.6	18.3
2	214°17.2	241°05.3	49.9	69°38.0	42.6	74°03.3	36.6	198°29.8	18.5
3	229°19.7	256°04.8	·· 49.0	84°40.7	·· 42.6	89°05.8	·· 36.6	213°32.0	·· 18.6
4	244°22.2	271°04.4	48.0	99°43.3	42.5	104°08.4	36.7	228°34.2	18.7
5	259°24.6	286°03.9	47.0	114°46.0	42.5	119°11.0	36.7	243°36.3	18.8
6	274°27.1	301°03.5	S11°46.1	129°48.7	N17°42.4	134°13.6	N16°36.7	258°38.5	N04°19.0
7	289°29.5	316°03.0	45.1	144°51.3	42.4	149°16.2	36.8	273°40.7	19.1
8	304°32.0	331°02.6	44.2	159°54.0	42.3	164°18.8	36.8	288°42.9	19.2
9	319°34.5	346°02.1	·· 43.2	174°56.7	·· 42.3	179°21.4	·· 36.8	303°45.0	·· 19.3
10	334°36.9	1°01.7	42.2	189°59.3	42.3	194°24.0	36.9	318°47.2	19.4
11	349°39.4	16°01.2	41.3	205°02.0	42.2	209°26.6	36.9	333°49.4	19.6
12	4°41.9	31°00.7	S11°40.3	220°04.6	N17°42.2	224°29.2	N16°36.9	348°51.6	N04°19.7
13	19°44.3	46°00.3	39.3	235°07.3	42.1	239°31.8	37.0	3°53.7	19.8
14	34°46.8	60°59.8	38.4	250°10.0	42.1	254°34.4	37.0	18°55.9	19.9
15	49°49.3	75°59.4	·· 37.4	265°12.6	·· 42.0	269°37.0	·· 37.1	33°58.1	·· 20.0
16	64°51.7	90°58.9	36.4	280°15.3	42.0	284°39.6	37.1	49°00.3	20.2
17	79°54.2	105°58.5	35.5	295°17.9	41.9	299°42.2	37.1	64°02.4	20.3
18	94°56.7	120°58.0	S11°34.5	310°20.6	N17°41.9	314°44.8	N16°37.2	79°04.6	N04°20.4
19	109°59.1	135°57.6	33.5	325°23.2	41.8	329°47.4	37.2	94°06.8	20.5
20	125°01.6	150°57.1	32.6	340°25.9	41.8	344°49.9	37.2	109°09.0	20.6
21	140°04.0	165°56.7	·· 31.6	355°28.5	·· 41.7	359°52.5	·· 37.3	124°11.1	·· 20.8
22	155°06.5	180°56.2	30.6	10°31.1	41.7	14°55.1	37.3	139°13.3	20.9
23	170°09.0	195°55.8	29.7	25°33.8	41.7	29°57.7	37.3	154°15.5	21.0
Mer.pass. 11:41		ν -0.5′ d 1.0′	m -3.94	ν 2.7′ d 0.0′	m -0.49	ν 2.6′ d 0.0′	m -2.38	ν 2.2′ d 0.1′	m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	185°11.4	210°55.4	S11°28.7	40°36.4	N17°41.6	45°00.3	N16°37.4	169°17.7	N04°21.1
1	200°13.9	225°54.9	27.7	55°39.1	41.5	60°02.9	37.4	184°19.8	21.2
2	215°16.4	240°54.5	26.7	70°41.7	41.5	75°05.5	37.5	199°22.0	21.4
3	230°18.8	255°54.0	·· 25.8	85°44.3	·· 41.4	90°08.1	·· 37.5	214°24.2	·· 21.5
4	245°21.3	270°53.6	24.8	100°47.0	41.4	105°10.7	37.5	229°26.4	21.6
5	260°23.8	285°53.1	23.8	115°49.6	41.3	120°13.3	37.6	244°28.5	21.7
6	275°26.2	300°52.7	S11°22.8	130°52.3	N17°41.3	135°15.8	N16°37.6	259°30.7	N04°21.9
7	290°28.7	315°52.2	21.9	145°54.9	41.2	150°18.4	37.6	274°32.9	22.0
8	305°31.2	330°51.8	20.9	160°57.5	41.2	165°21.0	37.7	289°35.1	22.1
9	320°33.6	345°51.3	·· 19.9	176°00.1	·· 41.1	180°23.6	·· 37.7	304°37.2	·· 22.2
10	335°36.1	0°50.9	18.9	191°02.8	41.1	195°26.2	37.7	319°39.4	22.3
11	350°38.5	15°50.4	18.0	206°05.4	41.0	210°28.8	37.8	334°41.6	22.5
12	5°41.0	30°50.0	S11°17.0	221°08.0	N17°41.0	225°31.4	N16°37.8	349°43.8	N04°22.6
13	20°43.5	45°49.6	16.0	236°10.7	40.9	240°34.0	37.8	4°45.9	22.7
14	35°45.9	60°49.1	15.0	251°13.3	40.9	255°36.5	37.9	19°48.1	22.8
15	50°48.4	75°48.7	·· 14.0	266°15.9	·· 40.8	270°39.1	·· 37.9	34°50.3	·· 22.9
16	65°50.9	90°48.2	13.1	281°18.5	40.7	285°41.7	37.9	49°52.5	23.1
17	80°53.3	105°47.8	12.1	296°21.1	40.7	300°44.3	38.0	64°54.6	23.2
18	95°55.8	120°47.3	S11°11.1	311°23.8	N17°40.6	315°46.9	N16°38.0	79°56.8	N04°23.3
19	110°58.3	135°46.9	10.1	326°26.4	40.6	330°49.5	38.0	94°59.0	23.4
20	126°00.7	150°46.5	09.1	341°29.0	40.5	345°52.1	38.1	110°01.2	23.5
21	141°03.2	165°46.0	·· 08.1	356°31.6	·· 40.5	0°54.6	·· 38.1	125°03.3	·· 23.7
22	156°05.6	180°45.6	07.2	11°34.2	40.4	15°57.2	38.1	140°05.5	23.8
23	171°08.1	195°45.1	06.2	26°36.8	40.3	30°59.8	38.2	155°07.7	23.9
Mer.pass. 11:37		ν -0.4′ d 1.0′	m -3.94	ν 2.6′ d 0.1′	m -0.46	ν 2.6′ d 0.0′	m -2.37	ν 2.2′ d 0.1′	m 0.72

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.0
Hamal	327°49.4	23°35.5
Polaris	313°26.7	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.6
Aldebaran	290°37.7	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.3	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.6	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.4	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.7	-59°36.1
Suhail	222°44.7	-43°32.8
Miaplacidus	221°37.3	-69°50.0
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.1
Gacrux	171°49.0	-57°16.1
Alioth	166°10.8	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.1	49°10.4
Hadar	148°32.8	-60°30.2
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.2
Rigil Kent.	139°37.2	-60°56.8
Kochab	137°19.0	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.4	-26°29.5
Atria	107°05.8	-69°04.3
Sabik	102°00.6	-15°45.6
Shaula	96°07.8	-37°07.3
Rasalhague	95°56.8	12°32.2
Eltanin	90°41.3	51°28.7
Kaus Aust.	83°30.1	-34°22.2
Vega	80°32.0	38°48.2
Nunki	75°45.6	-26°15.7
Altair	61°58.3	8°56.3
Peacock	53°03.2	-56°38.6
Deneb	49°24.8	45°22.4
Enif	33°37.3	9°59.9
Al Na'ir	27°31.0	-46°49.6
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.7
Markab	13°28.4	15°21.0

Mar 26 Fri	SHA	Mer.pass
Venus	28°04.1	09:55
Mars	215°15.0	21:22
Jupiter	219°42.5	21:05
Saturn	344°20.1	12:48

Mar 27 Sat	SHA	Mer.pass
Venus	26°53.9	09:56
Mars	215°20.4	21:18
Jupiter	219°45.8	21:00
Saturn	344°13.2	12:44

Mar 28 Sun	SHA	Mer.pass
Venus	25°43.9	09:57
Mars	215°25.0	21:14
Jupiter	219°48.9	20:56
Saturn	344°06.2	12:41

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°31.9	N02°01.8	317°37.9	10.1′	S22°33.7	8.9′	56.2′
1	193°32.0	02.7	332°07.0	10.1′	22°42.6	8.8′	56.2′
2	208°32.2	03.7	346°36.1	10.1′	22°51.4	8.6′	56.2′
3	223°32.4	·· 04.7	1°05.1	10.0′	23°00.0	8.5′	56.1′
4	238°32.6	05.7	15°34.2	10.0′	23°08.5	8.4′	56.1′
5	253°32.8	06.7	30°03.2	10.0′	23°16.9	8.3′	56.1′
6	268°33.0	N02°07.6	44°32.1	9.9′	S23°25.2	8.1′	56.1′
7	283°33.2	08.6	59°01.1	9.9′	23°33.3	8.0′	56.0′
8	298°33.4	09.6	73°30.0	9.9′	23°41.3	7.8′	56.0′
9	313°33.6	·· 10.6	87°58.9	9.8′	23°49.1	7.8′	56.0′
10	328°33.8	11.6	102°27.7	9.8′	23°56.9	7.6′	55.9′
11	343°33.9	12.5	116°56.5	9.8′	24°04.5	7.5′	55.9′
12	358°34.1	N02°13.5	131°25.3	9.8′	S24°12.0	7.3′	55.9′
13	13°34.3	14.5	145°54.1	9.7′	24°19.3	7.2′	55.9′
14	28°34.5	15.5	160°22.8	9.7′	24°26.5	7.1′	55.8′
15	43°34.7	·· 16.5	174°51.5	9.7′	24°33.6	7.0′	55.8′
16	58°34.9	17.4	189°20.2	9.7′	24°40.6	6.8′	55.8′
17	73°35.1	18.4	203°48.9	9.6′	24°47.4	6.6′	55.7′
18	88°35.3	N02°19.4	218°17.5	9.6′	S24°54.0	6.6′	55.7′
19	103°35.5	20.4	232°46.1	9.6′	25°00.6	6.4′	55.7′
20	118°35.6	21.4	247°14.7	9.6′	25°07.0	6.3′	55.7′
21	133°35.8	·· 22.3	261°43.2	9.5′	25°13.3	6.1′	55.6′
22	148°36.0	23.3	276°11.8	9.5′	25°19.4	6.0′	55.6′
23	163°36.2	24.3	290°40.3	9.5′	25°25.4	5.9′	55.6′
	SD = 16.0′	d = 1.0′	SD = 15.3′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°36.4	N02°25.3	305°08.8	9.5′	S25°31.3	5.7′	55.6′
1	193°36.6	26.3	319°37.3	9.5′	25°37.0	5.6′	55.5′
2	208°36.8	27.2	334°05.7	9.4′	25°42.6	5.5′	55.5′
3	223°37.0	·· 28.2	348°34.2	9.4′	25°48.1	5.3′	55.5′
4	238°37.2	29.2	3°02.6	9.4′	25°53.4	5.2′	55.4′
5	253°37.3	30.2	17°31.0	9.4′	25°58.6	5.0′	55.4′
6	268°37.5	N02°31.2	31°59.4	9.4′	S26°03.6	4.9′	55.4′
7	283°37.7	32.1	46°27.8	9.4′	26°08.5	4.8′	55.4′
8	298°37.9	33.1	60°56.2	9.4′	26°13.3	4.6′	55.3′
9	313°38.1	·· 34.1	75°24.5	9.3′	26°17.9	4.5′	55.3′
10	328°38.3	35.1	89°52.8	9.3′	26°22.4	4.3′	55.3′
11	343°38.5	36.1	104°21.2	9.3′	26°26.7	4.2′	55.3′
12	358°38.7	N02°37.0	118°49.5	9.3′	S26°30.9	4.1′	55.2′
13	13°38.9	38.0	133°17.8	9.3′	26°35.0	3.9′	55.2′
14	28°39.1	39.0	147°46.1	9.3′	26°38.9	3.8′	55.2′
15	43°39.2	·· 40.0	162°14.4	9.3′	26°42.7	3.6′	55.2′
16	58°39.4	41.0	176°42.7	9.3′	26°46.3	3.6′	55.2′
17	73°39.6	41.9	191°11.0	9.3′	26°49.9	3.3′	55.1′
18	88°39.8	N02°42.9	205°39.3	9.3′	S26°53.2	3.3′	55.1′
19	103°40.0	43.9	220°07.6	9.3′	26°56.5	3.0′	55.1′
20	118°40.2	44.9	234°35.8	9.3′	26°59.5	3.0′	55.1′
21	133°40.4	·· 45.8	249°04.1	9.3′	27°02.5	2.8′	55.0′
22	148°40.6	46.8	263°32.4	9.3′	27°05.3	2.7′	55.0′
23	163°40.8	47.8	278°00.7	9.3′	27°08.0	2.5′	55.0′
	SD = 16.0′	d = 1.0′	SD = 15.2′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°40.9	N02°48.8	292°29.0	9.3′	S27°10.5	2.4′	55.0′
1	193°41.1	49.8	306°57.3	9.3′	27°12.9	2.2′	55.0′
2	208°41.3	50.7	321°25.5	9.3′	27°15.1	2.1′	54.9′
3	223°41.5	·· 51.7	335°53.8	9.3′	27°17.2	2.0′	54.9′
4	238°41.7	52.7	350°22.1	9.3′	27°19.2	1.8′	54.9′
5	253°41.9	53.7	4°50.5	9.3′	27°21.0	1.7′	54.9′
6	268°42.1	N02°54.6	19°18.8	9.3′	S27°22.7	1.5′	54.9′
7	283°42.3	55.6	33°47.1	9.3′	27°24.2	1.4′	54.8′
8	298°42.5	56.6	48°15.4	9.4′	27°25.6	1.3′	54.8′
9	313°42.6	·· 57.6	62°43.8	9.4′	27°26.9	1.1′	54.8′
10	328°42.8	58.6	77°12.2	9.4′	27°28.0	1.0′	54.8′
11	343°43.0	02°59.5	91°40.5	9.4′	27°29.0	0.9′	54.8′
12	358°43.2	N03°00.5	106°08.9	9.4′	S27°29.9	0.7′	54.7′
13	13°43.4	01.5	120°37.4	9.4′	27°30.6	0.6′	54.7′
14	28°43.6	02.5	135°05.8	9.4′	27°31.2	0.4′	54.7′
15	43°43.8	·· 03.4	149°34.2	9.5′	27°31.6	0.3′	54.7′
16	58°44.0	04.4	164°02.7	9.5′	27°31.9	0.1′	54.7′
17	73°44.1	05.4	178°31.2	9.5′	27°32.0	0.1′	54.7′
18	88°44.3	N03°06.4	192°59.7	9.5′	S27°32.1	0.2′	54.6′
19	103°44.5	07.3	207°28.2	9.6′	27°31.9	0.2′	54.6′
20	118°44.7	08.3	221°56.8	9.6′	27°31.7	0.4′	54.6′
21	133°44.9	·· 09.3	236°25.4	9.6′	27°31.3	0.5′	54.6′
22	148°45.1	10.3	250°54.0	9.6′	27°30.8	0.7′	54.6′
23	163°45.3	11.2	265°22.6	9.7′	27°30.1	0.8′	54.6′
	SD = 16.0′	d = 1.0′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:31	04:13	05:24	18:50	20:02	21:47
N 70°	02:59	04:25	05:28	18:45	19:49	21:17
68°	03:20	04:34	05:32	18:41	19:39	20:55
66°	03:36	04:42	05:35	18:38	19:31	20:39
64°	03:48	04:49	05:37	18:35	19:24	20:25
62°	03:59	04:54	05:39	18:33	19:18	20:14
60°	04:08	04:59	05:41	18:31	19:13	20:05
N 58°	04:15	05:03	05:43	18:29	19:09	19:57
56°	04:22	05:07	05:45	18:27	19:05	19:51
54°	04:28	05:10	05:46	18:26	19:02	19:45
52°	04:33	05:13	05:47	18:25	18:59	19:39
50°	04:37	05:16	05:48	18:24	18:56	19:35
45°	04:47	05:21	05:51	18:21	18:50	19:25
N 40°	04:54	05:26	05:53	18:19	18:46	19:18
35°	04:59	05:29	05:54	18:17	18:42	19:12
30°	05:04	05:32	05:56	18:15	18:39	19:07
20°	05:11	05:36	05:58	18:13	18:35	19:01
N 10°	05:15	05:39	06:00	18:11	18:32	18:56
0°	05:17	05:41	06:02	18:09	18:29	18:53
S 10°	05:19	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:05	18:27	18:52
30°	05:16	05:44	06:07	18:03	18:27	18:54
35°	05:14	05:43	06:09	18:02	18:27	18:56
40°	05:11	05:43	06:10	18:01	18:28	18:59
45°	05:07	05:42	06:11	17:59	18:28	19:02
S 50°	05:02	05:40	06:12	17:58	18:30	19:07
52°	05:00	05:39	06:13	17:57	18:30	19:10
54°	04:57	05:39	06:14	17:56	18:31	19:12
56°	04:54	05:37	06:15	17:55	18:32	19:15
58°	04:50	05:36	06:15	17:54	18:33	19:19
S 60°	04:46	05:35	06:16	17:53	18:34	19:23

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	01:40	▬	▬	03:58	▬	▬
64°	00:49	03:32	▬	04:50	03:55	▬
62°	00:18	02:06	03:47	05:22	05:22	05:30
60°	·· ··	01:30	02:51	05:46	05:59	06:26
N 58°	·· ··	01:04	02:19	06:05	06:25	06:59
56°	·· ··	00:43	01:54	06:21	06:46	07:23
54°	·· ··	00:26	01:35	06:35	07:03	07:43
52°	·· ··	00:12	01:19	06:47	07:18	08:00
50°	23:59	·· ··	01:04	06:58	07:31	08:14
45°	23:33	·· ··	00:36	07:20	07:57	08:43
N 40°	23:13	·· ··	00:13	07:38	08:18	09:05
35°	22:55	23:55	·· ··	07:54	08:36	09:24
30°	22:41	23:39	·· ··	08:07	08:51	09:40
20°	22:16	23:12	·· ··	08:30	09:17	10:07
N 10°	21:55	22:49	23:41	08:49	09:39	10:31
0°	21:35	22:27	23:20	09:08	10:00	10:53
S 10°	21:15	22:06	22:58	09:26	10:21	11:14
20°	20:54	21:43	22:34	09:46	10:43	11:38
30°	20:30	21:16	22:07	10:09	11:09	12:05
35°	20:15	21:01	21:51	10:23	11:24	12:21
40°	19:59	20:42	21:32	10:39	11:42	12:40
45°	19:39	20:20	21:10	10:58	12:04	13:02
S 50°	19:15	19:53	20:41	11:21	12:31	13:31
52°	19:03	19:39	20:27	11:32	12:44	13:45
54°	18:50	19:24	20:10	11:45	13:00	14:02
56°	18:35	19:05	19:51	12:00	13:18	14:21
58°	18:16	18:43	19:26	12:18	13:40	14:46
S 60°	17:54	18:14	18:54	12:40	14:09	15:18

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 86-69%
26	05:53	05:43	12:06	02:56	15:21	
27	05:34	05:25	12:05	03:47	16:14	
28	05:16	05:07	12:05	04:40	17:06	

March 29, 30, 31 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	186°10.6	210°44.7	S11°05.2	41°39.4	N17°40.3	46°02.4	N16°38.2	170°09.9	N04°24.0
1	201°13.0	225°44.3	04.2	56°42.1	40.2	61°05.0	38.2	185°12.0	24.1
2	216°15.5	240°43.8	03.2	71°44.7	40.1	76°07.5	38.3	200°14.2	24.3
3	231°18.0	255°43.4	·· 02.2	86°47.3	·· 40.1	91°10.1	·· 38.3	215°16.4	·· 24.4
4	246°20.4	270°42.9	01.2	101°49.9	40.0	106°12.7	38.3	230°18.6	24.5
5	261°22.9	285°42.5	11°00.3	116°52.5	40.0	121°15.3	38.4	245°20.7	24.6
6	276°25.4	300°42.1	S10°59.3	131°55.1	N17°39.9	136°17.9	N16°38.4	260°22.9	N04°24.8
7	291°27.8	315°41.6	58.3	146°57.7	39.8	151°20.5	38.4	275°25.1	24.9
8	306°30.3	330°41.2	57.3	162°00.3	39.8	166°23.0	38.5	290°27.3	25.0
9	321°32.8	345°40.7	·· 56.3	177°02.9	·· 39.7	181°25.6	·· 38.5	305°29.4	·· 25.1
10	336°35.2	0°40.3	55.3	192°05.5	39.6	196°28.2	38.5	320°31.6	25.2
11	351°37.7	15°39.9	54.3	207°08.1	39.6	211°30.8	38.6	335°33.8	25.4
12	6°40.1	30°39.4	S10°53.3	222°10.7	N17°39.5	226°33.4	N16°38.6	350°36.0	N04°25.5
13	21°42.6	45°39.0	52.3	237°13.3	39.4	241°35.9	38.6	5°38.1	25.6
14	36°45.1	60°38.6	51.3	252°15.9	39.4	256°38.5	38.7	20°40.3	25.7
15	51°47.5	75°38.1	·· 50.3	267°18.4	·· 39.3	271°41.1	·· 38.7	35°42.5	·· 25.8
16	66°50.0	90°37.7	49.4	282°21.0	39.2	286°43.7	38.7	50°44.6	26.0
17	81°52.5	105°37.3	48.4	297°23.6	39.2	301°46.2	38.7	65°46.8	26.1
18	96°54.9	120°36.8	S10°47.4	312°26.2	N17°39.1	316°48.8	N16°38.8	80°49.0	N04°26.2
19	111°57.4	135°36.4	46.4	327°28.8	39.0	331°51.4	38.8	95°51.2	26.3
20	126°59.9	150°36.0	45.4	342°31.4	39.0	346°54.0	38.8	110°53.3	26.4
21	142°02.3	165°35.5	·· 44.4	357°34.0	·· 38.9	1°56.6	·· 38.9	125°55.5	·· 26.6
22	157°04.8	180°35.1	43.4	12°36.5	38.8	16°59.1	38.9	140°57.7	26.7
23	172°07.3	195°34.7	42.4	27°39.1	38.8	32°01.7	38.9	155°59.9	26.8
Mer.pass. 11:33		ν -0.4′	d 1.0′	ν 2.6′	d 0.1′	ν 2.6′	d 0.0′	ν 2.2′	d 0.1′
		m -3.93		m -0.44		m -2.36		m 0.72	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	187°09.7	210°34.2	S10°41.4	42°41.7	N17°38.7	47°04.3	N16°39.0	171°02.0	N04°26.9
1	202°12.2	225°33.8	40.4	57°44.3	38.6	62°06.9	39.0	186°04.2	27.0
2	217°14.6	240°33.4	39.4	72°46.9	38.6	77°09.4	39.0	201°06.4	27.2
3	232°17.1	255°32.9	·· 38.4	87°49.4	·· 38.5	92°12.0	·· 39.1	216°08.6	·· 27.3
4	247°19.6	270°32.5	37.4	102°52.0	38.4	107°14.6	39.1	231°10.7	27.4
5	262°22.0	285°32.1	36.4	117°54.6	38.3	122°17.2	39.1	246°12.9	27.5
6	277°24.5	300°31.6	S10°35.4	132°57.1	N17°38.3	137°19.7	N16°39.1	261°15.1	N04°27.7
7	292°27.0	315°31.2	34.4	147°59.7	38.2	152°22.3	39.2	276°17.3	27.8
8	307°29.4	330°30.8	33.4	163°02.3	38.1	167°24.9	39.2	291°19.4	27.9
9	322°31.9	345°30.3	·· 32.4	178°04.9	·· 38.0	182°27.4	·· 39.2	306°21.6	·· 28.0
10	337°34.4	0°29.9	31.4	193°07.4	38.0	197°30.0	39.3	321°23.8	28.1
11	352°36.8	15°29.5	30.4	208°10.0	37.9	212°32.6	39.3	336°26.0	28.3
12	7°39.3	30°29.0	S10°29.4	223°12.5	N17°37.8	227°35.2	N16°39.3	351°28.1	N04°28.4
13	22°41.8	45°28.6	28.4	238°15.1	37.7	242°37.7	39.4	6°30.3	28.5
14	37°44.2	60°28.2	27.4	253°17.7	37.7	257°40.3	39.4	21°32.5	28.6
15	52°46.7	75°27.8	·· 26.3	268°20.2	·· 37.6	272°42.9	·· 39.4	36°34.6	·· 28.7
16	67°49.1	90°27.3	25.3	283°22.8	37.5	287°45.4	39.4	51°36.8	28.9
17	82°51.6	105°26.9	24.3	298°25.3	37.4	302°48.0	39.5	66°39.0	29.0
18	97°54.1	120°26.5	S10°23.3	313°27.9	N17°37.4	317°50.6	N16°39.5	81°41.2	N04°29.1
19	112°56.5	135°26.1	22.3	328°30.5	37.3	332°53.2	39.5	96°43.3	29.2
20	127°59.0	150°25.6	21.3	343°33.0	37.2	347°55.7	39.6	111°45.5	29.3
21	143°01.5	165°25.2	·· 20.3	358°35.6	·· 37.1	2°58.3	·· 39.6	126°47.7	·· 29.5
22	158°03.9	180°24.8	19.3	13°38.1	37.0	18°00.9	39.6	141°49.9	29.6
23	173°06.4	195°24.3	18.3	28°40.7	37.0	33°03.4	39.6	156°52.0	29.7
Mer.pass. 11:29		ν -0.4′	d 1.0′	ν 2.6′	d 0.1′	ν 2.6′	d 0.0′	ν 2.2′	d 0.1′
		m -3.93		m -0.41		m -2.35		m 0.71	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	188°08.9	210°23.9	S10°17.3	43°43.2	N17°36.9	48°06.0	N16°39.7	171°54.2	N04°29.8
1	203°11.3	225°23.5	16.3	58°45.8	36.8	63°08.6	39.7	186°56.4	29.9
2	218°13.8	240°23.1	15.2	73°48.3	36.7	78°11.1	39.7	201°58.6	30.1
3	233°16.2	255°22.6	·· 14.2	88°50.8	·· 36.6	93°13.7	·· 39.8	217°00.7	·· 30.2
4	248°18.7	270°22.2	13.2	103°53.4	36.6	108°16.3	39.8	232°02.9	30.3
5	263°21.2	285°21.8	12.2	118°55.9	36.5	123°18.8	39.8	247°05.1	30.4
6	278°23.6	300°21.4	S10°11.2	133°58.5	N17°36.4	138°21.4	N16°39.8	262°07.2	N04°30.5
7	293°26.1	315°20.9	10.2	149°01.0	36.3	153°24.0	39.9	277°09.4	30.7
8	308°28.6	330°20.5	09.2	164°03.5	36.2	168°26.5	39.9	292°11.6	30.8
9	323°31.0	345°20.1	·· 08.2	179°06.1	·· 36.1	183°29.1	·· 39.9	307°13.8	·· 30.9
10	338°33.5	0°19.7	07.1	194°08.6	36.1	198°31.7	39.9	322°15.9	31.0
11	353°36.0	15°19.3	06.1	209°11.2	36.0	213°34.2	40.0	337°18.1	31.2
12	8°38.4	30°18.8	S10°05.1	224°13.7	N17°35.9	228°36.8	N16°40.0	352°20.3	N04°31.3
13	23°40.9	45°18.4	04.1	239°16.2	35.8	243°39.3	40.0	7°22.5	31.4
14	38°43.4	60°18.0	03.1	254°18.7	35.7	258°41.9	40.1	22°24.6	31.5
15	53°45.8	75°17.6	·· 02.1	269°21.3	·· 35.6	273°44.5	·· 40.1	37°26.8	·· 31.6
16	68°48.3	90°17.1	01.0	284°23.8	35.5	288°47.0	40.1	52°29.0	31.8
17	83°50.7	105°16.7	10°00.0	299°26.3	35.4	303°49.6	40.1	67°31.2	31.9
18	98°53.2	120°16.3	S09°59.0	314°28.9	N17°35.4	318°52.2	N16°40.2	82°33.3	N04°32.0
19	113°55.7	135°15.9	58.0	329°31.4	35.3	333°54.7	40.2	97°35.5	32.1
20	128°58.1	150°15.5	57.0	344°33.9	35.2	348°57.3	40.2	112°37.7	32.2
21	144°00.6	165°15.0	·· 55.9	359°36.4	·· 35.1	3°59.8	·· 40.2	127°39.8	·· 32.4
22	159°03.1	180°14.6	54.9	14°38.9	35.0	19°02.4	40.3	142°42.0	32.5
23	174°05.5	195°14.2	53.9	29°41.5	34.9	34°05.0	40.3	157°44.2	32.6
Mer.pass. 11:26		ν -0.4′	d 1.0′	ν 2.5′	d 0.1′	ν 2.6′	d 0.0′	ν 2.2′	d 0.1′
		m -3.93		m -0.39		m -2.35		m 0.71	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.0
Hamal	327°49.4	23°35.4
Polaris	313°27.5	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.6
Aldebaran	290°37.7	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.3	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.6	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.4	-29°00.8
Procyon	244°48.8	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.7	-59°36.1
Suhail	222°44.7	-43°32.9
Miaplacidus	221°37.3	-69°50.0
Alphard	217°45.7	-8°46.8
Regulus	207°32.2	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.1
Gacrux	171°49.0	-57°16.1
Alioth	166°10.8	55°48.5
Spica	158°20.1	-11°18.4
Alkaid	152°50.1	49°10.4
Hadar	148°32.8	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.2	-60°56.8
Kochab	137°18.9	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.1
Antares	112°13.4	-26°29.5
Atria	107°05.7	-69°04.3
Sabik	102°00.6	-15°45.6
Shaula	96°07.8	-37°07.3
Rasalhague	95°56.8	12°32.2
Eltanin	90°41.2	51°28.8
Kaus Aust.	83°30.1	-34°22.2
Vega	80°32.0	38°48.2
Nunki	75°45.5	-26°15.7
Altair	61°58.3	8°56.3
Peacock	53°03.1	-56°38.6
Deneb	49°24.8	45°22.4
Enif	33°37.2	9°59.9
Al Na'ir	27°31.0	-46°49.6
Fomalhaut	15°12.8	-29°28.7
Scheat	13°43.7	28°13.7
Markab	13°28.4	15°21.0

Mar 29 Mon	SHA	Mer.pass
Venus	24°34.1	09:57
Mars	215°28.9	21:10
Jupiter	219°51.8	20:52
Saturn	343°59.3	12:38

Mar 30 Tue	SHA	Mer.pass
Venus	23°24.5	09:58
Mars	215°32.0	21:06
Jupiter	219°54.6	20:48
Saturn	343°52.3	12:34

Mar 31 Wed	SHA	Mer.pass
Venus	22°15.1	09:59
Mars	215°34.4	21:02
Jupiter	219°57.1	20:44
Saturn	343°45.4	12:31

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h

	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°45.5	N03°12.2	279°51.3	9.7′	S27°29.3	0.9′	54.5′
1	193°45.7	13.2	294°19.9	9.7′	27°28.4	1.1′	54.5′
2	208°45.8	14.2	308°48.7	9.7′	27°27.3	1.2′	54.5′
3	223°46.0	·· 15.1	323°17.4	9.8′	27°26.1	1.4′	54.5′
4	238°46.2	16.1	337°46.2	9.8′	27°24.7	1.4′	54.5′
5	253°46.4	17.1	352°15.0	9.8′	27°23.3	1.6′	54.5′
6	268°46.6	N03°18.1	6°43.8	9.9′	S27°21.7	1.8′	54.5′
7	283°46.8	19.0	21°12.7	9.9′	27°19.9	1.9′	54.4′
8	298°47.0	20.0	35°41.6	9.9′	27°18.0	2.0′	54.4′
9	313°47.2	·· 21.0	50°10.6	10.0′	27°16.0	2.1′	54.4′
10	328°47.4	22.0	64°39.6	10.0′	27°13.9	2.3′	54.4′
11	343°47.5	22.9	79°08.6	10.1′	27°11.6	2.4′	54.4′
12	358°47.7	N03°23.9	93°37.6	10.1′	S27°09.2	2.5′	54.4′
13	13°47.9	24.9	108°06.7	10.1′	27°06.7	2.7′	54.4′
14	28°48.1	25.9	122°35.9	10.2′	27°04.0	2.8′	54.4′
15	43°48.3	·· 26.8	137°05.1	10.2′	27°01.2	2.9′	54.3′
16	58°48.5	27.8	151°34.3	10.3′	26°58.3	3.0′	54.3′
17	73°48.7	28.8	166°03.5	10.3′	26°55.3	3.2′	54.3′
18	88°48.9	N03°29.8	180°32.9	10.4′	S26°52.1	3.3′	54.3′
19	103°49.0	30.7	195°02.2	10.4′	26°48.8	3.5′	54.3′
20	118°49.2	31.7	209°31.6	10.4′	26°45.3	3.5′	54.3′
21	133°49.4	·· 32.7	224°01.0	10.5′	26°41.8	3.7′	54.3′
22	148°49.6	33.6	238°30.5	10.5′	26°38.1	3.8′	54.3′
23	163°49.8	34.6	253°00.1	10.6′	26°34.3	4.0′	54.3′
	SD = 16.0′	d = 1.0′	SD = 14.9′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°50.0	N03°35.6	267°29.6	10.6′	S26°30.3	4.0′	54.3′
1	193°50.2	36.6	281°59.3	10.7′	26°26.3	4.2′	54.3′
2	208°50.4	37.5	296°28.9	10.7′	26°22.1	4.3′	54.3′
3	223°50.5	·· 38.5	310°58.7	10.8′	26°17.8	4.4′	54.2′
4	238°50.7	39.5	325°28.4	10.8′	26°13.4	4.6′	54.2′
5	253°50.9	40.5	339°58.3	10.9′	26°08.8	4.7′	54.2′
6	268°51.1	N03°41.4	354°28.1	10.9′	S26°04.1	4.8′	54.2′
7	283°51.3	42.4	8°58.0	11.0′	25°59.3	4.9′	54.2′
8	298°51.5	43.4	23°28.0	11.0′	25°54.4	5.0′	54.2′
9	313°51.7	·· 44.3	37°58.0	11.1′	25°49.4	5.2′	54.2′
10	328°51.9	45.3	52°28.1	11.1′	25°44.2	5.2′	54.2′
11	343°52.0	46.3	66°58.3	11.2′	25°39.0	5.4′	54.2′
12	358°52.2	N03°47.3	81°28.4	11.2′	S25°33.6	5.5′	54.2′
13	13°52.4	48.2	95°58.7	11.3′	25°28.1	5.7′	54.2′
14	28°52.6	49.2	110°29.0	11.3′	25°22.4	5.7′	54.2′
15	43°52.8	·· 50.2	124°59.3	11.4′	25°16.7	5.8′	54.2′
16	58°53.0	51.1	139°29.7	11.5′	25°10.9	6.0′	54.2′
17	73°53.2	52.1	154°00.2	11.5′	25°04.9	6.1′	54.2′
18	88°53.4	N03°53.1	168°30.7	11.6′	S24°58.8	6.2′	54.2′
19	103°53.5	54.1	183°01.2	11.6′	24°52.6	6.3′	54.2′
20	118°53.7	55.0	197°31.9	11.7′	24°46.3	6.4′	54.2′
21	133°53.9	·· 56.0	212°02.5	11.7′	24°39.9	6.5′	54.2′
22	148°54.1	57.0	226°33.3	11.8′	24°33.4	6.7′	54.2′
23	163°54.3	57.9	241°04.0	11.8′	24°26.7	6.7′	54.2′
	SD = 16.0′	d = 1.0′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°54.5	N03°58.9	255°34.9	11.9′	S24°20.0	6.9′	54.2′
1	193°54.7	03°59.9	270°05.8	12.0′	24°13.1	7.0′	54.2′
2	208°54.9	04°00.8	284°36.7	12.0′	24°06.1	7.0′	54.2′
3	223°55.0	·· 01.8	299°07.7	12.1′	23°59.1	7.2′	54.2′
4	238°55.2	02.8	313°38.8	12.1′	23°51.9	7.3′	54.2′
5	253°55.4	03.7	328°09.9	12.2′	23°44.6	7.4′	54.2′
6	268°55.6	N04°04.7	342°41.1	12.2′	S23°37.2	7.5′	54.2′
7	283°55.8	05.7	357°12.3	12.3′	23°29.7	7.6′	54.2′
8	298°56.0	06.7	11°43.6	12.3′	23°22.1	7.7′	54.2′
9	313°56.2	·· 07.6	26°15.0	12.4′	23°14.4	7.8′	54.2′
10	328°56.3	08.6	40°46.4	12.5′	23°06.6	7.9′	54.2′
11	343°56.5	09.6	55°17.8	12.5′	22°58.7	8.0′	54.2′
12	358°56.7	N04°10.5	69°49.4	12.6′	S22°50.7	8.2′	54.2′
13	13°56.9	11.5	84°20.9	12.6′	22°42.5	8.2′	54.2′
14	28°57.1	12.5	98°52.6	12.7′	22°34.3	8.3′	54.2′
15	43°57.3	·· 13.4	113°24.2	12.7′	22°26.0	8.4′	54.2′
16	58°57.5	14.4	127°56.0	12.8′	22°17.6	8.5′	54.2′
17	73°57.6	15.4	142°27.8	12.9′	22°09.1	8.6′	54.2′
18	88°57.8	N04°16.3	156°59.6	12.9′	S22°00.5	8.7′	54.2′
19	103°58.0	17.3	171°31.5	13.0′	21°51.8	8.8′	54.2′
20	118°58.2	18.3	186°03.5	13.0′	21°43.0	8.9′	54.2′
21	133°58.4	·· 19.2	200°35.5	13.1′	21°34.1	9.0′	54.2′
22	148°58.6	20.2	215°07.6	13.1′	21°25.1	9.1′	54.2′
23	163°58.8	21.2	229°39.7	13.2′	21°16.0	9.1′	54.2′
	SD = 16.0′	d = 1.0′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:03	03:55	05:08	19:04	20:18	22:14
N 70°	02:38	04:09	05:14	18:58	20:03	21:36
68°	03:03	04:21	05:19	18:52	19:51	21:11
66°	03:21	04:30	05:23	18:48	19:42	20:52
64°	03:35	04:38	05:27	18:44	19:34	20:37
62°	03:47	04:44	05:30	18:41	19:27	20:24
60°	03:57	04:50	05:32	18:38	19:21	20:14
N 58°	04:06	04:55	05:35	18:36	19:16	20:05
56°	04:13	04:59	05:37	18:34	19:11	19:58
54°	04:20	05:03	05:39	18:32	19:08	19:51
52°	04:25	05:06	05:40	18:30	19:04	19:45
50°	04:30	05:09	05:42	18:28	19:01	19:40
45°	04:41	05:16	05:45	18:25	18:54	19:30
N 40°	04:49	05:21	05:48	18:22	18:49	19:21
35°	04:55	05:25	05:50	18:19	18:45	19:15
30°	05:00	05:28	05:52	18:17	18:41	19:09
20°	05:08	05:34	05:56	18:14	18:36	19:02
N 10°	05:13	05:38	05:59	18:11	18:32	18:56
0°	05:17	05:41	06:01	18:08	18:28	18:53
S 10°	05:18	05:43	06:04	18:05	18:26	18:50
20°	05:19	05:44	06:06	18:02	18:24	18:50
30°	05:18	05:45	06:09	17:59	18:23	18:51
35°	05:16	05:46	06:11	17:58	18:23	18:52
40°	05:14	05:46	06:13	17:56	18:23	18:54
45°	05:11	05:45	06:15	17:54	18:23	18:57
S 50°	05:07	05:45	06:17	17:51	18:23	19:01
52°	05:05	05:44	06:18	17:50	18:23	19:03
54°	05:03	05:44	06:19	17:49	18:24	19:05
56°	05:00	05:44	06:21	17:47	18:24	19:07
58°	04:57	05:43	06:22	17:46	18:25	19:10
S 60°	04:53	05:42	06:24	17:44	18:25	19:14

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	06:29	▬	▬	08:06
64°	▬	▬	05:27	▬	▬	09:07
62°	04:43	04:52	04:52	06:24	08:00	09:41
60°	03:46	04:14	04:27	07:20	08:38	10:05
N 58°	03:13	03:47	04:07	07:53	09:04	10:25
56°	02:49	03:26	03:50	08:17	09:25	10:41
54°	02:29	03:09	03:36	08:37	09:42	10:55
52°	02:13	02:54	03:24	08:53	09:57	11:07
50°	01:59	02:41	03:13	09:07	10:10	11:18
45°	01:30	02:14	02:50	09:36	10:36	11:40
N 40°	01:07	01:53	02:31	09:58	10:56	11:57
35°	00:48	01:35	02:15	10:17	11:14	12:12
30°	00:32	01:20	02:02	10:33	11:28	12:25
20°	00:05	00:54	01:39	11:00	11:53	12:47
N 10°	·· ··	00:32	01:19	11:23	12:15	13:05
0°	·· ··	00:11	01:00	11:45	12:35	13:23
S 10°	23:50	·· ··	00:41	12:06	12:55	13:40
20°	23:27	·· ··	00:21	12:29	13:16	13:59
30°	23:01	23:58	·· ··	12:56	13:41	14:20
35°	22:46	23:44	·· ··	13:11	13:55	14:32
40°	22:28	23:28	·· ··	13:30	14:12	14:47
45°	22:06	23:09	·· ··	13:52	14:31	15:03
S 50°	21:39	22:45	23:54	14:19	14:56	15:24
52°	21:26	22:33	23:45	14:33	15:08	15:34
54°	21:10	22:20	23:34	14:49	15:22	15:45
56°	20:52	22:04	23:22	15:07	15:37	15:57
58°	20:29	21:46	23:09	15:30	15:56	16:11
S 60°	20:00	21:24	22:52	15:59	16:19	16:28

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 60-41%
29	04:58	04:49	12:05	05:32	17:58	
30	04:40	04:31	12:05	06:23	18:48	
31	04:22	04:13	12:04	07:12	19:35	

April 01, 02, 03 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	189°08.0	210°13.8	S09°52.9	44°44.0	N17°34.8	49°07.5	N16°40.3	172°46.4	N04°32.7
1	204°10.5	225°13.4	51.8	59°46.5	34.7	64°10.1	40.3	187°48.5	32.8
2	219°12.9	240°12.9	50.8	74°49.0	34.6	79°12.6	40.4	202°50.7	33.0
3	234°15.4	255°12.5	·· 49.8	89°51.5	·· 34.5	94°15.2	·· 40.4	217°52.9	·· 33.1
4	249°17.9	270°12.1	48.8	104°54.0	34.5	109°17.8	40.4	232°55.1	33.2
5	264°20.3	285°11.7	47.7	119°56.5	34.4	124°20.3	40.4	247°57.2	33.3
6	279°22.8	300°11.3	S09°46.7	134°59.1	N17°34.3	139°22.9	N16°40.5	262°59.4	N04°33.4
7	294°25.2	315°10.9	45.7	150°01.6	34.2	154°25.4	40.5	278°01.6	33.6
8	309°27.7	330°10.4	44.7	165°04.1	34.1	169°28.0	40.5	293°03.8	33.7
9	324°30.2	345°10.0	·· 43.6	180°06.6	·· 34.0	184°30.6	·· 40.5	308°05.9	·· 33.8
10	339°32.6	0°09.6	42.6	195°09.1	33.9	199°33.1	40.6	323°08.1	33.9
11	354°35.1	15°09.2	41.6	210°11.6	33.8	214°35.7	40.6	338°10.3	34.1
12	9°37.6	30°08.8	S09°40.6	225°14.1	N17°33.7	229°38.2	N16°40.6	353°12.4	N04°34.2
13	24°40.0	45°08.4	39.5	240°16.6	33.6	244°40.8	40.6	8°14.6	34.3
14	39°42.5	60°08.0	38.5	255°19.1	33.5	259°43.3	40.7	23°16.8	34.4
15	54°45.0	75°07.5	·· 37.5	270°21.6	·· 33.4	274°45.9	·· 40.7	38°19.0	·· 34.5
16	69°47.4	90°07.1	36.4	285°24.1	33.3	289°48.4	40.7	53°21.1	34.7
17	84°49.9	105°06.7	35.4	300°26.6	33.2	304°51.0	40.7	68°23.3	34.8
18	99°52.3	120°06.3	S09°34.4	315°29.1	N17°33.1	319°53.6	N16°40.8	83°25.5	N04°34.9
19	114°54.8	135°05.9	33.4	330°31.6	33.0	334°56.1	40.8	98°27.7	35.0
20	129°57.3	150°05.5	32.3	345°34.1	32.9	349°58.7	40.8	113°29.8	35.1
21	144°59.7	165°05.1	·· 31.3	0°36.5	·· 32.8	5°01.2	·· 40.8	128°32.0	·· 35.3
22	160°02.2	180°04.6	30.3	15°39.0	32.7	20°03.8	40.9	143°34.2	35.4
23	175°04.7	195°04.2	29.2	30°41.5	32.6	35°06.3	40.9	158°36.3	35.5
Mer.pass. 11:22		ν -0.4′	d 1.0′	m -3.92	ν 2.5′	d 0.1′	m -0.36	ν 2.6′	d 0.0′ m -2.34	ν 2.2′	d 0.1′ m 0.70

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	190°07.1	210°03.8	S09°28.2	45°44.0	N17°32.5	50°08.9	N16°40.9	173°38.5	N04°35.6
1	205°09.6	225°03.4	27.2	60°46.5	32.4	65°11.4	40.9	188°40.7	35.7
2	220°12.1	240°03.0	26.1	75°49.0	32.3	80°14.0	41.0	203°42.9	35.9
3	235°14.5	255°02.6	·· 25.1	90°51.5	·· 32.2	95°16.5	·· 41.0	218°45.0	·· 36.0
4	250°17.0	270°02.2	24.0	105°53.9	32.1	110°19.1	41.0	233°47.2	36.1
5	265°19.5	285°01.8	23.0	120°56.4	32.0	125°21.6	41.0	248°49.4	36.2
6	280°21.9	300°01.4	S09°22.0	135°58.9	N17°31.9	140°24.2	N16°41.0	263°51.5	N04°36.3
7	295°24.4	315°00.9	20.9	151°01.4	31.8	155°26.7	41.1	278°53.7	36.5
8	310°26.8	330°00.5	19.9	166°03.9	31.7	170°29.3	41.1	293°55.9	36.6
9	325°29.3	345°00.1	·· 18.9	181°06.3	·· 31.6	185°31.8	·· 41.1	308°58.1	·· 36.7
10	340°31.8	359°59.7	17.8	196°08.8	31.5	200°34.4	41.1	324°00.2	36.8
11	355°34.2	14°59.3	16.8	211°11.3	31.4	215°36.9	41.2	339°02.4	36.9
12	10°36.7	29°58.9	S09°15.7	226°13.8	N17°31.3	230°39.5	N16°41.2	354°04.6	N04°37.1
13	25°39.2	44°58.5	14.7	241°16.2	31.2	245°42.0	41.2	9°06.8	37.2
14	40°41.6	59°58.1	13.7	256°18.7	31.1	260°44.6	41.2	24°08.9	37.3
15	55°44.1	74°57.7	·· 12.6	271°21.2	·· 31.0	275°47.1	·· 41.2	39°11.1	·· 37.4
16	70°46.6	89°57.3	11.6	286°23.6	30.9	290°49.7	41.3	54°13.3	37.5
17	85°49.0	104°56.9	10.5	301°26.1	30.8	305°52.2	41.3	69°15.4	37.7
18	100°51.5	119°56.5	S09°09.5	316°28.6	N17°30.7	320°54.8	N16°41.3	84°17.6	N04°37.8
19	115°54.0	134°56.0	08.5	331°31.0	30.6	335°57.3	41.3	99°19.8	37.9
20	130°56.4	149°55.6	07.4	346°33.5	30.5	350°59.9	41.4	114°22.0	38.0
21	145°58.9	164°55.2	·· 06.4	1°35.9	·· 30.3	6°02.4	·· 41.4	129°24.1	·· 38.2
22	161°01.3	179°54.8	05.3	16°38.4	30.2	21°04.9	41.4	144°26.3	38.3
23	176°03.8	194°54.4	04.3	31°40.9	30.1	36°07.5	41.4	159°28.5	38.4
Mer.pass. 11:18		ν -0.4′	d 1.0′	m -3.92	ν 2.5′	d 0.1′	m -0.34	ν 2.6′	d 0.0′ m -2.33	ν 2.2′	d 0.1′ m 0.69

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	191°06.3	209°54.0	S09°03.2	46°43.3	N17°30.0	51°10.0	N16°41.4	174°30.7	N04°38.5
1	206°08.7	224°53.6	02.2	61°45.8	29.9	66°12.6	41.5	189°32.8	38.6
2	221°11.2	239°53.2	01.1	76°48.2	29.8	81°15.1	41.5	204°35.0	38.8
3	236°13.7	254°52.8	09°00.1	91°50.7	·· 29.7	96°17.7	·· 41.5	219°37.2	·· 38.9
4	251°16.1	269°52.4	08°59.0	106°53.1	29.6	111°20.2	41.5	234°39.3	39.0
5	266°18.6	284°52.0	58.0	121°55.6	29.5	126°22.8	41.5	249°41.5	39.1
6	281°21.1	299°51.6	S08°57.0	136°58.0	N17°29.4	141°25.3	N16°41.6	264°43.7	N04°39.2
7	296°23.5	314°51.2	55.9	152°00.5	29.2	156°27.8	41.6	279°45.9	39.4
8	311°26.0	329°50.8	54.9	167°02.9	29.1	171°30.4	41.6	294°48.0	39.5
9	326°28.4	344°50.4	·· 53.8	182°05.4	·· 29.0	186°32.9	·· 41.6	309°50.2	·· 39.6
10	341°30.9	359°50.0	52.8	197°07.8	28.9	201°35.5	41.6	324°52.4	39.7
11	356°33.4	14°49.6	51.7	212°10.3	28.8	216°38.0	41.7	339°54.5	39.8
12	11°35.8	29°49.2	S08°50.7	227°12.7	N17°28.7	231°40.5	N16°41.7	354°56.7	N04°40.0
13	26°38.3	44°48.8	49.6	242°15.1	28.6	246°43.1	41.7	9°58.9	40.1
14	41°40.8	59°48.4	48.6	257°17.6	28.4	261°45.6	41.7	25°01.1	40.2
15	56°43.2	74°48.0	·· 47.5	272°20.0	·· 28.3	276°48.2	·· 41.7	40°03.2	·· 40.3
16	71°45.7	89°47.6	46.4	287°22.5	28.2	291°50.7	41.8	55°05.4	40.4
17	86°48.2	104°47.2	45.4	302°24.9	28.1	306°53.2	41.8	70°07.6	40.6
18	101°50.6	119°46.8	S08°44.3	317°27.3	N17°28.0	321°55.8	N16°41.8	85°09.8	N04°40.7
19	116°53.1	134°46.4	43.3	332°29.8	27.9	336°58.3	41.8	100°11.9	40.8
20	131°55.6	149°46.0	42.2	347°32.2	27.7	352°00.9	41.8	115°14.1	40.9
21	146°58.0	164°45.6	·· 41.2	2°34.6	·· 27.6	7°03.4	·· 41.9	130°16.3	·· 41.0
22	162°00.5	179°45.2	40.1	17°37.0	27.5	22°05.9	41.9	145°18.4	41.2
23	177°02.9	194°44.8	39.1	32°39.5	27.4	37°08.5	41.9	160°20.6	41.3
Mer.pass. 11:14		ν -0.4′	d 1.0′	m -3.92	ν 2.5′	d 0.1′	m -0.31	ν 2.5′	d 0.0′ m -2.33	ν 2.2′	d 0.1′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°06.0
Hamal	327°49.4	23°35.4
Polaris	313°28.3	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.6
Aldebaran	290°37.7	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.3	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.6	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.4	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.7	-59°36.1
Suhail	222°44.7	-43°32.9
Miaplacidus	221°37.4	-69°50.0
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.2
Gacrux	171°49.0	-57°16.1
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.4
Hadar	148°32.8	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.2	-60°56.9
Kochab	137°18.9	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.1
Antares	112°13.4	-26°29.5
Atria	107°05.7	-69°04.3
Sabik	102°00.5	-15°45.6
Shaula	96°07.7	-37°07.3
Rasalhague	95°56.7	12°32.2
Eltanin	90°41.2	51°28.8
Kaus Aust.	83°30.0	-34°22.2
Vega	80°32.0	38°48.2
Nunki	75°45.5	-26°15.7
Altair	61°58.3	8°56.3
Peacock	53°03.1	-56°38.6
Deneb	49°24.8	45°22.4
Enif	33°37.2	9°59.9
Al Na'ir	27°31.0	-46°49.6
Fomalhaut	15°12.8	-29°28.6
Scheat	13°43.7	28°13.7
Markab	13°28.4	15°21.0

Apr 01 Thu	SHA	Mer.pass
Venus	21°05.8	09:59
Mars	215°36.0	20:58
Jupiter	219°59.5	20:40
Saturn	343°38.4	12:27

Apr 02 Fri	SHA	Mer.pass
Venus	19°56.7	10:00
Mars	215°36.9	20:54
Jupiter	220°01.7	20:36
Saturn	343°31.4	12:24

Apr 03 Sat	SHA	Mer.pass
Venus	18°47.7	10:01
Mars	215°37.0	20:50
Jupiter	220°03.8	20:32
Saturn	343°24.4	12:20

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.1118 sec ΔT = TT-UT1 = +69.2958 sec

2027 April 01 to Apr. 03 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°59.0	N04°22.1	244°11.9	13.2′	S21°06.9	9.3′	54.2′
1	193°59.1	23.1	258°44.1	13.3′	20°57.6	9.4′	54.2′
2	208°59.3	24.1	273°16.4	13.3′	20°48.2	9.4′	54.3′
3	223°59.5	·· 25.0	287°48.7	13.4′	20°38.8	9.6′	54.3′
4	238°59.7	26.0	302°21.1	13.4′	20°29.2	9.6′	54.3′
5	253°59.9	27.0	316°53.6	13.5′	20°19.6	9.7′	54.3′
6	269°00.1	N04°27.9	331°26.1	13.5′	S20°09.9	9.8′	54.3′
7	284°00.2	28.9	345°58.6	13.6′	20°00.1	9.9′	54.3′
8	299°00.4	29.9	0°31.2	13.6′	19°50.2	10.0′	54.3′
9	314°00.6	·· 30.8	15°03.9	13.7′	19°40.2	10.0′	54.3′
10	329°00.8	31.8	29°36.6	13.7′	19°30.2	10.2′	54.3′
11	344°01.0	32.8	44°09.3	13.8′	19°20.0	10.2′	54.3′
12	359°01.2	N04°33.7	58°42.1	13.8′	S19°09.8	10.3′	54.3′
13	14°01.4	34.7	73°14.9	13.9′	18°59.5	10.4′	54.4′
14	29°01.5	35.7	87°47.8	13.9′	18°49.1	10.5′	54.4′
15	44°01.7	·· 36.6	102°20.8	14.0′	18°38.6	10.6′	54.4′
16	59°01.9	37.6	116°53.8	14.0′	18°28.0	10.6′	54.4′
17	74°02.1	38.6	131°26.8	14.1′	18°17.4	10.7′	54.4′
18	89°02.3	N04°39.5	145°59.9	14.1′	S18°06.7	10.8′	54.4′
19	104°02.5	40.5	160°33.0	14.2′	17°55.9	10.9′	54.4′
20	119°02.7	41.4	175°06.2	14.2′	17°45.0	11.0′	54.4′
21	134°02.8	·· 42.4	189°39.4	14.3′	17°34.0	11.0′	54.4′
22	149°03.0	43.4	204°12.7	14.3′	17°23.0	11.1′	54.5′
23	164°03.2	44.3	218°46.0	14.3′	17°11.9	11.2′	54.5′
	SD = 16.0′	d = 1.0′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°03.4	N04°45.3	233°19.3	14.4′	S17°00.7	11.3′	54.5′
1	194°03.6	46.3	247°52.7	14.4′	16°49.4	11.3′	54.5′
2	209°03.8	47.2	262°26.1	14.5′	16°38.1	11.4′	54.5′
3	224°03.9	·· 48.2	276°59.6	14.5′	16°26.7	11.5′	54.5′
4	239°04.1	49.2	291°33.1	14.5′	16°15.2	11.6′	54.5′
5	254°04.3	50.1	306°06.6	14.6′	16°03.6	11.6′	54.5′
6	269°04.5	N04°51.1	320°40.2	14.6′	S15°52.0	11.7′	54.6′
7	284°04.7	52.0	335°13.9	14.7′	15°40.3	11.8′	54.6′
8	299°04.9	53.0	349°47.5	14.7′	15°28.5	11.8′	54.6′
9	314°05.1	·· 54.0	4°21.2	14.7′	15°16.7	11.9′	54.6′
10	329°05.2	54.9	18°55.0	14.8′	15°04.8	12.0′	54.6′
11	344°05.4	55.9	33°28.7	14.8′	14°52.8	12.0′	54.6′
12	359°05.6	N04°56.9	48°02.5	14.8′	S14°40.8	12.1′	54.6′
13	14°05.8	57.8	62°36.4	14.9′	14°28.7	12.2′	54.7′
14	29°06.0	58.8	77°10.2	14.9′	14°16.5	12.2′	54.7′
15	44°06.2	04°59.7	91°44.1	14.9′	14°04.3	12.3′	54.7′
16	59°06.3	05°00.7	106°18.1	15.0′	13°52.0	12.4′	54.7′
17	74°06.5	01.7	120°52.0	15.0′	13°39.6	12.4′	54.7′
18	89°06.7	N05°02.6	135°26.0	15.0′	S13°27.2	12.5′	54.7′
19	104°06.9	03.6	150°00.1	15.1′	13°14.7	12.5′	54.8′
20	119°07.1	04.5	164°34.1	15.1′	13°02.2	12.6′	54.8′
21	134°07.3	·· 05.5	179°08.2	15.1′	12°49.6	12.7′	54.8′
22	149°07.4	06.5	193°42.3	15.1′	12°36.9	12.7′	54.8′
23	164°07.6	07.4	208°16.4	15.2′	12°24.2	12.8′	54.8′
	SD = 16.0′	d = 1.0′	SD = 14.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°07.8	N05°08.4	222°50.6	15.2′	S12°11.4	12.9′	54.9′
1	194°08.0	09.3	237°24.8	15.2′	11°58.5	12.9′	54.9′
2	209°08.2	10.3	251°59.0	15.2′	11°45.6	12.9′	54.9′
3	224°08.4	·· 11.3	266°33.2	15.3′	11°32.7	13.0′	54.9′
4	239°08.5	12.2	281°07.5	15.3′	11°19.7	13.1′	54.9′
5	254°08.7	13.2	295°41.8	15.3′	11°06.6	13.1′	54.9′
6	269°08.9	N05°14.1	310°16.0	15.3′	S10°53.5	13.2′	55.0′
7	284°09.1	15.1	324°50.4	15.3′	10°40.3	13.2′	55.0′
8	299°09.3	16.1	339°24.7	15.3′	10°27.1	13.3′	55.0′
9	314°09.4	·· 17.0	353°59.0	15.4′	10°13.8	13.3′	55.0′
10	329°09.6	18.0	8°33.4	15.4′	10°00.5	13.4′	55.0′
11	344°09.8	18.9	23°07.8	15.4′	09°47.1	13.4′	55.1′
12	359°10.0	N05°19.9	37°42.2	15.4′	S09°33.7	13.5′	55.1′
13	14°10.2	20.8	52°16.6	15.4′	09°20.2	13.5′	55.1′
14	29°10.4	21.8	66°51.0	15.4′	09°06.7	13.6′	55.1′
15	44°10.5	·· 22.8	81°25.4	15.4′	08°53.1	13.6′	55.1′
16	59°10.7	23.7	95°59.9	15.5′	08°39.5	13.6′	55.2′
17	74°10.9	24.7	110°34.3	15.5′	08°25.9	13.8′	55.2′
18	89°11.1	N05°25.6	125°08.8	15.5′	S08°12.1	13.7′	55.2′
19	104°11.3	26.6	139°43.3	15.5′	07°58.4	13.8′	55.2′
20	119°11.4	27.5	154°17.7	15.5′	07°44.6	13.8′	55.2′
21	134°11.6	·· 28.5	168°52.2	15.5′	07°30.8	13.9′	55.3′
22	149°11.8	29.5	183°26.7	15.5′	07°16.9	13.9′	55.3′
23	164°12.0	30.4	198°01.2	15.5′	07°03.0	14.0′	55.3′
	SD = 16.0′	d = 1.0′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	01:29	03:37	04:52	19:18	20:35	22:52
N 70°	02:15	03:53	05:00	19:10	20:17	21:59
68°	02:44	04:07	05:06	19:03	20:04	21:28
66°	03:05	04:17	05:11	18:58	19:52	21:06
64°	03:22	04:26	05:16	18:53	19:43	20:48
62°	03:35	04:34	05:20	18:49	19:35	20:34
60°	03:47	04:40	05:23	18:46	19:29	20:23
N 58°	03:56	04:46	05:26	18:42	19:23	20:13
56°	04:04	04:51	05:29	18:40	19:18	20:05
54°	04:11	04:55	05:31	18:37	19:13	19:58
52°	04:18	04:59	05:33	18:35	19:09	19:51
50°	04:23	05:02	05:35	18:33	19:06	19:46
45°	04:35	05:10	05:40	18:29	18:58	19:34
N 40°	04:43	05:16	05:43	18:25	18:52	19:25
35°	04:51	05:21	05:46	18:22	18:47	19:17
30°	04:56	05:25	05:49	18:19	18:43	19:11
20°	05:05	05:31	05:53	18:14	18:37	19:02
N 10°	05:11	05:36	05:57	18:11	18:32	18:56
0°	05:16	05:40	06:00	18:07	18:28	18:52
S 10°	05:18	05:43	06:04	18:03	18:24	18:49
20°	05:20	05:45	06:07	18:00	18:22	18:47
30°	05:19	05:47	06:11	17:56	18:20	18:47
35°	05:19	05:48	06:13	17:53	18:19	18:48
40°	05:17	05:49	06:16	17:51	18:18	18:49
45°	05:15	05:49	06:18	17:48	18:17	18:51
S 50°	05:12	05:49	06:22	17:45	18:17	18:54
52°	05:10	05:50	06:23	17:43	18:17	18:56
54°	05:09	05:50	06:25	17:41	18:17	18:57
56°	05:06	05:50	06:27	17:40	18:17	19:00
58°	05:04	05:49	06:29	17:37	18:17	19:02
S 60°	05:01	05:49	06:31	17:35	18:17	19:05

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	06:41	05:46	▬	11:05	13:30
N 70°	07:44	06:04	05:29	08:28	11:40	13:46
68°	06:17	05:38	05:15	09:54	12:05	13:58
66°	05:39	05:18	05:03	10:32	12:24	14:08
64°	05:11	05:01	04:53	10:58	12:39	14:16
62°	04:50	04:48	04:45	11:18	12:52	14:23
60°	04:33	04:36	04:38	11:35	13:03	14:29
N 58°	04:19	04:26	04:31	11:49	13:12	14:34
56°	04:06	04:17	04:25	12:00	13:20	14:39
54°	03:55	04:09	04:20	12:11	13:27	14:43
52°	03:45	04:02	04:16	12:20	13:33	14:47
50°	03:37	03:56	04:12	12:28	13:39	14:50
45°	03:18	03:42	04:02	12:45	13:51	14:58
N 40°	03:03	03:30	03:55	12:59	14:02	15:04
35°	02:50	03:21	03:48	13:11	14:10	15:09
30°	02:39	03:12	03:42	13:22	14:18	15:14
20°	02:20	02:57	03:32	13:39	14:31	15:22
N 10°	02:03	02:44	03:23	13:54	14:42	15:28
0°	01:47	02:32	03:15	14:09	14:52	15:35
S 10°	01:31	02:19	03:06	14:23	15:03	15:41
20°	01:14	02:06	02:57	14:38	15:14	15:48
30°	00:54	01:51	02:47	14:55	15:26	15:56
35°	00:43	01:42	02:41	15:05	15:34	16:00
40°	00:29	01:32	02:34	15:16	15:42	16:05
45°	00:14	01:20	02:26	15:29	15:51	16:11
S 50°	·· ··	01:05	02:16	15:45	16:03	16:17
52°	·· ··	00:58	02:11	15:53	16:08	16:20
54°	·· ··	00:50	02:06	16:01	16:14	16:24
56°	·· ··	00:42	02:01	16:10	16:20	16:28
58°	·· ··	00:32	01:55	16:21	16:27	16:32
S 60°	·· ··	00:21	01:48	16:33	16:35	16:36

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 32-16%
01	04:04	03:55	12:04	07:58	20:20	
02	03:46	03:38	12:04	08:42	21:04	
03	03:29	03:20	12:03	09:25	21:46	

April 04, 05, 06 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	192°05.4	209°44.4	S08°38.0	47°41.9	N17°27.3	52°11.0	N16°41.9	175°22.8	N04°41.4
1	207°07.9	224°44.0	37.0	62°44.3	27.2	67°13.5	41.9	190°25.0	41.5
2	222°10.3	239°43.6	35.9	77°46.8	27.0	82°16.1	41.9	205°27.1	41.6
3	237°12.8	254°43.2	·· 34.8	92°49.2	·· 26.9	97°18.6	·· 42.0	220°29.3	·· 41.8
4	252°15.3	269°42.8	33.8	107°51.6	26.8	112°21.2	42.0	235°31.5	41.9
5	267°17.7	284°42.4	32.7	122°54.0	26.7	127°23.7	42.0	250°33.6	42.0
6	282°20.2	299°42.0	S08°31.7	137°56.4	N17°26.6	142°26.2	N16°42.0	265°35.8	N04°42.1
7	297°22.7	314°41.6	30.6	152°58.9	26.4	157°28.8	42.0	280°38.0	42.2
8	312°25.1	329°41.2	29.6	168°01.3	26.3	172°31.3	42.1	295°40.2	42.4
9	327°27.6	344°40.8	·· 28.5	183°03.7	·· 26.2	187°33.8	·· 42.1	310°42.3	·· 42.5
10	342°30.0	359°40.4	27.4	198°06.1	26.1	202°36.4	42.1	325°44.5	42.6
11	357°32.5	14°40.0	26.4	213°08.5	25.9	217°38.9	42.1	340°46.7	42.7
12	12°35.0	29°39.6	S08°25.3	228°10.9	N17°25.8	232°41.4	N16°42.1	355°48.8	N04°42.8
13	27°37.4	44°39.2	24.3	243°13.3	25.7	247°44.0	42.1	10°51.0	43.0
14	42°39.9	59°38.8	23.2	258°15.7	25.6	262°46.5	42.2	25°53.2	43.1
15	57°42.4	74°38.4	·· 22.1	273°18.2	·· 25.4	277°49.0	·· 42.2	40°55.4	·· 43.2
16	72°44.8	89°38.0	21.1	288°20.6	25.3	292°51.6	42.2	55°57.5	43.3
17	87°47.3	104°37.6	20.0	303°23.0	25.2	307°54.1	42.2	70°59.7	43.4
18	102°49.8	119°37.2	S08°18.9	318°25.4	N17°25.1	322°56.6	N16°42.2	86°01.9	N04°43.6
19	117°52.2	134°36.8	17.9	333°27.8	24.9	337°59.2	42.2	101°04.0	43.7
20	132°54.7	149°36.4	16.8	348°30.2	24.8	353°01.7	42.3	116°06.2	43.8
21	147°57.2	164°36.0	·· 15.8	3°32.6	·· 24.7	8°04.2	·· 42.3	131°08.4	·· 43.9
22	162°59.6	179°35.7	14.7	18°35.0	24.6	23°06.7	42.3	146°10.6	44.0
23	178°02.1	194°35.3	13.6	33°37.4	24.4	38°09.3	42.3	161°12.7	44.2
Mer.pass. 11:10		ν -0.4′	d 1.1′	m -3.92	ν 2.4′	d 0.1′	m -0.29	ν 2.5′	d 0.0′ m -2.32	ν 2.2′	d 0.1′ m 0.68

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	193°04.5	209°34.9	S08°12.6	48°39.8	N17°24.3	53°11.8	N16°42.3	176°14.9	N04°44.3
1	208°07.0	224°34.5	11.5	63°42.2	24.2	68°14.3	42.3	191°17.1	44.4
2	223°09.5	239°34.1	10.4	78°44.6	24.0	83°16.9	42.4	206°19.3	44.5
3	238°11.9	254°33.7	·· 09.4	93°47.0	·· 23.9	98°19.4	·· 42.4	221°21.4	·· 44.6
4	253°14.4	269°33.3	08.3	108°49.4	23.8	113°21.9	42.4	236°23.6	44.8
5	268°16.9	284°32.9	07.2	123°51.7	23.7	128°24.4	42.4	251°25.8	44.9
6	283°19.3	299°32.5	S08°06.2	138°54.1	N17°23.5	143°27.0	N16°42.4	266°27.9	N04°45.0
7	298°21.8	314°32.1	05.1	153°56.5	23.4	158°29.5	42.4	281°30.1	45.1
8	313°24.3	329°31.7	04.0	168°58.9	23.3	173°32.0	42.4	296°32.3	45.3
9	328°26.7	344°31.3	·· 02.9	184°01.3	·· 23.1	188°34.6	·· 42.5	311°34.5	·· 45.4
10	343°29.2	359°31.0	01.9	199°03.7	23.0	203°37.1	42.5	326°36.6	45.5
11	358°31.6	14°30.6	08°00.8	214°06.1	22.9	218°39.6	42.5	341°38.8	45.6
12	13°34.1	29°30.2	S07°59.7	229°08.4	N17°22.7	233°42.1	N16°42.5	356°41.0	N04°45.7
13	28°36.6	44°29.8	58.7	244°10.8	22.6	248°44.7	42.5	11°43.1	45.9
14	43°39.0	59°29.4	57.6	259°13.2	22.5	263°47.2	42.5	26°45.3	46.0
15	58°41.5	74°29.0	·· 56.5	274°15.6	·· 22.3	278°49.7	·· 42.5	41°47.5	·· 46.1
16	73°44.0	89°28.6	55.4	289°18.0	22.2	293°52.2	42.6	56°49.7	46.2
17	88°46.4	104°28.2	54.4	304°20.3	22.1	308°54.7	42.6	71°51.8	46.3
18	103°48.9	119°27.8	S07°53.3	319°22.7	N17°21.9	323°57.3	N16°42.6	86°54.0	N04°46.5
19	118°51.4	134°27.5	52.2	334°25.1	21.8	338°59.8	42.6	101°56.2	46.6
20	133°53.8	149°27.1	51.2	349°27.5	21.7	354°02.3	42.6	116°58.3	46.7
21	148°56.3	164°26.7	·· 50.1	4°29.8	·· 21.5	9°04.8	·· 42.6	132°00.5	·· 46.8
22	163°58.8	179°26.3	49.0	19°32.2	21.4	24°07.4	42.6	147°02.7	46.9
23	179°01.2	194°25.9	47.9	34°34.6	21.3	39°09.9	42.7	162°04.9	47.1
Mer.pass. 11:06		ν -0.4′	d 1.1′	m -3.91	ν 2.4′	d 0.1′	m -0.27	ν 2.5′	d 0.0′ m -2.31	ν 2.2′	d 0.1′ m 0.67

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	194°03.7	209°25.5	S07°46.9	49°36.9	N17°21.1	54°12.4	N16°42.7	177°07.0	N04°47.2
1	209°06.1	224°25.1	45.8	64°39.3	21.0	69°14.9	42.7	192°09.2	47.3
2	224°08.6	239°24.7	44.7	79°41.7	20.8	84°17.4	42.7	207°11.4	47.4
3	239°11.1	254°24.4	·· 43.6	94°44.0	·· 20.7	99°20.0	·· 42.7	222°13.5	·· 47.5
4	254°13.5	269°24.0	42.6	109°46.4	20.6	114°22.5	42.7	237°15.7	47.7
5	269°16.0	284°23.6	41.5	124°48.8	20.4	129°25.0	42.7	252°17.9	47.8
6	284°18.5	299°23.2	S07°40.4	139°51.1	N17°20.3	144°27.5	N16°42.8	267°20.1	N04°47.9
7	299°20.9	314°22.8	39.3	154°53.5	20.1	159°30.0	42.8	282°22.2	48.0
8	314°23.4	329°22.4	38.2	169°55.8	20.0	174°32.6	42.8	297°24.4	48.1
9	329°25.9	344°22.0	·· 37.2	184°58.2	·· 19.9	189°35.1	·· 42.8	312°26.6	·· 48.3
10	344°28.3	359°21.7	36.1	200°00.6	19.7	204°37.6	42.8	327°28.7	48.4
11	359°30.8	14°21.3	35.0	215°02.9	19.6	219°40.1	42.8	342°30.9	48.5
12	14°33.2	29°20.9	S07°33.9	230°05.3	N17°19.4	234°42.6	N16°42.8	357°33.1	N04°48.6
13	29°35.7	44°20.5	32.8	245°07.6	19.3	249°45.2	42.8	12°35.3	48.7
14	44°38.2	59°20.1	31.8	260°10.0	19.2	264°47.7	42.9	27°37.4	48.9
15	59°40.6	74°19.7	·· 30.7	275°12.3	·· 19.0	279°50.2	·· 42.9	42°39.6	·· 49.0
16	74°43.1	89°19.4	29.6	290°14.7	18.9	294°52.7	42.9	57°41.8	49.1
17	89°45.6	104°19.0	28.5	305°17.0	18.7	309°55.2	42.9	72°43.9	49.2
18	104°48.0	119°18.6	S07°27.4	320°19.4	N17°18.6	324°57.7	N16°42.9	87°46.1	N04°49.3
19	119°50.5	134°18.2	26.4	335°21.7	18.4	340°00.2	42.9	102°48.3	49.5
20	134°53.0	149°17.8	25.3	350°24.1	18.3	355°02.8	42.9	117°50.5	49.6
21	149°55.4	164°17.5	·· 24.2	5°26.4	·· 18.2	10°05.3	·· 42.9	132°52.6	·· 49.7
22	164°57.9	179°17.1	23.1	20°28.7	18.0	25°07.8	42.9	147°54.8	49.8
23	180°00.4	194°16.7	22.0	35°31.1	17.9	40°10.3	43.0	162°57.0	49.9
Mer.pass. 11:02		ν -0.4′	d 1.1′	m -3.91	ν 2.4′	d 0.1′	m -0.24	ν 2.5′	d 0.0′ m -2.30	ν 2.2′	d 0.1′ m 0.67

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.5
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°05.9
Hamal	327°49.4	23°35.4
Polaris	313°29.2	89°22.9
Acamar	315°10.7	-40°11.9
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.2	-8°10.4
Capella	280°19.4	46°01.6
Bellatrix	278°21.0	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.7	-52°42.9
Sirius	258°24.6	-16°45.4
Adhara	255°04.4	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.8	-59°36.1
Suhail	222°44.7	-43°32.9
Miaplacidus	221°37.4	-69°50.0
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.2	61°36.2
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.2
Gacrux	171°49.0	-57°16.1
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.4
Hadar	148°32.8	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.1	-60°56.9
Kochab	137°18.8	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.1
Antares	112°13.4	-26°29.6
Atria	107°05.6	-69°04.3
Sabik	102°00.5	-15°45.6
Shaula	96°07.7	-37°07.3
Rasalhague	95°56.7	12°32.2
Eltanin	90°41.2	51°28.8
Kaus Aust.	83°30.0	-34°22.2
Vega	80°31.9	38°48.2
Nunki	75°45.5	-26°15.7
Altair	61°58.2	8°56.3
Peacock	53°03.1	-56°38.6
Deneb	49°24.7	45°22.4
Enif	33°37.2	9°59.9
Al Na'ir	27°31.0	-46°49.6
Fomalhaut	15°12.8	-29°28.6
Scheat	13°43.7	28°13.7
Markab	13°28.3	15°21.0

Apr 04 Sun	SHA	Mer.pass
Venus	17°39.0	10:01
Mars	215°36.5	20:46
Jupiter	220°05.6	20:28
Saturn	343°17.4	12:17

Apr 05 Mon	SHA	Mer.pass
Venus	16°30.3	10:02
Mars	215°35.2	20:42
Jupiter	220°07.3	20:24
Saturn	343°10.4	12:13

Apr 06 Tue	SHA	Mer.pass
Venus	15°21.8	10:03
Mars	215°33.3	20:38
Jupiter	220°08.7	20:20
Saturn	343°03.3	12:10

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.1139 sec ΔT = TT-UT1 = +69.2979 sec

2027 April 04 to Apr. 06 UT

h

	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°12.2	N05°31.4	212°35.7	15.5′	S06°49.0	14.0′	55.3′
1	194°12.4	32.3	227°10.2	15.5′	06°35.0	14.0′	55.4′
2	209°12.5	33.3	241°44.7	15.5′	06°21.0	14.0′	55.4′
3	224°12.7	·· 34.2	256°19.2	15.5′	06°07.0	14.1′	55.4′
4	239°12.9	35.2	270°53.7	15.5′	05°52.9	14.2′	55.4′
5	254°13.1	36.1	285°28.2	15.5′	05°38.7	14.2′	55.4′
6	269°13.3	N05°37.1	300°02.7	15.5′	S05°24.5	14.2′	55.5′
7	284°13.4	38.1	314°37.2	15.5′	05°10.3	14.2′	55.5′
8	299°13.6	39.0	329°11.7	15.5′	04°56.1	14.3′	55.5′
9	314°13.8	·· 40.0	343°46.2	15.5′	04°41.8	14.3′	55.5′
10	329°14.0	40.9	358°20.6	15.5′	04°27.5	14.3′	55.6′
11	344°14.2	41.9	12°55.1	15.5′	04°13.2	14.4′	55.6′
12	359°14.3	N05°42.8	27°29.6	15.5′	S03°58.8	14.4′	55.6′
13	14°14.5	43.8	42°04.0	15.4′	03°44.4	14.4′	55.6′
14	29°14.7	44.7	56°38.5	15.4′	03°30.0	14.4′	55.7′
15	44°14.9	·· 45.7	71°12.9	15.4′	03°15.6	14.5′	55.7′
16	59°15.1	46.6	85°47.3	15.4′	03°01.1	14.5′	55.7′
17	74°15.2	47.6	100°21.7	15.4′	02°46.6	14.5′	55.7′
18	89°15.4	N05°48.5	114°56.1	15.4′	S02°32.1	14.6′	55.8′
19	104°15.6	49.5	129°30.5	15.4′	02°17.5	14.6′	55.8′
20	119°15.8	50.4	144°04.8	15.3′	02°02.9	14.5′	55.8′
21	134°16.0	·· 51.4	158°39.2	15.3′	01°48.4	14.7′	55.8′
22	149°16.1	52.4	173°13.5	15.3′	01°33.7	14.6′	55.8′
23	164°16.3	53.3	187°47.8	15.3′	01°19.1	14.6′	55.9′
	SD = 16.0′	d = 1.0′	SD = 15.1′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°16.5	N05°54.3	202°22.1	15.3′	S01°04.5	14.7′	55.9′
1	194°16.7	55.2	216°56.3	15.2′	00°49.8	14.7′	55.9′
2	209°16.9	56.2	231°30.6	15.2′	00°35.1	14.7′	55.9′
3	224°17.0	·· 57.1	246°04.8	15.2′	00°20.4	14.7′	56.0′
4	239°17.2	58.1	260°38.9	15.2′	S00°05.7	14.7′	56.0′
5	254°17.4	05°59.0	275°13.1	15.1′	N00°09.0	14.8′	56.0′
6	269°17.6	N06°00.0	289°47.2	15.1′	N00°23.8	14.7′	56.0′
7	284°17.8	00.9	304°21.3	15.1′	00°38.5	14.8′	56.1′
8	299°17.9	01.9	318°55.4	15.0′	00°53.3	14.8′	56.1′
9	314°18.1	·· 02.8	333°29.5	15.0′	01°08.1	14.7′	56.1′
10	329°18.3	03.8	348°03.5	15.0′	01°22.8	14.8′	56.1′
11	344°18.5	04.7	2°37.4	14.9′	01°37.6	14.8′	56.2′
12	359°18.7	N06°05.7	17°11.4	14.9′	N01°52.4	14.8′	56.2′
13	14°18.8	06.6	31°45.3	14.9′	02°07.2	14.8′	56.2′
14	29°19.0	07.6	46°19.2	14.8′	02°22.0	14.8′	56.2′
15	44°19.2	·· 08.5	60°53.0	14.8′	02°36.8	14.9′	56.3′
16	59°19.4	09.5	75°26.8	14.8′	02°51.7	14.8′	56.3′
17	74°19.5	10.4	90°00.5	14.7′	03°06.5	14.8′	56.3′
18	89°19.7	N06°11.4	104°34.3	14.7′	N03°21.3	14.8′	56.3′
19	104°19.9	12.3	119°07.9	14.6′	03°36.1	14.8′	56.4′
20	119°20.1	13.3	133°41.6	14.6′	03°50.9	14.8′	56.4′
21	134°20.3	·· 14.2	148°15.2	14.5′	04°05.7	14.8′	56.4′
22	149°20.4	15.2	162°48.7	14.5′	04°20.5	14.8′	56.4′
23	164°20.6	16.1	177°22.2	14.5′	04°35.3	14.8′	56.5′
	SD = 16.0′	d = 1.0′	SD = 15.2′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°20.8	N06°17.0	191°55.6	14.4′	N04°50.1	14.8′	56.5′
1	194°21.0	18.0	206°29.1	14.4′	05°04.9	14.8′	56.5′
2	209°21.1	18.9	221°02.4	14.3′	05°19.7	14.8′	56.5′
3	224°21.3	·· 19.9	235°35.7	14.3′	05°34.5	14.7′	56.6′
4	239°21.5	20.8	250°09.0	14.2′	05°49.2	14.8′	56.6′
5	254°21.7	21.8	264°42.2	14.1′	06°04.0	14.7′	56.6′
6	269°21.9	N06°22.7	279°15.3	14.1′	N06°18.7	14.7′	56.6′
7	284°22.0	23.7	293°48.4	14.0′	06°33.4	14.7′	56.7′
8	299°22.2	24.6	308°21.4	14.0′	06°48.1	14.7′	56.7′
9	314°22.4	·· 25.6	322°54.4	13.9′	07°02.8	14.7′	56.7′
10	329°22.6	26.5	337°27.3	13.9′	07°17.5	14.7′	56.7′
11	344°22.7	27.5	352°00.2	13.8′	07°32.2	14.6′	56.8′
12	359°22.9	N06°28.4	6°33.0	13.7′	N07°46.8	14.6′	56.8′
13	14°23.1	29.3	21°05.7	13.7′	08°01.4	14.6′	56.8′
14	29°23.3	30.3	35°38.4	13.6′	08°16.0	14.5′	56.8′
15	44°23.4	·· 31.2	50°11.0	13.6′	08°30.5	14.6′	56.9′
16	59°23.6	32.2	64°43.6	13.5′	08°45.1	14.5′	56.9′
17	74°23.8	33.1	79°16.1	13.4′	08°59.6	14.5′	56.9′
18	89°24.0	N06°34.1	93°48.5	13.4′	N09°14.1	14.4′	56.9′
19	104°24.1	35.0	108°20.8	13.3′	09°28.5	14.4′	57.0′
20	119°24.3	36.0	122°53.1	13.2′	09°42.9	14.4′	57.0′
21	134°24.5	·· 36.9	137°25.3	13.1′	09°57.3	14.4′	57.0′
22	149°24.7	37.8	151°57.5	13.1′	10°11.7	14.3′	57.0′
23	164°24.9	38.8	166°29.5	13.0′	10°26.0	14.3′	57.1′
	SD = 16.0′	d = 0.9′	SD = 15.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	00:26	03:17	04:36	19:33	20:53	////
N 70°	01:48	03:37	04:46	19:23	20:32	22:26
68°	02:24	03:52	04:53	19:14	20:16	21:47
66°	02:49	04:05	05:00	19:08	20:04	21:20
64°	03:08	04:15	05:05	19:02	19:53	21:01
62°	03:23	04:23	05:10	18:57	19:44	20:45
60°	03:36	04:31	05:14	18:53	19:37	20:32
N 58°	03:46	04:37	05:18	18:49	19:30	20:21
56°	03:55	04:43	05:21	18:46	19:24	20:12
54°	04:03	04:47	05:24	18:43	19:19	20:04
52°	04:10	04:52	05:26	18:40	19:15	19:57
50°	04:16	04:56	05:29	18:38	19:11	19:51
45°	04:28	05:04	05:34	18:32	19:02	19:38
N 40°	04:38	05:11	05:38	18:28	18:55	19:28
35°	04:46	05:16	05:42	18:24	18:50	19:20
30°	04:53	05:21	05:45	18:21	18:45	19:14
20°	05:02	05:28	05:51	18:15	18:38	19:03
N 10°	05:09	05:34	05:55	18:10	18:32	18:56
0°	05:15	05:39	05:59	18:06	18:27	18:51
S 10°	05:18	05:43	06:04	18:02	18:23	18:47
20°	05:20	05:46	06:08	17:57	18:19	18:45
30°	05:21	05:49	06:13	17:52	18:16	18:44
35°	05:21	05:50	06:16	17:49	18:15	18:44
40°	05:20	05:52	06:19	17:46	18:13	18:45
45°	05:19	05:53	06:22	17:43	18:12	18:46
S 50°	05:17	05:54	06:26	17:38	18:11	18:48
52°	05:15	05:55	06:28	17:36	18:10	18:49
54°	05:14	05:55	06:30	17:34	18:09	18:50
56°	05:12	05:55	06:33	17:32	18:09	18:52
58°	05:10	05:56	06:35	17:29	18:08	18:54
S 60°	05:08	05:56	06:38	17:26	18:08	18:56

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	05:10	04:39	04:08	15:36	17:40	19:53
N 70°	05:02	04:39	04:16	15:41	17:36	19:37
68°	04:56	04:39	04:22	15:45	17:32	19:25
66°	04:51	04:39	04:27	15:48	17:29	19:14
64°	04:46	04:39	04:32	15:50	17:26	19:06
62°	04:42	04:39	04:36	15:53	17:24	18:59
60°	04:38	04:39	04:40	15:55	17:22	18:52
N 58°	04:35	04:39	04:43	15:56	17:20	18:47
56°	04:32	04:39	04:46	15:58	17:19	18:42
54°	04:30	04:39	04:48	15:59	17:17	18:38
52°	04:28	04:39	04:51	16:01	17:16	18:34
50°	04:26	04:39	04:53	16:02	17:15	18:30
45°	04:21	04:39	04:57	16:04	17:12	18:23
N 40°	04:17	04:39	05:01	16:06	17:10	18:16
35°	04:14	04:39	05:05	16:08	17:08	18:11
30°	04:11	04:39	05:08	16:10	17:07	18:06
20°	04:06	04:39	05:13	16:12	17:04	17:58
N 10°	04:01	04:39	05:18	16:15	17:02	17:51
0°	03:57	04:39	05:22	16:17	16:59	17:44
S 10°	03:52	04:39	05:27	16:19	16:57	17:37
20°	03:48	04:39	05:32	16:21	16:55	17:30
30°	03:43	04:39	05:37	16:24	16:52	17:22
35°	03:40	04:39	05:41	16:25	16:51	17:17
40°	03:36	04:39	05:44	16:27	16:49	17:12
45°	03:32	04:39	05:49	16:29	16:47	17:06
S 50°	03:27	04:40	05:54	16:31	16:44	16:59
52°	03:25	04:40	05:56	16:32	16:43	16:55
54°	03:23	04:40	05:59	16:33	16:42	16:52
56°	03:20	04:40	06:02	16:34	16:41	16:48
58°	03:17	04:40	06:05	16:35	16:39	16:43
S 60°	03:14	04:40	06:09	16:37	16:37	16:38

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 27-0 9-1%
04	03:11	03:03	12:03	10:07	22:28	
05	02:54	02:45	12:03	10:49	23:11	
06	02:37	02:28	12:02	11:33	23:56	



April 07, 08, 09 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	195°02.8	209°16.3	S07°20.9	50°33.4	N17°17.7	55°12.8	N16°43.0	177°59.1	N04°50.1
1	210°05.3	224°15.9	19.8	65°35.8	17.6	70°15.3	43.0	193°01.3	50.2
2	225°07.7	239°15.5	18.8	80°38.1	17.4	85°17.8	43.0	208°03.5	50.3
3	240°10.2	254°15.2	·· 17.7	95°40.4	·· 17.3	100°20.4	·· 43.0	223°05.7	·· 50.4
4	255°12.7	269°14.8	16.6	110°42.8	17.1	115°22.9	43.0	238°07.8	50.5
5	270°15.1	284°14.4	15.5	125°45.1	17.0	130°25.4	43.0	253°10.0	50.6
6	285°17.6	299°14.0	S07°14.4	140°47.4	N17°16.8	145°27.9	N16°43.0	268°12.2	N04°50.8
7	300°20.1	314°13.6	13.3	155°49.8	16.7	160°30.4	43.0	283°14.3	50.9
8	315°22.5	329°13.3	12.2	170°52.1	16.5	175°32.9	43.1	298°16.5	51.0
9	330°25.0	344°12.9	·· 11.2	185°54.4	·· 16.4	190°35.4	·· 43.1	313°18.7	·· 51.1
10	345°27.5	359°12.5	10.1	200°56.7	16.2	205°37.9	43.1	328°20.9	51.2
11	0°29.9	14°12.1	09.0	215°59.1	16.1	220°40.4	43.1	343°23.0	51.4
12	15°32.4	29°11.8	S07°07.9	231°01.4	N17°15.9	235°43.0	N16°43.1	358°25.2	N04°51.5
13	30°34.9	44°11.4	06.8	246°03.7	15.8	250°45.5	43.1	13°27.4	51.6
14	45°37.3	59°11.0	05.7	261°06.0	15.6	265°48.0	43.1	28°29.5	51.7
15	60°39.8	74°10.6	·· 04.6	276°08.4	·· 15.5	280°50.5	·· 43.1	43°31.7	·· 51.8
16	75°42.2	89°10.2	03.5	291°10.7	15.3	295°53.0	43.1	58°33.9	52.0
17	90°44.7	104°09.9	02.4	306°13.0	15.2	310°55.5	43.1	73°36.1	52.1
18	105°47.2	119°09.5	S07°01.3	321°15.3	N17°15.0	325°58.0	N16°43.1	88°38.2	N04°52.2
19	120°49.6	134°09.1	07°00.3	336°17.6	14.9	341°00.5	43.2	103°40.4	52.3
20	135°52.1	149°08.7	06°59.2	351°20.0	14.7	356°03.0	43.2	118°42.6	52.4
21	150°54.6	164°08.4	·· 58.1	6°22.3	·· 14.6	11°05.5	·· 43.2	133°44.7	·· 52.6
22	165°57.0	179°08.0	57.0	21°24.6	14.4	26°08.0	43.2	148°46.9	52.7
23	180°59.5	194°07.6	55.9	36°26.9	14.3	41°10.5	43.2	163°49.1	52.8
Mer.pass. 10:58		ν -0.4′	d 1.1′	m -3.91	ν 2.3′	d 0.1′	m -0.22	ν 2.5′	d 0.0′ m -2.30	ν 2.2′	d 0.1′ m 0.66

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	196°02.0	209°07.2	S06°54.8	51°29.2	N17°14.1	56°13.0	N16°43.2	178°51.3	N04°52.9
1	211°04.4	224°06.9	53.7	66°31.5	14.0	71°15.6	43.2	193°53.4	53.0
2	226°06.9	239°06.5	52.6	81°33.8	13.8	86°18.1	43.2	208°55.6	53.2
3	241°09.3	254°06.1	·· 51.5	96°36.1	·· 13.6	101°20.6	·· 43.2	223°57.8	·· 53.3
4	256°11.8	269°05.7	50.4	111°38.4	13.5	116°23.1	43.2	238°59.9	53.4
5	271°14.3	284°05.4	49.3	126°40.7	13.3	131°25.6	43.2	254°02.1	53.5
6	286°16.7	299°05.0	S06°48.2	141°43.1	N17°13.2	146°28.1	N16°43.2	269°04.3	N04°53.6
7	301°19.2	314°04.6	47.1	156°45.4	13.0	161°30.6	43.3	284°06.5	53.8
8	316°21.7	329°04.2	46.0	171°47.7	12.9	176°33.1	43.3	299°08.6	53.9
9	331°24.1	344°03.9	·· 44.9	186°50.0	·· 12.7	191°35.6	·· 43.3	314°10.8	·· 54.0
10	346°26.6	359°03.5	43.8	201°52.3	12.5	206°38.1	43.3	329°13.0	54.1
11	1°29.1	14°03.1	42.7	216°54.6	12.4	221°40.6	43.3	344°15.1	54.2
12	16°31.5	29°02.7	S06°41.6	231°56.9	N17°12.2	236°43.1	N16°43.3	359°17.3	N04°54.4
13	31°34.0	44°02.4	40.5	246°59.1	12.1	251°45.6	43.3	14°19.5	54.5
14	46°36.5	59°02.0	39.5	262°01.4	11.9	266°48.1	43.3	29°21.7	54.6
15	61°38.9	74°01.6	·· 38.4	277°03.7	·· 11.7	281°50.6	·· 43.3	44°23.8	·· 54.7
16	76°41.4	89°01.3	37.3	292°06.0	11.6	296°53.1	43.3	59°26.0	54.8
17	91°43.8	104°00.9	36.2	307°08.3	11.4	311°55.6	43.3	74°28.2	55.0
18	106°46.3	119°00.5	S06°35.1	322°10.6	N17°11.3	326°58.1	N16°43.3	89°30.3	N04°55.1
19	121°48.8	134°00.1	34.0	337°12.9	11.1	342°00.6	43.3	104°32.5	55.2
20	136°51.2	148°59.8	32.9	352°15.2	10.9	357°03.1	43.3	119°34.7	55.3
21	151°53.7	163°59.4	·· 31.8	7°17.5	·· 10.8	12°05.6	·· 43.4	134°36.9	·· 55.4
22	166°56.2	178°59.0	30.7	22°19.8	10.6	27°08.1	43.4	149°39.0	55.6
23	181°58.6	193°58.7	29.6	37°22.0	10.4	42°10.6	43.4	164°41.2	55.7
Mer.pass. 10:54		ν -0.4′	d 1.1′	m -3.90	ν 2.3′	d 0.2′	m -0.19	ν 2.5′	d 0.0′ m -2.29	ν 2.2′	d 0.1′ m 0.66

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	197°01.1	208°58.3	S06°28.5	52°24.3	N17°10.3	57°13.1	N16°43.4	179°43.4	N04°55.8
1	212°03.6	223°57.9	27.3	67°26.6	10.1	72°15.6	43.4	194°45.5	55.9
2	227°06.0	238°57.5	26.2	82°28.9	10.0	87°18.1	43.4	209°47.7	56.0
3	242°08.5	253°57.2	·· 25.1	97°31.2	·· 09.8	102°20.6	·· 43.4	224°49.9	·· 56.2
4	257°11.0	268°56.8	24.0	112°33.4	09.6	117°23.1	43.4	239°52.0	56.3
5	272°13.4	283°56.4	22.9	127°35.7	09.5	132°25.6	43.4	254°54.2	56.4
6	287°15.9	298°56.1	S06°21.8	142°38.0	N17°09.3	147°28.1	N16°43.4	269°56.4	N04°56.5
7	302°18.3	313°55.7	20.7	157°40.3	09.1	162°30.6	43.4	284°58.6	56.6
8	317°20.8	328°55.3	19.6	172°42.6	09.0	177°33.1	43.4	300°00.7	56.8
9	332°23.3	343°55.0	·· 18.5	187°44.8	·· 08.8	192°35.6	·· 43.4	315°02.9	·· 56.9
10	347°25.7	358°54.6	17.4	202°47.1	08.6	207°38.0	43.4	330°05.1	57.0
11	2°28.2	13°54.2	16.3	217°49.4	08.5	222°40.5	43.4	345°07.2	57.1
12	17°30.7	28°53.9	S06°15.2	232°51.6	N17°08.3	237°43.0	N16°43.4	0°09.4	N04°57.2
13	32°33.1	43°53.5	14.1	247°53.9	08.1	252°45.5	43.4	15°11.6	57.3
14	47°35.6	58°53.1	13.0	262°56.2	08.0	267°48.0	43.4	30°13.8	57.5
15	62°38.1	73°52.8	·· 11.9	277°58.4	·· 07.8	282°50.5	·· 43.5	45°15.9	·· 57.6
16	77°40.5	88°52.4	10.8	293°00.7	07.6	297°53.0	43.5	60°18.1	57.7
17	92°43.0	103°52.0	09.7	308°03.0	07.5	312°55.5	43.5	75°20.3	57.8
18	107°45.4	118°51.7	S06°08.6	323°05.2	N17°07.3	327°58.0	N16°43.5	90°22.4	N04°57.9
19	122°47.9	133°51.3	07.5	338°07.5	07.1	343°00.5	43.5	105°24.6	58.1
20	137°50.4	148°50.9	06.4	353°09.8	06.9	358°03.0	43.5	120°26.8	58.2
21	152°52.8	163°50.6	·· 05.2	8°12.0	·· 06.8	13°05.5	·· 43.5	135°29.0	·· 58.3
22	167°55.3	178°50.2	04.1	23°14.3	06.6	28°08.0	43.5	150°31.1	58.4
23	182°57.8	193°49.8	03.0	38°16.5	06.4	43°10.4	43.5	165°33.3	58.5
Mer.pass. 10:50		ν -0.4′	d 1.1′	m -3.90	ν 2.3′	d 0.2′	m -0.17	ν 2.5′	d 0.0′ m -2.28	ν 2.2′	d 0.1′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°05.9
Hamal	327°49.4	23°35.4
Polaris	313°30.0	89°22.9
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.4
Capella	280°19.4	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.7	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.4	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.8	-59°36.1
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.4	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.2	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.2
Gacrux	171°49.0	-57°16.1
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.4
Hadar	148°32.7	-60°30.3
Menkent	147°55.1	-36°30.4
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.1	-60°56.9
Kochab	137°18.8	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.1
Antares	112°13.3	-26°29.6
Atria	107°05.6	-69°04.4
Sabik	102°00.5	-15°45.6
Shaula	96°07.7	-37°07.3
Rasalhague	95°56.7	12°32.2
Eltanin	90°41.2	51°28.8
Kaus Aust.	83°30.0	-34°22.2
Vega	80°31.9	38°48.2
Nunki	75°45.5	-26°15.7
Altair	61°58.2	8°56.3
Peacock	53°03.0	-56°38.6
Deneb	49°24.7	45°22.4
Enif	33°37.2	9°59.9
Al Na'ir	27°30.9	-46°49.6
Fomalhaut	15°12.8	-29°28.6
Scheat	13°43.7	28°13.7
Markab	13°28.3	15°21.0

Apr 07 Wed	SHA	Mer.pass
Venus	14°13.5	10:03
Mars	215°30.6	20:35
Jupiter	220°10.0	20:16
Saturn	342°56.3	12:06

Apr 08 Thu	SHA	Mer.pass
Venus	13°05.3	10:04
Mars	215°27.3	20:31
Jupiter	220°11.1	20:12
Saturn	342°49.3	12:03

Apr 09 Fri	SHA	Mer.pass
Venus	11°57.2	10:04
Mars	215°23.2	20:27
Jupiter	220°12.0	20:08
Saturn	342°42.3	11:59

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.1175 sec ΔT = TT-UT1 = +69.3015 sec

2027 April 07 to Apr. 09 UT

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°25.0	N06°39.7	181°01.5	12.9′	N10°40.3	14.2′	57.1′
1	194°25.2	40.7	195°33.5	12.9′	10°54.5	14.2′	57.1′
2	209°25.4	41.6	210°05.3	12.8′	11°08.7	14.2′	57.1′
3	224°25.6	·· 42.6	224°37.1	12.7′	11°22.9	14.1′	57.2′
4	239°25.7	43.5	239°08.8	12.6′	11°37.0	14.1′	57.2′
5	254°25.9	44.4	253°40.4	12.5′	11°51.1	14.0′	57.2′
6	269°26.1	N06°45.4	268°12.0	12.5′	N12°05.1	14.0′	57.2′
7	284°26.3	46.3	282°43.4	12.4′	12°19.1	14.0′	57.3′
8	299°26.4	47.3	297°14.8	12.3′	12°33.1	13.9′	57.3′
9	314°26.6	·· 48.2	311°46.1	12.2′	12°47.0	13.8′	57.3′
10	329°26.8	49.1	326°17.3	12.1′	13°00.8	13.8′	57.3′
11	344°26.9	50.1	340°48.5	12.1′	13°14.6	13.8′	57.3′
12	359°27.1	N06°51.0	355°19.5	12.0′	N13°28.4	13.6′	57.4′
13	14°27.3	52.0	9°50.5	11.9′	13°42.0	13.7′	57.4′
14	29°27.5	52.9	24°21.4	11.8′	13°55.7	13.5′	57.4′
15	44°27.6	·· 53.8	38°52.1	11.7′	14°09.2	13.6′	57.4′
16	59°27.8	54.8	53°22.8	11.6′	14°22.8	13.4′	57.5′
17	74°28.0	55.7	67°53.5	11.5′	14°36.2	13.4′	57.5′
18	89°28.2	N06°56.7	82°24.0	11.4′	N14°49.6	13.3′	57.5′
19	104°28.3	57.6	96°54.4	11.3′	15°02.9	13.3′	57.5′
20	119°28.5	58.5	111°24.8	11.3′	15°16.2	13.2′	57.6′
21	134°28.7	06°59.5	125°55.0	11.2′	15°29.4	13.1′	57.6′
22	149°28.9	07°00.4	140°25.2	11.1′	15°42.5	13.0′	57.6′
23	164°29.0	01.4	154°55.3	11.0′	15°55.5	13.0′	57.6′
	SD = 16.0′	*d* = 0.9′	SD = 15.6′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°29.2	N07°02.3	169°25.2	10.9′	N16°08.5	12.9′	57.6′
1	194°29.4	03.2	183°55.1	10.8′	16°21.4	12.9′	57.7′
2	209°29.6	04.2	198°24.9	10.7′	16°34.3	12.7′	57.7′
3	224°29.7	·· 05.1	212°54.6	10.6′	16°47.0	12.7′	57.7′
4	239°29.9	06.0	227°24.2	10.5′	16°59.7	12.6′	57.7′
5	254°30.1	07.0	241°53.7	10.4′	17°12.3	12.5′	57.7′
6	269°30.2	N07°07.9	256°23.1	10.3′	N17°24.8	12.5′	57.8′
7	284°30.4	08.9	270°52.4	10.2′	17°37.3	12.3′	57.8′
8	299°30.6	09.8	285°21.6	10.1′	17°49.6	12.3′	57.8′
9	314°30.8	·· 10.7	299°50.7	10.0′	18°01.9	12.2′	57.8′
10	329°30.9	11.7	314°19.7	9.9′	18°14.1	12.0′	57.8′
11	344°31.1	12.6	328°48.6	9.8′	18°26.1	12.0′	57.9′
12	359°31.3	N07°13.5	343°17.4	9.7′	N18°38.1	11.9′	57.9′
13	14°31.4	14.5	357°46.1	9.6′	18°50.0	11.9′	57.9′
14	29°31.6	15.4	12°14.7	9.5′	19°01.9	11.7′	57.9′
15	44°31.8	·· 16.3	26°43.2	9.4′	19°13.6	11.6′	58.0′
16	59°32.0	17.3	41°11.6	9.3′	19°25.2	11.5′	58.0′
17	74°32.1	18.2	55°39.9	9.2′	19°36.7	11.4′	58.0′
18	89°32.3	N07°19.1	70°08.1	9.1′	N19°48.1	11.3′	58.0′
19	104°32.5	20.1	84°36.2	9.0′	19°59.4	11.2′	58.0′
20	119°32.6	21.0	99°04.1	8.9′	20°10.6	11.1′	58.0′
21	134°32.8	·· 21.9	113°32.0	8.8′	20°21.7	11.0′	58.1′
22	149°33.0	22.9	127°59.8	8.7′	20°32.7	10.9′	58.1′
23	164°33.2	23.8	142°27.5	8.6′	20°43.6	10.8′	58.1′
	SD = 16.0′	*d* = 0.9′	SD = 15.7′				

Fri	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°33.3	N07°24.7	156°55.1	8.5′	N20°54.4	10.7′	58.1′
1	194°33.5	25.7	171°22.5	8.4′	21°05.1	10.5′	58.1′
2	209°33.7	26.6	185°49.9	8.3′	21°15.6	10.4′	58.2′
3	224°33.8	·· 27.5	200°17.2	8.2′	21°26.0	10.3′	58.2′
4	239°34.0	28.5	214°44.3	8.1′	21°36.3	10.2′	58.2′
5	254°34.2	29.4	229°11.4	8.0′	21°46.5	10.1′	58.2′
6	269°34.4	N07°30.3	243°38.3	7.9′	N21°56.6	10.0′	58.2′
7	284°34.5	31.3	258°05.2	7.7′	22°06.6	9.8′	58.2′
8	299°34.7	32.2	272°31.9	7.6′	22°16.4	9.7′	58.3′
9	314°34.9	·· 33.1	286°58.6	7.5′	22°26.1	9.6′	58.3′
10	329°35.0	34.1	301°25.1	7.4′	22°35.7	9.4′	58.3′
11	344°35.2	35.0	315°51.6	7.3′	22°45.1	9.3′	58.3′
12	359°35.4	N07°35.9	330°17.9	7.2′	N22°54.4	9.2′	58.3′
13	14°35.5	36.8	344°44.1	7.1′	23°03.6	9.1′	58.3′
14	29°35.7	37.8	359°10.3	7.0′	23°12.7	8.9′	58.4′
15	44°35.9	·· 38.7	13°36.3	6.9′	23°21.6	8.8′	58.4′
16	59°36.1	39.6	28°02.3	6.8′	23°30.4	8.6′	58.4′
17	74°36.2	40.6	42°28.1	6.7′	23°39.0	8.5′	58.4′
18	89°36.4	N07°41.5	56°53.9	6.7′	N23°47.5	8.3′	58.4′
19	104°36.6	42.4	71°19.5	6.6′	23°55.8	8.3′	58.4′
20	119°36.7	43.3	85°45.1	6.5′	24°04.1	8.0′	58.5′
21	134°36.9	·· 44.3	100°10.5	6.4′	24°12.1	8.0′	58.5′
22	149°37.1	45.2	114°35.9	6.3′	24°20.1	7.7′	58.5′
23	164°37.2	46.1	129°01.2	6.2′	24°27.8	7.7′	58.5′
	SD = 16.0′	*d* = 0.9′	SD = 15.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	02:57	04:20	19:47	21:12	////
N 70°	01:13	03:20	04:31	19:35	20:48	23:05
68°	02:02	03:38	04:41	19:26	20:30	22:09
66°	02:32	03:52	04:48	19:18	20:15	21:37
64°	02:54	04:03	04:55	19:11	20:03	21:14
62°	03:11	04:13	05:00	19:05	19:53	20:56
60°	03:25	04:21	05:05	19:00	19:45	20:42
N 58°	03:36	04:28	05:09	18:56	19:37	20:30
56°	03:46	04:34	05:13	18:52	19:31	20:20
54°	03:55	04:40	05:17	18:48	19:25	20:11
52°	04:02	04:45	05:20	18:45	19:20	20:03
50°	04:09	04:49	05:22	18:42	19:16	19:57
45°	04:22	04:58	05:28	18:36	19:06	19:43
N 40°	04:33	05:06	05:34	18:31	18:59	19:32
35°	04:42	05:12	05:38	18:27	18:52	19:23
30°	04:49	05:17	05:42	18:23	18:47	19:16
20°	05:00	05:26	05:48	18:16	18:38	19:04
N 10°	05:08	05:32	05:54	18:10	18:32	18:56
0°	05:14	05:38	05:59	18:05	18:26	18:50
S 10°	05:18	05:43	06:04	18:00	18:21	18:46
20°	05:21	05:47	06:09	17:55	18:17	18:42
30°	05:23	05:51	06:15	17:49	18:13	18:40
35°	05:23	05:53	06:18	17:45	18:11	18:40
40°	05:23	05:55	06:22	17:42	18:09	18:40
45°	05:23	05:57	06:26	17:37	18:07	18:40
S 50°	05:21	05:59	06:31	17:32	18:04	18:42
52°	05:20	05:59	06:33	17:30	18:03	18:42
54°	05:19	06:00	06:36	17:27	18:02	18:43
56°	05:18	06:01	06:39	17:24	18:01	18:44
58°	05:17	06:02	06:42	17:21	18:00	18:46
S 60°	05:15	06:03	06:45	17:17	17:59	18:47

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	03:30	02:23	▭	22:40	▭	▭
N 70°	03:48	03:07	▭	21:58	▭	▭
68°	04:03	03:37	02:41	21:30	·· ··	00:13
66°	04:15	03:59	03:34	21:09	23:22	▭
64°	04:25	04:17	04:06	20:53	22:51	·· ··
62°	04:34	04:31	04:30	20:39	22:28	·· ··
60°	04:41	04:44	04:50	20:28	22:09	23:54
N 58°	04:48	04:55	05:06	20:18	21:54	23:31
56°	04:54	05:04	05:20	20:09	21:41	23:13
54°	04:59	05:13	05:32	20:02	21:29	22:58
52°	05:04	05:20	05:42	19:55	21:19	22:44
50°	05:08	05:27	05:52	19:49	21:10	22:33
45°	05:18	05:42	06:12	19:36	20:52	22:09
N 40°	05:26	05:54	06:28	19:25	20:37	21:49
35°	05:33	06:05	06:42	19:16	20:24	21:33
30°	05:39	06:14	06:54	19:08	20:13	21:20
20°	05:50	06:30	07:15	18:54	19:54	20:56
N 10°	05:59	06:44	07:33	18:42	19:37	20:36
0°	06:08	06:57	07:50	18:31	19:22	20:17
S 10°	06:17	07:10	08:07	18:20	19:06	19:58
20°	06:27	07:25	08:26	18:08	18:50	19:38
30°	06:38	07:41	08:47	17:54	18:32	19:15
35°	06:44	07:51	09:00	17:47	18:21	19:02
40°	06:52	08:02	09:15	17:38	18:09	18:46
45°	07:00	08:15	09:32	17:28	17:54	18:27
S 50°	07:11	08:31	09:54	17:15	17:36	18:05
52°	07:16	08:39	10:04	17:10	17:28	17:54
54°	07:21	08:47	10:16	17:03	17:19	17:41
56°	07:27	08:57	10:30	16:56	17:09	17:27
58°	07:34	09:08	10:46	16:49	16:57	17:11
S 60°	07:42	09:21	11:05	16:40	16:43	16:51

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 0-5%
07	02:20	02:12	12:02	12:19	–:–	
08	02:03	01:55	12:02	13:09	00:44	
09	01:47	01:39	12:02	14:03	01:36	

April 10, 11, 12 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	198°00.2	208°49.5	S06°01.9	53°18.8	N17°06.3	58°12.9	N16°43.5	180°35.5	N04°58.7
1	213°02.7	223°49.1	06°00.8	68°21.0	06.1	73°15.4	43.5	195°37.6	58.8
2	228°05.2	238°48.7	05°59.7	83°23.3	05.9	88°17.9	43.5	210°39.8	58.9
3	243°07.6	253°48.4	·· 58.6	98°25.5	·· 05.7	103°20.4	·· 43.5	225°42.0	·· 59.0
4	258°10.1	268°48.0	57.5	113°27.8	05.6	118°22.9	43.5	240°44.2	59.1
5	273°12.6	283°47.6	56.4	128°30.0	05.4	133°25.4	43.5	255°46.3	59.3
6	288°15.0	298°47.3	S05°55.3	143°32.3	N17°05.2	148°27.9	N16°43.5	270°48.5	N04°59.4
7	303°17.5	313°46.9	54.1	158°34.5	05.0	163°30.4	43.5	285°50.7	59.5
8	318°19.9	328°46.5	53.0	173°36.8	04.9	178°32.8	43.5	300°52.8	59.6
9	333°22.4	343°46.2	·· 51.9	188°39.0	·· 04.7	193°35.3	·· 43.5	315°55.0	·· 59.7
10	348°24.9	358°45.8	50.8	203°41.3	04.5	208°37.8	43.5	330°57.2	04°59.9
11	3°27.3	13°45.5	49.7	218°43.5	04.3	223°40.3	43.5	345°59.4	05°00.0
12	18°29.8	28°45.1	S05°48.6	233°45.8	N17°04.2	238°42.8	N16°43.5	1°01.5	N05°00.1
13	33°32.3	43°44.7	47.5	248°48.0	04.0	253°45.3	43.5	16°03.7	00.2
14	48°34.7	58°44.4	46.4	263°50.2	03.8	268°47.8	43.5	31°05.9	00.3
15	63°37.2	73°44.0	·· 45.2	278°52.5	·· 03.6	283°50.2	·· 43.5	46°08.0	·· 00.5
16	78°39.7	88°43.6	44.1	293°54.7	03.5	298°52.7	43.5	61°10.2	00.6
17	93°42.1	103°43.3	43.0	308°57.0	03.3	313°55.2	43.5	76°12.4	00.7
18	108°44.6	118°42.9	S05°41.9	323°59.2	N17°03.1	328°57.7	N16°43.5	91°14.6	N05°00.8
19	123°47.1	133°42.6	40.8	339°01.4	02.9	344°00.2	43.5	106°16.7	00.9
20	138°49.5	148°42.2	39.7	354°03.7	02.8	359°02.7	43.5	121°18.9	01.0
21	153°52.0	163°41.8	·· 38.6	9°05.9	·· 02.6	14°05.1	·· 43.5	136°21.1	·· 01.2
22	168°54.4	178°41.5	37.4	24°08.1	02.4	29°07.6	43.5	151°23.2	01.3
23	183°56.9	193°41.1	36.3	39°10.4	02.2	44°10.1	43.5	166°25.4	01.4
Mer.pass. 10:46		ν -0.4′	d 1.1′	m -3.90	ν 2.3′	d 0.2′	m -0.15	ν 2.5′	d 0.0′ m -2.27	ν 2.2′	d 0.1′ m 0.67

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	198°59.4	208°40.8	S05°35.2	54°12.6	N17°02.0	59°12.6	N16°43.5	181°27.6	N05°01.5
1	214°01.8	223°40.4	34.1	69°14.8	01.9	74°15.1	43.5	196°29.8	01.6
2	229°04.3	238°40.0	33.0	84°17.0	01.7	89°17.6	43.5	211°31.9	01.8
3	244°06.8	253°39.7	·· 31.9	99°19.3	·· 01.5	104°20.0	·· 43.5	226°34.1	·· 01.9
4	259°09.2	268°39.3	30.7	114°21.5	01.3	119°22.5	43.5	241°36.3	02.0
5	274°11.7	283°39.0	29.6	129°23.7	01.1	134°25.0	43.5	256°38.4	02.1
6	289°14.2	298°38.6	S05°28.5	144°25.9	N17°00.9	149°27.5	N16°43.5	271°40.6	N05°02.2
7	304°16.6	313°38.2	27.4	159°28.2	00.8	164°30.0	43.5	286°42.8	02.4
8	319°19.1	328°37.9	26.3	174°30.4	00.6	179°32.4	43.5	301°45.0	02.5
9	334°21.6	343°37.5	·· 25.1	189°32.6	·· 00.4	194°34.9	·· 43.5	316°47.1	·· 02.6
10	349°24.0	358°37.2	24.0	204°34.8	00.2	209°37.4	43.5	331°49.3	02.7
11	4°26.5	13°36.8	22.9	219°37.0	17°00.0	224°39.9	43.5	346°51.5	02.8
12	19°28.9	28°36.4	S05°21.8	234°39.2	N16°59.8	239°42.4	N16°43.5	1°53.6	N05°03.0
13	34°31.4	43°36.1	20.7	249°41.5	59.7	254°44.8	43.5	16°55.8	03.1
14	49°33.9	58°35.7	19.5	264°43.7	59.5	269°47.3	43.5	31°58.0	03.2
15	64°36.3	73°35.4	·· 18.4	279°45.9	·· 59.3	284°49.8	·· 43.5	47°00.1	·· 03.3
16	79°38.8	88°35.0	17.3	294°48.1	59.1	299°52.3	43.5	62°02.3	03.4
17	94°41.3	103°34.7	16.2	309°50.3	58.9	314°54.7	43.5	77°04.5	03.5
18	109°43.7	118°34.3	S05°15.1	324°52.5	N16°58.7	329°57.2	N16°43.5	92°06.7	N05°03.7
19	124°46.2	133°33.9	13.9	339°54.7	58.5	344°59.7	43.5	107°08.8	03.8
20	139°48.7	148°33.6	12.8	354°56.9	58.4	0°02.2	43.5	122°11.0	03.9
21	154°51.1	163°33.2	·· 11.7	9°59.1	·· 58.2	15°04.6	·· 43.5	137°13.2	·· 04.0
22	169°53.6	178°32.9	10.6	25°01.3	58.0	30°07.1	43.5	152°15.3	04.1
23	184°56.0	193°32.5	09.4	40°03.5	57.8	45°09.6	43.5	167°17.5	04.3
Mer.pass. 10:42		ν -0.4′	d 1.1′	m -3.90	ν 2.2′	d 0.2′	m -0.13	ν 2.5′	d 0.0′ m -2.27	ν 2.2′	d 0.1′ m 0.67

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	199°58.5	208°32.2	S05°08.3	55°05.8	N16°57.6	60°12.1	N16°43.5	182°19.7	N05°04.4
1	215°01.0	223°31.8	07.2	70°08.0	57.4	75°14.5	43.5	197°21.9	04.5
2	230°03.4	238°31.4	06.1	85°10.2	57.2	90°17.0	43.5	212°24.0	04.6
3	245°05.9	253°31.1	·· 04.9	100°12.4	·· 57.0	105°19.5	·· 43.5	227°26.2	·· 04.7
4	260°08.4	268°30.7	03.8	115°14.5	56.9	120°22.0	43.5	242°28.4	04.9
5	275°10.8	283°30.4	02.7	130°16.7	56.7	135°24.4	43.5	257°30.5	05.0
6	290°13.3	298°30.0	S05°01.6	145°18.9	N16°56.5	150°26.9	N16°43.5	272°32.7	N05°05.1
7	305°15.8	313°29.7	05°00.4	160°21.1	56.3	165°29.4	43.5	287°34.9	05.2
8	320°18.2	328°29.3	04°59.3	175°23.3	56.1	180°31.9	43.5	302°37.1	05.3
9	335°20.7	343°29.0	·· 58.2	190°25.5	·· 55.9	195°34.3	·· 43.5	317°39.2	·· 05.4
10	350°23.2	358°28.6	57.1	205°27.7	55.7	210°36.8	43.5	332°41.4	05.6
11	5°25.6	13°28.2	55.9	220°29.9	55.5	225°39.3	43.5	347°43.6	05.7
12	20°28.1	28°27.9	S04°54.8	235°32.1	N16°55.3	240°41.7	N16°43.5	2°45.7	N05°05.8
13	35°30.5	43°27.5	53.7	250°34.3	55.1	255°44.2	43.5	17°47.9	05.9
14	50°33.0	58°27.2	52.6	265°36.5	54.9	270°46.7	43.5	32°50.1	06.0
15	65°35.5	73°26.8	·· 51.4	280°38.7	·· 54.8	285°49.1	·· 43.5	47°52.3	·· 06.2
16	80°37.9	88°26.5	50.3	295°40.8	54.6	300°51.6	43.5	62°54.4	06.3
17	95°40.4	103°26.1	49.2	310°43.0	54.4	315°54.1	43.5	77°56.6	06.4
18	110°42.9	118°25.8	S04°48.1	325°45.2	N16°54.2	330°56.5	N16°43.5	92°58.8	N05°06.5
19	125°45.3	133°25.4	46.9	340°47.4	54.0	345°59.0	43.5	108°00.9	06.6
20	140°47.8	148°25.1	45.8	355°49.6	53.8	1°01.5	43.5	123°03.1	06.8
21	155°50.3	163°24.7	·· 44.7	10°51.8	·· 53.6	16°04.0	·· 43.5	138°05.3	·· 06.9
22	170°52.7	178°24.4	43.5	25°53.9	53.4	31°06.4	43.5	153°07.5	07.0
23	185°55.2	193°24.0	42.4	40°56.1	53.2	46°08.9	43.5	168°09.6	07.1
Mer.pass. 10:38		ν -0.4′	d 1.1′	m -3.89	ν 2.2′	d 0.2′	m -0.10	ν 2.5′	d 0.0′ m -2.26	ν 2.2′	d 0.1′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°41.2
Diphda	348°45.8	-17°50.3
Achernar	335°19.4	-57°05.9
Hamal	327°49.4	23°35.4
Polaris	313°30.3	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.4
Capella	280°19.4	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.7	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.8	-59°36.1
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.5	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.2
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.7	-60°30.3
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.1	-60°56.9
Kochab	137°18.8	74°02.4
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.1
Antares	112°13.3	-26°29.6
Atria	107°05.5	-69°04.4
Sabik	102°00.5	-15°45.6
Shaula	96°07.7	-37°07.3
Rasalhague	95°56.7	12°32.2
Eltanin	90°41.1	51°28.8
Kaus Aust.	83°30.0	-34°22.2
Vega	80°31.9	38°48.2
Nunki	75°45.4	-26°15.7
Altair	61°58.2	8°56.3
Peacock	53°03.0	-56°38.6
Deneb	49°24.7	45°22.4
Enif	33°37.2	9°59.9
Al Na'ir	27°30.9	-46°49.6
Fomalhaut	15°12.8	-29°28.6
Scheat	13°43.7	28°13.7
Markab	13°28.3	15°21.0

Apr 10 Sat	SHA	Mer.pass
Venus	10°49.2	10:05
Mars	215°18.5	20:24
Jupiter	220°12.7	20:04
Saturn	342°35.2	11:56

Apr 11 Sun	SHA	Mer.pass
Venus	9°41.4	10:06
Mars	215°13.2	20:20
Jupiter	220°13.2	20:00
Saturn	342°28.2	11:52

Apr 12 Mon	SHA	Mer.pass
Venus	8°33.6	10:06
Mars	215°07.2	20:17
Jupiter	220°13.6	19:56
Saturn	342°21.2	11:49

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h

Sat	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	179°37.4	N07°47.1	143°26.4	6.1′	N24°35.5	7.4′	58.5′
1	194°37.6	48.0	157°51.5	6.0′	24°42.9	7.4′	58.5′
2	209°37.7	48.9	172°16.5	5.9′	24°50.3	7.1′	58.5′
3	224°37.9	·· 49.8	186°41.4	5.8′	24°57.4	7.0′	58.6′
4	239°38.1	50.8	201°06.2	5.7′	25°04.4	6.9′	58.6′
5	254°38.2	51.7	215°30.9	5.7′	25°11.3	6.7′	58.6′
6	269°38.4	N07°52.6	229°55.6	5.6′	N25°18.0	6.5′	58.6′
7	284°38.6	53.5	244°20.2	5.5′	25°24.5	6.4′	58.6′
8	299°38.7	54.5	258°44.7	5.4′	25°30.9	6.2′	58.6′
9	314°38.9	·· 55.4	273°09.1	5.3′	25°37.1	6.1′	58.6′
10	329°39.1	56.3	287°33.4	5.3′	25°43.2	5.9′	58.7′
11	344°39.2	57.2	301°57.7	5.2′	25°49.1	5.7′	58.7′
12	359°39.4	N07°58.2	316°21.8	5.1′	N25°54.8	5.6′	58.7′
13	14°39.6	07°59.1	330°45.9	5.0′	26°00.4	5.4′	58.7′
14	29°39.7	08°00.0	345°10.0	5.0′	26°05.8	5.2′	58.7′
15	44°39.9	·· 00.9	359°33.9	4.9′	26°11.0	5.1′	58.7′
16	59°40.1	01.9	13°57.8	4.8′	26°16.1	4.9′	58.7′
17	74°40.2	02.8	28°21.6	4.8′	26°21.0	4.7′	58.7′
18	89°40.4	N08°03.7	42°45.4	4.7′	N26°25.7	4.5′	58.7′
19	104°40.6	04.6	57°09.1	4.6′	26°30.2	4.4′	58.8′
20	119°40.7	05.6	71°32.7	4.6′	26°34.6	4.2′	58.8′
21	134°40.9	·· 06.5	85°56.3	4.5′	26°38.8	4.0′	58.8′
22	149°41.1	07.4	100°19.8	4.5′	26°42.8	3.8′	58.8′
23	164°41.2	08.3	114°43.2	4.4′	26°46.6	3.7′	58.8′
	SD = 16.0′	d = 0.9′	SD = 16.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°41.4	N08°09.2	129°06.6	4.3′	N26°50.3	3.5′	58.8′
1	194°41.6	10.2	143°30.0	4.3′	26°53.8	3.3′	58.8′
2	209°41.7	11.1	157°53.3	4.2′	26°57.1	3.1′	58.8′
3	224°41.9	·· 12.0	172°16.5	4.2′	27°00.2	3.0′	58.8′
4	239°42.1	12.9	186°39.7	4.2′	27°03.2	2.7′	58.9′
5	254°42.2	13.8	201°02.9	4.1′	27°05.9	2.6′	58.9′
6	269°42.4	N08°14.8	215°26.0	4.1′	N27°08.5	2.4′	58.9′
7	284°42.6	15.7	229°49.1	4.0′	27°10.9	2.2′	58.9′
8	299°42.7	16.6	244°12.1	4.0′	27°13.1	2.1′	58.9′
9	314°42.9	·· 17.5	258°35.1	4.0′	27°15.2	1.8′	58.9′
10	329°43.0	18.4	272°58.1	3.9′	27°17.0	1.7′	58.9′
11	344°43.2	19.4	287°21.0	3.9′	27°18.7	1.5′	58.9′
12	359°43.4	N08°20.3	301°43.9	3.9′	N27°20.2	1.3′	58.9′
13	14°43.5	21.2	316°06.8	3.9′	27°21.5	1.1′	58.9′
14	29°43.7	22.1	330°29.7	3.8′	27°22.6	0.9′	58.9′
15	44°43.9	·· 23.0	344°52.5	3.8′	27°23.5	0.7′	59.0′
16	59°44.0	24.0	359°15.4	3.8′	27°24.2	0.6′	59.0′
17	74°44.2	24.9	13°38.2	3.8′	27°24.8	0.3′	59.0′
18	89°44.4	N08°25.8	28°01.0	3.8′	N27°25.1	0.2′	59.0′
19	104°44.5	26.7	42°23.7	3.8′	27°25.3	0.0′	59.0′
20	119°44.7	27.6	56°46.5	3.8′	27°25.3	0.2′	59.0′
21	134°44.8	·· 28.5	71°09.3	3.8′	27°25.1	0.4′	59.0′
22	149°45.0	29.5	85°32.1	3.8′	27°24.7	0.6′	59.0′
23	164°45.2	30.4	99°54.8	3.8′	27°24.1	0.7′	59.0′
	SD = 16.0′	d = 0.9′	SD = 16.0′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°45.3	N08°31.3	114°17.6	3.8′	N27°23.4	1.0′	59.0′
1	194°45.5	32.2	128°40.4	3.8′	27°22.4	1.1′	59.0′
2	209°45.7	33.1	143°03.1	3.8′	27°21.3	1.3′	59.0′
3	224°45.8	·· 34.0	157°25.9	3.8′	27°20.0	1.6′	59.0′
4	239°46.0	35.0	171°48.7	3.8′	27°18.4	1.7′	59.0′
5	254°46.1	35.9	186°11.5	3.8′	27°16.7	1.8′	59.1′
6	269°46.3	N08°36.8	200°34.4	3.8′	N27°14.9	2.1′	59.1′
7	284°46.5	37.7	214°57.2	3.9′	27°12.8	2.3′	59.1′
8	299°46.6	38.6	229°20.1	3.9′	27°10.5	2.4′	59.1′
9	314°46.8	·· 39.5	243°42.9	3.9′	27°08.1	2.7′	59.1′
10	329°47.0	40.4	258°05.9	3.9′	27°05.4	2.8′	59.1′
11	344°47.1	41.3	272°28.8	4.0′	27°02.6	3.0′	59.1′
12	359°47.3	N08°42.3	286°51.8	4.0′	N26°59.6	3.2′	59.1′
13	14°47.4	43.2	301°14.7	4.0′	26°56.4	3.3′	59.1′
14	29°47.6	44.1	315°37.8	4.1′	26°53.1	3.6′	59.1′
15	44°47.8	·· 45.0	330°00.8	4.1′	26°49.5	3.7′	59.1′
16	59°47.9	45.9	344°23.9	4.1′	26°45.8	3.9′	59.1′
17	74°48.1	46.8	358°47.1	4.2′	26°41.9	4.1′	59.1′
18	89°48.2	N08°47.7	13°10.3	4.2′	N26°37.8	4.3′	59.1′
19	104°48.4	48.6	27°33.5	4.3′	26°33.5	4.5′	59.1′
20	119°48.6	49.6	41°56.8	4.3′	26°29.0	4.6′	59.1′
21	134°48.7	·· 50.5	56°20.1	4.4′	26°24.4	4.8′	59.1′
22	149°48.9	51.4	70°43.5	4.4′	26°19.6	5.0′	59.1′
23	164°49.0	52.3	85°06.9	4.5′	26°14.6	5.2′	59.1′
	SD = 16.0′	d = 0.9′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:34	04:03	20:02	21:34	////
N 70°	////	03:02	04:17	19:48	21:05	////
68°	01:36	03:22	04:28	19:37	20:43	22:35
66°	02:13	03:38	04:37	19:28	20:27	21:55
64°	02:38	03:51	04:44	19:20	20:13	21:28
62°	02:58	04:02	04:51	19:13	20:02	21:08
60°	03:13	04:11	04:56	19:08	19:53	20:52
N 58°	03:26	04:19	05:01	19:03	19:45	20:39
56°	03:37	04:26	05:05	18:58	19:38	20:28
54°	03:46	04:32	05:09	18:54	19:31	20:18
52°	03:54	04:38	05:13	18:50	19:26	20:10
50°	04:02	04:43	05:16	18:47	19:21	20:02
45°	04:16	04:53	05:23	18:40	19:10	19:47
N 40°	04:28	05:01	05:29	18:34	19:02	19:35
35°	04:37	05:08	05:34	18:29	18:55	19:26
30°	04:45	05:14	05:38	18:25	18:49	19:18
20°	04:57	05:23	05:46	18:17	18:39	19:06
N 10°	05:06	05:31	05:52	18:10	18:32	18:56
0°	05:13	05:37	05:58	18:04	18:25	18:50
S 10°	05:18	05:42	06:04	17:58	18:20	18:44
20°	05:22	05:48	06:10	17:52	18:14	18:40
30°	05:25	05:52	06:16	17:45	18:09	18:37
35°	05:26	05:55	06:20	17:41	18:07	18:36
40°	05:26	05:57	06:25	17:37	18:04	18:36
45°	05:26	06:00	06:30	17:32	18:01	18:35
S 50°	05:26	06:03	06:36	17:26	17:58	18:36
52°	05:25	06:04	06:38	17:23	17:57	18:36
54°	05:25	06:06	06:41	17:20	17:55	18:36
56°	05:24	06:07	06:45	17:16	17:54	18:37
58°	05:23	06:09	06:48	17:13	17:52	18:38
S 60°	05:22	06:10	06:52	17:09	17:51	18:39

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	03:46	▭	▭	01:08	▭	▭
62°	04:32	04:44	05:40	00:23	02:17	03:31
60°	05:02	05:30	06:30	·· ··	01:31	02:41
N 58°	05:25	06:00	07:01	·· ··	01:01	02:09
56°	05:44	06:23	07:25	·· ··	00:38	01:46
54°	05:59	06:42	07:44	·· ··	00:20	01:27
52°	06:13	06:58	08:00	·· ··	00:04	01:10
50°	06:25	07:11	08:14	23:50	·· ··	00:56
45°	06:50	07:40	08:42	23:22	·· ··	00:28
N 40°	07:10	08:02	09:04	23:00	·· ··	00:05
35°	07:27	08:20	09:23	22:42	23:46	·· ··
30°	07:41	08:36	09:39	22:27	23:30	·· ··
20°	08:06	09:03	10:06	22:00	23:03	·· ··
N 10°	08:27	09:27	10:29	21:37	22:40	23:40
0°	08:48	09:48	10:50	21:16	22:18	23:20
S 10°	09:08	10:10	11:12	20:55	21:56	22:59
20°	09:30	10:34	11:35	20:32	21:32	22:36
30°	09:55	11:01	12:02	20:06	21:05	22:10
35°	10:10	11:17	12:18	19:51	20:49	21:55
40°	10:27	11:36	12:36	19:33	20:30	21:37
45°	10:48	11:59	12:58	19:11	20:07	21:15
S 50°	11:15	12:28	13:26	18:44	19:38	20:48
52°	11:28	12:42	13:40	18:30	19:23	20:34
54°	11:43	12:59	13:56	18:15	19:07	20:18
56°	12:01	13:19	14:15	17:57	18:47	20:00
58°	12:22	13:43	14:38	17:36	18:22	19:37
S 60°	12:49	14:17	15:08	17:08	17:49	19:08

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 4-6 11-28%
10	01:30	01:22	12:01	15:02	02:32	
11	01:14	01:06	12:01	16:03	03:32	
12	00:59	00:51	12:01	17:05	04:34	

April 13, 14, 15 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	200°57.7	208°23.7	S04°41.3	55°58.3	N16°53.0	61°11.4	N16°43.5	183°11.8	N05°07.2
1	216°00.1	223°23.3	40.1	71°00.5	52.8	76°13.8	43.5	198°14.0	07.3
2	231°02.6	238°23.0	39.0	86°02.6	52.6	91°16.3	43.5	213°16.1	07.5
3	246°05.0	253°22.6	·· 37.9	101°04.8	·· 52.4	106°18.7	·· 43.5	228°18.3	·· 07.6
4	261°07.5	268°22.2	36.8	116°07.0	52.2	121°21.2	43.5	243°20.5	07.7
5	276°10.0	283°21.9	35.6	131°09.2	52.0	136°23.7	43.5	258°22.7	07.8
6	291°12.4	298°21.5	S04°34.5	146°11.3	N16°51.8	151°26.1	N16°43.5	273°24.8	N05°07.9
7	306°14.9	313°21.2	33.4	161°13.5	51.6	166°28.6	43.4	288°27.0	08.1
8	321°17.4	328°20.8	32.2	176°15.7	51.4	181°31.1	43.4	303°29.2	08.2
9	336°19.8	343°20.5	·· 31.1	191°17.8	·· 51.2	196°33.5	·· 43.4	318°31.3	·· 08.3
10	351°22.3	358°20.1	30.0	206°20.0	51.0	211°36.0	43.4	333°33.5	08.4
11	6°24.8	13°19.8	28.8	221°22.2	50.8	226°38.5	43.4	348°35.7	08.5
12	21°27.2	28°19.4	S04°27.7	236°24.3	N16°50.6	241°40.9	N16°43.4	3°37.9	N05°08.6
13	36°29.7	43°19.1	26.6	251°26.5	50.4	256°43.4	43.4	18°40.0	08.8
14	51°32.2	58°18.7	25.4	266°28.7	50.2	271°45.8	43.4	33°42.2	08.9
15	66°34.6	73°18.4	·· 24.3	281°30.8	·· 50.0	286°48.3	·· 43.4	48°44.4	·· 09.0
16	81°37.1	88°18.0	23.2	296°33.0	49.8	301°50.8	43.4	63°46.5	09.1
17	96°39.5	103°17.7	22.0	311°35.1	49.6	316°53.2	43.4	78°48.7	09.2
18	111°42.0	118°17.3	S04°20.9	326°37.3	N16°49.4	331°55.7	N16°43.4	93°50.9	N05°09.4
19	126°44.5	133°17.0	19.8	341°39.4	49.2	346°58.2	43.4	108°53.1	09.5
20	141°46.9	148°16.6	18.6	356°41.6	49.0	2°00.6	43.4	123°55.2	09.6
21	156°49.4	163°16.3	·· 17.5	11°43.8	·· 48.8	17°03.1	·· 43.4	138°57.4	·· 09.7
22	171°51.9	178°15.9	16.4	26°45.9	48.6	32°05.5	43.4	153°59.6	09.8
23	186°54.3	193°15.6	15.2	41°48.1	48.4	47°08.0	43.4	169°01.7	09.9
Mer.pass. 10:34		ν -0.4′	d 1.1′	m -3.89	ν 2.2′	d 0.2′	m -0.08	ν 2.5′	d 0.0′ m -2.25	ν 2.2′	d 0.1′ m 0.68

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	201°56.8	208°15.2	S04°14.1	56°50.2	N16°48.2	62°10.4	N16°43.4	184°03.9	N05°10.1
1	216°59.3	223°14.9	13.0	71°52.4	48.0	77°12.9	43.4	199°06.1	10.2
2	232°01.7	238°14.6	11.8	86°54.5	47.8	92°15.4	43.3	214°08.3	10.3
3	247°04.2	253°14.2	·· 10.7	101°56.7	·· 47.6	107°17.8	·· 43.3	229°10.4	·· 10.4
4	262°06.7	268°13.9	09.5	116°58.8	47.4	122°20.3	43.3	244°12.6	10.5
5	277°09.1	283°13.5	08.4	132°01.0	47.2	137°22.7	43.3	259°14.8	10.7
6	292°11.6	298°13.2	S04°07.3	147°03.1	N16°47.0	152°25.2	N16°43.3	274°16.9	N05°10.8
7	307°14.0	313°12.8	06.1	162°05.2	46.8	167°27.6	43.3	289°19.1	10.9
8	322°16.5	328°12.5	05.0	177°07.4	46.6	182°30.1	43.3	304°21.3	11.0
9	337°19.0	343°12.1	·· 03.9	192°09.5	·· 46.3	197°32.6	·· 43.3	319°23.5	·· 11.1
10	352°21.4	358°11.8	02.7	207°11.7	46.1	212°35.0	43.3	334°25.6	11.2
11	7°23.9	13°11.4	01.6	222°13.8	45.9	227°37.5	43.3	349°27.8	11.4
12	22°26.4	28°11.1	S04°00.4	237°15.9	N16°45.7	242°39.9	N16°43.3	4°30.0	N05°11.5
13	37°28.8	43°10.7	03°59.3	252°18.1	45.5	257°42.4	43.3	19°32.1	11.6
14	52°31.3	58°10.4	58.2	267°20.2	45.3	272°44.8	43.3	34°34.3	11.7
15	67°33.8	73°10.0	·· 57.0	282°22.4	·· 45.1	287°47.3	·· 43.3	49°36.5	·· 11.8
16	82°36.2	88°09.7	55.9	297°24.5	44.9	302°49.7	43.2	64°38.7	12.0
17	97°38.7	103°09.3	54.8	312°26.6	44.7	317°52.2	43.2	79°40.8	12.1
18	112°41.1	118°09.0	S03°53.6	327°28.8	N16°44.5	332°54.6	N16°43.2	94°43.0	N05°12.2
19	127°43.6	133°08.7	52.5	342°30.9	44.3	347°57.1	43.2	109°45.2	12.3
20	142°46.1	148°08.3	51.3	357°33.0	44.1	2°59.6	43.2	124°47.3	12.4
21	157°48.5	163°08.0	·· 50.2	12°35.2	·· 43.8	18°02.0	·· 43.2	139°49.5	·· 12.5
22	172°51.0	178°07.6	49.0	27°37.3	43.6	33°04.5	43.2	154°51.7	12.7
23	187°53.5	193°07.3	47.9	42°39.4	43.4	48°06.9	43.2	169°53.9	12.8
Mer.pass. 10:30		ν -0.3′	d 1.1′	m -3.89	ν 2.2′	d 0.2′	m -0.06	ν 2.5′	d 0.0′ m -2.24	ν 2.2′	d 0.1′ m 0.69

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	202°55.9	208°06.9	S03°46.8	57°41.5	N16°43.2	63°09.4	N16°43.2	184°56.0	N05°12.9
1	217°58.4	223°06.6	45.6	72°43.7	43.0	78°11.8	43.2	199°58.2	13.0
2	233°00.9	238°06.2	44.5	87°45.8	42.8	93°14.3	43.2	215°00.4	13.1
3	248°03.3	253°05.9	·· 43.3	102°47.9	·· 42.6	108°16.7	·· 43.2	230°02.6	·· 13.3
4	263°05.8	268°05.5	42.2	117°50.0	42.4	123°19.2	43.1	245°04.7	13.4
5	278°08.3	283°05.2	41.1	132°52.2	42.2	138°21.6	43.1	260°06.9	13.5
6	293°10.7	298°04.9	S03°39.9	147°54.3	N16°41.9	153°24.1	N16°43.1	275°09.1	N05°13.6
7	308°13.2	313°04.5	38.8	162°56.4	41.7	168°26.5	43.1	290°11.2	13.7
8	323°15.6	328°04.2	37.6	177°58.5	41.5	183°29.0	43.1	305°13.4	13.8
9	338°18.1	343°03.8	·· 36.5	193°00.6	·· 41.3	198°31.4	·· 43.1	320°15.6	·· 14.0
10	353°20.6	358°03.5	35.3	208°02.7	41.1	213°33.8	43.1	335°17.8	14.1
11	8°23.0	13°03.1	34.2	223°04.9	40.9	228°36.3	43.1	350°19.9	14.2
12	23°25.5	28°02.8	S03°33.1	238°07.0	N16°40.7	243°38.7	N16°43.1	5°22.1	N05°14.3
13	38°28.0	43°02.5	31.9	253°09.1	40.4	258°41.2	43.1	20°24.3	14.4
14	53°30.4	58°02.1	30.8	268°11.2	40.2	273°43.6	43.1	35°26.4	14.5
15	68°32.9	73°01.8	·· 29.6	283°13.3	·· 40.0	288°46.1	·· 43.0	50°28.6	·· 14.7
16	83°35.4	88°01.4	28.5	298°15.4	39.8	303°48.5	43.0	65°30.8	14.8
17	98°37.8	103°01.1	27.3	313°17.5	39.6	318°51.0	43.0	80°33.0	14.9
18	113°40.3	118°00.7	S03°26.2	328°19.6	N16°39.4	333°53.4	N16°43.0	95°35.1	N05°15.0
19	128°42.8	133°00.4	25.0	343°21.7	39.1	348°55.9	43.0	110°37.3	15.1
20	143°45.2	148°00.1	23.9	358°23.9	38.9	3°58.3	43.0	125°39.5	15.3
21	158°47.7	162°59.7	·· 22.8	13°26.0	·· 38.7	19°00.7	·· 43.0	140°41.6	·· 15.4
22	173°50.1	177°59.4	21.6	28°28.1	38.5	34°03.2	43.0	155°43.8	15.5
23	188°52.6	192°59.0	20.5	43°30.2	38.3	49°05.6	43.0	170°46.0	15.6
Mer.pass. 10:27		ν -0.3′	d 1.1′	m -3.89	ν 2.1′	d 0.2′	m -0.04	ν 2.5′	d 0.0′ m -2.24	ν 2.2′	d 0.1′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°41.1
Diphda	348°45.8	-17°50.2
Achernar	335°19.4	-57°05.9
Hamal	327°49.4	23°35.4
Polaris	313°30.6	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.4
Capella	280°19.4	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.7	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.0	27°57.6
Avior	234°13.9	-59°36.2
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.5	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.2
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.7	-60°30.3
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.1	-60°56.9
Kochab	137°18.8	74°02.4
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.9	26°37.1
Antares	112°13.3	-26°29.6
Atria	107°05.5	-69°04.4
Sabik	102°00.4	-15°45.6
Shaula	96°07.6	-37°07.3
Rasalhague	95°56.7	12°32.2
Eltanin	90°41.1	51°28.8
Kaus Aust.	83°29.9	-34°22.2
Vega	80°31.9	38°48.2
Nunki	75°45.4	-26°15.7
Altair	61°58.2	8°56.3
Peacock	53°02.9	-56°38.6
Deneb	49°24.6	45°22.4
Enif	33°37.1	9°59.9
Al Na'ir	27°30.9	-46°49.6
Fomalhaut	15°12.8	-29°28.6
Scheat	13°43.7	28°13.7
Markab	13°28.3	15°21.0

Apr 13 Tue	SHA	Mer.pass
Venus	7°26.0	10:07
Mars	215°00.6	20:13
Jupiter	220°13.7	19:52
Saturn	342°14.1	11:46

Apr 14 Wed	SHA	Mer.pass
Venus	6°18.5	10:07
Mars	214°53.4	20:10
Jupiter	220°13.7	19:48
Saturn	342°07.1	11:42

Apr 15 Thu	SHA	Mer.pass
Venus	5°11.0	10:08
Mars	214°45.6	20:06
Jupiter	220°13.4	19:44
Saturn	342°00.1	11:39

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.1210 sec ΔT = TT-UT1 = +69.3050 sec

2027 April 13 to Apr. 15 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°49.2	N08°53.2	99°30.4	4.5′	N26°09.4	5.3′	59.1′
1	194°49.4	54.1	113°53.9	4.6′	26°04.1	5.5′	59.1′
2	209°49.5	55.0	128°17.5	4.6′	25°58.6	5.7′	59.1′
3	224°49.7	·· 55.9	142°41.1	4.7′	25°52.9	5.9′	59.2′
4	239°49.8	56.8	157°04.8	4.8′	25°47.0	6.0′	59.2′
5	254°50.0	57.7	171°28.6	4.8′	25°41.0	6.2′	59.2′
6	269°50.2	N08°58.6	185°52.4	4.9′	N25°34.8	6.4′	59.2′
7	284°50.3	08°59.6	200°16.3	5.0′	25°28.4	6.5′	59.2′
8	299°50.5	09°00.5	214°40.3	5.0′	25°21.9	6.7′	59.2′
9	314°50.6	·· 01.4	229°04.3	5.1′	25°15.2	6.9′	59.2′
10	329°50.8	02.3	243°28.4	5.2′	25°08.3	7.0′	59.2′
11	344°50.9	03.2	257°52.6	5.2′	25°01.3	7.2′	59.2′
12	359°51.1	N09°04.1	272°16.9	5.3′	N24°54.1	7.4′	59.2′
13	14°51.3	05.0	286°41.2	5.4′	24°46.7	7.5′	59.2′
14	29°51.4	05.9	301°05.6	5.5′	24°39.2	7.7′	59.2′
15	44°51.6	·· 06.8	315°30.0	5.5′	24°31.5	7.8′	59.2′
16	59°51.7	07.7	329°54.6	5.6′	24°23.7	8.0′	59.2′
17	74°51.9	08.6	344°19.2	5.7′	24°15.7	8.2′	59.2′
18	89°52.1	N09°09.5	358°43.9	5.8′	N24°07.5	8.3′	59.2′
19	104°52.2	10.4	13°08.7	5.9′	23°59.2	8.4′	59.2′
20	119°52.4	11.3	27°33.6	5.9′	23°50.8	8.7′	59.2′
21	134°52.5	·· 12.2	41°58.5	6.0′	23°42.1	8.7′	59.2′
22	149°52.7	13.1	56°23.6	6.1′	23°33.4	8.9′	59.2′
23	164°52.8	14.0	70°48.7	6.2′	23°24.5	9.1′	59.2′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°53.0	N09°14.9	85°13.9	6.3′	N23°15.4	9.2′	59.2′
1	194°53.1	15.9	99°39.1	6.4′	23°06.2	9.4′	59.2′
2	209°53.3	16.8	114°04.5	6.5′	22°56.8	9.5′	59.2′
3	224°53.5	·· 17.7	128°30.0	6.5′	22°47.3	9.6′	59.2′
4	239°53.6	18.6	142°55.5	6.6′	22°37.7	9.8′	59.2′
5	254°53.8	19.5	157°21.1	6.7′	22°27.9	9.9′	59.2′
6	269°53.9	N09°20.4	171°46.9	6.8′	N22°18.0	10.0′	59.2′
7	284°54.1	21.3	186°12.7	6.9′	22°08.0	10.2′	59.2′
8	299°54.2	22.2	200°38.5	7.0′	21°57.8	10.4′	59.2′
9	314°54.4	·· 23.1	215°04.5	7.1′	21°47.4	10.4′	59.2′
10	329°54.5	24.0	229°30.6	7.2′	21°37.0	10.6′	59.2′
11	344°54.7	24.9	243°56.8	7.2′	21°26.4	10.7′	59.2′
12	359°54.9	N09°25.8	258°23.0	7.3′	N21°15.7	10.9′	59.2′
13	14°55.0	26.7	272°49.3	7.4′	21°04.8	10.9′	59.2′
14	29°55.2	27.6	287°15.8	7.5′	20°53.9	11.1′	59.2′
15	44°55.3	·· 28.5	301°42.3	7.6′	20°42.8	11.3′	59.2′
16	59°55.5	29.4	316°08.9	7.7′	20°31.5	11.3′	59.2′
17	74°55.6	30.3	330°35.6	7.8′	20°20.2	11.5′	59.2′
18	89°55.8	N09°31.2	345°02.4	7.9′	N20°08.7	11.6′	59.2′
19	104°55.9	32.1	359°29.2	8.0′	19°57.1	11.7′	59.2′
20	119°56.1	33.0	13°56.2	8.1′	19°45.4	11.8′	59.2′
21	134°56.2	·· 33.9	28°23.3	8.1′	19°33.6	11.9′	59.2′
22	149°56.4	34.8	42°50.4	8.2′	19°21.7	12.0′	59.2′
23	164°56.6	35.6	57°17.6	8.3′	19°09.7	12.2′	59.1′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°56.7	N09°36.5	71°45.0	8.4′	N18°57.5	12.3′	59.1′
1	194°56.9	37.4	86°12.4	8.5′	18°45.2	12.3′	59.1′
2	209°57.0	38.3	100°39.9	8.6′	18°32.9	12.5′	59.1′
3	224°57.2	·· 39.2	115°07.4	8.7′	18°20.4	12.6′	59.1′
4	239°57.3	40.1	129°35.1	8.8′	18°07.8	12.7′	59.1′
5	254°57.5	41.0	144°02.9	8.8′	17°55.1	12.8′	59.1′
6	269°57.6	N09°41.9	158°30.7	8.9′	N17°42.3	12.8′	59.1′
7	284°57.8	42.8	172°58.6	9.0′	17°29.5	13.0′	59.1′
8	299°57.9	43.7	187°26.7	9.1′	17°16.5	13.1′	59.1′
9	314°58.1	·· 44.6	201°54.8	9.2′	17°03.4	13.2′	59.1′
10	329°58.2	45.5	216°22.9	9.3′	16°50.2	13.2′	59.1′
11	344°58.4	46.4	230°51.2	9.3′	16°37.0	13.4′	59.1′
12	359°58.5	N09°47.3	245°19.6	9.4′	N16°23.6	13.4′	59.1′
13	14°58.7	48.2	259°48.0	9.5′	16°10.2	13.6′	59.1′
14	29°58.8	49.1	274°16.5	9.6′	15°56.6	13.6′	59.1′
15	44°59.0	·· 50.0	288°45.1	9.7′	15°43.0	13.7′	59.1′
16	59°59.1	50.9	303°13.8	9.8′	15°29.3	13.8′	59.1′
17	74°59.3	51.7	317°42.5	9.8′	15°15.5	13.8′	59.1′
18	89°59.4	N09°52.6	332°11.4	9.9′	N15°01.7	14.0′	59.1′
19	104°59.6	53.5	346°40.3	10.0′	14°47.7	14.0′	59.1′
20	119°59.7	54.4	1°09.3	10.1′	14°33.7	14.1′	59.1′
21	134°59.9	·· 55.3	15°38.3	10.1′	14°19.6	14.2′	59.0′
22	150°00.0	56.2	30°07.5	10.2′	14°05.4	14.3′	59.0′
23	165°00.2	57.1	44°36.7	10.3′	13°51.1	14.3′	59.0′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	02:10	03:46	20:18	21:59	////
N 70°	////	02:43	04:02	20:02	21:23	////
68°	01:00	03:07	04:15	19:49	20:58	23:16
66°	01:52	03:25	04:25	19:38	20:39	22:16
64°	02:22	03:39	04:34	19:29	20:24	21:43
62°	02:44	03:51	04:41	19:22	20:12	21:20
60°	03:01	04:02	04:47	19:15	20:01	21:02
N 58°	03:15	04:10	04:53	19:09	19:52	20:48
56°	03:27	04:18	04:58	19:04	19:44	20:35
54°	03:38	04:25	05:02	19:00	19:38	20:25
52°	03:46	04:31	05:06	18:56	19:31	20:16
50°	03:54	04:36	05:10	18:52	19:26	20:08
45°	04:10	04:47	05:18	18:44	19:14	19:51
N 40°	04:23	04:56	05:24	18:37	19:05	19:39
35°	04:33	05:04	05:30	18:31	18:57	19:28
30°	04:41	05:10	05:35	18:26	18:51	19:20
20°	04:54	05:21	05:43	18:18	18:40	19:07
N 10°	05:04	05:29	05:50	18:10	18:32	18:57
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:57	18:18	18:43
20°	05:23	05:48	06:11	17:50	18:12	18:38
30°	05:26	05:54	06:18	17:42	18:06	18:34
35°	05:28	05:57	06:23	17:37	18:03	18:32
40°	05:29	06:00	06:28	17:32	18:00	18:31
45°	05:30	06:04	06:33	17:27	17:56	18:30
S 50°	05:30	06:08	06:40	17:20	17:52	18:30
52°	05:30	06:09	06:43	17:16	17:51	18:30
54°	05:30	06:11	06:47	17:13	17:49	18:30
56°	05:30	06:13	06:51	17:09	17:47	18:30
58°	05:29	06:15	06:55	17:05	17:45	18:30
S 60°	05:29	06:17	07:00	17:00	17:42	18:30

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▭	▭	08:54	▭	▭	06:29
N 70°	▭	▭	09:52	▭	▭	05:29
68°	▭	▭	10:25	▭	▭	04:54
66°	▭	08:24	10:49	▭	04:59	04:28
64°	06:32	09:02	11:08	04:48	04:20	04:08
62°	07:30	09:29	11:23	03:50	03:53	03:52
60°	08:03	09:50	11:36	03:16	03:31	03:38
N 58°	08:28	10:07	11:47	02:51	03:14	03:26
56°	08:47	10:21	11:56	02:31	02:59	03:16
54°	09:03	10:33	12:05	02:14	02:46	03:07
52°	09:17	10:44	12:12	02:00	02:34	02:59
50°	09:30	10:53	12:19	01:47	02:24	02:51
45°	09:55	11:13	12:33	01:21	02:03	02:36
N 40°	10:15	11:30	12:45	01:00	01:46	02:22
35°	10:32	11:43	12:54	00:43	01:31	02:11
30°	10:46	11:55	13:03	00:28	01:18	02:01
20°	11:11	12:15	13:18	00:03	00:56	01:44
N 10°	11:32	12:33	13:31	·· ··	00:37	01:29
0°	11:51	12:49	13:43	·· ··	00:19	01:15
S 10°	12:11	13:05	13:55	·· ··	00:01	01:01
20°	12:32	13:22	14:08	23:42	·· ··	00:45
30°	12:56	13:42	14:22	23:19	·· ··	00:28
35°	13:10	13:54	14:31	23:06	·· ··	00:17
40°	13:26	14:07	14:40	22:50	·· ··	00:05
45°	13:46	14:22	14:51	22:32	23:51	·· ··
S 50°	14:10	14:41	15:04	22:08	23:34	·· ··
52°	14:21	14:50	15:11	21:57	23:26	·· ··
54°	14:35	15:00	15:17	21:45	23:16	·· ··
56°	14:50	15:11	15:25	21:30	23:06	·· ··
58°	15:08	15:24	15:34	21:13	22:54	·· ··
S 60°	15:29	15:39	15:43	20:51	22:40	·· ··

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 39-62%
13	00:43	00:36	12:01	18:05	05:36	
14	00:28	00:21	12:00	19:02	06:34	
15	00:13	00:06	12:00	19:55	07:29	

April 16, 17, 18 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	203°55.1	207°58.7	S03°19.3	58°32.3	N16°38.0	64°08.1	N16°42.9	185°48.2	N05°15.7
1	218°57.5	222°58.3	18.2	73°34.4	37.8	79°10.5	42.9	200°50.3	15.8
2	234°00.0	237°58.0	17.0	88°36.5	37.6	94°13.0	42.9	215°52.5	16.0
3	249°02.5	252°57.7	·· 15.9	103°38.6	·· 37.4	109°15.4	·· 42.9	230°54.7	·· 16.1
4	264°04.9	267°57.3	14.7	118°40.7	37.2	124°17.8	42.9	245°56.8	16.2
5	279°07.4	282°57.0	13.6	133°42.8	36.9	139°20.3	42.9	260°59.0	16.3
6	294°09.9	297°56.6	S03°12.4	148°44.9	N16°36.7	154°22.7	N16°42.9	276°01.2	N05°16.4
7	309°12.3	312°56.3	11.3	163°47.0	36.5	169°25.2	42.9	291°03.4	16.5
8	324°14.8	327°56.0	10.1	178°49.1	36.3	184°27.6	42.9	306°05.5	16.7
9	339°17.2	342°55.6	·· 09.0	193°51.1	·· 36.1	199°30.1	·· 42.8	321°07.7	·· 16.8
10	354°19.7	357°55.3	07.8	208°53.2	35.8	214°32.5	42.8	336°09.9	16.9
11	9°22.2	12°54.9	06.7	223°55.3	35.6	229°34.9	42.8	351°12.1	17.0
12	24°24.6	27°54.6	S03°05.6	238°57.4	N16°35.4	244°37.4	N16°42.8	6°14.2	N05°17.1
13	39°27.1	42°54.2	04.4	253°59.5	35.2	259°39.8	42.8	21°16.4	17.2
14	54°29.6	57°53.9	03.3	269°01.6	34.9	274°42.2	42.8	36°18.6	17.4
15	69°32.0	72°53.6	·· 02.1	284°03.7	·· 34.7	289°44.7	·· 42.8	51°20.7	·· 17.5
16	84°34.5	87°53.2	03°01.0	299°05.8	34.5	304°47.1	42.8	66°22.9	17.6
17	99°37.0	102°52.9	02°59.8	314°07.9	34.3	319°49.6	42.7	81°25.1	17.7
18	114°39.4	117°52.5	S02°58.7	329°09.9	N16°34.1	334°52.0	N16°42.7	96°27.3	N05°17.8
19	129°41.9	132°52.2	57.5	344°12.0	33.8	349°54.4	42.7	111°29.4	18.0
20	144°44.4	147°51.9	56.4	359°14.1	33.6	4°56.9	42.7	126°31.6	18.1
21	159°46.8	162°51.5	·· 55.2	14°16.2	·· 33.4	19°59.3	·· 42.7	141°33.8	·· 18.2
22	174°49.3	177°51.2	54.1	29°18.3	33.2	35°01.7	42.7	156°35.9	18.3
23	189°51.7	192°50.8	52.9	44°20.4	32.9	50°04.2	42.7	171°38.1	18.4
Mer.pass. 10:23		ν -0.3′ d 1.1′		ν 2.1′ d 0.2′		ν 2.4′ d 0.0′		ν 2.2′ d 0.1′	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	204°54.2	207°50.5	S02°51.8	59°22.4	N16°32.7	65°06.6	N16°42.7	186°40.3	N05°18.5
1	219°56.7	222°50.2	50.6	74°24.5	32.5	80°09.1	42.6	201°42.5	18.7
2	234°59.1	237°49.8	49.5	89°26.6	32.2	95°11.5	42.6	216°44.6	18.8
3	250°01.6	252°49.5	·· 48.3	104°28.7	·· 32.0	110°13.9	·· 42.6	231°46.8	·· 18.9
4	265°04.1	267°49.2	47.2	119°30.7	31.8	125°16.4	42.6	246°49.0	19.0
5	280°06.5	282°48.8	46.0	134°32.8	31.6	140°18.8	42.6	261°51.2	19.1
6	295°09.0	297°48.5	S02°44.8	149°34.9	N16°31.3	155°21.2	N16°42.6	276°53.3	N05°19.2
7	310°11.5	312°48.1	43.7	164°37.0	31.1	170°23.7	42.6	291°55.5	19.4
8	325°13.9	327°47.8	42.5	179°39.0	30.9	185°26.1	42.5	306°57.7	19.5
9	340°16.4	342°47.5	·· 41.4	194°41.1	·· 30.7	200°28.5	·· 42.5	321°59.8	·· 19.6
10	355°18.9	357°47.1	40.2	209°43.2	30.4	215°31.0	42.5	337°02.0	19.7
11	10°21.3	12°46.8	39.1	224°45.2	30.2	230°33.4	42.5	352°04.2	19.8
12	25°23.8	27°46.4	S02°37.9	239°47.3	N16°30.0	245°35.8	N16°42.5	7°06.4	N05°19.9
13	40°26.2	42°46.1	36.8	254°49.4	29.7	260°38.2	42.5	22°08.5	20.1
14	55°28.7	57°45.8	35.6	269°51.4	29.5	275°40.7	42.5	37°10.7	20.2
15	70°31.2	72°45.4	·· 34.5	284°53.5	·· 29.3	290°43.1	·· 42.4	52°12.9	·· 20.3
16	85°33.6	87°45.1	33.3	299°55.6	29.0	305°45.5	42.4	67°15.0	20.4
17	100°36.1	102°44.8	32.2	314°57.6	28.8	320°48.0	42.4	82°17.2	20.5
18	115°38.6	117°44.4	S02°31.0	329°59.7	N16°28.6	335°50.4	N16°42.4	97°19.4	N05°20.6
19	130°41.0	132°44.1	29.9	345°01.7	28.3	350°52.8	42.4	112°21.6	20.8
20	145°43.5	147°43.7	28.7	0°03.8	28.1	5°55.3	42.4	127°23.7	20.9
21	160°46.0	162°43.4	·· 27.6	15°05.9	·· 27.9	20°57.7	·· 42.4	142°25.9	·· 21.0
22	175°48.4	177°43.1	26.4	30°07.9	27.7	36°00.1	42.3	157°28.1	21.1
23	190°50.9	192°42.7	25.2	45°10.0	27.4	51°02.5	42.3	172°30.3	21.2
Mer.pass. 10:19		ν -0.3′ d 1.2′		ν 2.1′ d 0.2′		ν 2.4′ d 0.0′		ν 2.2′ d 0.1′	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	205°53.3	207°42.4	S02°24.1	60°12.0	N16°27.2	66°05.0	N16°42.3	187°32.4	N05°21.3
1	220°55.8	222°42.1	22.9	75°14.1	27.0	81°07.4	42.3	202°34.6	21.5
2	235°58.3	237°41.7	21.8	90°16.1	26.7	96°09.8	42.3	217°36.8	21.6
3	251°00.7	252°41.4	·· 20.6	105°18.2	·· 26.5	111°12.3	·· 42.3	232°38.9	·· 21.7
4	266°03.2	267°41.0	19.5	120°20.2	26.2	126°14.7	42.2	247°41.1	21.8
5	281°05.7	282°40.7	18.3	135°22.3	26.0	141°17.1	42.2	262°43.3	21.9
6	296°08.1	297°40.4	S02°17.2	150°24.3	N16°25.8	156°19.5	N16°42.2	277°45.5	N05°22.0
7	311°10.6	312°40.0	16.0	165°26.4	25.5	171°22.0	42.2	292°47.6	22.2
8	326°13.1	327°39.7	14.8	180°28.4	25.3	186°24.4	42.2	307°49.8	22.3
9	341°15.5	342°39.4	·· 13.7	195°30.5	·· 25.1	201°26.8	·· 42.2	322°52.0	·· 22.4
10	356°18.0	357°39.0	12.5	210°32.5	24.8	216°29.2	42.1	337°54.2	22.5
11	11°20.5	12°38.7	11.4	225°34.6	24.6	231°31.7	42.1	352°56.3	22.6
12	26°22.9	27°38.4	S02°10.2	240°36.6	N16°24.4	246°34.1	N16°42.1	7°58.5	N05°22.7
13	41°25.4	42°38.0	09.1	255°38.7	24.1	261°36.5	42.1	23°00.7	22.9
14	56°27.8	57°37.7	07.9	270°40.7	23.9	276°38.9	42.1	38°02.8	23.0
15	71°30.3	72°37.3	·· 06.7	285°42.8	·· 23.7	291°41.3	·· 42.1	53°05.0	·· 23.1
16	86°32.8	87°37.0	05.6	300°44.8	23.4	306°43.8	42.0	68°07.2	23.2
17	101°35.2	102°36.7	04.4	315°46.8	23.2	321°46.2	42.0	83°09.4	23.3
18	116°37.7	117°36.3	S02°03.3	330°48.9	N16°22.9	336°48.6	N16°42.0	98°11.5	N05°23.4
19	131°40.2	132°36.0	02.1	345°50.9	22.7	351°51.0	42.0	113°13.7	23.6
20	146°42.6	147°35.7	02°01.0	0°52.9	22.5	6°53.5	42.0	128°15.9	23.7
21	161°45.1	162°35.3	01°59.8	15°55.0	·· 22.2	21°55.9	·· 42.0	143°18.1	·· 23.8
22	176°47.6	177°35.0	58.6	30°57.0	22.0	36°58.3	41.9	158°20.2	23.9
23	191°50.0	192°34.7	57.5	45°59.1	21.7	52°00.7	41.9	173°22.4	24.0
Mer.pass. 10:15		ν -0.3′ d 1.2′		ν 2.1′ d 0.2′		ν 2.4′ d 0.0′		ν 2.2′ d 0.1′	

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°41.1
Diphda	348°45.8	-17°50.2
Achernar	335°19.4	-57°05.9
Hamal	327°49.4	23°35.4
Polaris	313°31.2	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.4
Capella	280°19.4	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.8	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°13.9	-59°36.2
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.6	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.2
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.7	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.1	-60°56.9
Kochab	137°18.8	74°02.4
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.2
Antares	112°13.3	-26°29.6
Atria	107°05.4	-69°04.4
Sabik	102°00.4	-15°45.6
Shaula	96°07.6	-37°07.3
Rasalhague	95°56.6	12°32.2
Eltanin	90°41.1	51°28.8
Kaus Aust.	83°29.9	-34°22.2
Vega	80°31.8	38°48.2
Nunki	75°45.4	-26°15.7
Altair	61°58.1	8°56.3
Peacock	53°02.9	-56°38.6
Deneb	49°24.6	45°22.4
Enif	33°37.1	9°59.9
Al Na'ir	27°30.9	-46°49.5
Fomalhaut	15°12.7	-29°28.6
Scheat	13°43.7	28°13.7
Markab	13°28.3	15°21.0

Apr 16 Fri	SHA	Mer.pass
Venus	4°03.6	10:08
Mars	214°37.2	20:03
Jupiter	220°13.0	19:40
Saturn	341°53.1	11:35

Apr 17 Sat	SHA	Mer.pass
Venus	2°56.3	10:09
Mars	214°28.2	20:00
Jupiter	220°12.4	19:36
Saturn	341°46.1	11:32

Apr 18 Sun	SHA	Mer.pass
Venus	1°49.0	10:09
Mars	214°18.7	19:56
Jupiter	220°11.6	19:33
Saturn	341°39.1	11:28

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = -0.1227 sec ΔT = TT-UT1 = +69.3067 sec

2027 April 16 to Apr. 18 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°00.3	N09°58.0	59°06.0	10.4′	N13°36.8	14.4′	59.0′
1	195°00.5	58.9	73°35.3	10.4′	13°22.4	14.4′	59.0′
2	210°00.6	09°59.8	88°04.7	10.5′	13°08.0	14.6′	59.0′
3	225°00.8	10°00.6	102°34.2	10.6′	12°53.4	14.6′	59.0′
4	240°00.9	01.5	117°03.8	10.6′	12°38.8	14.6′	59.0′
5	255°01.1	02.4	131°33.4	10.7′	12°24.2	14.8′	59.0′
6	270°01.2	N10°03.3	146°03.2	10.8′	N12°09.4	14.8′	59.0′
7	285°01.4	04.2	160°32.9	10.8′	11°54.6	14.8′	59.0′
8	300°01.5	05.1	175°02.8	10.9′	11°39.8	14.9′	59.0′
9	315°01.7	·· 06.0	189°32.7	11.0′	11°24.9	15.0′	59.0′
10	330°01.8	06.9	204°02.6	11.0′	11°09.9	15.0′	59.0′
11	345°02.0	07.7	218°32.7	11.1′	10°54.9	15.0′	58.9′
12	0°02.1	N10°08.6	233°02.8	11.2′	N10°39.9	15.2′	58.9′
13	15°02.3	09.5	247°32.9	11.2′	10°24.7	15.1′	58.9′
14	30°02.4	10.4	262°03.1	11.3′	10°09.6	15.3′	58.9′
15	45°02.6	·· 11.3	276°33.4	11.3′	09°54.3	15.2′	58.9′
16	60°02.7	12.2	291°03.7	11.4′	09°39.1	15.3′	58.9′
17	75°02.9	13.1	305°34.1	11.4′	09°23.8	15.4′	58.9′
18	90°03.0	N10°13.9	320°04.6	11.5′	N09°08.4	15.4′	58.9′
19	105°03.2	14.8	334°35.0	11.5′	08°53.0	15.4′	58.9′
20	120°03.3	15.7	349°05.6	11.6′	08°37.6	15.5′	58.9′
21	135°03.4	·· 16.6	3°36.2	11.6′	08°22.1	15.5′	58.9′
22	150°03.6	17.5	18°06.8	11.7′	08°06.6	15.6′	58.8′
23	165°03.7	18.4	32°37.5	11.7′	07°51.0	15.6′	58.8′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°03.9	N10°19.2	47°08.3	11.8′	N07°35.4	15.6′	58.8′
1	195°04.0	20.1	61°39.1	11.8′	07°19.8	15.6′	58.8′
2	210°04.2	21.0	76°09.9	11.9′	07°04.2	15.7′	58.8′
3	225°04.3	·· 21.9	90°40.8	11.9′	06°48.5	15.7′	58.8′
4	240°04.5	22.8	105°11.7	12.0′	06°32.8	15.8′	58.8′
5	255°04.6	23.7	119°42.7	12.0′	06°17.0	15.7′	58.8′
6	270°04.8	N10°24.5	134°13.7	12.1′	N06°01.3	15.8′	58.8′
7	285°04.9	25.4	148°44.8	12.1′	05°45.5	15.9′	58.7′
8	300°05.0	26.3	163°15.9	12.1′	05°29.6	15.8′	58.7′
9	315°05.2	·· 27.2	177°47.0	12.2′	05°13.8	15.8′	58.7′
10	330°05.3	28.1	192°18.2	12.2′	04°58.0	15.9′	58.7′
11	345°05.5	28.9	206°49.4	12.2′	04°42.1	15.9′	58.7′
12	0°05.6	N10°29.8	221°20.6	12.3′	N04°26.2	15.9′	58.7′
13	15°05.8	30.7	235°51.9	12.3′	04°10.3	15.9′	58.7′
14	30°05.9	31.6	250°23.2	12.3′	03°54.4	16.0′	58.7′
15	45°06.1	·· 32.5	264°54.5	12.4′	03°38.4	15.9′	58.6′
16	60°06.2	33.3	279°25.9	12.4′	03°22.5	16.0′	58.6′
17	75°06.3	34.2	293°57.3	12.4′	03°06.5	16.0′	58.6′
18	90°06.5	N10°35.1	308°28.7	12.4′	N02°50.5	15.9′	58.6′
19	105°06.6	36.0	323°00.2	12.5′	02°34.6	16.0′	58.6′
20	120°06.8	36.8	337°31.6	12.5′	02°18.6	16.0′	58.6′
21	135°06.9	·· 37.7	352°03.1	12.5′	02°02.6	16.0′	58.6′
22	150°07.1	38.6	6°34.7	12.5′	01°46.6	16.0′	58.5′
23	165°07.2	39.5	21°06.2	12.6′	01°30.6	16.0′	58.5′
	SD = 15.9′	d = 0.9′	SD = 16.0′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°07.3	N10°40.3	35°37.8	12.6′	N01°14.6	16.0′	58.5′
1	195°07.5	41.2	50°09.3	12.6′	00°58.6	15.9′	58.5′
2	210°07.6	42.1	64°40.9	12.6′	00°42.7	16.0′	58.5′
3	225°07.8	·· 43.0	79°12.6	12.6′	00°26.7	16.0′	58.5′
4	240°07.9	43.8	93°44.2	12.6′	N00°10.7	16.0′	58.5′
5	255°08.1	44.7	108°15.8	12.7′	S00°05.3	15.9′	58.4′
6	270°08.2	N10°45.6	122°47.5	12.7′	S00°21.2	16.0′	58.4′
7	285°08.3	46.5	137°19.2	12.7′	00°37.2	15.9′	58.4′
8	300°08.5	47.3	151°50.9	12.7′	00°53.1	16.0′	58.4′
9	315°08.6	·· 48.2	166°22.6	12.7′	01°09.1	15.9′	58.4′
10	330°08.8	49.1	180°54.3	12.7′	01°25.0	15.9′	58.4′
11	345°08.9	50.0	195°26.0	12.7′	01°40.9	15.9′	58.3′
12	0°09.0	N10°50.8	209°57.7	12.7′	S01°56.8	15.8′	58.3′
13	15°09.2	51.7	224°29.4	12.7′	02°12.6	15.9′	58.3′
14	30°09.3	52.6	239°01.1	12.7′	02°28.5	15.8′	58.3′
15	45°09.5	·· 53.4	253°32.9	12.7′	02°44.3	15.8′	58.3′
16	60°09.6	54.3	268°04.6	12.7′	03°00.1	15.8′	58.3′
17	75°09.7	55.2	282°36.3	12.7′	03°15.9	15.7′	58.2′
18	90°09.9	N10°56.0	297°08.1	12.7′	S03°31.6	15.8′	58.2′
19	105°10.0	56.9	311°39.8	12.7′	03°47.4	15.7′	58.2′
20	120°10.2	57.8	326°11.5	12.7′	04°03.1	15.7′	58.2′
21	135°10.3	·· 58.7	340°43.3	12.7′	04°18.8	15.6′	58.2′
22	150°10.4	10°59.5	355°15.0	12.7′	04°34.4	15.6′	58.2′
23	165°10.6	11°00.4	9°46.7	12.7′	04°50.0	15.6′	58.1′
	SD = 15.9′	d = 0.9′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	01:40	03:29	20:34	22:29	////
N 70°	////	02:22	03:47	20:15	21:43	////
68°	////	02:50	04:02	20:00	21:13	////
66°	01:26	03:11	04:13	19:48	20:52	22:41
64°	02:04	03:27	04:23	19:38	20:35	22:00
62°	02:30	03:41	04:31	19:30	20:21	21:33
60°	02:49	03:52	04:38	19:22	20:10	21:13
N 58°	03:05	04:01	04:45	19:16	20:00	20:57
56°	03:18	04:10	04:50	19:10	19:51	20:44
54°	03:29	04:17	04:55	19:05	19:44	20:32
52°	03:39	04:24	05:00	19:01	19:37	20:22
50°	03:47	04:29	05:04	18:57	19:31	20:14
45°	04:04	04:42	05:13	18:48	19:18	19:56
N 40°	04:18	04:52	05:20	18:40	19:08	19:42
35°	04:29	05:00	05:26	18:34	19:00	19:31
30°	04:38	05:07	05:31	18:28	18:53	19:22
20°	04:52	05:18	05:41	18:19	18:41	19:08
N 10°	05:03	05:27	05:49	18:11	18:32	18:57
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:18	05:42	06:04	17:55	18:17	18:41
20°	05:23	05:49	06:11	17:48	18:10	18:36
30°	05:28	05:56	06:20	17:39	18:03	18:31
35°	05:30	05:59	06:25	17:34	17:59	18:29
40°	05:32	06:03	06:31	17:28	17:55	18:27
45°	05:33	06:07	06:37	17:21	17:51	18:25
S 50°	05:34	06:12	06:45	17:14	17:46	18:24
52°	05:35	06:14	06:49	17:10	17:44	18:23
54°	05:35	06:16	06:52	17:06	17:42	18:23
56°	05:35	06:19	06:57	17:02	17:40	18:23
58°	05:36	06:21	07:02	16:57	17:37	18:22
S 60°	05:36	06:24	07:07	16:51	17:34	18:22

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	12:09	14:35	16:51	05:01	04:19	03:46
N 70°	12:28	14:40	16:46	04:41	04:11	03:46
68°	12:42	14:44	16:42	04:24	04:04	03:45
66°	12:53	14:48	16:39	04:11	03:58	03:45
64°	13:03	14:51	16:36	04:00	03:52	03:45
62°	13:11	14:54	16:34	03:50	03:48	03:45
60°	13:18	14:56	16:32	03:42	03:44	03:45
N 58°	13:24	14:58	16:30	03:35	03:40	03:45
56°	13:29	15:00	16:28	03:28	03:37	03:45
54°	13:34	15:01	16:27	03:22	03:34	03:45
52°	13:39	15:03	16:25	03:17	03:32	03:45
50°	13:42	15:04	16:24	03:12	03:29	03:45
45°	13:51	15:07	16:22	03:02	03:24	03:45
N 40°	13:58	15:09	16:19	02:53	03:20	03:45
35°	14:04	15:11	16:18	02:46	03:16	03:45
30°	14:09	15:13	16:16	02:39	03:13	03:44
20°	14:18	15:16	16:13	02:27	03:07	03:44
N 10°	14:26	15:19	16:11	02:17	03:02	03:44
0°	14:34	15:22	16:09	02:07	02:57	03:44
S 10°	14:41	15:24	16:06	01:58	02:52	03:44
20°	14:49	15:27	16:04	01:47	02:46	03:44
30°	14:58	15:30	16:01	01:35	02:40	03:43
35°	15:03	15:32	16:00	01:28	02:36	03:43
40°	15:08	15:34	15:58	01:20	02:32	03:43
45°	15:15	15:36	15:56	01:10	02:27	03:43
S 50°	15:23	15:39	15:54	00:59	02:22	03:42
52°	15:27	15:40	15:53	00:53	02:19	03:42
54°	15:31	15:42	15:52	00:47	02:16	03:42
56°	15:35	15:43	15:51	00:41	02:13	03:42
58°	15:40	15:45	15:49	00:33	02:09	03:42
S 60°	15:45	15:47	15:48	00:25	02:05	03:42

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 10-12 73-90%
16	00:01	00:08	12:00	20:45	08:21	
17	00:16	00:23	12:00	21:33	09:09	
18	00:29	00:36	11:59	22:20	09:56	

April 19, 20, 21 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	206°52.5	207°34.3	S01°56.3	61°01.1	N16°21.5	67°03.1	N16°41.9	188°24.6	N05°24.1
1	221°54.9	222°34.0	55.2	76°03.1	21.3	82°05.6	41.9	203°26.7	24.3
2	236°57.4	237°33.7	54.0	91°05.2	21.0	97°08.0	41.9	218°28.9	24.4
3	251°59.9	252°33.3	·· 52.9	106°07.2	·· 20.8	112°10.4	·· 41.8	233°31.1	·· 24.5
4	267°02.3	267°33.0	51.7	121°09.2	20.5	127°12.8	41.8	248°33.3	24.6
5	282°04.8	282°32.6	50.5	136°11.2	20.3	142°15.2	41.8	263°35.4	24.7
6	297°07.3	297°32.3	S01°49.4	151°13.3	N16°20.0	157°17.7	N16°41.8	278°37.6	N05°24.8
7	312°09.7	312°32.0	48.2	166°15.3	19.8	172°20.1	41.8	293°39.8	25.0
8	327°12.2	327°31.6	47.1	181°17.3	19.6	187°22.5	41.8	308°42.0	25.1
9	342°14.7	342°31.3	·· 45.9	196°19.3	·· 19.3	202°24.9	·· 41.7	323°44.1	·· 25.2
10	357°17.1	357°31.0	44.7	211°21.4	19.1	217°27.3	41.7	338°46.3	25.3
11	12°19.6	12°30.6	43.6	226°23.4	18.8	232°29.7	41.7	353°48.5	25.4
12	27°22.1	27°30.3	S01°42.4	241°25.4	N16°18.6	247°32.2	N16°41.7	8°50.7	N05°25.5
13	42°24.5	42°30.0	41.3	256°27.4	18.3	262°34.6	41.7	23°52.8	25.7
14	57°27.0	57°29.6	40.1	271°29.5	18.1	277°37.0	41.6	38°55.0	25.8
15	72°29.4	72°29.3	·· 38.9	286°31.5	·· 17.9	292°39.4	·· 41.6	53°57.2	·· 25.9
16	87°31.9	87°29.0	37.8	301°33.5	17.6	307°41.8	41.6	68°59.3	26.0
17	102°34.4	102°28.6	36.6	316°35.5	17.4	322°44.2	41.6	84°01.5	26.1
18	117°36.8	117°28.3	S01°35.5	331°37.5	N16°17.1	337°46.6	N16°41.6	99°03.7	N05°26.2
19	132°39.3	132°28.0	34.3	346°39.5	16.9	352°49.1	41.5	114°05.9	26.4
20	147°41.8	147°27.6	33.1	1°41.6	16.6	7°51.5	41.5	129°08.0	26.5
21	162°44.2	162°27.3	·· 32.0	16°43.6	·· 16.4	22°53.9	·· 41.5	144°10.2	·· 26.6
22	177°46.7	177°27.0	30.8	31°45.6	16.1	37°56.3	41.5	159°12.4	26.7
23	192°49.2	192°26.6	29.6	46°47.6	15.9	52°58.7	41.5	174°14.6	26.8
Mer.pass. 10:11		ν -0.3′	d 1.2′	m -3.88	ν 2.0′	d 0.2′	m 0.05	ν 2.4′	d 0.0′ m -2.21	ν 2.2′	d 0.1′ m 0.70

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	207°51.6	207°26.3	S01°28.5	61°49.6	N16°15.6	68°01.1	N16°41.4	189°16.7	N05°26.9
1	222°54.1	222°26.0	27.3	76°51.6	15.4	83°03.5	41.4	204°18.9	27.0
2	237°56.5	237°25.6	26.2	91°53.6	15.1	98°05.9	41.4	219°21.1	27.2
3	252°59.0	252°25.3	·· 25.0	106°55.6	·· 14.9	113°08.4	·· 41.4	234°23.3	·· 27.3
4	268°01.5	267°25.0	23.8	121°57.6	14.7	128°10.8	41.4	249°25.4	27.4
5	283°03.9	282°24.6	22.7	136°59.6	14.4	143°13.2	41.3	264°27.6	27.5
6	298°06.4	297°24.3	S01°21.5	152°01.7	N16°14.2	158°15.6	N16°41.3	279°29.8	N05°27.6
7	313°08.9	312°24.0	20.4	167°03.7	13.9	173°18.0	41.3	294°31.9	27.7
8	328°11.3	327°23.6	19.2	182°05.7	13.7	188°20.4	41.3	309°34.1	27.9
9	343°13.8	342°23.3	·· 18.0	197°07.7	·· 13.4	203°22.8	·· 41.2	324°36.3	·· 28.0
10	358°16.3	357°23.0	16.9	212°09.7	13.2	218°25.2	41.2	339°38.5	28.1
11	13°18.7	12°22.6	15.7	227°11.7	12.9	233°27.6	41.2	354°40.6	28.2
12	28°21.2	27°22.3	S01°14.5	242°13.7	N16°12.7	248°30.0	N16°41.2	9°42.8	N05°28.3
13	43°23.7	42°22.0	13.4	257°15.7	12.4	263°32.5	41.2	24°45.0	28.4
14	58°26.1	57°21.6	12.2	272°17.7	12.2	278°34.9	41.1	39°47.2	28.6
15	73°28.6	72°21.3	·· 11.0	287°19.7	·· 11.9	293°37.3	·· 41.1	54°49.3	·· 28.7
16	88°31.0	87°21.0	09.9	302°21.7	11.6	308°39.7	41.1	69°51.5	28.8
17	103°33.5	102°20.6	08.7	317°23.7	11.4	323°42.1	41.1	84°53.7	28.9
18	118°36.0	117°20.3	S01°07.6	332°25.7	N16°11.1	338°44.5	N16°41.1	99°55.9	N05°29.0
19	133°38.4	132°20.0	06.4	347°27.6	10.9	353°46.9	41.0	114°58.0	29.1
20	148°40.9	147°19.6	05.2	2°29.6	10.6	8°49.3	41.0	130°00.2	29.2
21	163°43.4	162°19.3	·· 04.1	17°31.6	·· 10.4	23°51.7	·· 41.0	145°02.4	·· 29.4
22	178°45.8	177°19.0	02.9	32°33.6	10.1	38°54.1	41.0	160°04.5	29.5
23	193°48.3	192°18.6	01.7	47°35.6	09.9	53°56.5	40.9	175°06.7	29.6
Mer.pass. 10:07		ν -0.3′	d 1.2′	m -3.88	ν 2.0′	d 0.2′	m 0.07	ν 2.4′	d 0.0′ m -2.20	ν 2.2′	d 0.1′ m 0.70

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	208°50.8	207°18.3	S01°00.6	62°37.6	N16°09.6	68°58.9	N16°40.9	190°08.9	N05°29.7
1	223°53.2	222°18.0	00°59.4	77°39.6	09.4	84°01.3	40.9	205°11.1	29.8
2	238°55.7	237°17.6	58.2	92°41.6	09.1	99°03.7	40.9	220°13.2	29.9
3	253°58.2	252°17.3	·· 57.1	107°43.6	·· 08.9	114°06.1	·· 40.8	235°15.4	·· 30.1
4	269°00.6	267°17.0	55.9	122°45.6	08.6	129°08.5	40.8	250°17.6	30.2
5	284°03.1	282°16.6	54.7	137°47.5	08.3	144°10.9	40.8	265°19.8	30.3
6	299°05.5	297°16.3	S00°53.6	152°49.5	N16°08.1	159°13.4	N16°40.8	280°21.9	N05°30.4
7	314°08.0	312°16.0	52.4	167°51.5	07.8	174°15.8	40.8	295°24.1	30.5
8	329°10.5	327°15.6	51.3	182°53.5	07.6	189°18.2	40.7	310°26.3	30.6
9	344°12.9	342°15.3	·· 50.1	197°55.5	·· 07.3	204°20.6	·· 40.7	325°28.5	·· 30.7
10	359°15.4	357°15.0	48.9	212°57.5	07.1	219°23.0	40.7	340°30.6	30.9
11	14°17.9	12°14.6	47.8	227°59.4	06.8	234°25.4	40.7	355°32.8	31.0
12	29°20.3	27°14.3	S00°46.6	243°01.4	N16°06.6	249°27.8	N16°40.6	10°35.0	N05°31.1
13	44°22.8	42°14.0	45.4	258°03.4	06.3	264°30.2	40.6	25°37.2	31.2
14	59°25.3	57°13.7	44.3	273°05.4	06.0	279°32.6	40.6	40°39.3	31.3
15	74°27.7	72°13.3	·· 43.1	288°07.3	·· 05.8	294°35.0	·· 40.6	55°41.5	·· 31.4
16	89°30.2	87°13.0	41.9	303°09.3	05.5	309°37.4	40.5	70°43.7	31.6
17	104°32.6	102°12.7	40.8	318°11.3	05.3	324°39.8	40.5	85°45.9	31.7
18	119°35.1	117°12.3	S00°39.6	333°13.3	N16°05.0	339°42.2	N16°40.5	100°48.0	N05°31.8
19	134°37.6	132°12.0	38.4	348°15.2	04.7	354°44.6	40.5	115°50.2	31.9
20	149°40.0	147°11.7	37.3	3°17.2	04.5	9°47.0	40.4	130°52.4	32.0
21	164°42.5	162°11.3	·· 36.1	18°19.2	·· 04.2	24°49.4	·· 40.4	145°54.5	·· 32.1
22	179°45.0	177°11.0	34.9	33°21.2	04.0	39°51.8	40.4	160°56.7	32.2
23	194°47.4	192°10.7	33.8	48°23.1	03.7	54°54.2	40.4	175°58.9	32.4
Mer.pass. 10:03		ν -0.3′	d 1.2′	m -3.88	ν 2.0′	d 0.3′	m 0.09	ν 2.4′	d 0.0′ m -2.19	ν 2.2′	d 0.1′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.4
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.9
Hamal	327°49.4	23°35.4
Polaris	313°31.6	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.4	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.2	7°24.6
Canopus	263°51.8	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°13.9	-59°36.2
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.6	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.3
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.6
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.7	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.2
Rigil Kent.	139°37.0	-60°56.9
Kochab	137°18.7	74°02.4
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.2
Antares	112°13.3	-26°29.6
Atria	107°05.4	-69°04.4
Sabik	102°00.4	-15°45.6
Shaula	96°07.6	-37°07.3
Rasalhague	95°56.6	12°32.2
Eltanin	90°41.0	51°28.8
Kaus Aust.	83°29.9	-34°22.2
Vega	80°31.8	38°48.3
Nunki	75°45.3	-26°15.7
Altair	61°58.1	8°56.3
Peacock	53°02.9	-56°38.6
Deneb	49°24.6	45°22.4
Enif	33°37.1	9°59.9
Al Na'ir	27°30.8	-46°49.5
Fomalhaut	15°12.7	-29°28.6
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Apr 19 Mon	SHA	Mer.pass
Venus	0°41.8	10:10
Mars	214°08.6	19:53
Jupiter	220°10.7	19:29
Saturn	341°32.1	11:25

Apr 20 Tue	SHA	Mer.pass
Venus	359°34.7	10:10
Mars	213°58.0	19:50
Jupiter	220°09.5	19:25
Saturn	341°25.1	11:21

Apr 21 Wed	SHA	Mer.pass
Venus	358°27.5	10:11
Mars	213°46.8	19:47
Jupiter	220°08.2	19:21
Saturn	341°18.1	11:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°10.7	N11°01.3	24°18.4	12.7′	S05°05.6	15.6′	58.1′
1	195°10.8	02.1	38°50.1	12.7′	05°21.2	15.5′	58.1′
2	210°11.0	03.0	53°21.9	12.7′	05°36.7	15.5′	58.1′
3	225°11.1	·· 03.9	67°53.5	12.7′	05°52.2	15.4′	58.1′
4	240°11.3	04.7	82°25.2	12.7′	06°07.6	15.4′	58.0′
5	255°11.4	05.6	96°56.9	12.7′	06°23.0	15.4′	58.0′
6	270°11.5	N11°06.5	111°28.6	12.6′	S06°38.4	15.3′	58.0′
7	285°11.7	07.3	126°00.2	12.6′	06°53.7	15.3′	58.0′
8	300°11.8	08.2	140°31.8	12.6′	07°09.0	15.2′	58.0′
9	315°11.9	·· 09.1	155°03.4	12.6′	07°24.2	15.2′	57.9′
10	330°12.1	09.9	169°35.0	12.6′	07°39.4	15.1′	57.9′
11	345°12.2	10.8	184°06.6	12.6′	07°54.5	15.1′	57.9′
12	0°12.3	N11°11.7	198°38.2	12.5′	S08°09.6	15.1′	57.9′
13	15°12.5	12.5	213°09.7	12.5′	08°24.7	14.9′	57.9′
14	30°12.6	13.4	227°41.3	12.5′	08°39.6	15.0′	57.8′
15	45°12.8	·· 14.2	242°12.8	12.5′	08°54.6	14.9′	57.8′
16	60°12.9	15.1	256°44.3	12.5′	09°09.5	14.8′	57.8′
17	75°13.0	16.0	271°15.7	12.4′	09°24.3	14.8′	57.8′
18	90°13.2	N11°16.8	285°47.2	12.4′	S09°39.1	14.7′	57.8′
19	105°13.3	17.7	300°18.6	12.4′	09°53.8	14.7′	57.7′
20	120°13.4	18.6	314°50.0	12.4′	10°08.5	14.6′	57.7′
21	135°13.6	·· 19.4	329°21.3	12.3′	10°23.1	14.5′	57.7′
22	150°13.7	20.3	343°52.7	12.3′	10°37.6	14.5′	57.7′
23	165°13.8	21.1	358°24.0	12.3′	10°52.1	14.4′	57.7′
	SD = 15.9′	d = 0.9′	SD = 15.9′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°14.0	N11°22.0	12°55.3	12.3′	S11°06.5	14.4′	57.6′
1	195°14.1	22.9	27°26.5	12.2′	11°20.9	14.3′	57.6′
2	210°14.2	23.7	41°57.8	12.2′	11°35.2	14.2′	57.6′
3	225°14.4	·· 24.6	56°28.9	12.2′	11°49.4	14.1′	57.6′
4	240°14.5	25.4	71°00.1	12.1′	12°03.5	14.1′	57.5′
5	255°14.6	26.3	85°31.2	12.1′	12°17.6	14.0′	57.5′
6	270°14.8	N11°27.2	100°02.4	12.1′	S12°31.6	14.0′	57.5′
7	285°14.9	28.0	114°33.4	12.0′	12°45.6	13.8′	57.5′
8	300°15.0	28.9	129°04.5	12.0′	12°59.4	13.8′	57.5′
9	315°15.2	·· 29.7	143°35.5	12.0′	13°13.2	13.7′	57.4′
10	330°15.3	30.6	158°06.4	11.9′	13°26.9	13.7′	57.4′
11	345°15.4	31.4	172°37.4	11.9′	13°40.6	13.5′	57.4′
12	0°15.6	N11°32.3	187°08.3	11.9′	S13°54.1	13.5′	57.4′
13	15°15.7	33.2	201°39.1	11.8′	14°07.6	13.4′	57.3′
14	30°15.8	34.0	216°09.9	11.8′	14°21.0	13.4′	57.3′
15	45°16.0	·· 34.9	230°40.7	11.7′	14°34.4	13.2′	57.3′
16	60°16.1	35.7	245°11.5	11.7′	14°47.6	13.2′	57.3′
17	75°16.2	36.6	259°42.2	11.7′	15°00.8	13.0′	57.2′
18	90°16.3	N11°37.4	274°12.8	11.6′	S15°13.8	13.0′	57.2′
19	105°16.5	38.3	288°43.5	11.6′	15°26.8	12.9′	57.2′
20	120°16.6	39.1	303°14.1	11.5′	15°39.7	12.8′	57.2′
21	135°16.7	·· 40.0	317°44.6	11.5′	15°52.5	12.8′	57.2′
22	150°16.9	40.8	332°15.1	11.5′	16°05.3	12.6′	57.1′
23	165°17.0	41.7	346°45.6	11.4′	16°17.9	12.5′	57.1′
	SD = 15.9′	d = 0.9′	SD = 15.7′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°17.1	N11°42.5	1°16.0	11.4′	S16°30.4	12.5′	57.1′
1	195°17.3	43.4	15°46.4	11.3′	16°42.9	12.3′	57.1′
2	210°17.4	44.3	30°16.7	11.3′	16°55.2	12.3′	57.0′
3	225°17.5	·· 45.1	44°47.0	11.3′	17°07.5	12.2′	57.0′
4	240°17.6	46.0	59°17.3	11.2′	17°19.7	12.0′	57.0′
5	255°17.8	46.8	73°47.5	11.2′	17°31.7	12.0′	57.0′
6	270°17.9	N11°47.7	88°17.7	11.1′	S17°43.7	11.9′	56.9′
7	285°18.0	48.5	102°47.8	11.1′	17°55.6	11.7′	56.9′
8	300°18.2	49.4	117°17.9	11.0′	18°07.3	11.7′	56.9′
9	315°18.3	·· 50.2	131°47.9	11.0′	18°19.0	11.6′	56.9′
10	330°18.4	51.1	146°17.9	11.0′	18°30.6	11.4′	56.8′
11	345°18.5	51.9	160°47.9	10.9′	18°42.0	11.4′	56.8′
12	0°18.7	N11°52.8	175°17.8	10.9′	S18°53.4	11.3′	56.8′
13	15°18.8	53.6	189°47.6	10.8′	19°04.7	11.1′	56.8′
14	30°18.9	54.4	204°17.4	10.8′	19°15.8	11.1′	56.7′
15	45°19.0	·· 55.3	218°47.2	10.7′	19°26.9	10.9′	56.7′
16	60°19.2	56.1	233°16.9	10.7′	19°37.8	10.8′	56.7′
17	75°19.3	57.0	247°46.6	10.6′	19°48.6	10.7′	56.7′
18	90°19.4	N11°57.8	262°16.3	10.6′	S19°59.3	10.6′	56.6′
19	105°19.6	58.7	276°45.9	10.6′	20°09.9	10.5′	56.6′
20	120°19.7	11°59.5	291°15.4	10.5′	20°20.4	10.4′	56.6′
21	135°19.8	12°00.4	305°44.9	10.5′	20°30.8	10.3′	56.6′
22	150°19.9	01.2	320°14.4	10.4′	20°41.1	10.1′	56.5′
23	165°20.1	02.1	334°43.8	10.4′	20°51.2	10.1′	56.5′
	SD = 15.9′	d = 0.9′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	01:00	03:11	20:51	23:16	////
N 70°	////	01:59	03:32	20:29	22:05	////
68°	////	02:33	03:48	20:12	21:30	////
66°	00:52	02:56	04:02	19:59	21:05	23:22
64°	01:44	03:15	04:13	19:48	20:46	22:20
62°	02:14	03:30	04:22	19:38	20:31	21:48
60°	02:36	03:42	04:30	19:30	20:18	21:25
N 58°	02:54	03:52	04:37	19:23	20:07	21:07
56°	03:08	04:02	04:43	19:16	19:58	20:52
54°	03:20	04:10	04:48	19:11	19:50	20:40
52°	03:31	04:17	04:53	19:06	19:43	20:29
50°	03:40	04:23	04:58	19:01	19:36	20:20
45°	03:59	04:36	05:07	18:51	19:23	20:01
N 40°	04:13	04:47	05:15	18:43	19:12	19:46
35°	04:25	04:56	05:22	18:36	19:03	19:34
30°	04:34	05:03	05:28	18:30	18:55	19:24
20°	04:49	05:16	05:38	18:20	18:42	19:09
N 10°	05:01	05:26	05:47	18:11	18:32	18:57
0°	05:10	05:35	05:56	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:54	18:15	18:40
20°	05:24	05:50	06:12	17:45	18:08	18:34
30°	05:30	05:58	06:22	17:36	18:00	18:28
35°	05:32	06:02	06:27	17:30	17:56	18:25
40°	05:34	06:06	06:34	17:24	17:51	18:23
45°	05:37	06:11	06:41	17:16	17:46	18:21
S 50°	05:39	06:16	06:50	17:08	17:41	18:18
52°	05:39	06:19	06:54	17:04	17:38	18:18
54°	05:40	06:21	06:58	16:59	17:36	18:17
56°	05:41	06:24	07:03	16:54	17:33	18:16
58°	05:42	06:27	07:08	16:49	17:30	18:15
S 60°	05:42	06:31	07:14	16:43	17:26	18:15

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	19:12	22:06	▬	03:12	02:32	01:20
N 70°	18:55	21:19	▬	03:21	02:52	02:09
68°	18:41	20:49	23:32	03:28	03:07	02:40
66°	18:30	20:27	22:37	03:33	03:20	03:04
64°	18:21	20:10	22:04	03:38	03:31	03:22
62°	18:14	19:55	21:40	03:43	03:40	03:38
60°	18:07	19:43	21:21	03:46	03:48	03:51
N 58°	18:01	19:33	21:06	03:50	03:55	04:02
56°	17:56	19:24	20:52	03:53	04:01	04:12
54°	17:51	19:16	20:41	03:55	04:07	04:20
52°	17:47	19:09	20:31	03:58	04:12	04:28
50°	17:44	19:03	20:22	04:00	04:16	04:35
45°	17:36	18:50	20:03	04:05	04:26	04:50
N 40°	17:29	18:38	19:48	04:09	04:35	05:03
35°	17:23	18:29	19:35	04:13	04:42	05:13
30°	17:18	18:21	19:23	04:16	04:48	05:23
20°	17:10	18:07	19:04	04:21	04:59	05:39
N 10°	17:02	17:54	18:48	04:26	05:09	05:53
0°	16:55	17:43	18:33	04:31	05:18	06:07
S 10°	16:48	17:32	18:17	04:35	05:27	06:20
20°	16:41	17:20	18:01	04:40	05:37	06:34
30°	16:33	17:06	17:43	04:46	05:48	06:51
35°	16:28	16:59	17:32	04:49	05:55	07:01
40°	16:23	16:50	17:20	04:53	06:02	07:12
45°	16:17	16:39	17:05	04:57	06:11	07:25
S 50°	16:10	16:27	16:48	05:02	06:22	07:41
52°	16:06	16:21	16:40	05:04	06:26	07:48
54°	16:03	16:15	16:31	05:07	06:32	07:57
56°	15:59	16:08	16:20	05:10	06:38	08:06
58°	15:54	16:00	16:09	05:13	06:45	08:17
S 60°	15:49	15:52	15:56	05:17	06:53	08:30

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 13-15 95-100%
19	00:43	00:49	11:59	23:07	10:43	
20	00:56	01:02	11:59	23:55	11:30	
21	01:09	01:15	11:59	–:–	12:19	

April 22, 23, 24 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	209°49.9	207°10.3	S00°32.6	63°25.1	N16°03.4	69°56.6	N16°40.3	191°01.1	N05°32.5
1	224°52.4	222°10.0	31.4	78°27.1	03.2	84°58.9	40.3	206°03.2	32.6
2	239°54.8	237°09.7	30.3	93°29.0	02.9	100°01.3	40.3	221°05.4	32.7
3	254°57.3	252°09.3	·· 29.1	108°31.0	·· 02.7	115°03.7	·· 40.3	236°07.6	·· 32.8
4	269°59.8	267°09.0	27.9	123°33.0	02.4	130°06.1	40.2	251°09.8	32.9
5	285°02.2	282°08.7	26.8	138°34.9	02.1	145°08.5	40.2	266°11.9	33.1
6	300°04.7	297°08.3	S00°25.6	153°36.9	N16°01.9	160°10.9	N16°40.2	281°14.1	N05°33.2
7	315°07.1	312°08.0	24.4	168°38.8	01.6	175°13.3	40.2	296°16.3	33.3
8	330°09.6	327°07.7	23.3	183°40.8	01.3	190°15.7	40.1	311°18.5	33.4
9	345°12.1	342°07.3	·· 22.1	198°42.8	·· 01.1	205°18.1	·· 40.1	326°20.6	·· 33.5
10	0°14.5	357°07.0	20.9	213°44.7	00.8	220°20.5	40.1	341°22.8	33.6
11	15°17.0	12°06.7	19.8	228°46.7	00.6	235°22.9	40.1	356°25.0	33.7
12	30°19.5	27°06.4	S00°18.6	243°48.6	N16°00.3	250°25.3	N16°40.0	11°27.2	N05°33.9
13	45°21.9	42°06.0	17.4	258°50.6	16°00.0	265°27.7	40.0	26°29.3	34.0
14	60°24.4	57°05.7	16.3	273°52.6	15°59.8	280°30.1	40.0	41°31.5	34.1
15	75°26.9	72°05.4	·· 15.1	288°54.5	·· 59.5	295°32.5	·· 40.0	56°33.7	·· 34.2
16	90°29.3	87°05.0	13.9	303°56.5	59.2	310°34.9	39.9	71°35.9	34.3
17	105°31.8	102°04.7	12.7	318°58.4	59.0	325°37.3	39.9	86°38.0	34.4
18	120°34.3	117°04.4	S00°11.6	334°00.4	N15°58.7	340°39.7	N16°39.9	101°40.2	N05°34.5
19	135°36.7	132°04.0	10.4	349°02.3	58.4	355°42.0	39.8	116°42.4	34.7
20	150°39.2	147°03.7	09.2	4°04.3	58.2	10°44.4	39.8	131°44.6	34.8
21	165°41.6	162°03.4	·· 08.1	19°06.2	·· 57.9	25°46.8	·· 39.8	146°46.7	·· 34.9
22	180°44.1	177°03.0	06.9	34°08.2	57.6	40°49.2	39.8	161°48.9	35.0
23	195°46.6	192°02.7	05.7	49°10.1	57.4	55°51.6	39.7	176°51.1	35.1
Mer.pass. 09:59		ν -0.3′	d 1.2′	m -3.87	ν 2.0′	d 0.3′	m 0.11	ν 2.4′	d 0.0′ m -2.18	ν 2.2′	d 0.1′ m 0.70

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	210°49.0	207°02.4	S00°04.6	64°12.1	N15°57.1	70°54.0	N16°39.7	191°53.3	N05°35.2
1	225°51.5	222°02.0	03.4	79°14.0	56.8	85°56.4	39.7	206°55.4	35.3
2	240°54.0	237°01.7	02.2	94°16.0	56.6	100°58.8	39.7	221°57.6	35.5
3	255°56.4	252°01.4	S00°01.1	109°17.9	·· 56.3	116°01.2	·· 39.6	236°59.8	·· 35.6
4	270°58.9	267°01.0	N00°00.1	124°19.9	56.0	131°03.6	39.6	252°02.0	35.7
5	286°01.4	282°00.7	01.3	139°21.8	55.8	146°05.9	39.6	267°04.1	35.8
6	301°03.8	297°00.4	N00°02.4	154°23.8	N15°55.5	161°08.3	N16°39.5	282°06.3	N05°35.9
7	316°06.3	312°00.1	03.6	169°25.7	55.2	176°10.7	39.5	297°08.5	36.0
8	331°08.7	326°59.7	04.8	184°27.6	55.0	191°13.1	39.5	312°10.7	36.2
9	346°11.2	341°59.4	·· 06.0	199°29.6	·· 54.7	206°15.5	·· 39.5	327°12.8	·· 36.3
10	1°13.7	356°59.1	07.1	214°31.5	54.4	221°17.9	39.4	342°15.0	36.4
11	16°16.1	11°58.7	08.3	229°33.5	54.1	236°20.3	39.4	357°17.2	36.5
12	31°18.6	26°58.4	N00°09.5	244°35.4	N15°53.9	251°22.6	N16°39.4	12°19.4	N05°36.6
13	46°21.1	41°58.1	10.6	259°37.3	53.6	266°25.0	39.3	27°21.5	36.7
14	61°23.5	56°57.7	11.8	274°39.3	53.3	281°27.4	39.3	42°23.7	36.8
15	76°26.0	71°57.4	·· 13.0	289°41.2	·· 53.1	296°29.8	·· 39.3	57°25.9	·· 37.0
16	91°28.5	86°57.1	14.1	304°43.1	52.8	311°32.2	39.3	72°28.1	37.1
17	106°30.9	101°56.7	15.3	319°45.1	52.5	326°34.6	39.2	87°30.2	37.2
18	121°33.4	116°56.4	N00°16.5	334°47.0	N15°52.2	341°37.0	N16°39.2	102°32.4	N05°37.3
19	136°35.9	131°56.1	17.6	349°48.9	52.0	356°39.3	39.2	117°34.6	37.4
20	151°38.3	146°55.7	18.8	4°50.9	51.7	11°41.7	39.1	132°36.8	37.5
21	166°40.8	161°55.4	·· 20.0	19°52.8	·· 51.4	26°44.1	·· 39.1	147°38.9	·· 37.6
22	181°43.2	176°55.1	21.2	34°54.7	51.1	41°46.5	39.1	162°41.1	37.8
23	196°45.7	191°54.7	22.3	49°56.7	50.9	56°48.9	39.1	177°43.3	37.9
Mer.pass. 09:55		ν -0.3′	d 1.2′	m -3.87	ν 1.9′	d 0.3′	m 0.13	ν 2.4′	d 0.0′ m -2.18	ν 2.2′	d 0.1′ m 0.71

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	211°48.2	206°54.4	N00°23.5	64°58.6	N15°50.6	71°51.3	N16°39.0	192°45.5	N05°38.0
1	226°50.6	221°54.1	24.7	80°00.5	50.3	86°53.6	39.0	207°47.6	38.1
2	241°53.1	236°53.8	25.8	95°02.4	50.1	101°56.0	39.0	222°49.8	38.2
3	256°55.6	251°53.4	·· 27.0	110°04.4	·· 49.8	116°58.4	·· 38.9	237°52.0	·· 38.3
4	271°58.0	266°53.1	28.2	125°06.3	49.5	132°00.8	38.9	252°54.2	38.4
5	287°00.5	281°52.8	29.3	140°08.2	49.2	147°03.2	38.9	267°56.3	38.6
6	302°03.0	296°52.4	N00°30.5	155°10.1	N15°49.0	162°05.5	N16°38.8	282°58.5	N05°38.7
7	317°05.4	311°52.1	31.7	170°12.1	48.7	177°07.9	38.8	298°00.7	38.8
8	332°07.9	326°51.8	32.9	185°14.0	48.4	192°10.3	38.8	313°02.9	38.9
9	347°10.4	341°51.4	·· 34.0	200°15.9	·· 48.1	207°12.7	·· 38.8	328°05.0	·· 39.0
10	2°12.8	356°51.1	35.2	215°17.8	47.8	222°15.1	38.7	343°07.2	39.1
11	17°15.3	11°50.8	36.4	230°19.7	47.6	237°17.4	38.7	358°09.4	39.2
12	32°17.7	26°50.4	N00°37.5	245°21.7	N15°47.3	252°19.8	N16°38.7	13°11.6	N05°39.4
13	47°20.2	41°50.1	38.7	260°23.6	47.0	267°22.2	38.6	28°13.7	39.5
14	62°22.7	56°49.8	39.9	275°25.5	46.7	282°24.6	38.6	43°15.9	39.6
15	77°25.1	71°49.4	·· 41.1	290°27.4	·· 46.5	297°27.0	·· 38.6	58°18.1	·· 39.7
16	92°27.6	86°49.1	42.2	305°29.3	46.2	312°29.3	38.5	73°20.3	39.8
17	107°30.1	101°48.8	43.4	320°31.2	45.9	327°31.7	38.5	88°22.4	39.9
18	122°32.5	116°48.4	N00°44.6	335°33.1	N15°45.6	342°34.1	N16°38.5	103°24.6	N05°40.0
19	137°35.0	131°48.1	45.7	350°35.1	45.3	357°36.5	38.4	118°26.8	40.1
20	152°37.5	146°47.8	46.9	5°37.0	45.1	12°38.8	38.4	133°29.0	40.3
21	167°39.9	161°47.5	·· 48.1	20°38.9	·· 44.8	27°41.2	·· 38.4	148°31.1	·· 40.4
22	182°42.4	176°47.1	49.2	35°40.8	44.5	42°43.6	38.3	163°33.3	40.5
23	197°44.9	191°46.8	50.4	50°42.7	44.2	57°46.0	38.3	178°35.5	40.6
Mer.pass. 09:51		ν -0.3′	d 1.2′	m -3.87	ν 1.9′	d 0.3′	m 0.15	ν 2.4′	d 0.0′ m -2.17	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.4
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°31.7	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.4	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.8	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.0	-59°36.2
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.6	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.3
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.7	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.4
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.2
Antares	112°13.2	-26°29.6
Atria	107°05.4	-69°04.4
Sabik	102°00.4	-15°45.6
Shaula	96°07.6	-37°07.3
Rasalhague	95°56.6	12°32.2
Eltanin	90°41.0	51°28.8
Kaus Aust.	83°29.9	-34°22.2
Vega	80°31.8	38°48.3
Nunki	75°45.3	-26°15.7
Altair	61°58.1	8°56.3
Peacock	53°02.8	-56°38.5
Deneb	49°24.6	45°22.4
Enif	33°37.1	9°59.9
Al Na'ir	27°30.8	-46°49.5
Fomalhaut	15°12.7	-29°28.6
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Apr 22 Thu	SHA	Mer.pass
Venus	357°20.4	10:12
Mars	213°35.2	19:44
Jupiter	220°06.7	19:17
Saturn	341°11.2	11:14

Apr 23 Fri	SHA	Mer.pass
Venus	356°13.3	10:12
Mars	213°23.0	19:41
Jupiter	220°05.0	19:13
Saturn	341°04.2	11:11

Apr 24 Sat	SHA	Mer.pass
Venus	355°06.2	10:13
Mars	213°10.4	19:38
Jupiter	220°03.1	19:10
Saturn	340°57.3	11:07

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°20.2	N12°02.9	349°13.2	10.3′	S21°01.3	9.9′	56.5′
1	195°20.3	03.8	3°42.5	10.3′	21°11.2	9.8′	56.5′
2	210°20.4	04.6	18°11.8	10.2′	21°21.0	9.7′	56.4′
3	225°20.6	·· 05.4	32°41.0	10.2′	21°30.7	9.5′	56.4′
4	240°20.7	06.3	47°10.3	10.2′	21°40.2	9.5′	56.4′
5	255°20.8	07.1	61°39.4	10.1′	21°49.7	9.3′	56.4′
6	270°20.9	N12°08.0	76°08.5	10.1′	S21°59.0	9.2′	56.3′
7	285°21.1	08.8	90°37.6	10.0′	22°08.2	9.1′	56.3′
8	300°21.2	09.6	105°06.6	10.0′	22°17.3	8.9′	56.3′
9	315°21.3	·· 10.5	119°35.6	10.0′	22°26.2	8.9′	56.3′
10	330°21.4	11.3	134°04.6	9.9′	22°35.1	8.7′	56.2′
11	345°21.5	12.2	148°33.5	9.9′	22°43.8	8.6′	56.2′
12	0°21.7	N12°13.0	163°02.4	9.8′	S22°52.4	8.4′	56.2′
13	15°21.8	13.9	177°31.2	9.8′	23°00.8	8.4′	56.2′
14	30°21.9	14.7	192°00.0	9.8′	23°09.2	8.2′	56.1′
15	45°22.0	·· 15.5	206°28.8	9.7′	23°17.4	8.0′	56.1′
16	60°22.2	16.4	220°57.5	9.7′	23°25.4	8.0′	56.1′
17	75°22.3	17.2	235°26.2	9.7′	23°33.4	7.8′	56.1′
18	90°22.4	N12°18.0	249°54.9	9.6′	S23°41.2	7.7′	56.0′
19	105°22.5	18.9	264°23.5	9.6′	23°48.9	7.5′	56.0′
20	120°22.6	19.7	278°52.1	9.5′	23°56.4	7.5′	56.0′
21	135°22.8	·· 20.6	293°20.6	9.5′	24°03.9	7.3′	56.0′
22	150°22.9	21.4	307°49.1	9.5′	24°11.2	7.1′	55.9′
23	165°23.0	22.2	322°17.6	9.5′	24°18.3	7.1′	55.9′
	SD = 15.9′	d = 0.8′	SD = 15.4′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°23.1	N12°23.1	336°46.1	9.4′	S24°25.4	6.8′	55.9′
1	195°23.2	23.9	351°14.5	9.4′	24°32.2	6.8′	55.9′
2	210°23.4	24.7	5°42.9	9.4′	24°39.0	6.6′	55.8′
3	225°23.5	·· 25.6	20°11.2	9.3′	24°45.6	6.5′	55.8′
4	240°23.6	26.4	34°39.6	9.3′	24°52.1	6.4′	55.8′
5	255°23.7	27.2	49°07.9	9.3′	24°58.5	6.2′	55.8′
6	270°23.8	N12°28.1	63°36.2	9.3′	S25°04.7	6.1′	55.7′
7	285°24.0	28.9	78°04.4	9.2′	25°10.8	5.9′	55.7′
8	300°24.1	29.7	92°32.6	9.2′	25°16.7	5.8′	55.7′
9	315°24.2	·· 30.6	107°00.8	9.2′	25°22.5	5.7′	55.7′
10	330°24.3	31.4	121°29.0	9.2′	25°28.2	5.5′	55.6′
11	345°24.4	32.2	135°57.2	9.1′	25°33.7	5.4′	55.6′
12	0°24.5	N12°33.1	150°25.3	9.1′	S25°39.1	5.3′	55.6′
13	15°24.7	33.9	164°53.4	9.1′	25°44.4	5.1′	55.6′
14	30°24.8	34.7	179°21.5	9.1′	25°49.5	4.9′	55.6′
15	45°24.9	·· 35.6	193°49.6	9.1′	25°54.4	4.9′	55.5′
16	60°25.0	36.4	208°17.7	9.1′	25°59.3	4.7′	55.5′
17	75°25.1	37.2	222°45.7	9.0′	26°04.0	4.5′	55.5′
18	90°25.3	N12°38.1	237°13.8	9.0′	S26°08.5	4.4′	55.5′
19	105°25.4	38.9	251°41.8	9.0′	26°12.9	4.3′	55.4′
20	120°25.5	39.7	266°09.8	9.0′	26°17.2	4.1′	55.4′
21	135°25.6	·· 40.5	280°37.8	9.0′	26°21.3	4.0′	55.4′
22	150°25.7	41.4	295°05.8	9.0′	26°25.3	3.9′	55.4′
23	165°25.8	42.2	309°33.8	9.0′	26°29.2	3.7′	55.4′
	SD = 15.9′	d = 0.8′	SD = 15.2′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°25.9	N12°43.0	324°01.8	9.0′	S26°32.9	3.5′	55.3′
1	195°26.1	43.9	338°29.7	9.0′	26°36.4	3.5′	55.3′
2	210°26.2	44.7	352°57.7	9.0′	26°39.9	3.2′	55.3′
3	225°26.3	·· 45.5	7°25.6	9.0′	26°43.1	3.2′	55.3′
4	240°26.4	46.3	21°53.6	9.0′	26°46.3	3.0′	55.2′
5	255°26.5	47.2	36°21.6	9.0′	26°49.3	2.8′	55.2′
6	270°26.6	N12°48.0	50°49.5	9.0′	S26°52.1	2.7′	55.2′
7	285°26.7	48.8	65°17.5	9.0′	26°54.8	2.6′	55.2′
8	300°26.9	49.6	79°45.4	9.0′	26°57.4	2.4′	55.2′
9	315°27.0	·· 50.5	94°13.4	9.0′	26°59.8	2.3′	55.1′
10	330°27.1	51.3	108°41.3	9.0′	27°02.1	2.1′	55.1′
11	345°27.2	52.1	123°09.3	9.0′	27°04.2	2.0′	55.1′
12	0°27.3	N12°52.9	137°37.3	9.0′	S27°06.2	1.9′	55.1′
13	15°27.4	53.7	152°05.3	9.0′	27°08.1	1.7′	55.1′
14	30°27.5	54.6	166°33.3	9.0′	27°09.8	1.6′	55.0′
15	45°27.7	·· 55.4	181°01.3	9.0′	27°11.4	1.4′	55.0′
16	60°27.8	56.2	195°29.3	9.0′	27°12.8	1.3′	55.0′
17	75°27.9	57.0	209°57.3	9.0′	27°14.1	1.1′	55.0′
18	90°28.0	N12°57.9	224°25.4	9.1′	S27°15.2	1.0′	55.0′
19	105°28.1	58.7	238°53.4	9.1′	27°16.2	0.9′	54.9′
20	120°28.2	12°59.5	253°21.5	9.1′	27°17.1	0.7′	54.9′
21	135°28.3	13°00.3	267°49.6	9.1′	27°17.8	0.6′	54.9′
22	150°28.4	01.1	282°17.7	9.1′	27°18.4	0.5′	54.9′
23	165°28.5	02.0	296°45.8	9.2′	27°18.9	0.3′	54.9′
	SD = 15.9′	d = 0.8′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:52	21:09	////	////
N 70°	////	01:32	03:17	20:44	22:33	////
68°	////	02:14	03:35	20:25	21:48	////
66°	////	02:41	03:50	20:09	21:19	////
64°	01:21	03:02	04:02	19:57	20:58	22:44
62°	01:58	03:19	04:12	19:46	20:41	22:04
60°	02:23	03:32	04:21	19:37	20:27	21:37
N 58°	02:43	03:44	04:29	19:29	20:15	21:17
56°	02:58	03:54	04:36	19:23	20:05	21:01
54°	03:12	04:02	04:42	19:16	19:56	20:47
52°	03:23	04:10	04:47	19:11	19:48	20:36
50°	03:33	04:17	04:52	19:06	19:41	20:26
45°	03:53	04:31	05:02	18:55	19:27	20:05
N 40°	04:08	04:43	05:11	18:46	19:15	19:50
35°	04:20	04:52	05:19	18:39	19:05	19:37
30°	04:31	05:00	05:25	18:32	18:57	19:27
20°	04:47	05:14	05:36	18:21	18:43	19:10
N 10°	04:59	05:24	05:46	18:11	18:32	18:58
0°	05:09	05:34	05:55	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:53	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:06	18:32
30°	05:31	05:59	06:24	17:33	17:57	18:25
35°	05:34	06:04	06:30	17:26	17:52	18:22
40°	05:37	06:09	06:37	17:20	17:47	18:19
45°	05:40	06:14	06:45	17:11	17:42	18:16
S 50°	05:43	06:21	06:54	17:02	17:35	18:13
52°	05:44	06:24	06:58	16:57	17:32	18:12
54°	05:45	06:27	07:03	16:53	17:29	18:11
56°	05:46	06:30	07:09	16:47	17:26	18:09
58°	05:47	06:33	07:15	16:41	17:22	18:08
S 60°	05:49	06:37	07:21	16:34	17:18	18:07

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	01:42	▬	▬
66°	▬	▬	▬	02:38	▬	▬
64°	·· ··	00:11	▬	03:12	02:52	▬
62°	23:27	·· ··	01:11	03:36	03:37	03:43
60°	22:58	·· ··	00:27	03:56	04:06	04:27
N 58°	22:36	23:58	·· ··	04:12	04:29	04:57
56°	22:18	23:35	·· ··	04:26	04:47	05:20
54°	22:03	23:17	·· ··	04:38	05:03	05:38
52°	21:50	23:01	·· ··	04:49	05:16	05:54
50°	21:38	22:48	23:47	04:58	05:28	06:07
45°	21:14	22:20	23:19	05:19	05:53	06:35
N 40°	20:55	21:59	22:56	05:35	06:13	06:57
35°	20:39	21:41	22:38	05:49	06:29	07:15
30°	20:26	21:26	22:21	06:01	06:44	07:31
20°	20:02	21:00	21:54	06:22	07:08	07:58
N 10°	19:42	20:37	21:31	06:40	07:29	08:21
0°	19:24	20:16	21:09	06:57	07:49	08:42
S 10°	19:05	19:56	20:48	07:14	08:09	09:03
20°	18:46	19:34	20:25	07:32	08:30	09:26
30°	18:23	19:08	19:58	07:53	08:55	09:53
35°	18:10	18:53	19:42	08:06	09:09	10:09
40°	17:54	18:36	19:23	08:20	09:26	10:27
45°	17:36	18:15	19:01	08:37	09:46	10:49
S 50°	17:14	17:48	18:33	08:59	10:12	11:17
52°	17:04	17:36	18:19	09:09	10:25	11:31
54°	16:52	17:21	18:03	09:20	10:39	11:47
56°	16:38	17:04	17:44	09:33	10:55	12:06
58°	16:22	16:44	17:20	09:49	11:15	12:29
S 60°	16:03	16:18	16:50	10:07	11:41	13:00

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 16-18 99-90%
22	01:21	01:27	11:59	00:45	13:10	
23	01:32	01:38	11:58	01:36	14:03	
24	01:44	01:49	11:58	02:29	14:56	

April 25, 26, 27 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	212°47.3	206°46.5	N00°51.6	65°44.6	N15°43.9	72°48.3	N16°38.3	193°37.7	N05°40.7
1	227°49.8	221°46.1	52.8	80°46.5	43.7	87°50.7	38.3	208°39.8	40.8
2	242°52.2	236°45.8	53.9	95°48.4	43.4	102°53.1	38.2	223°42.0	40.9
3	257°54.7	251°45.5	·· 55.1	110°50.3	·· 43.1	117°55.5	·· 38.2	238°44.2	·· 41.1
4	272°57.2	266°45.1	56.3	125°52.2	42.8	132°57.8	38.2	253°46.4	41.2
5	287°59.6	281°44.8	57.4	140°54.1	42.5	148°00.2	38.1	268°48.6	41.3
6	303°02.1	296°44.5	N00°58.6	155°56.0	N15°42.3	163°02.6	N16°38.1	283°50.7	N05°41.4
7	318°04.6	311°44.1	00°59.8	170°57.9	42.0	178°05.0	38.1	298°52.9	41.5
8	333°07.0	326°43.8	01°01.0	185°59.8	41.7	193°07.3	38.0	313°55.1	41.6
9	348°09.5	341°43.5	·· 02.1	201°01.7	·· 41.4	208°09.7	·· 38.0	328°57.3	·· 41.7
10	3°12.0	356°43.1	03.3	216°03.6	41.1	223°12.1	38.0	343°59.4	41.9
11	18°14.4	11°42.8	04.5	231°05.5	40.8	238°14.5	37.9	359°01.6	42.0
12	33°16.9	26°42.5	N01°05.6	246°07.4	N15°40.6	253°16.8	N16°37.9	14°03.8	N05°42.1
13	48°19.4	41°42.1	06.8	261°09.3	40.3	268°19.2	37.9	29°06.0	42.2
14	63°21.8	56°41.8	08.0	276°11.2	40.0	283°21.6	37.8	44°08.1	42.3
15	78°24.3	71°41.5	·· 09.2	291°13.1	·· 39.7	298°23.9	·· 37.8	59°10.3	·· 42.4
16	93°26.7	86°41.1	10.3	306°15.0	39.4	313°26.3	37.8	74°12.5	42.5
17	108°29.2	101°40.8	11.5	321°16.9	39.1	328°28.7	37.7	89°14.7	42.6
18	123°31.7	116°40.5	N01°12.7	336°18.8	N15°38.9	343°31.0	N16°37.7	104°16.8	N05°42.8
19	138°34.1	131°40.1	13.8	351°20.7	38.6	358°33.4	37.7	119°19.0	42.9
20	153°36.6	146°39.8	15.0	6°22.6	38.3	13°35.8	37.6	134°21.2	43.0
21	168°39.1	161°39.5	·· 16.2	21°24.5	·· 38.0	28°38.2	·· 37.6	149°23.4	·· 43.1
22	183°41.5	176°39.1	17.4	36°26.4	37.7	43°40.5	37.6	164°25.5	43.2
23	198°44.0	191°38.8	18.5	51°28.3	37.4	58°42.9	37.5	179°27.7	43.3
Mer.pass. 09:47		ν -0.3′	d 1.2′	m -3.87	ν 1.9′	d 0.3′	m 0.17	ν 2.4′	d 0.0′ m -2.16	ν 2.2′	d 0.1′ m 0.71

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	213°46.5	206°38.5	N01°19.7	66°30.2	N15°37.1	73°45.3	N16°37.5	194°29.9	N05°43.4
1	228°48.9	221°38.2	20.9	81°32.1	36.9	88°47.6	37.5	209°32.1	43.6
2	243°51.4	236°37.8	22.0	96°33.9	36.6	103°50.0	37.4	224°34.3	43.7
3	258°53.8	251°37.5	·· 23.2	111°35.8	·· 36.3	118°52.4	·· 37.4	239°36.4	·· 43.8
4	273°56.3	266°37.2	24.4	126°37.7	36.0	133°54.7	37.3	254°38.6	43.9
5	288°58.8	281°36.8	25.6	141°39.6	35.7	148°57.1	37.3	269°40.8	44.0
6	304°01.2	296°36.5	N01°26.7	156°41.5	N15°35.4	163°59.5	N16°37.3	284°43.0	N05°44.1
7	319°03.7	311°36.2	27.9	171°43.4	35.1	179°01.8	37.2	299°45.1	44.2
8	334°06.2	326°35.8	29.1	186°45.2	34.8	194°04.2	37.2	314°47.3	44.3
9	349°08.6	341°35.5	·· 30.2	201°47.1	·· 34.6	209°06.5	·· 37.2	329°49.5	·· 44.5
10	4°11.1	356°35.2	31.4	216°49.0	34.3	224°08.9	37.1	344°51.7	44.6
11	19°13.6	11°34.8	32.6	231°50.9	34.0	239°11.3	37.1	359°53.8	44.7
12	34°16.0	26°34.5	N01°33.8	246°52.8	N15°33.7	254°13.6	N16°37.1	14°56.0	N05°44.8
13	49°18.5	41°34.2	34.9	261°54.7	33.4	269°16.0	37.0	29°58.2	44.9
14	64°21.0	56°33.8	36.1	276°56.5	33.1	284°18.4	37.0	45°00.4	45.0
15	79°23.4	71°33.5	·· 37.3	291°58.4	·· 32.8	299°20.7	·· 37.0	60°02.5	·· 45.1
16	94°25.9	86°33.2	38.4	307°00.3	32.5	314°23.1	36.9	75°04.7	45.3
17	109°28.3	101°32.8	39.6	322°02.2	32.2	329°25.5	36.9	90°06.9	45.4
18	124°30.8	116°32.5	N01°40.8	337°04.0	N15°31.9	344°27.8	N16°36.9	105°09.1	N05°45.5
19	139°33.3	131°32.2	42.0	352°05.9	31.6	359°30.2	36.8	120°11.3	45.6
20	154°35.7	146°31.8	43.1	7°07.8	31.4	14°32.5	36.8	135°13.4	45.7
21	169°38.2	161°31.5	·· 44.3	22°09.7	·· 31.1	29°34.9	·· 36.7	150°15.6	·· 45.8
22	184°40.7	176°31.2	45.5	37°11.5	30.8	44°37.3	36.7	165°17.8	45.9
23	199°43.1	191°30.8	46.6	52°13.4	30.5	59°39.6	36.7	180°20.0	46.0
Mer.pass. 09:43		ν -0.3′	d 1.2′	m -3.87	ν 1.9′	d 0.3′	m 0.19	ν 2.4′	d 0.0′ m -2.15	ν 2.2′	d 0.1′ m 0.71

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	214°45.6	206°30.5	N01°47.8	67°15.3	N15°30.2	74°42.0	N16°36.6	195°22.1	N05°46.2
1	229°48.1	221°30.2	49.0	82°17.1	29.9	89°44.3	36.6	210°24.3	46.3
2	244°50.5	236°29.8	50.2	97°19.0	29.6	104°46.7	36.6	225°26.5	46.4
3	259°53.0	251°29.5	·· 51.3	112°20.9	·· 29.3	119°49.1	·· 36.5	240°28.7	·· 46.5
4	274°55.5	266°29.1	52.5	127°22.7	29.0	134°51.4	36.5	255°30.9	46.6
5	289°57.9	281°28.8	53.7	142°24.6	28.7	149°53.8	36.5	270°33.0	46.7
6	305°00.4	296°28.5	N01°54.8	157°26.5	N15°28.4	164°56.1	N16°36.4	285°35.2	N05°46.8
7	320°02.8	311°28.1	56.0	172°28.3	28.1	179°58.5	36.4	300°37.4	46.9
8	335°05.3	326°27.8	57.2	187°30.2	27.8	195°00.9	36.3	315°39.6	47.1
9	350°07.8	341°27.5	·· 58.4	202°32.1	·· 27.5	210°03.2	·· 36.3	330°41.7	·· 47.2
10	5°10.2	356°27.1	01°59.5	217°33.9	27.2	225°05.6	36.3	345°43.9	47.3
11	20°12.7	11°26.8	02°00.7	232°35.8	26.9	240°07.9	36.2	0°46.1	47.4
12	35°15.2	26°26.5	N02°01.9	247°37.7	N15°26.7	255°10.3	N16°36.2	15°48.3	N05°47.5
13	50°17.6	41°26.1	03.0	262°39.5	26.4	270°12.6	36.2	30°50.4	47.6
14	65°20.1	56°25.8	04.2	277°41.4	26.1	285°15.0	36.1	45°52.6	47.7
15	80°22.6	71°25.5	·· 05.4	292°43.2	·· 25.8	300°17.4	·· 36.1	60°54.8	·· 47.8
16	95°25.0	86°25.1	06.6	307°45.1	25.5	315°19.7	36.0	75°57.0	48.0
17	110°27.5	101°24.8	07.7	322°46.9	25.2	330°22.1	36.0	90°59.2	48.1
18	125°30.0	116°24.5	N02°08.9	337°48.8	N15°24.9	345°24.4	N16°36.0	106°01.3	N05°48.2
19	140°32.4	131°24.1	10.1	352°50.7	24.6	0°26.8	35.9	121°03.5	48.3
20	155°34.9	146°23.8	11.2	7°52.5	24.3	15°29.1	35.9	136°05.7	48.4
21	170°37.3	161°23.5	·· 12.4	22°54.4	·· 24.0	30°31.5	·· 35.8	151°07.9	·· 48.5
22	185°39.8	176°23.1	13.6	37°56.2	23.7	45°33.8	35.8	166°10.0	48.6
23	200°42.3	191°22.8	14.8	52°58.1	23.4	60°36.2	35.8	181°12.2	48.7
Mer.pass. 09:39		ν -0.3′	d 1.2′	m -3.87	ν 1.9′	d 0.3′	m 0.21	ν 2.4′	d 0.0′ m -2.15	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.4
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°31.7	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.8	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°48.9	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.0	-59°36.2
Suhail	222°44.8	-43°32.9
Miaplacidus	221°37.7	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.3	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.3
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.6	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.4
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.2
Antares	112°13.2	-26°29.6
Atria	107°05.3	-69°04.4
Sabik	102°00.4	-15°45.6
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.6	12°32.3
Eltanin	90°41.0	51°28.8
Kaus Aust.	83°29.8	-34°22.2
Vega	80°31.8	38°48.3
Nunki	75°45.3	-26°15.7
Altair	61°58.1	8°56.3
Peacock	53°02.8	-56°38.5
Deneb	49°24.5	45°22.4
Enif	33°37.1	9°59.9
Al Na'ir	27°30.8	-46°49.5
Fomalhaut	15°12.7	-29°28.5
Scheat	13°43.6	28°13.7
Markab	13°28.2	15°21.0

Apr 25 Sun	SHA	Mer.pass
Venus	353°59.1	10:13
Mars	212°57.3	19:35
Jupiter	220°01.0	19:06
Saturn	340°50.4	11:04

Apr 26 Mon	SHA	Mer.pass
Venus	352°52.0	10:14
Mars	212°43.7	19:32
Jupiter	219°58.8	19:02
Saturn	340°43.4	11:00

Apr 27 Tue	SHA	Mer.pass
Venus	351°44.9	10:14
Mars	212°29.7	19:29
Jupiter	219°56.4	18:58
Saturn	340°36.5	10:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°28.7	N13°02.8	311°14.0	9.2′	S27°19.2	0.1′	54.8′
1	195°28.8	03.6	325°42.2	9.2′	27°19.3	0.0′	54.8′
2	210°28.9	04.4	340°10.4	9.2′	27°19.3	0.1′	54.8′
3	225°29.0	·· 05.2	354°38.6	9.3′	27°19.2	0.2′	54.8′
4	240°29.1	06.0	9°06.9	9.3′	27°19.0	0.4′	54.8′
5	255°29.2	06.9	23°35.1	9.3′	27°18.6	0.6′	54.8′
6	270°29.3	N13°07.7	38°03.5	9.3′	S27°18.0	0.6′	54.7′
7	285°29.4	08.5	52°31.8	9.4′	27°17.4	0.8′	54.7′
8	300°29.5	09.3	67°00.2	9.4′	27°16.6	1.0′	54.7′
9	315°29.6	·· 10.1	81°28.6	9.4′	27°15.6	1.1′	54.7′
10	330°29.7	10.9	95°57.0	9.5′	27°14.5	1.2′	54.7′
11	345°29.9	11.8	110°25.5	9.5′	27°13.3	1.4′	54.7′
12	0°30.0	N13°12.6	124°54.0	9.5′	S27°11.9	1.4′	54.6′
13	15°30.1	13.4	139°22.5	9.6′	27°10.5	1.7′	54.6′
14	30°30.2	14.2	153°51.1	9.6′	27°08.8	1.7′	54.6′
15	45°30.3	·· 15.0	168°19.7	9.7′	27°07.1	1.9′	54.6′
16	60°30.4	15.8	182°48.4	9.7′	27°05.2	2.1′	54.6′
17	75°30.5	16.6	197°17.1	9.7′	27°03.1	2.1′	54.6′
18	90°30.6	N13°17.4	211°45.8	9.8′	S27°01.0	2.3′	54.6′
19	105°30.7	18.3	226°14.6	9.8′	26°58.7	2.5′	54.5′
20	120°30.8	19.1	240°43.4	9.9′	26°56.2	2.5′	54.5′
21	135°30.9	·· 19.9	255°12.3	9.9′	26°53.7	2.7′	54.5′
22	150°31.0	20.7	269°41.2	10.0′	26°51.0	2.8′	54.5′
23	165°31.1	21.5	284°10.2	10.0′	26°48.2	3.0′	54.5′
	SD = 15.9′	d = 0.8′	SD = 15.0′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°31.2	N13°22.3	298°39.2	10.1′	S26°45.2	3.1′	54.5′
1	195°31.3	23.1	313°08.2	10.1′	26°42.1	3.2′	54.5′
2	210°31.4	23.9	327°37.3	10.2′	26°38.9	3.3′	54.5′
3	225°31.6	·· 24.7	342°06.5	10.2′	26°35.6	3.5′	54.4′
4	240°31.7	25.5	356°35.7	10.3′	26°32.1	3.6′	54.4′
5	255°31.8	26.4	11°04.9	10.3′	26°28.5	3.7′	54.4′
6	270°31.9	N13°27.2	25°34.2	10.4′	S26°24.8	3.8′	54.4′
7	285°32.0	28.0	40°03.6	10.4′	26°21.0	4.0′	54.4′
8	300°32.1	28.8	54°33.0	10.5′	26°17.0	4.1′	54.4′
9	315°32.2	·· 29.6	69°02.5	10.5′	26°12.9	4.2′	54.4′
10	330°32.3	30.4	83°32.0	10.6′	26°08.7	4.3′	54.4′
11	345°32.4	31.2	98°01.5	10.6′	26°04.4	4.5′	54.4′
12	0°32.5	N13°32.0	112°31.2	10.7′	S25°59.9	4.6′	54.4′
13	15°32.6	32.8	127°00.9	10.7′	25°55.3	4.7′	54.3′
14	30°32.7	33.6	141°30.6	10.8′	25°50.6	4.8′	54.3′
15	45°32.8	·· 34.4	156°00.4	10.9′	25°45.8	4.9′	54.3′
16	60°32.9	35.2	170°30.2	10.9′	25°40.9	5.1′	54.3′
17	75°33.0	36.0	185°00.1	11.0′	25°35.8	5.2′	54.3′
18	90°33.1	N13°36.8	199°30.1	11.0′	S25°30.6	5.3′	54.3′
19	105°33.2	37.6	214°00.1	11.1′	25°25.3	5.4′	54.3′
20	120°33.3	38.4	228°30.2	11.1′	25°19.9	5.5′	54.3′
21	135°33.4	·· 39.2	243°00.4	11.2′	25°14.4	5.7′	54.3′
22	150°33.5	40.0	257°30.6	11.3′	25°08.7	5.7′	54.3′
23	165°33.6	40.8	272°00.8	11.3′	25°03.0	5.9′	54.3′
	SD = 15.9′	d = 0.8′	SD = 14.9′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°33.7	N13°41.6	286°31.2	11.4′	S24°57.1	6.0′	54.3′
1	195°33.8	42.4	301°01.5	11.4′	24°51.1	6.1′	54.3′
2	210°33.9	43.2	315°32.0	11.5′	24°45.0	6.2′	54.2′
3	225°34.0	·· 44.0	330°02.5	11.6′	24°38.8	6.4′	54.2′
4	240°34.1	44.8	344°33.1	11.6′	24°32.4	6.4′	54.2′
5	255°34.2	45.6	359°03.7	11.7′	24°26.0	6.5′	54.2′
6	270°34.3	N13°46.4	13°34.4	11.8′	S24°19.5	6.7′	54.2′
7	285°34.4	47.2	28°05.1	11.8′	24°12.8	6.7′	54.2′
8	300°34.5	48.0	42°36.0	11.9′	24°06.1	6.9′	54.2′
9	315°34.6	·· 48.8	57°06.8	11.9′	23°59.2	7.0′	54.2′
10	330°34.7	49.6	71°37.8	12.0′	23°52.2	7.1′	54.2′
11	345°34.8	50.4	86°08.8	12.1′	23°45.1	7.1′	54.2′
12	0°34.9	N13°51.2	100°39.8	12.1′	S23°38.0	7.3′	54.2′
13	15°35.0	52.0	115°11.0	12.2′	23°30.7	7.4′	54.2′
14	30°35.1	52.8	129°42.2	12.3′	23°23.3	7.5′	54.2′
15	45°35.2	·· 53.6	144°13.4	12.3′	23°15.8	7.6′	54.2′
16	60°35.3	54.4	158°44.7	12.4′	23°08.2	7.7′	54.2′
17	75°35.4	55.2	173°16.1	12.4′	23°00.5	7.8′	54.2′
18	90°35.5	N13°56.0	187°47.5	12.5′	S22°52.7	7.9′	54.2′
19	105°35.6	56.8	202°19.0	12.6′	22°44.8	8.0′	54.2′
20	120°35.6	57.6	216°50.6	12.6′	22°36.8	8.1′	54.2′
21	135°35.7	·· 58.4	231°22.2	12.7′	22°28.7	8.2′	54.2′
22	150°35.8	59.1	245°53.9	12.7′	22°20.5	8.3′	54.2′
23	165°35.9	59.9	260°25.7	12.8′	22°12.2	8.4′	54.2′
	SD = 15.9′	d = 0.8′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:32	21:29	////	////
N 70°	////	00:56	03:01	20:59	23:16	////
68°	////	01:53	03:22	20:37	22:09	////
66°	////	02:26	03:38	20:20	21:34	////
64°	00:49	02:49	03:52	20:06	21:10	23:21
62°	01:40	03:07	04:03	19:55	20:51	22:22
60°	02:09	03:22	04:13	19:45	20:36	21:50
N 58°	02:31	03:35	04:21	19:36	20:23	21:27
56°	02:48	03:46	04:28	19:29	20:12	21:10
54°	03:03	03:55	04:35	19:22	20:02	20:55
52°	03:15	04:03	04:41	19:16	19:54	20:42
50°	03:26	04:10	04:46	19:11	19:46	20:32
45°	03:47	04:26	04:58	18:59	19:31	20:10
N 40°	04:03	04:38	05:07	18:49	19:18	19:53
35°	04:17	04:48	05:15	18:41	19:08	19:40
30°	04:27	04:57	05:22	18:34	18:59	19:29
20°	04:45	05:11	05:34	18:22	18:45	19:11
N 10°	04:58	05:23	05:45	18:11	18:33	18:58
0°	05:09	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:51	18:13	18:38
20°	05:26	05:52	06:14	17:41	18:04	18:30
30°	05:33	06:01	06:26	17:30	17:54	18:22
35°	05:36	06:06	06:32	17:23	17:49	18:19
40°	05:40	06:12	06:40	17:15	17:43	18:15
45°	05:43	06:18	06:48	17:07	17:37	18:12
S 50°	05:47	06:25	06:59	16:56	17:30	18:08
52°	05:48	06:28	07:03	16:51	17:27	18:06
54°	05:50	06:32	07:09	16:46	17:23	18:05
56°	05:52	06:35	07:15	16:40	17:19	18:03
58°	05:53	06:39	07:21	16:34	17:15	18:01
S 60°	05:55	06:44	07:28	16:26	17:11	18:00

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	03:42	▬	▬	06:34
62°	02:30	02:55	03:00	04:15	05:37	07:16
60°	01:34	02:13	02:31	05:10	06:20	07:44
N 58°	01:02	01:44	02:09	05:43	06:48	08:06
56°	00:38	01:22	01:51	06:07	07:10	08:24
54°	00:18	01:04	01:36	06:27	07:28	08:39
52°	00:02	00:48	01:23	06:43	07:43	08:52
50°	·· ··	00:35	01:11	06:57	07:57	09:03
45°	·· ··	00:07	00:47	07:26	08:24	09:26
N 40°	23:46	·· ··	00:27	07:48	08:45	09:45
35°	23:28	·· ··	00:11	08:07	09:03	10:01
30°	23:12	23:57	·· ··	08:23	09:18	10:14
20°	22:46	23:33	·· ··	08:50	09:44	10:37
N 10°	22:23	23:12	23:57	09:13	10:06	10:57
0°	22:02	22:52	23:40	09:35	10:26	11:16
S 10°	21:41	22:33	23:23	09:56	10:47	11:34
20°	21:18	22:11	23:05	10:20	11:09	11:53
30°	20:51	21:47	22:44	10:46	11:34	12:16
35°	20:36	21:33	22:31	11:02	11:49	12:29
40°	20:17	21:16	22:17	11:21	12:06	12:44
45°	19:55	20:56	22:00	11:43	12:27	13:02
S 50°	19:28	20:31	21:39	12:11	12:53	13:24
52°	19:14	20:18	21:29	12:25	13:05	13:34
54°	18:58	20:04	21:17	12:41	13:19	13:46
56°	18:39	19:48	21:04	13:00	13:36	14:00
58°	18:16	19:29	20:49	13:23	13:56	14:16
S 60°	17:46	19:04	20:31	13:53	14:21	14:34

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 19-21 84-67%
25	01:55	02:00	11:58	03:22	15:48	
26	02:05	02:10	11:58	04:14	16:39	
27	02:15	02:20	11:58	05:04	17:28	

April 28, 29, 30 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	215°44.7	206°22.5	N02°15.9	67°59.9	N15°23.1	75°38.5	N16°35.7	196°14.4	N05°48.9
1	230°47.2	221°22.1	17.1	83°01.8	22.8	90°40.9	35.7	211°16.6	49.0
2	245°49.7	236°21.8	18.3	98°03.6	22.5	105°43.2	35.7	226°18.8	49.1
3	260°52.1	251°21.4	·· 19.4	113°05.5	·· 22.2	120°45.6	·· 35.6	241°20.9	·· 49.2
4	275°54.6	266°21.1	20.6	128°07.3	21.9	135°48.0	35.6	256°23.1	49.3
5	290°57.1	281°20.8	21.8	143°09.2	21.6	150°50.3	35.5	271°25.3	49.4
6	305°59.5	296°20.4	N02°22.9	158°11.0	N15°21.3	165°52.7	N16°35.5	286°27.5	N05°49.5
7	321°02.0	311°20.1	24.1	173°12.9	21.0	180°55.0	35.5	301°29.6	49.6
8	336°04.4	326°19.8	25.3	188°14.7	20.7	195°57.4	35.4	316°31.8	49.8
9	351°06.9	341°19.4	·· 26.5	203°16.6	·· 20.4	210°59.7	·· 35.4	331°34.0	·· 49.9
10	6°09.4	356°19.1	27.6	218°18.4	20.1	226°02.1	35.3	346°36.2	50.0
11	21°11.8	11°18.8	28.8	233°20.2	19.8	241°04.4	35.3	1°38.4	50.1
12	36°14.3	26°18.4	N02°30.0	248°22.1	N15°19.5	256°06.8	N16°35.3	16°40.5	N05°50.2
13	51°16.8	41°18.1	31.1	263°23.9	19.2	271°09.1	35.2	31°42.7	50.3
14	66°19.2	56°17.8	32.3	278°25.8	18.9	286°11.5	35.2	46°44.9	50.4
15	81°21.7	71°17.4	·· 33.5	293°27.6	·· 18.6	301°13.8	·· 35.1	61°47.1	·· 50.5
16	96°24.2	86°17.1	34.7	308°29.5	18.3	316°16.2	35.1	76°49.3	50.7
17	111°26.6	101°16.7	35.8	323°31.3	18.0	331°18.5	35.1	91°51.4	50.8
18	126°29.1	116°16.4	N02°37.0	338°33.1	N15°17.7	346°20.8	N16°35.0	106°53.6	N05°50.9
19	141°31.6	131°16.1	38.2	353°35.0	17.4	1°23.2	35.0	121°55.8	51.0
20	156°34.0	146°15.7	39.3	8°36.8	17.0	16°25.5	34.9	136°58.0	51.1
21	171°36.5	161°15.4	·· 40.5	23°38.6	·· 16.7	31°27.9	·· 34.9	152°00.1	·· 51.2
22	186°38.9	176°15.1	41.7	38°40.5	16.4	46°30.2	34.9	167°02.3	51.3
23	201°41.4	191°14.7	42.8	53°42.3	16.1	61°32.6	34.8	182°04.5	51.4
Mer.pass. 09:35		ν -0.3′	d 1.2′	m -3.87	ν 1.9′	d 0.3′	m 0.23	ν 2.4′	d 0.0′ m -2.14	ν 2.2′	d 0.1′ m 0.71

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°43.9	206°14.4	N02°44.0	68°44.1	N15°15.8	76°34.9	N16°34.8	197°06.7	N05°51.5
1	231°46.3	221°14.0	45.2	83°46.0	15.5	91°37.3	34.7	212°08.9	51.7
2	246°48.8	236°13.7	46.4	98°47.8	15.2	106°39.6	34.7	227°11.0	51.8
3	261°51.3	251°13.4	·· 47.5	113°49.6	·· 14.9	121°42.0	·· 34.7	242°13.2	·· 51.9
4	276°53.7	266°13.0	48.7	128°51.5	14.6	136°44.3	34.6	257°15.4	52.0
5	291°56.2	281°12.7	49.9	143°53.3	14.3	151°46.7	34.6	272°17.6	52.1
6	306°58.7	296°12.4	N02°51.0	158°55.1	N15°14.0	166°49.0	N16°34.5	287°19.7	N05°52.2
7	322°01.1	311°12.0	52.2	173°57.0	13.7	181°51.3	34.5	302°21.9	52.3
8	337°03.6	326°11.7	53.4	188°58.8	13.4	196°53.7	34.4	317°24.1	52.4
9	352°06.1	341°11.3	·· 54.5	204°00.6	·· 13.1	211°56.0	·· 34.4	332°26.3	·· 52.5
10	7°08.5	356°11.0	55.7	219°02.4	12.8	226°58.4	34.4	347°28.5	52.7
11	22°11.0	11°10.7	56.9	234°04.3	12.5	242°00.7	34.3	2°30.6	52.8
12	37°13.4	26°10.3	N02°58.0	249°06.1	N15°12.1	257°03.1	N16°34.3	17°32.8	N05°52.9
13	52°15.9	41°10.0	02°59.2	264°07.9	11.8	272°05.4	34.2	32°35.0	53.0
14	67°18.4	56°09.7	03°00.4	279°09.7	11.5	287°07.7	34.2	47°37.2	53.1
15	82°20.8	71°09.3	·· 01.6	294°11.6	·· 11.2	302°10.1	·· 34.1	62°39.4	·· 53.2
16	97°23.3	86°09.0	02.7	309°13.4	10.9	317°12.4	34.1	77°41.5	53.3
17	112°25.8	101°08.6	03.9	324°15.2	10.6	332°14.8	34.1	92°43.7	53.4
18	127°28.2	116°08.3	N03°05.1	339°17.0	N15°10.3	347°17.1	N16°34.0	107°45.9	N05°53.6
19	142°30.7	131°08.0	06.2	354°18.8	10.0	2°19.4	34.0	122°48.1	53.7
20	157°33.2	146°07.6	07.4	9°20.7	09.7	17°21.8	33.9	137°50.3	53.8
21	172°35.6	161°07.3	·· 08.6	24°22.5	·· 09.4	32°24.1	·· 33.9	152°52.4	·· 53.9
22	187°38.1	176°06.9	09.7	39°24.3	09.1	47°26.5	33.8	167°54.6	54.0
23	202°40.5	191°06.6	10.9	54°26.1	08.7	62°28.8	33.8	182°56.8	54.1
Mer.pass. 09:32		ν -0.3′	d 1.2′	m -3.87	ν 1.8′	d 0.3′	m 0.25	ν 2.3′	d 0.0′ m -2.13	ν 2.2′	d 0.1′ m 0.71

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°43.0	206°06.3	N03°12.1	69°27.9	N15°08.4	77°31.1	N16°33.8	197°59.0	N05°54.2
1	232°45.5	221°05.9	13.2	84°29.8	08.1	92°33.5	33.7	213°01.2	54.3
2	247°47.9	236°05.6	14.4	99°31.6	07.8	107°35.8	33.7	228°03.3	54.4
3	262°50.4	251°05.2	·· 15.6	114°33.4	·· 07.5	122°38.2	·· 33.6	243°05.5	·· 54.6
4	277°52.9	266°04.9	16.7	129°35.2	07.2	137°40.5	33.6	258°07.7	54.7
5	292°55.3	281°04.6	17.9	144°37.0	06.9	152°42.8	33.5	273°09.9	54.8
6	307°57.8	296°04.2	N03°19.1	159°38.8	N15°06.6	167°45.2	N16°33.5	288°12.1	N05°54.9
7	323°00.3	311°03.9	20.3	174°40.6	06.2	182°47.5	33.5	303°14.2	55.0
8	338°02.7	326°03.5	21.4	189°42.4	05.9	197°49.8	33.4	318°16.4	55.1
9	353°05.2	341°03.2	·· 22.6	204°44.3	·· 05.6	212°52.2	·· 33.4	333°18.6	·· 55.2
10	8°07.7	356°02.9	23.8	219°46.1	05.3	227°54.5	33.3	348°20.8	55.3
11	23°10.1	11°02.5	24.9	234°47.9	05.0	242°56.8	33.3	3°22.9	55.4
12	38°12.6	26°02.2	N03°26.1	249°49.7	N15°04.7	257°59.2	N16°33.2	18°25.1	N05°55.6
13	53°15.0	41°01.8	27.3	264°51.5	04.4	273°01.5	33.2	33°27.3	55.7
14	68°17.5	56°01.5	28.4	279°53.3	04.0	288°03.8	33.1	48°29.5	55.8
15	83°20.0	71°01.2	·· 29.6	294°55.1	·· 03.7	303°06.2	·· 33.1	63°31.7	·· 55.9
16	98°22.4	86°00.8	30.8	309°56.9	03.4	318°08.5	33.1	78°33.8	56.0
17	113°24.9	101°00.5	31.9	324°58.7	03.1	333°10.9	33.0	93°36.0	56.1
18	128°27.4	116°00.1	N03°33.1	340°00.5	N15°02.8	348°13.2	N16°33.0	108°38.2	N05°56.2
19	143°29.8	130°59.8	34.3	355°02.3	02.5	3°15.5	32.9	123°40.4	56.3
20	158°32.3	145°59.5	35.4	10°04.1	02.2	18°17.9	32.9	138°42.6	56.4
21	173°34.8	160°59.1	·· 36.6	25°05.9	·· 01.8	33°20.2	·· 32.8	153°44.7	·· 56.5
22	188°37.2	175°58.8	37.8	40°07.7	01.5	48°22.5	32.8	168°46.9	56.7
23	203°39.7	190°58.4	38.9	55°09.5	01.2	63°24.8	32.7	183°49.1	56.8
Mer.pass. 09:28		ν -0.3′	d 1.2′	m -3.86	ν 1.8′	d 0.3′	m 0.27	ν 2.3′	d 0.0′ m -2.13	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.4
Ankaa	353°05.7	-42°09.3
Schedar	349°29.4	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°31.8	89°22.8
Acamar	315°10.8	-40°11.8
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.0	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.9	-52°42.9
Sirius	258°24.7	-16°45.4
Adhara	255°04.5	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.0	-59°36.2
Suhail	222°44.9	-43°32.9
Miaplacidus	221°37.7	-69°50.1
Alphard	217°45.8	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.3	-63°15.3
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.6	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.5
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.2
Antares	112°13.2	-26°29.6
Atria	107°05.3	-69°04.4
Sabik	102°00.3	-15°45.6
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.6	12°32.3
Eltanin	90°41.0	51°28.8
Kaus Aust.	83°29.8	-34°22.2
Vega	80°31.7	38°48.3
Nunki	75°45.3	-26°15.7
Altair	61°58.0	8°56.3
Peacock	53°02.8	-56°38.5
Deneb	49°24.5	45°22.4
Enif	33°37.0	9°59.9
Al Na'ir	27°30.8	-46°49.5
Fomalhaut	15°12.7	-29°28.5
Scheat	13°43.6	28°13.7
Markab	13°28.2	15°21.0

Apr 28 Wed	SHA	Mer.pass
Venus	350°37.7	10:15
Mars	212°15.2	19:26
Jupiter	219°53.8	18:54
Saturn	340°29.7	10:53

Apr 29 Thu	SHA	Mer.pass
Venus	349°30.5	10:15
Mars	212°00.3	19:23
Jupiter	219°51.1	18:51
Saturn	340°22.8	10:50

Apr 30 Fri	SHA	Mer.pass
Venus	348°23.2	10:16
Mars	211°44.9	19:20
Jupiter	219°48.1	18:47
Saturn	340°16.0	10:47

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1281 sec ΔT = TT-UT1 = +69.3121 sec

2027 April 28 to Apr. 30 UT

h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.0	N14°00.7	274°57.5	12.9′	S22°03.8	8.5′	54.2′
1	195°36.1	01.5	289°29.3	12.9′	21°55.3	8.5′	54.2′
2	210°36.2	02.3	304°01.3	13.0′	21°46.8	8.7′	54.2′
3	225°36.3	·· 03.1	318°33.3	13.1′	21°38.1	8.8′	54.2′
4	240°36.4	03.9	333°05.3	13.1′	21°29.3	8.8′	54.2′
5	255°36.5	04.7	347°37.4	13.2′	21°20.5	9.0′	54.2′
6	270°36.6	N14°05.5	2°09.6	13.2′	S21°11.5	9.0′	54.2′
7	285°36.7	06.3	16°41.8	13.3′	21°02.5	9.1′	54.2′
8	300°36.8	07.0	31°14.1	13.3′	20°53.4	9.2′	54.2′
9	315°36.9	·· 07.8	45°46.5	13.4′	20°44.2	9.3′	54.2′
10	330°37.0	08.6	60°18.9	13.5′	20°34.9	9.4′	54.2′
11	345°37.0	09.4	74°51.3	13.5′	20°25.5	9.5′	54.2′
12	0°37.1	N14°10.2	89°23.8	13.6′	S20°16.0	9.6′	54.2′
13	15°37.2	11.0	103°56.4	13.6′	20°06.4	9.6′	54.2′
14	30°37.3	11.8	118°29.0	13.7′	19°56.8	9.7′	54.2′
15	45°37.4	·· 12.5	133°01.7	13.7′	19°47.1	9.8′	54.2′
16	60°37.5	13.3	147°34.5	13.8′	19°37.3	9.9′	54.2′
17	75°37.6	14.1	162°07.3	13.9′	19°27.4	10.0′	54.2′
18	90°37.7	N14°14.9	176°40.1	13.9′	S19°17.4	10.1′	54.3′
19	105°37.8	15.7	191°13.0	14.0′	19°07.3	10.1′	54.3′
20	120°37.9	16.5	205°46.0	14.0′	18°57.2	10.3′	54.3′
21	135°38.0	·· 17.2	220°19.0	14.1′	18°46.9	10.3′	54.3′
22	150°38.0	18.0	234°52.1	14.1′	18°36.6	10.3′	54.3′
23	165°38.1	18.8	249°25.2	14.2′	18°26.3	10.5′	54.3′
	SD = 15.9′	d = 0.8′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.2	N14°19.6	263°58.3	14.2′	S18°15.8	10.5′	54.3′
1	195°38.3	20.4	278°31.5	14.3′	18°05.3	10.7′	54.3′
2	210°38.4	21.2	293°04.8	14.3′	17°54.6	10.6′	54.3′
3	225°38.5	·· 21.9	307°38.1	14.4′	17°44.0	10.8′	54.3′
4	240°38.6	22.7	322°11.5	14.4′	17°33.2	10.8′	54.3′
5	255°38.7	23.5	336°44.9	14.5′	17°22.4	11.0′	54.3′
6	270°38.8	N14°24.3	351°18.4	14.5′	S17°11.4	10.9′	54.4′
7	285°38.8	25.1	5°51.9	14.5′	17°00.5	11.1′	54.4′
8	300°38.9	25.8	20°25.4	14.6′	16°49.4	11.1′	54.4′
9	315°39.0	·· 26.6	34°59.0	14.6′	16°38.3	11.2′	54.4′
10	330°39.1	27.4	49°32.6	14.7′	16°27.1	11.3′	54.4′
11	345°39.2	28.2	64°06.3	14.7′	16°15.8	11.3′	54.4′
12	0°39.3	N14°28.9	78°40.0	14.8′	S16°04.5	11.5′	54.4′
13	15°39.4	29.7	93°13.8	14.8′	15°53.0	11.4′	54.4′
14	30°39.4	30.5	107°47.6	14.8′	15°41.6	11.6′	54.4′
15	45°39.5	·· 31.3	122°21.5	14.9′	15°30.0	11.6′	54.4′
16	60°39.6	32.0	136°55.4	14.9′	15°18.4	11.7′	54.5′
17	75°39.7	32.8	151°29.3	15.0′	15°06.7	11.7′	54.5′
18	90°39.8	N14°33.6	166°03.2	15.0′	S14°55.0	11.8′	54.5′
19	105°39.9	34.4	180°37.2	15.0′	14°43.2	11.9′	54.5′
20	120°40.0	35.1	195°11.3	15.1′	14°31.3	11.9′	54.5′
21	135°40.0	·· 35.9	209°45.4	15.1′	14°19.4	12.0′	54.5′
22	150°40.1	36.7	224°19.5	15.1′	14°07.4	12.1′	54.5′
23	165°40.2	37.5	238°53.6	15.2′	13°55.3	12.1′	54.6′
	SD = 15.9′	d = 0.8′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°40.3	N14°38.2	253°27.8	15.2′	S13°43.2	12.2′	54.6′
1	195°40.4	39.0	268°02.0	15.2′	13°31.0	12.2′	54.6′
2	210°40.5	39.8	282°36.2	15.3′	13°18.8	12.3′	54.6′
3	225°40.5	·· 40.5	297°10.5	15.3′	13°06.5	12.4′	54.6′
4	240°40.6	41.3	311°44.8	15.3′	12°54.1	12.4′	54.6′
5	255°40.7	42.1	326°19.1	15.4′	12°41.7	12.5′	54.7′
6	270°40.8	N14°42.8	340°53.5	15.4′	S12°29.2	12.5′	54.7′
7	285°40.9	43.6	355°27.9	15.4′	12°16.7	12.6′	54.7′
8	300°40.9	44.4	10°02.3	15.4′	12°04.1	12.6′	54.7′
9	315°41.0	·· 45.1	24°36.7	15.5′	11°51.5	12.7′	54.7′
10	330°41.1	45.9	39°11.2	15.5′	11°38.8	12.8′	54.7′
11	345°41.2	46.7	53°45.6	15.5′	11°26.0	12.8′	54.8′
12	0°41.3	N14°47.5	68°20.2	15.5′	S11°13.2	12.9′	54.8′
13	15°41.4	48.2	82°54.7	15.5′	11°00.3	12.9′	54.8′
14	30°41.4	49.0	97°29.2	15.6′	10°47.4	12.9′	54.8′
15	45°41.5	·· 49.7	112°03.8	15.6′	10°34.5	13.0′	54.8′
16	60°41.6	50.5	126°38.4	15.6′	10°21.5	13.1′	54.8′
17	75°41.7	51.3	141°13.0	15.6′	10°08.4	13.1′	54.9′
18	90°41.7	N14°52.0	155°47.6	15.6′	S09°55.3	13.2′	54.9′
19	105°41.8	52.8	170°22.2	15.6′	09°42.1	13.2′	54.9′
20	120°41.9	53.6	184°56.9	15.7′	09°28.9	13.2′	54.9′
21	135°42.0	·· 54.3	199°31.5	15.7′	09°15.7	13.3′	54.9′
22	150°42.1	55.1	214°06.2	15.7′	09°02.4	13.3′	55.0′
23	165°42.1	55.9	228°40.9	15.7′	08°49.1	13.4′	55.0′
	SD = 15.9′	d = 0.8′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	02:11	21:50	////	////
N 70°	////	////	02:44	21:15	////	////
68°	////	01:29	03:08	20:50	22:33	////
66°	////	02:09	03:26	20:31	21:51	////
64°	////	02:36	03:41	20:16	21:23	////
62°	01:19	02:56	03:54	20:03	21:01	22:43
60°	01:55	03:12	04:04	19:52	20:45	22:04
N 58°	02:19	03:26	04:13	19:43	20:31	21:39
56°	02:38	03:38	04:21	19:35	20:19	21:19
54°	02:54	03:48	04:28	19:28	20:09	21:03
52°	03:07	03:57	04:35	19:21	20:00	20:49
50°	03:19	04:04	04:41	19:15	19:52	20:38
45°	03:41	04:21	04:53	19:03	19:35	20:15
N 40°	03:59	04:34	05:03	18:52	19:22	19:57
35°	04:13	04:45	05:12	18:44	19:11	19:43
30°	04:24	04:54	05:19	18:36	19:01	19:31
20°	04:42	05:09	05:32	18:23	18:46	19:13
N 10°	04:56	05:22	05:44	18:11	18:33	18:59
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:50	18:12	18:37
20°	05:26	05:53	06:15	17:39	18:02	18:28
30°	05:35	06:03	06:28	17:27	17:52	18:20
35°	05:39	06:08	06:35	17:20	17:46	18:16
40°	05:43	06:15	06:43	17:12	17:40	18:12
45°	05:47	06:21	06:52	17:02	17:33	18:07
S 50°	05:51	06:29	07:03	16:51	17:25	18:03
52°	05:53	06:33	07:08	16:46	17:21	18:01
54°	05:55	06:37	07:14	16:40	17:17	17:59
56°	05:57	06:41	07:20	16:34	17:13	17:57
58°	05:59	06:45	07:28	16:26	17:08	17:55
S 60°	06:01	06:50	07:36	16:18	17:03	17:53

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	05:31	04:14	▬	08:01	10:48
N 70°	▬	04:33	03:51	▬	08:57	11:09
68°	04:55	03:59	03:33	07:01	09:30	11:25
66°	03:58	03:34	03:18	07:57	09:54	11:38
64°	03:25	03:14	03:06	08:30	10:13	11:49
62°	03:00	02:58	02:56	08:54	10:28	11:58
60°	02:40	02:45	02:47	09:13	10:40	12:06
N 58°	02:24	02:33	02:40	09:28	10:51	12:13
56°	02:10	02:23	02:33	09:42	11:00	12:18
54°	01:58	02:14	02:27	09:53	11:09	12:24
52°	01:47	02:06	02:21	10:03	11:16	12:29
50°	01:38	01:59	02:16	10:12	11:23	12:33
45°	01:18	01:43	02:05	10:31	11:37	12:42
N 40°	01:02	01:31	01:56	10:47	11:48	12:50
35°	00:48	01:20	01:48	11:00	11:58	12:56
30°	00:36	01:10	01:41	11:11	12:07	13:02
20°	00:15	00:53	01:29	11:30	12:22	13:12
N 10°	·· ··	00:39	01:18	11:47	12:34	13:21
0°	·· ··	00:25	01:09	12:02	12:46	13:29
S 10°	·· ··	00:12	00:59	12:17	12:58	13:37
20°	23:57	·· ··	00:48	12:34	13:11	13:45
30°	23:40	·· ··	00:36	12:52	13:25	13:55
35°	23:30	·· ··	00:28	13:03	13:33	14:00
40°	23:19	·· ··	00:20	13:16	13:43	14:06
45°	23:05	·· ··	00:11	13:30	13:53	14:14
S 50°	22:49	23:59	·· ··	13:48	14:07	14:22
52°	22:41	23:54	·· ··	13:56	14:13	14:26
54°	22:32	23:48	·· ··	14:05	14:19	14:30
56°	22:23	23:41	·· ··	14:16	14:27	14:35
58°	22:12	23:34	·· ··	14:27	14:35	14:40
S 60°	21:59	23:25	·· ··	14:41	14:45	14:46

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Age 22-24 58-39%
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
28	02:24	02:29	11:58	05:51	18:14	
29	02:33	02:37	11:57	06:36	18:57	
30	02:41	02:45	11:57	07:19	19:40	

May 01, 02, 03 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°42.2	205°58.1	N03°40.1	70°11.3	N15°00.9	78°27.2	N16°32.7	198°51.3	N05°56.9
1	233°44.6	220°57.7	41.3	85°13.1	00.6	93°29.5	32.7	213°53.5	57.0
2	248°47.1	235°57.4	42.4	100°14.9	15°00.3	108°31.8	32.6	228°55.6	57.1
3	263°49.5	250°57.1	·· 43.6	115°16.7	14°59.9	123°34.2	·· 32.6	243°57.8	·· 57.2
4	278°52.0	265°56.7	44.8	130°18.5	59.6	138°36.5	32.5	259°00.0	57.3
5	293°54.5	280°56.4	45.9	145°20.3	59.3	153°38.8	32.5	274°02.2	57.4
6	308°56.9	295°56.0	N03°47.1	160°22.1	N14°59.0	168°41.2	N16°32.4	289°04.4	N05°57.5
7	323°59.4	310°55.7	48.3	175°23.9	58.7	183°43.5	32.4	304°06.6	57.7
8	339°01.9	325°55.3	49.4	190°25.7	58.3	198°45.8	32.3	319°08.7	57.8
9	354°04.3	340°55.0	·· 50.6	205°27.5	·· 58.0	213°48.1	·· 32.3	334°10.9	·· 57.9
10	9°06.8	355°54.7	51.8	220°29.3	57.7	228°50.5	32.2	349°13.1	58.0
11	24°09.3	10°54.3	52.9	235°31.1	57.4	243°52.8	32.2	4°15.3	58.1
12	39°11.7	25°54.0	N03°54.1	250°32.8	N14°57.1	258°55.1	N16°32.1	19°17.5	N05°58.2
13	54°14.2	40°53.6	55.3	265°34.6	56.7	273°57.5	32.1	34°19.6	58.3
14	69°16.6	55°53.3	56.4	280°36.4	56.4	288°59.8	32.1	49°21.8	58.4
15	84°19.1	70°52.9	·· 57.6	295°38.2	·· 56.1	304°02.1	·· 32.0	64°24.0	·· 58.5
16	99°21.6	85°52.6	58.8	310°40.0	55.8	319°04.4	32.0	79°26.2	58.6
17	114°24.0	100°52.2	03°59.9	325°41.8	55.5	334°06.8	31.9	94°28.4	58.8
18	129°26.5	115°51.9	N04°01.1	340°43.6	N14°55.1	349°09.1	N16°31.9	109°30.5	N05°58.9
19	144°29.0	130°51.6	02.2	355°45.4	54.8	4°11.4	31.8	124°32.7	59.0
20	159°31.4	145°51.2	03.4	10°47.1	54.5	19°13.7	31.8	139°34.9	59.1
21	174°33.9	160°50.9	·· 04.6	25°48.9	·· 54.2	34°16.1	·· 31.7	154°37.1	·· 59.2
22	189°36.4	175°50.5	05.7	40°50.7	53.8	49°18.4	31.7	169°39.3	59.3
23	204°38.8	190°50.2	06.9	55°52.5	53.5	64°20.7	31.6	184°41.4	59.4
Mer.pass. 09:24		ν -0.3′	d 1.2′	m -3.86	ν 1.8′	d 0.3′	m 0.29	ν 2.3′	d 0.0′ m -2.12	ν 2.2′	d 0.1′ m 0.71

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°41.3	205°49.8	N04°08.1	70°54.3	N14°53.2	79°23.0	N16°31.6	199°43.6	N05°59.5
1	234°43.8	220°49.5	09.2	85°56.1	52.9	94°25.4	31.5	214°45.8	59.6
2	249°46.2	235°49.1	10.4	100°57.8	52.6	109°27.7	31.5	229°48.0	59.7
3	264°48.7	250°48.8	·· 11.6	115°59.6	·· 52.2	124°30.0	·· 31.4	244°50.2	05°59.9
4	279°51.1	265°48.5	12.7	131°01.4	51.9	139°32.3	31.4	259°52.3	06°00.0
5	294°53.6	280°48.1	13.9	146°03.2	51.6	154°34.7	31.3	274°54.5	00.1
6	309°56.1	295°47.8	N04°15.1	161°05.0	N14°51.3	169°37.0	N16°31.3	289°56.7	N06°00.2
7	324°58.5	310°47.4	16.2	176°06.7	50.9	184°39.3	31.2	304°58.9	00.3
8	340°01.0	325°47.1	17.4	191°08.5	50.6	199°41.6	31.2	320°01.1	00.4
9	355°03.5	340°46.7	·· 18.5	206°10.3	·· 50.3	214°44.0	·· 31.1	335°03.3	·· 00.5
10	10°05.9	355°46.4	19.7	221°12.1	50.0	229°46.3	31.1	350°05.4	00.6
11	25°08.4	10°46.0	20.9	236°13.8	49.6	244°48.6	31.0	5°07.6	00.7
12	40°10.9	25°45.7	N04°22.0	251°15.6	N14°49.3	259°50.9	N16°31.0	20°09.8	N06°00.8
13	55°13.3	40°45.3	23.2	266°17.4	49.0	274°53.2	31.0	35°12.0	01.0
14	70°15.8	55°45.0	24.4	281°19.2	48.7	289°55.6	30.9	50°14.2	01.1
15	85°18.2	70°44.6	·· 25.5	296°20.9	·· 48.3	304°57.9	·· 30.9	65°16.3	·· 01.2
16	100°20.7	85°44.3	26.7	311°22.7	48.0	320°00.2	30.8	80°18.5	01.3
17	115°23.2	100°43.9	27.8	326°24.5	47.7	335°02.5	30.8	95°20.7	01.4
18	130°25.6	115°43.6	N04°29.0	341°26.2	N14°47.3	350°04.8	N16°30.7	110°22.9	N06°01.5
19	145°28.1	130°43.3	30.2	356°28.0	47.0	5°07.2	30.7	125°25.1	01.6
20	160°30.6	145°42.9	31.3	11°29.8	46.7	20°09.5	30.6	140°27.3	01.7
21	175°33.0	160°42.6	·· 32.5	26°31.5	·· 46.4	35°11.8	·· 30.6	155°29.4	·· 01.8
22	190°35.5	175°42.2	33.7	41°33.3	46.0	50°14.1	30.5	170°31.6	01.9
23	205°38.0	190°41.9	34.8	56°35.1	45.7	65°16.4	30.5	185°33.8	02.0
Mer.pass. 09:20		ν -0.3′	d 1.2′	m -3.86	ν 1.8′	d 0.3′	m 0.30	ν 2.3′	d 0.0′ m -2.11	ν 2.2′	d 0.1′ m 0.71

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°40.4	205°41.5	N04°36.0	71°36.8	N14°45.4	80°18.7	N16°30.4	200°36.0	N06°02.2
1	235°42.9	220°41.2	37.1	86°38.6	45.0	95°21.1	30.4	215°38.2	02.3
2	250°45.4	235°40.8	38.3	101°40.4	44.7	110°23.4	30.3	230°40.3	02.4
3	265°47.8	250°40.5	·· 39.5	116°42.1	·· 44.4	125°25.7	·· 30.3	245°42.5	·· 02.5
4	280°50.3	265°40.1	40.6	131°43.9	44.1	140°28.0	30.2	260°44.7	02.6
5	295°52.7	280°39.8	41.8	146°45.7	43.7	155°30.3	30.2	275°46.9	02.7
6	310°55.2	295°39.4	N04°42.9	161°47.4	N14°43.4	170°32.6	N16°30.1	290°49.1	N06°02.8
7	325°57.7	310°39.1	44.1	176°49.2	43.1	185°35.0	30.1	305°51.3	02.9
8	341°00.1	325°38.7	45.3	191°51.0	42.7	200°37.3	30.0	320°53.4	03.0
9	356°02.6	340°38.4	·· 46.4	206°52.7	·· 42.4	215°39.6	·· 30.0	335°55.6	·· 03.1
10	11°05.1	355°38.0	47.6	221°54.5	42.1	230°41.9	29.9	350°57.8	03.2
11	26°07.5	10°37.7	48.7	236°56.2	41.7	245°44.2	29.9	6°00.0	03.4
12	41°10.0	25°37.3	N04°49.9	251°58.0	N14°41.4	260°46.5	N16°29.8	21°02.2	N06°03.5
13	56°12.5	40°37.0	51.1	266°59.7	41.1	275°48.8	29.8	36°04.3	03.6
14	71°14.9	55°36.6	52.2	282°01.5	40.7	290°51.2	29.7	51°06.5	03.7
15	86°17.4	70°36.3	·· 53.4	297°03.3	·· 40.4	305°53.5	·· 29.6	66°08.7	·· 03.8
16	101°19.9	85°35.9	54.5	312°05.0	40.1	320°55.8	29.6	81°10.9	03.9
17	116°22.3	100°35.6	55.7	327°06.8	39.7	335°58.1	29.5	96°13.1	04.0
18	131°24.8	115°35.2	N04°56.9	342°08.5	N14°39.4	351°00.4	N16°29.5	111°15.3	N06°04.1
19	146°27.2	130°34.9	58.0	357°10.3	39.1	6°02.7	29.4	126°17.4	04.2
20	161°29.7	145°34.5	04°59.2	12°12.0	38.7	21°05.0	29.4	141°19.6	04.3
21	176°32.2	160°34.2	05°00.3	27°13.8	·· 38.4	36°07.3	·· 29.3	156°21.8	·· 04.4
22	191°34.6	175°33.8	01.5	42°15.5	38.1	51°09.7	29.3	171°24.0	04.6
23	206°37.1	190°33.5	02.6	57°17.3	37.7	66°12.0	29.2	186°26.2	04.7
Mer.pass. 09:16		ν -0.3′	d 1.2′	m -3.86	ν 1.8′	d 0.3′	m 0.32	ν 2.3′	d 0.0′ m -2.10	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.4
Ankaa	353°05.7	-42°09.3
Schedar	349°29.3	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°32.0	89°22.7
Acamar	315°10.8	-40°11.7
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.8	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.6
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.9	-52°42.9
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.0	-59°36.2
Suhail	222°44.9	-43°32.9
Miaplacidus	221°37.8	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.3
Denebola	182°22.8	14°25.0
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.3
Gacrux	171°49.0	-57°16.2
Alioth	166°10.8	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.5
Hadar	148°32.6	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.5
Zuben'ubi	136°53.6	-16°09.5
Alphecca	126°01.8	26°37.2
Antares	112°13.2	-26°29.6
Atria	107°05.2	-69°04.4
Sabik	102°00.3	-15°45.6
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.5	12°32.3
Eltanin	90°40.9	51°28.8
Kaus Aust.	83°29.8	-34°22.2
Vega	80°31.7	38°48.3
Nunki	75°45.2	-26°15.7
Altair	61°58.0	8°56.3
Peacock	53°02.7	-56°38.5
Deneb	49°24.5	45°22.4
Enif	33°37.0	9°59.9
Al Na'ir	27°30.7	-46°49.5
Fomalhaut	15°12.6	-29°28.5
Scheat	13°43.6	28°13.7
Markab	13°28.2	15°21.0

May 01 Sat	SHA	Mer.pass
Venus	347°15.9	10:16
Mars	211°29.2	19:17
Jupiter	219°45.0	18:43
Saturn	340°09.1	10:43

May 02 Sun	SHA	Mer.pass
Venus	346°08.5	10:17
Mars	211°13.0	19:14
Jupiter	219°41.8	18:40
Saturn	340°02.3	10:40

May 03 Mon	SHA	Mer.pass
Venus	345°01.1	10:17
Mars	210°56.4	19:11
Jupiter	219°38.3	18:36
Saturn	339°55.6	10:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1289 sec ΔT = TT-UT1 = +69.3129 sec

2027 May 01 to May. 03 UT

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Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°42.2	N14°56.6	243°15.6	15.7′	S08°35.7	13.5′	55.0′
1	195°42.3	57.4	257°50.3	15.7′	08°22.2	13.4′	55.0′
2	210°42.4	58.1	272°25.0	15.7′	08°08.8	13.6′	55.1′
3	225°42.5	·· 58.9	286°59.7	15.7′	07°55.2	13.5′	55.1′
4	240°42.5	14°59.7	301°34.4	15.7′	07°41.7	13.6′	55.1′
5	255°42.6	15°00.4	316°09.2	15.7′	07°28.1	13.7′	55.1′
6	270°42.7	N15°01.2	330°43.9	15.7′	S07°14.4	13.7′	55.1′
7	285°42.8	01.9	345°18.6	15.7′	07°00.7	13.7′	55.2′
8	300°42.8	02.7	359°53.4	15.7′	06°47.0	13.7′	55.2′
9	315°42.9	·· 03.4	14°28.1	15.7′	06°33.3	13.8′	55.2′
10	330°43.0	04.2	29°02.9	15.7′	06°19.5	13.9′	55.2′
11	345°43.1	05.0	43°37.6	15.7′	06°05.6	13.8′	55.3′
12	0°43.1	N15°05.7	58°12.3	15.7′	S05°51.8	13.9′	55.3′
13	15°43.2	06.5	72°47.1	15.7′	05°37.9	14.0′	55.3′
14	30°43.3	07.2	87°21.8	15.7′	05°23.9	14.0′	55.3′
15	45°43.4	·· 08.0	101°56.5	15.7′	05°09.9	14.0′	55.4′
16	60°43.4	08.7	116°31.2	15.7′	04°55.9	14.0′	55.4′
17	75°43.5	09.5	131°06.0	15.7′	04°41.9	14.1′	55.4′
18	90°43.6	N15°10.2	145°40.7	15.7′	S04°27.8	14.1′	55.4′
19	105°43.6	11.0	160°15.3	15.7′	04°13.7	14.1′	55.5′
20	120°43.7	11.8	174°50.0	15.7′	03°59.6	14.2′	55.5′
21	135°43.8	·· 12.5	189°24.7	15.7′	03°45.4	14.2′	55.5′
22	150°43.9	13.3	203°59.4	15.6′	03°31.2	14.2′	55.5′
23	165°43.9	14.0	218°34.0	15.6′	03°17.0	14.3′	55.6′
	SD = 15.9′	d = 0.8′		SD = 15.0′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.0	N15°14.8	233°08.6	15.6′	S03°02.7	14.2′	55.6′
1	195°44.1	15.5	247°43.2	15.6′	02°48.5	14.3′	55.6′
2	210°44.2	16.3	262°17.8	15.6′	02°34.2	14.4′	55.6′
3	225°44.2	·· 17.0	276°52.4	15.6′	02°19.8	14.3′	55.7′
4	240°44.3	17.8	291°27.0	15.5′	02°05.5	14.4′	55.7′
5	255°44.4	18.5	306°01.5	15.5′	01°51.1	14.4′	55.7′
6	270°44.4	N15°19.3	320°36.0	15.5′	S01°36.7	14.4′	55.7′
7	285°44.5	20.0	335°10.5	15.5′	01°22.3	14.4′	55.8′
8	300°44.6	20.8	349°44.9	15.4′	01°07.9	14.5′	55.8′
9	315°44.6	·· 21.5	4°19.4	15.4′	00°53.4	14.5′	55.8′
10	330°44.7	22.2	18°53.8	15.4′	00°38.9	14.5′	55.9′
11	345°44.8	23.0	33°28.2	15.4′	00°24.4	14.5′	55.9′
12	0°44.9	N15°23.7	48°02.5	15.3′	S00°09.9	14.5′	55.9′
13	15°44.9	24.5	62°36.9	15.3′	N00°04.6	14.6′	55.9′
14	30°45.0	25.2	77°11.1	15.3′	00°19.2	14.5′	56.0′
15	45°45.1	·· 26.0	91°45.4	15.2′	00°33.7	14.6′	56.0′
16	60°45.1	26.7	106°19.6	15.2′	00°48.3	14.6′	56.0′
17	75°45.2	27.5	120°53.8	15.2′	01°02.9	14.6′	56.1′
18	90°45.3	N15°28.2	135°28.0	15.1′	N01°17.5	14.6′	56.1′
19	105°45.3	28.9	150°02.1	15.1′	01°32.1	14.6′	56.1′
20	120°45.4	29.7	164°36.2	15.0′	01°46.7	14.6′	56.1′
21	135°45.5	·· 30.4	179°10.2	15.0′	02°01.3	14.6′	56.2′
22	150°45.5	31.2	193°44.2	15.0′	02°15.9	14.7′	56.2′
23	165°45.6	31.9	208°18.1	14.9′	02°30.6	14.6′	56.2′
	SD = 15.9′	d = 0.8′		SD = 15.2′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.7	N15°32.7	222°52.1	14.9′	N02°45.2	14.7′	56.3′
1	195°45.7	33.4	237°25.9	14.8′	02°59.9	14.6′	56.3′
2	210°45.8	34.1	251°59.7	14.8′	03°14.5	14.7′	56.3′
3	225°45.9	·· 34.9	266°33.5	14.7′	03°29.2	14.7′	56.4′
4	240°45.9	35.6	281°07.2	14.7′	03°43.9	14.6′	56.4′
5	255°46.0	36.3	295°40.9	14.6′	03°58.5	14.7′	56.4′
6	270°46.1	N15°37.1	310°14.5	14.6′	N04°13.2	14.7′	56.4′
7	285°46.1	37.8	324°48.1	14.5′	04°27.9	14.6′	56.5′
8	300°46.2	38.6	339°21.6	14.5′	04°42.5	14.7′	56.5′
9	315°46.2	·· 39.3	353°55.1	14.4′	04°57.2	14.6′	56.5′
10	330°46.3	40.0	8°28.5	14.4′	05°11.8	14.7′	56.6′
11	345°46.4	40.8	23°01.9	14.3′	05°26.5	14.6′	56.6′
12	0°46.4	N15°41.5	37°35.2	14.2′	N05°41.1	14.6′	56.6′
13	15°46.5	42.2	52°08.4	14.2′	05°55.7	14.7′	56.7′
14	30°46.6	43.0	66°41.6	14.1′	06°10.4	14.6′	56.7′
15	45°46.6	·· 43.7	81°14.7	14.1′	06°25.0	14.6′	56.7′
16	60°46.7	44.4	95°47.7	14.0′	06°39.6	14.6′	56.8′
17	75°46.7	45.2	110°20.7	13.9′	06°54.2	14.6′	56.8′
18	90°46.8	N15°45.9	124°53.6	13.9′	N07°08.8	14.5′	56.8′
19	105°46.9	46.6	139°26.5	13.8′	07°23.3	14.6′	56.9′
20	120°46.9	47.4	153°59.3	13.7′	07°37.9	14.5′	56.9′
21	135°47.0	·· 48.1	168°32.0	13.7′	07°52.4	14.5′	56.9′
22	150°47.1	48.8	183°04.7	13.6′	08°06.9	14.5′	56.9′
23	165°47.1	49.6	197°37.2	13.5′	08°21.4	14.5′	57.0′
	SD = 15.9′	d = 0.7′		SD = 15.3′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	01:46	22:15	////	////
N 70°	////	////	02:27	21:32	////	////
68°	////	00:59	02:54	21:03	23:08	////
66°	////	01:51	03:15	20:42	22:09	////
64°	////	02:22	03:31	20:25	21:36	////
62°	00:51	02:45	03:45	20:11	21:12	23:14
60°	01:38	03:03	03:56	20:00	20:54	22:20
N 58°	02:07	03:17	04:06	19:50	20:39	21:50
56°	02:28	03:30	04:15	19:41	20:26	21:28
54°	02:45	03:41	04:22	19:33	20:15	21:11
52°	02:59	03:50	04:29	19:26	20:05	20:56
50°	03:12	03:59	04:35	19:20	19:57	20:44
45°	03:36	04:16	04:48	19:06	19:39	20:19
N 40°	03:54	04:30	04:59	18:55	19:25	20:01
35°	04:09	04:41	05:09	18:46	19:13	19:46
30°	04:21	04:51	05:17	18:38	19:03	19:34
20°	04:40	05:07	05:30	18:24	18:47	19:14
N 10°	04:55	05:21	05:42	18:12	18:34	18:59
0°	05:07	05:32	05:54	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:49	18:11	18:36
20°	05:27	05:53	06:16	17:38	18:00	18:27
30°	05:36	06:05	06:29	17:24	17:49	18:17
35°	05:41	06:11	06:37	17:17	17:43	18:13
40°	05:45	06:17	06:46	17:08	17:36	18:08
45°	05:50	06:25	06:56	16:58	17:29	18:03
S 50°	05:55	06:33	07:08	16:46	17:20	17:58
52°	05:57	06:37	07:13	16:40	17:16	17:56
54°	05:59	06:42	07:19	16:34	17:12	17:54
56°	06:02	06:46	07:26	16:27	17:07	17:51
58°	06:04	06:51	07:34	16:19	17:02	17:49
S 60°	06:07	06:57	07:43	16:10	16:56	17:46

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	03:34	03:03	02:33	12:57	14:58	17:05
N 70°	03:23	02:59	02:37	13:05	14:58	16:54
68°	03:14	02:57	02:41	13:12	14:57	16:46
66°	03:06	02:55	02:44	13:18	14:57	16:39
64°	02:59	02:53	02:46	13:23	14:56	16:33
62°	02:54	02:51	02:48	13:27	14:56	16:28
60°	02:49	02:50	02:50	13:30	14:56	16:24
N 58°	02:44	02:48	02:52	13:34	14:55	16:20
56°	02:40	02:47	02:54	13:36	14:55	16:17
54°	02:37	02:46	02:55	13:39	14:55	16:14
52°	02:33	02:45	02:57	13:41	14:55	16:11
50°	02:31	02:44	02:58	13:43	14:55	16:08
45°	02:24	02:42	03:00	13:48	14:54	16:03
N 40°	02:19	02:41	03:03	13:51	14:54	15:59
35°	02:14	02:39	03:05	13:55	14:54	15:55
30°	02:10	02:38	03:06	13:57	14:54	15:51
20°	02:03	02:36	03:09	14:02	14:53	15:46
N 10°	01:56	02:34	03:12	14:06	14:53	15:40
0°	01:50	02:32	03:15	14:10	14:52	15:36
S 10°	01:44	02:30	03:17	14:14	14:52	15:31
20°	01:38	02:28	03:20	14:18	14:51	15:26
30°	01:31	02:26	03:23	14:23	14:51	15:20
35°	01:27	02:25	03:25	14:26	14:51	15:17
40°	01:22	02:24	03:27	14:29	14:50	15:13
45°	01:16	02:22	03:30	14:32	14:50	15:09
S 50°	01:09	02:20	03:33	14:36	14:50	15:03
52°	01:06	02:19	03:34	14:38	14:49	15:01
54°	01:03	02:18	03:36	14:40	14:49	14:59
56°	00:59	02:17	03:37	14:42	14:49	14:56
58°	00:55	02:16	03:39	14:45	14:49	14:53
S 60°	00:50	02:15	03:41	14:47	14:48	14:49

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	25-27 30-14%	
01	02:49	02:53	11:57	08:00	20:21		
02	02:56	02:59	11:57	08:42	21:03		
03	03:03	03:06	11:57	09:25	21:47		

May 04, 05, 06 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°39.6	205°33.1	N05°03.8	72°19.0	N14°37.4	81°14.3	N16°29.2	201°28.4	N06°04.8
1	236°42.0	220°32.7	05.0	87°20.8	37.1	96°16.6	29.1	216°30.5	04.9
2	251°44.5	235°32.4	06.1	102°22.5	36.7	111°18.9	29.1	231°32.7	05.0
3	266°47.0	250°32.0	·· 07.3	117°24.3	·· 36.4	126°21.2	·· 29.0	246°34.9	·· 05.1
4	281°49.4	265°31.7	08.4	132°26.0	36.1	141°23.5	29.0	261°37.1	05.2
5	296°51.9	280°31.3	09.6	147°27.8	35.7	156°25.8	28.9	276°39.3	05.3
6	311°54.3	295°31.0	N05°10.7	162°29.5	N14°35.4	171°28.1	N16°28.9	291°41.5	N06°05.4
7	326°56.8	310°30.6	11.9	177°31.3	35.1	186°30.4	28.8	306°43.6	05.5
8	341°59.3	325°30.3	13.1	192°33.0	34.7	201°32.8	28.8	321°45.8	05.6
9	357°01.7	340°29.9	·· 14.2	207°34.7	·· 34.4	216°35.1	·· 28.7	336°48.0	·· 05.7
10	12°04.2	355°29.6	15.4	222°36.5	34.0	231°37.4	28.7	351°50.2	05.9
11	27°06.7	10°29.2	16.5	237°38.2	33.7	246°39.7	28.6	6°52.4	06.0
12	42°09.1	25°28.9	N05°17.7	252°40.0	N14°33.4	261°42.0	N16°28.6	21°54.6	N06°06.1
13	57°11.6	40°28.5	18.8	267°41.7	33.0	276°44.3	28.5	36°56.7	06.2
14	72°14.1	55°28.2	20.0	282°43.5	32.7	291°46.6	28.4	51°58.9	06.3
15	87°16.5	70°27.8	·· 21.2	297°45.2	·· 32.4	306°48.9	·· 28.4	67°01.1	·· 06.4
16	102°19.0	85°27.4	22.3	312°46.9	32.0	321°51.2	28.3	82°03.3	06.5
17	117°21.5	100°27.1	23.5	327°48.7	31.7	336°53.5	28.3	97°05.5	06.6
18	132°23.9	115°26.7	N05°24.6	342°50.4	N14°31.3	351°55.8	N16°28.2	112°07.7	N06°06.7
19	147°26.4	130°26.4	25.8	357°52.1	31.0	6°58.1	28.2	127°09.8	06.8
20	162°28.8	145°26.0	26.9	12°53.9	30.7	22°00.4	28.1	142°12.0	06.9
21	177°31.3	160°25.7	·· 28.1	27°55.6	·· 30.3	37°02.7	·· 28.1	157°14.2	·· 07.0
22	192°33.8	175°25.3	29.2	42°57.4	30.0	52°05.0	28.0	172°16.4	07.2
23	207°36.2	190°25.0	30.4	57°59.1	29.6	67°07.3	28.0	187°18.6	07.3
Mer.pass. 09:12		ν -0.4′	d 1.2′	m -3.86	ν 1.7′	d 0.3′	m 0.34	ν 2.3′	d 0.1′ m -2.10	ν 2.2′	d 0.1′ m 0.71

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°38.7	205°24.6	N05°31.5	73°00.8	N14°29.3	82°09.6	N16°27.9	202°20.8	N06°07.4
1	237°41.2	220°24.2	32.7	88°02.6	29.0	97°11.9	27.9	217°22.9	07.5
2	252°43.6	235°23.9	33.9	103°04.3	28.6	112°14.3	27.8	232°25.1	07.6
3	267°46.1	250°23.5	·· 35.0	118°06.0	·· 28.3	127°16.6	·· 27.7	247°27.3	·· 07.7
4	282°48.6	265°23.2	36.2	133°07.8	27.9	142°18.9	27.7	262°29.5	07.8
5	297°51.0	280°22.8	37.3	148°09.5	27.6	157°21.2	27.6	277°31.7	07.9
6	312°53.5	295°22.5	N05°38.5	163°11.2	N14°27.2	172°23.5	N16°27.6	292°33.9	N06°08.0
7	327°55.9	310°22.1	39.6	178°12.9	26.9	187°25.8	27.5	307°36.0	08.1
8	342°58.4	325°21.7	40.8	193°14.7	26.6	202°28.1	27.5	322°38.2	08.2
9	358°00.9	340°21.4	·· 41.9	208°16.4	·· 26.2	217°30.4	·· 27.4	337°40.4	·· 08.3
10	13°03.3	355°21.0	43.1	223°18.1	25.9	232°32.7	27.4	352°42.6	08.5
11	28°05.8	10°20.7	44.2	238°19.9	25.5	247°35.0	27.3	7°44.8	08.6
12	43°08.3	25°20.3	N05°45.4	253°21.6	N14°25.2	262°37.3	N16°27.2	22°47.0	N06°08.7
13	58°10.7	40°20.0	46.5	268°23.3	24.8	277°39.6	27.2	37°49.2	08.8
14	73°13.2	55°19.6	47.7	283°25.0	24.5	292°41.9	27.1	52°51.3	08.9
15	88°15.7	70°19.2	·· 48.8	298°26.8	·· 24.2	307°44.2	·· 27.1	67°53.5	·· 09.0
16	103°18.1	85°18.9	50.0	313°28.5	23.8	322°46.5	27.0	82°55.7	09.1
17	118°20.6	100°18.5	51.1	328°30.2	23.5	337°48.8	27.0	97°57.9	09.2
18	133°23.1	115°18.2	N05°52.3	343°31.9	N14°23.1	352°51.1	N16°26.9	113°00.1	N06°09.3
19	148°25.5	130°17.8	53.4	358°33.6	22.8	7°53.4	26.9	128°02.3	09.4
20	163°28.0	145°17.4	54.6	13°35.4	22.4	22°55.7	26.8	143°04.4	09.5
21	178°30.4	160°17.1	·· 55.7	28°37.1	·· 22.1	37°58.0	·· 26.7	158°06.6	·· 09.6
22	193°32.9	175°16.7	56.9	43°38.8	21.7	53°00.3	26.7	173°08.8	09.7
23	208°35.4	190°16.4	58.0	58°40.5	21.4	68°02.5	26.6	188°11.0	09.9
Mer.pass. 09:08		ν -0.4′	d 1.2′	m -3.86	ν 1.7′	d 0.3′	m 0.36	ν 2.3′	d 0.1′ m -2.09	ν 2.2′	d 0.1′ m 0.71

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°37.8	205°16.0	N05°59.2	73°42.2	N14°21.1	83°04.8	N16°26.6	203°13.2	N06°10.0
1	238°40.3	220°15.6	06°00.3	88°44.0	20.7	98°07.1	26.5	218°15.4	10.1
2	253°42.8	235°15.3	01.5	103°45.7	20.4	113°09.4	26.5	233°17.6	10.2
3	268°45.2	250°14.9	·· 02.6	118°47.4	·· 20.0	128°11.7	·· 26.4	248°19.7	·· 10.3
4	283°47.7	265°14.5	03.8	133°49.1	19.7	143°14.0	26.4	263°21.9	10.4
5	298°50.2	280°14.2	04.9	148°50.8	19.3	158°16.3	26.3	278°24.1	10.5
6	313°52.6	295°13.8	N06°06.1	163°52.5	N14°19.0	173°18.6	N16°26.2	293°26.3	N06°10.6
7	328°55.1	310°13.5	07.2	178°54.3	18.6	188°20.9	26.2	308°28.5	10.7
8	343°57.6	325°13.1	08.4	193°56.0	18.3	203°23.2	26.1	323°30.7	10.8
9	359°00.0	340°12.7	·· 09.5	208°57.7	·· 17.9	218°25.5	·· 26.1	338°32.9	·· 10.9
10	14°02.5	355°12.4	10.7	223°59.4	17.6	233°27.8	26.0	353°35.0	11.0
11	29°04.9	10°12.0	11.8	239°01.1	17.2	248°30.1	26.0	8°37.2	11.1
12	44°07.4	25°11.7	N06°13.0	254°02.8	N14°16.9	263°32.4	N16°25.9	23°39.4	N06°11.2
13	59°09.9	40°11.3	14.1	269°04.5	16.5	278°34.7	25.8	38°41.6	11.4
14	74°12.3	55°10.9	15.3	284°06.2	16.2	293°37.0	25.8	53°43.8	11.5
15	89°14.8	70°10.6	·· 16.4	299°07.9	·· 15.8	308°39.3	·· 25.7	68°46.0	·· 11.6
16	104°17.3	85°10.2	17.6	314°09.7	15.5	323°41.6	25.7	83°48.2	11.7
17	119°19.7	100°09.8	18.7	329°11.4	15.1	338°43.8	25.6	98°50.3	11.8
18	134°22.2	115°09.5	N06°19.9	344°13.1	N14°14.8	353°46.1	N16°25.5	113°52.5	N06°11.9
19	149°24.7	130°09.1	21.0	359°14.8	14.4	8°48.4	25.5	128°54.7	12.0
20	164°27.1	145°08.7	22.1	14°16.5	14.1	23°50.7	25.4	143°56.9	12.1
21	179°29.6	160°08.4	·· 23.3	29°18.2	·· 13.7	38°53.0	·· 25.4	158°59.1	·· 12.2
22	194°32.1	175°08.0	24.4	44°19.9	13.4	53°55.3	25.3	174°01.3	12.3
23	209°34.5	190°07.6	25.6	59°21.6	13.0	68°57.6	25.3	189°03.5	12.4
Mer.pass. 09:04		ν -0.4′	d 1.1′	m -3.86	ν 1.7′	d 0.3′	m 0.38	ν 2.3′	d 0.1′ m -2.08	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.4
Ankaa	353°05.6	-42°09.3
Schedar	349°29.3	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°32.0	89°22.7
Acamar	315°10.8	-40°11.7
Menkar	314°04.5	4°11.7
Mirfak	308°26.0	49°57.5
Aldebaran	290°37.8	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.9	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.1	-59°36.2
Suhail	222°44.9	-43°32.9
Miaplacidus	221°37.8	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.3	11°49.9
Dubhe	193°38.4	61°36.3
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.8
Acrux	172°57.4	-63°15.3
Gacrux	171°49.0	-57°16.3
Alioth	166°10.9	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.4
Menkent	147°55.0	-36°30.4
Arcturus	145°45.9	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.5
Zuben'ubi	136°53.6	-16°09.5
Alphecca	126°01.8	26°37.2
Antares	112°13.2	-26°29.6
Atria	107°05.2	-69°04.4
Sabik	102°00.3	-15°45.6
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.5	12°32.3
Eltanin	90°40.9	51°28.9
Kaus Aust.	83°29.8	-34°22.2
Vega	80°31.7	38°48.3
Nunki	75°45.2	-26°15.7
Altair	61°58.0	8°56.3
Peacock	53°02.7	-56°38.5
Deneb	49°24.5	45°22.4
Enif	33°37.0	9°59.9
Al Na'ir	27°30.7	-46°49.5
Fomalhaut	15°12.6	-29°28.5
Scheat	13°43.5	28°13.7
Markab	13°28.2	15°21.0

May 04 Tue	SHA	Mer.pass
Venus	343°53.5	10:18
Mars	210°39.5	19:09
Jupiter	219°34.7	18:32
Saturn	339°48.8	10:33

May 05 Wed	SHA	Mer.pass
Venus	342°45.9	10:19
Mars	210°22.1	19:06
Jupiter	219°30.9	18:29
Saturn	339°42.1	10:29

May 06 Thu	SHA	Mer.pass
Venus	341°38.2	10:19
Mars	210°04.4	19:03
Jupiter	219°27.0	18:25
Saturn	339°35.3	10:26

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°47.2	N15°50.3	212°09.7	13.4′	N08°35.9	14.4′	57.0′
1	195°47.2	51.0	226°42.2	13.4′	08°50.3	14.4′	57.0′
2	210°47.3	51.7	241°14.5	13.3′	09°04.7	14.4′	57.1′
3	225°47.4	·· 52.5	255°46.8	13.2′	09°19.1	14.4′	57.1′
4	240°47.4	53.2	270°19.0	13.1′	09°33.5	14.4′	57.1′
5	255°47.5	53.9	284°51.2	13.0′	09°47.9	14.3′	57.2′
6	270°47.5	N15°54.7	299°23.2	13.0′	N10°02.2	14.3′	57.2′
7	285°47.6	55.4	313°55.2	12.9′	10°16.5	14.2′	57.2′
8	300°47.6	56.1	328°27.1	12.8′	10°30.7	14.3′	57.3′
9	315°47.7	·· 56.8	342°58.9	12.7′	10°45.0	14.1′	57.3′
10	330°47.8	57.6	357°30.6	12.6′	10°59.1	14.2′	57.3′
11	345°47.8	58.3	12°02.2	12.6′	11°13.3	14.1′	57.4′
12	0°47.9	N15°59.0	26°33.8	12.5′	N11°27.4	14.1′	57.4′
13	15°47.9	15°59.7	41°05.2	12.4′	11°41.5	14.0′	57.4′
14	30°48.0	16°00.5	55°36.6	12.3′	11°55.5	14.0′	57.4′
15	45°48.0	·· 01.2	70°07.9	12.2′	12°09.5	14.0′	57.5′
16	60°48.1	01.9	84°39.1	12.1′	12°23.5	13.9′	57.5′
17	75°48.2	02.6	99°10.2	12.0′	12°37.4	13.9′	57.5′
18	90°48.2	N16°03.3	113°41.2	11.9′	N12°51.3	13.8′	57.6′
19	105°48.3	04.1	128°12.1	11.8′	13°05.1	13.7′	57.6′
20	120°48.3	04.8	142°43.0	11.7′	13°18.8	13.8′	57.6′
21	135°48.4	·· 05.5	157°13.7	11.6′	13°32.6	13.6′	57.7′
22	150°48.4	06.2	171°44.3	11.5′	13°46.2	13.6′	57.7′
23	165°48.5	06.9	186°14.9	11.4′	13°59.8	13.6′	57.7′
	SD = 15.9′	*d* = 0.7′	SD = 15.5′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°48.5	N16°07.7	200°45.3	11.3′	N14°13.4	13.5′	57.7′
1	195°48.6	08.4	215°15.6	11.2′	14°26.9	13.4′	57.8′
2	210°48.7	09.1	229°45.9	11.1′	14°40.3	13.4′	57.8′
3	225°48.7	·· 09.8	244°16.0	11.0′	14°53.7	13.3′	57.8′
4	240°48.8	10.5	258°46.0	10.9′	15°07.0	13.3′	57.9′
5	255°48.8	11.2	273°16.0	10.8′	15°20.3	13.2′	57.9′
6	270°48.9	N16°12.0	287°45.8	10.7′	N15°33.5	13.1′	57.9′
7	285°48.9	12.7	302°15.5	10.6′	15°46.6	13.1′	58.0′
8	300°49.0	13.4	316°45.2	10.5′	15°59.7	12.9′	58.0′
9	315°49.0	·· 14.1	331°14.7	10.4′	16°12.6	13.0′	58.0′
10	330°49.1	14.8	345°44.1	10.3′	16°25.6	12.8′	58.0′
11	345°49.1	15.5	0°13.4	10.2′	16°38.4	12.8′	58.1′
12	0°49.2	N16°16.2	14°42.6	10.1′	N16°51.2	12.6′	58.1′
13	15°49.2	17.0	29°11.6	10.0′	17°03.8	12.7′	58.1′
14	30°49.3	17.7	43°40.6	9.9′	17°16.5	12.5′	58.2′
15	45°49.3	·· 18.4	58°09.5	9.7′	17°29.0	12.4′	58.2′
16	60°49.4	19.1	72°38.2	9.6′	17°41.4	12.4′	58.2′
17	75°49.4	19.8	87°06.9	9.5′	17°53.8	12.3′	58.2′
18	90°49.5	N16°20.5	101°35.4	9.4′	N18°06.1	12.2′	58.3′
19	105°49.5	21.2	116°03.8	9.3′	18°18.3	12.0′	58.3′
20	120°49.6	21.9	130°32.1	9.2′	18°30.3	12.1′	58.3′
21	135°49.6	·· 22.6	145°00.3	9.1′	18°42.4	11.9′	58.4′
22	150°49.7	23.3	159°28.4	9.0′	18°54.3	11.8′	58.4′
23	165°49.7	24.1	173°56.3	8.8′	19°06.1	11.7′	58.4′
	SD = 15.9′	*d* = 0.7′	SD = 15.7′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°49.8	N16°24.8	188°24.2	8.7′	N19°17.8	11.6′	58.4′
1	195°49.8	25.5	202°51.9	8.6′	19°29.4	11.6′	58.5′
2	210°49.9	26.2	217°19.5	8.5′	19°41.0	11.4′	58.5′
3	225°49.9	·· 26.9	231°47.0	8.4′	19°52.4	11.3′	58.5′
4	240°50.0	27.6	246°14.4	8.3′	20°03.7	11.2′	58.5′
5	255°50.0	28.3	260°41.7	8.2′	20°14.9	11.1′	58.6′
6	270°50.1	N16°29.0	275°08.8	8.0′	N20°26.0	11.0′	58.6′
7	285°50.1	29.7	289°35.9	7.9′	20°37.0	10.9′	58.6′
8	300°50.2	30.4	304°02.8	7.8′	20°47.9	10.7′	58.6′
9	315°50.2	·· 31.1	318°29.6	7.7′	20°58.6	10.7′	58.7′
10	330°50.2	31.8	332°56.3	7.6′	21°09.3	10.5′	58.7′
11	345°50.3	32.5	347°22.8	7.5′	21°19.8	10.4′	58.7′
12	0°50.3	N16°33.2	1°49.3	7.3′	N21°30.2	10.3′	58.7′
13	15°50.4	33.9	16°15.6	7.2′	21°40.5	10.2′	58.8′
14	30°50.4	34.6	30°41.9	7.1′	21°50.7	10.1′	58.8′
15	45°50.5	·· 35.3	45°08.0	7.0′	22°00.8	9.9′	58.8′
16	60°50.5	36.0	59°34.0	6.9′	22°10.7	9.8′	58.8′
17	75°50.6	36.7	73°59.9	6.8′	22°20.5	9.6′	58.9′
18	90°50.6	N16°37.4	88°25.6	6.7′	N22°30.1	9.6′	58.9′
19	105°50.7	38.1	102°51.3	6.5′	22°39.7	9.4′	58.9′
20	120°50.7	38.8	117°16.9	6.4′	22°49.1	9.2′	58.9′
21	135°50.7	·· 39.5	131°42.3	6.3′	22°58.3	9.1′	58.9′
22	150°50.8	40.2	146°07.6	6.2′	23°07.4	9.0′	59.0′
23	165°50.8	40.9	160°32.8	6.1′	23°16.4	8.9′	59.0′
	SD = 15.8′	*d* = 0.7′	SD = 15.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	01:17	22:47	////	////
N 70°	////	////	02:08	21:50	////	////
68°	////	////	02:40	21:17	////	////
66°	////	01:30	03:03	20:53	22:30	////
64°	////	02:07	03:21	20:35	21:50	////
62°	////	02:33	03:36	20:20	21:24	////
60°	01:20	02:53	03:48	20:07	21:03	22:39
N 58°	01:54	03:09	03:59	19:56	20:47	22:03
56°	02:18	03:22	04:08	19:47	20:33	21:38
54°	02:36	03:34	04:16	19:39	20:21	21:19
52°	02:52	03:44	04:23	19:31	20:11	21:04
50°	03:05	03:53	04:30	19:24	20:02	20:50
45°	03:30	04:11	04:44	19:10	19:43	20:24
N 40°	03:50	04:26	04:56	18:58	19:28	20:05
35°	04:05	04:38	05:06	18:48	19:16	19:49
30°	04:18	04:49	05:14	18:40	19:05	19:36
20°	04:38	05:06	05:29	18:25	18:48	19:16
N 10°	04:54	05:20	05:41	18:12	18:34	19:00
0°	05:07	05:32	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:10	18:35
20°	05:28	05:54	06:17	17:36	17:59	18:25
30°	05:38	06:06	06:31	17:22	17:47	18:15
35°	05:43	06:13	06:39	17:14	17:40	18:10
40°	05:48	06:20	06:49	17:04	17:33	18:05
45°	05:53	06:28	06:59	16:54	17:25	18:00
S 50°	05:59	06:38	07:12	16:41	17:15	17:54
52°	06:01	06:42	07:18	16:35	17:11	17:51
54°	06:04	06:46	07:25	16:28	17:06	17:49
56°	06:07	06:51	07:32	16:21	17:01	17:46
58°	06:10	06:57	07:40	16:12	16:56	17:43
S 60°	06:13	07:03	07:50	16:03	16:49	17:40

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	01:59	01:11		19:31		
N 70°	02:12	01:40	00:32	19:04	21:58	
68°	02:23	02:01	01:26	18:45	21:05	
66°	02:32	02:18	01:59	18:29	20:34	23:14
64°	02:40	02:32	02:24	18:17	20:10	22:19
62°	02:46	02:44	02:43	18:06	19:52	21:46
60°	02:52	02:54	02:59	17:57	19:37	21:22
N 58°	02:57	03:03	03:13	17:49	19:24	21:03
56°	03:01	03:11	03:25	17:42	19:13	20:47
54°	03:06	03:18	03:35	17:36	19:03	20:33
52°	03:09	03:25	03:44	17:31	18:55	20:21
50°	03:13	03:30	03:53	17:26	18:47	20:11
45°	03:20	03:43	04:11	17:15	18:31	19:49
N 40°	03:26	03:53	04:25	17:06	18:17	19:31
35°	03:32	04:02	04:38	16:59	18:06	19:17
30°	03:36	04:10	04:48	16:52	17:56	19:04
20°	03:45	04:24	05:07	16:41	17:40	18:42
N 10°	03:52	04:36	05:24	16:31	17:25	18:23
0°	03:59	04:47	05:39	16:22	17:11	18:06
S 10°	04:06	04:59	05:55	16:12	16:58	17:48
20°	04:14	05:11	06:12	16:03	16:43	17:30
30°	04:23	05:25	06:31	15:51	16:27	17:09
35°	04:28	05:33	06:43	15:45	16:18	16:56
40°	04:33	05:43	06:56	15:38	16:07	16:42
45°	04:40	05:54	07:12	15:29	15:54	16:25
S 50°	04:48	06:08	07:31	15:19	15:39	16:04
52°	04:52	06:14	07:40	15:15	15:32	15:55
54°	04:56	06:21	07:51	15:10	15:24	15:44
56°	05:01	06:29	08:02	15:04	15:15	15:31
58°	05:06	06:38	08:16	14:58	15:05	15:17
S 60°	05:12	06:49	08:32	14:51	14:54	15:00

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-0 7-0%
04	03:09	03:12	11:57	10:10	22:34	
05	03:14	03:17	11:57	10:59	23:25	
06	03:19	03:21	11:57	11:52	–:–	

May 07, 08, 09 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	224°37.0	205°07.3	N06°26.7	74°23.3	N14°12.7	83°59.9	N16°25.2	204°05.6	N06°12.5
1	239°39.4	220°06.9	27.9	89°25.0	12.3	99°02.2	25.1	219°07.8	12.6
2	254°41.9	235°06.5	29.0	104°26.7	12.0	114°04.5	25.1	234°10.0	12.7
3	269°44.4	250°06.2	·· 30.2	119°28.4	·· 11.6	129°06.7	·· 25.0	249°12.2	·· 12.8
4	284°46.8	265°05.8	31.3	134°30.1	11.3	144°09.0	25.0	264°14.4	13.0
5	299°49.3	280°05.5	32.5	149°31.8	10.9	159°11.3	24.9	279°16.6	13.1
6	314°51.8	295°05.1	N06°33.6	164°33.5	N14°10.6	174°13.6	N16°24.8	294°18.8	N06°13.2
7	329°54.2	310°04.7	34.7	179°35.2	10.2	189°15.9	24.8	309°20.9	13.3
8	344°56.7	325°04.3	35.9	194°36.9	09.8	204°18.2	24.7	324°23.1	13.4
9	359°59.2	340°04.0	·· 37.0	209°38.6	·· 09.5	219°20.5	·· 24.7	339°25.3	·· 13.5
10	15°01.6	355°03.6	38.2	224°40.3	09.1	234°22.8	24.6	354°27.5	13.6
11	30°04.1	10°03.2	39.3	239°42.0	08.8	249°25.1	24.5	9°29.7	13.7
12	45°06.5	25°02.9	N06°40.5	254°43.7	N14°08.4	264°27.3	N16°24.5	24°31.9	N06°13.8
13	60°09.0	40°02.5	41.6	269°45.4	08.1	279°29.6	24.4	39°34.1	13.9
14	75°11.5	55°02.1	42.7	284°47.1	07.7	294°31.9	24.4	54°36.3	14.0
15	90°13.9	70°01.8	·· 43.9	299°48.8	·· 07.4	309°34.2	·· 24.3	69°38.4	·· 14.1
16	105°16.4	85°01.4	45.0	314°50.5	07.0	324°36.5	24.2	84°40.6	14.2
17	120°18.9	100°01.0	46.2	329°52.2	06.7	339°38.8	24.2	99°42.8	14.3
18	135°21.3	115°00.7	N06°47.3	344°53.9	N14°06.3	354°41.1	N16°24.1	114°45.0	N06°14.4
19	150°23.8	130°00.3	48.4	359°55.6	05.9	9°43.3	24.1	129°47.2	14.6
20	165°26.3	144°59.9	49.6	14°57.2	05.6	24°45.6	24.0	144°49.4	14.7
21	180°28.7	159°59.6	·· 50.7	29°58.9	·· 05.2	39°47.9	·· 23.9	159°51.6	·· 14.8
22	195°31.2	174°59.2	51.9	45°00.6	04.9	54°50.2	23.9	174°53.7	14.9
23	210°33.7	189°58.8	53.0	60°02.3	04.5	69°52.5	23.8	189°55.9	15.0
Mer.pass. 09:00		ν -0.4′	d 1.1′	m -3.86	ν 1.7′	d 0.4′	m 0.39	ν 2.3′	d 0.1′ m -2.08	ν 2.2′	d 0.1′ m 0.71

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	225°36.1	204°58.4	N06°54.1	75°04.0	N14°04.2	84°54.8	N16°23.8	204°58.1	N06°15.1
1	240°38.6	219°58.1	55.3	90°05.7	03.8	99°57.0	23.7	220°00.3	15.2
2	255°41.0	234°57.7	56.4	105°07.4	03.4	114°59.3	23.6	235°02.5	15.3
3	270°43.5	249°57.3	·· 57.6	120°09.1	·· 03.1	130°01.6	·· 23.6	250°04.7	·· 15.4
4	285°46.0	264°57.0	58.7	135°10.8	02.7	145°03.9	23.5	265°06.9	15.5
5	300°48.4	279°56.6	06°59.8	150°12.4	02.4	160°06.2	23.5	280°09.1	15.6
6	315°50.9	294°56.2	N07°01.0	165°14.1	N14°02.0	175°08.4	N16°23.4	295°11.2	N06°15.7
7	330°53.4	309°55.8	02.1	180°15.8	01.6	190°10.7	23.3	310°13.4	15.8
8	345°55.8	324°55.5	03.3	195°17.5	01.3	205°13.0	23.3	325°15.6	15.9
9	0°58.3	339°55.1	·· 04.4	210°19.2	·· 00.9	220°15.3	·· 23.2	340°17.8	·· 16.0
10	16°00.8	354°54.7	05.5	225°20.9	00.6	235°17.6	23.1	355°20.0	16.1
11	31°03.2	9°54.4	06.7	240°22.5	14°00.2	250°19.9	23.1	10°22.2	16.2
12	46°05.7	24°54.0	N07°07.8	255°24.2	N13°59.8	265°22.1	N16°23.0	25°24.4	N06°16.4
13	61°08.2	39°53.6	08.9	270°25.9	59.5	280°24.4	23.0	40°26.6	16.5
14	76°10.6	54°53.2	10.1	285°27.6	59.1	295°26.7	22.9	55°28.7	16.6
15	91°13.1	69°52.9	·· 11.2	300°29.3	·· 58.8	310°29.0	·· 22.8	70°30.9	·· 16.7
16	106°15.5	84°52.5	12.3	315°30.9	58.4	325°31.2	22.8	85°33.1	16.8
17	121°18.0	99°52.1	13.5	330°32.6	58.0	340°33.5	22.7	100°35.3	16.9
18	136°20.5	114°51.7	N07°14.6	345°34.3	N13°57.7	355°35.8	N16°22.7	115°37.5	N06°17.0
19	151°22.9	129°51.4	15.8	0°36.0	57.3	10°38.1	22.6	130°39.7	17.1
20	166°25.4	144°51.0	16.9	15°37.7	57.0	25°40.4	22.5	145°41.9	17.2
21	181°27.9	159°50.6	·· 18.0	30°39.3	·· 56.6	40°42.6	·· 22.5	160°44.1	·· 17.3
22	196°30.3	174°50.2	19.2	45°41.0	56.2	55°44.9	22.4	175°46.3	17.4
23	211°32.8	189°49.9	20.3	60°42.7	55.9	70°47.2	22.3	190°48.4	17.5
Mer.pass. 08:56		ν -0.4′	d 1.1′	m -3.86	ν 1.7′	d 0.4′	m 0.41	ν 2.3′	d 0.1′ m -2.07	ν 2.2′	d 0.1′ m 0.71

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	226°35.3	204°49.5	N07°21.4	75°44.4	N13°55.5	85°49.5	N16°22.3	205°50.6	N06°17.6
1	241°37.7	219°49.1	22.6	90°46.0	55.1	100°51.7	22.2	220°52.8	17.7
2	256°40.2	234°48.7	23.7	105°47.7	54.8	115°54.0	22.1	235°55.0	17.8
3	271°42.7	249°48.4	·· 24.8	120°49.4	·· 54.4	130°56.3	·· 22.1	250°57.2	·· 17.9
4	286°45.1	264°48.0	26.0	135°51.0	54.1	145°58.6	22.0	265°59.4	18.0
5	301°47.6	279°47.6	27.1	150°52.7	53.7	161°00.8	22.0	281°01.6	18.1
6	316°50.0	294°47.2	N07°28.2	165°54.4	N13°53.3	176°03.1	N16°21.9	296°03.8	N06°18.3
7	331°52.5	309°46.9	29.4	180°56.1	53.0	191°05.4	21.8	311°05.9	18.4
8	346°55.0	324°46.5	30.5	195°57.7	52.6	206°07.7	21.8	326°08.1	18.5
9	1°57.4	339°46.1	·· 31.6	210°59.4	·· 52.2	221°09.9	·· 21.7	341°10.3	·· 18.6
10	16°59.9	354°45.7	32.8	226°01.1	51.9	236°12.2	21.6	356°12.5	18.7
11	32°02.4	9°45.3	33.9	241°02.7	51.5	251°14.5	21.6	11°14.7	18.8
12	47°04.8	24°45.0	N07°35.0	256°04.4	N13°51.1	266°16.8	N16°21.5	26°16.9	N06°18.9
13	62°07.3	39°44.6	36.1	271°06.1	50.8	281°19.0	21.5	41°19.1	19.0
14	77°09.8	54°44.2	37.3	286°07.7	50.4	296°21.3	21.4	56°21.3	19.1
15	92°12.2	69°43.8	·· 38.4	301°09.4	·· 50.0	311°23.6	·· 21.3	71°23.5	·· 19.2
16	107°14.7	84°43.4	39.5	316°11.1	49.7	326°25.9	21.3	86°25.7	19.3
17	122°17.2	99°43.1	40.7	331°12.7	49.3	341°28.1	21.2	101°27.8	19.4
18	137°19.6	114°42.7	N07°41.8	346°14.4	N13°48.9	356°30.4	N16°21.1	116°30.0	N06°19.5
19	152°22.1	129°42.3	42.9	1°16.1	48.6	11°32.7	21.1	131°32.2	19.6
20	167°24.5	144°41.9	44.1	16°17.7	48.2	26°34.9	21.0	146°34.4	19.7
21	182°27.0	159°41.5	·· 45.2	31°19.4	·· 47.8	41°37.2	·· 20.9	161°36.6	·· 19.8
22	197°29.5	174°41.2	46.3	46°21.0	47.5	56°39.5	20.9	176°38.8	19.9
23	212°31.9	189°40.8	47.4	61°22.7	47.1	71°41.8	20.8	191°41.0	20.0
Mer.pass. 08:52		ν -0.4′	d 1.1′	m -3.86	ν 1.7′	d 0.4′	m 0.43	ν 2.3′	d 0.1′ m -2.06	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.6	-42°09.3
Schedar	349°29.3	56°41.1
Diphda	348°45.7	-17°50.2
Achernar	335°19.4	-57°05.7
Hamal	327°49.4	23°35.4
Polaris	313°31.6	89°22.7
Acamar	315°10.8	-40°11.7
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.4
Aldebaran	290°37.8	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.9	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.1	-59°36.2
Suhail	222°44.9	-43°32.9
Miaplacidus	221°37.9	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.4	61°36.3
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.4	-63°15.3
Gacrux	171°49.0	-57°16.3
Alioth	166°10.9	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.4
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.5
Zuben'ubi	136°53.6	-16°09.5
Alphecca	126°01.8	26°37.2
Antares	112°13.2	-26°29.6
Atria	107°05.1	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.3
Rasalhague	95°56.5	12°32.3
Eltanin	90°40.9	51°28.9
Kaus Aust.	83°29.7	-34°22.2
Vega	80°31.7	38°48.3
Nunki	75°45.2	-26°15.7
Altair	61°58.0	8°56.3
Peacock	53°02.6	-56°38.5
Deneb	49°24.4	45°22.4
Enif	33°37.0	9°59.9
Al Na'ir	27°30.7	-46°49.5
Fomalhaut	15°12.6	-29°28.5
Scheat	13°43.5	28°13.7
Markab	13°28.2	15°21.0

May 07 Fri	SHA	Mer.pass
Venus	340°30.3	10:20
Mars	209°46.3	19:00
Jupiter	219°22.9	18:21
Saturn	339°28.7	10:22

May 08 Sat	SHA	Mer.pass
Venus	339°22.3	10:20
Mars	209°27.9	18:58
Jupiter	219°18.6	18:18
Saturn	339°22.0	10:19

May 09 Sun	SHA	Mer.pass
Venus	338°14.2	10:21
Mars	209°09.1	18:55
Jupiter	219°14.2	18:14
Saturn	339°15.4	10:15

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°50.9	N16°41.6	174°57.9	6.0′	N23°25.3	8.7′	59.0′
1	195°50.9	42.3	189°22.9	5.9′	23°34.0	8.5′	59.0′
2	210°51.0	43.0	203°47.8	5.8′	23°42.5	8.4′	59.1′
3	225°51.0	·· 43.7	218°12.6	5.7′	23°50.9	8.3′	59.1′
4	240°51.0	44.4	232°37.3	5.6′	23°59.2	8.1′	59.1′
5	255°51.1	45.1	247°01.8	5.5′	24°07.3	7.9′	59.1′
6	270°51.1	N16°45.8	261°26.3	5.4′	N24°15.2	7.9′	59.1′
7	285°51.2	46.5	275°50.7	5.3′	24°23.1	7.6′	59.2′
8	300°51.2	47.1	290°14.9	5.2′	24°30.7	7.5′	59.2′
9	315°51.2	·· 47.8	304°39.1	5.1′	24°38.2	7.3′	59.2′
10	330°51.3	48.5	319°03.2	5.0′	24°45.5	7.2′	59.2′
11	345°51.3	49.2	333°27.1	4.9′	24°52.7	7.0′	59.2′
12	0°51.4	N16°49.9	347°51.0	4.8′	N24°59.7	6.9′	59.2′
13	15°51.4	50.6	2°14.8	4.7′	25°06.6	6.7′	59.3′
14	30°51.4	51.3	16°38.4	4.6′	25°13.3	6.5′	59.3′
15	45°51.5	·· 52.0	31°02.0	4.5′	25°19.8	6.3′	59.3′
16	60°51.5	52.7	45°25.5	4.4′	25°26.1	6.2′	59.3′
17	75°51.6	53.3	59°49.0	4.3′	25°32.3	6.0′	59.3′
18	90°51.6	N16°54.0	74°12.3	4.2′	N25°38.3	5.9′	59.3′
19	105°51.6	54.7	88°35.5	4.2′	25°44.2	5.6′	59.4′
20	120°51.7	55.4	102°58.7	4.1′	25°49.8	5.5′	59.4′
21	135°51.7	·· 56.1	117°21.8	4.0′	25°55.3	5.4′	59.4′
22	150°51.7	56.8	131°44.8	3.9′	26°00.7	5.1′	59.4′
23	165°51.8	57.5	146°07.7	3.9′	26°05.8	5.0′	59.4′
	SD = 15.8′	d = 0.7′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°51.8	N16°58.1	160°30.6	3.8′	N26°10.8	4.8′	59.4′
1	195°51.9	58.8	174°53.3	3.7′	26°15.6	4.6′	59.4′
2	210°51.9	16°59.5	189°16.1	3.6′	26°20.2	4.4′	59.5′
3	225°51.9	17°00.2	203°38.7	3.6′	26°24.6	4.2′	59.5′
4	240°52.0	00.9	218°01.3	3.5′	26°28.8	4.1′	59.5′
5	255°52.0	01.6	232°23.8	3.5′	26°32.9	3.9′	59.5′
6	270°52.0	N17°02.2	246°46.3	3.4′	N26°36.8	3.6′	59.5′
7	285°52.1	02.9	261°08.7	3.3′	26°40.4	3.5′	59.5′
8	300°52.1	03.6	275°31.0	3.3′	26°43.9	3.3′	59.5′
9	315°52.1	·· 04.3	289°53.3	3.2′	26°47.2	3.2′	59.5′
10	330°52.2	05.0	304°15.5	3.2′	26°50.4	2.9′	59.6′
11	345°52.2	05.6	318°37.7	3.1′	26°53.3	2.7′	59.6′
12	0°52.2	N17°06.3	332°59.9	3.1′	N26°56.0	2.6′	59.6′
13	15°52.3	07.0	347°22.0	3.1′	26°58.6	2.4′	59.6′
14	30°52.3	07.7	1°44.0	3.0′	27°01.0	2.1′	59.6′
15	45°52.3	·· 08.3	16°06.0	3.0′	27°03.1	2.0′	59.6′
16	60°52.4	09.0	30°28.0	3.0′	27°05.1	1.8′	59.6′
17	75°52.4	09.7	44°50.0	2.9′	27°06.9	1.6′	59.6′
18	90°52.4	N17°10.4	59°11.9	2.9′	N27°08.5	1.4′	59.6′
19	105°52.5	11.1	73°33.8	2.9′	27°09.9	1.2′	59.6′
20	120°52.5	11.7	87°55.7	2.9′	27°11.1	1.0′	59.6′
21	135°52.5	·· 12.4	102°17.6	2.8′	27°12.1	0.8′	59.6′
22	150°52.6	13.1	116°39.4	2.8′	27°12.9	0.6′	59.7′
23	165°52.6	13.7	131°01.2	2.8′	27°13.5	0.4′	59.7′
	SD = 15.8′	d = 0.7′	SD = 16.2′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°52.6	N17°14.4	145°23.0	2.8′	N27°13.9	0.2′	59.7′
1	195°52.7	15.1	159°44.8	2.8′	27°14.1	0.1′	59.7′
2	210°52.7	15.8	174°06.6	2.8′	27°14.2	0.2′	59.7′
3	225°52.7	·· 16.4	188°28.4	2.8′	27°14.0	0.4′	59.7′
4	240°52.7	17.1	202°50.2	2.8′	27°13.6	0.5′	59.7′
5	255°52.8	17.8	217°12.0	2.8′	27°13.1	0.8′	59.7′
6	270°52.8	N17°18.4	231°33.8	2.8′	N27°12.3	0.9′	59.7′
7	285°52.8	19.1	245°55.6	2.8′	27°11.4	1.2′	59.7′
8	300°52.9	19.8	260°17.4	2.8′	27°10.2	1.3′	59.7′
9	315°52.9	·· 20.4	274°39.3	2.8′	27°08.9	1.6′	59.7′
10	330°52.9	21.1	289°01.1	2.9′	27°07.3	1.7′	59.7′
11	345°52.9	21.8	303°23.0	2.9′	27°05.6	1.9′	59.7′
12	0°53.0	N17°22.4	317°44.8	2.9′	N27°03.7	2.2′	59.7′
13	15°53.0	23.1	332°06.7	2.9′	27°01.5	2.3′	59.7′
14	30°53.0	23.8	346°28.7	3.0′	26°59.2	2.5′	59.7′
15	45°53.1	·· 24.4	0°50.6	3.0′	26°56.7	2.7′	59.7′
16	60°53.1	25.1	15°12.6	3.0′	26°54.0	2.9′	59.7′
17	75°53.1	25.8	29°34.7	3.1′	26°51.1	3.1′	59.7′
18	90°53.1	N17°26.4	43°56.7	3.1′	N26°48.0	3.3′	59.7′
19	105°53.2	27.1	58°18.8	3.1′	26°44.7	3.4′	59.7′
20	120°53.2	27.8	72°41.0	3.2′	26°41.3	3.7′	59.7′
21	135°53.2	·· 28.4	87°03.2	3.2′	26°37.6	3.9′	59.7′
22	150°53.2	29.1	101°25.4	3.3′	26°33.7	4.0′	59.7′
23	165°53.3	29.7	115°47.7	3.3′	26°29.7	4.2′	59.7′
	SD = 15.8′	d = 0.7′	SD = 16.3′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	////	////	00:31	////	////	////
N 70°	////	////	01:48	22:11	////	////
68°	////	////	02:25	21:32	////	////
66°	////	01:06	02:51	21:05	22:56	////
64°	////	01:52	03:11	20:45	22:05	////
62°	////	02:21	03:27	20:28	21:35	////
60°	00:59	02:43	03:40	20:15	21:13	23:03
N 58°	01:40	03:00	03:52	20:03	20:55	22:17
56°	02:07	03:15	04:02	19:53	20:40	21:49
54°	02:28	03:27	04:10	19:44	20:27	21:28
52°	02:44	03:38	04:18	19:36	20:17	21:11
50°	02:58	03:47	04:25	19:29	20:07	20:57
45°	03:25	04:07	04:40	19:14	19:47	20:29
N 40°	03:46	04:22	04:52	19:01	19:31	20:08
35°	04:02	04:35	05:03	18:51	19:18	19:52
30°	04:15	04:46	05:12	18:42	19:07	19:38
20°	04:36	05:04	05:27	18:26	18:49	19:17
N 10°	04:53	05:19	05:41	18:13	18:35	19:00
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:09	18:35
20°	05:29	05:55	06:18	17:34	17:57	18:24
30°	05:40	06:08	06:33	17:19	17:45	18:13
35°	05:45	06:15	06:42	17:11	17:38	18:08
40°	05:50	06:23	06:51	17:01	17:30	18:02
45°	05:56	06:32	07:03	16:50	17:21	17:56
S 50°	06:03	06:42	07:17	16:36	17:11	17:50
52°	06:05	06:46	07:23	16:30	17:06	17:47
54°	06:08	06:51	07:30	16:22	17:01	17:44
56°	06:12	06:57	07:38	16:15	16:56	17:41
58°	06:15	07:03	07:47	16:06	16:50	17:37
S 60°	06:19	07:09	07:57	15:55	16:43	17:34

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	01:15	▭	▭	▭	▭	▭
64°	02:11	▭	▭	▭	▭	▭
62°	02:45	02:53	03:31	23:43	·· ··	01:18
60°	03:09	03:31	04:21	23:05	·· ··	00:29
N 58°	03:29	03:59	04:52	22:39	23:58	·· ··
56°	03:46	04:20	05:15	22:18	23:34	·· ··
54°	04:00	04:38	05:34	22:00	23:15	·· ··
52°	04:12	04:53	05:50	21:45	22:59	23:56
50°	04:23	05:06	06:04	21:33	22:45	23:43
45°	04:46	05:33	06:33	21:06	22:17	23:16
N 40°	05:05	05:54	06:55	20:45	21:54	22:55
35°	05:20	06:12	07:13	20:28	21:36	22:37
30°	05:34	06:28	07:29	20:13	21:20	22:21
20°	05:57	06:54	07:56	19:47	20:53	21:55
N 10°	06:17	07:16	08:20	19:26	20:30	21:33
0°	06:36	07:38	08:41	19:05	20:08	21:12
S 10°	06:55	07:59	09:03	18:45	19:46	20:50
20°	07:16	08:22	09:26	18:23	19:23	20:28
30°	07:40	08:49	09:53	17:58	18:56	20:01
35°	07:54	09:04	10:09	17:43	18:40	19:45
40°	08:10	09:23	10:28	17:26	18:21	19:27
45°	08:30	09:45	10:50	17:06	17:59	19:05
S 50°	08:55	10:13	11:19	16:40	17:30	18:37
52°	09:07	10:27	11:33	16:28	17:16	18:23
54°	09:21	10:43	11:49	16:14	17:00	18:07
56°	09:37	11:02	12:08	15:57	16:40	17:48
58°	09:56	11:26	12:32	15:38	16:17	17:24
S 60°	10:19	11:57	13:03	15:13	15:45	16:53

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 1-9%
07	03:23	03:25	11:57	12:51	00:21	
08	03:27	03:29	11:57	13:53	01:21	
09	03:30	03:32	11:56	14:56	02:25	

May 10, 11, 12 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	227°34.4	204°40.4	N07°48.6	76°24.4	N13°46.7	86°44.0	N16°20.7	206°43.2	N06°20.1
1	242°36.9	219°40.0	49.7	91°26.0	46.4	101°46.3	20.7	221°45.4	20.2
2	257°39.3	234°39.6	50.8	106°27.7	46.0	116°48.6	20.6	236°47.5	20.3
3	272°41.8	249°39.3	·· 51.9	121°29.3	·· 45.6	131°50.8	·· 20.5	251°49.7	·· 20.5
4	287°44.3	264°38.9	53.1	136°31.0	45.2	146°53.1	20.5	266°51.9	20.6
5	302°46.7	279°38.5	54.2	151°32.7	44.9	161°55.4	20.4	281°54.1	20.7
6	317°49.2	294°38.1	N07°55.3	166°34.3	N13°44.5	176°57.6	N16°20.3	296°56.3	N06°20.8
7	332°51.7	309°37.7	56.4	181°36.0	44.1	191°59.9	20.3	311°58.5	20.9
8	347°54.1	324°37.3	57.6	196°37.6	43.8	207°02.2	20.2	327°00.7	21.0
9	2°56.6	339°37.0	·· 58.7	211°39.3	·· 43.4	222°04.4	·· 20.2	342°02.9	·· 21.1
10	17°59.0	354°36.6	07°59.8	226°40.9	43.0	237°06.7	20.1	357°05.1	21.2
11	33°01.5	9°36.2	08°00.9	241°42.6	42.7	252°09.0	20.0	12°07.3	21.3
12	48°04.0	24°35.8	N08°02.1	256°44.3	N13°42.3	267°11.2	N16°20.0	27°09.4	N06°21.4
13	63°06.4	39°35.4	03.2	271°45.9	41.9	282°13.5	19.9	42°11.6	21.5
14	78°08.9	54°35.0	04.3	286°47.6	41.5	297°15.8	19.8	57°13.8	21.6
15	93°11.4	69°34.6	·· 05.4	301°49.2	·· 41.2	312°18.0	·· 19.8	72°16.0	·· 21.7
16	108°13.8	84°34.3	06.6	316°50.9	40.8	327°20.3	19.7	87°18.2	21.8
17	123°16.3	99°33.9	07.7	331°52.5	40.4	342°22.6	19.6	102°20.4	21.9
18	138°18.8	114°33.5	N08°08.8	346°54.2	N13°40.1	357°24.8	N16°19.6	117°22.6	N06°22.0
19	153°21.2	129°33.1	09.9	1°55.8	39.7	12°27.1	19.5	132°24.8	22.1
20	168°23.7	144°32.7	11.1	16°57.5	39.3	27°29.4	19.4	147°27.0	22.2
21	183°26.2	159°32.3	·· 12.2	31°59.1	·· 38.9	42°31.6	·· 19.4	162°29.2	·· 22.3
22	198°28.6	174°31.9	13.3	47°00.8	38.6	57°33.9	19.3	177°31.4	22.4
23	213°31.1	189°31.6	14.4	62°02.4	38.2	72°36.2	19.2	192°33.5	22.5
Mer.pass. 08:48		ν -0.4′	d 1.1′	m -3.86	ν 1.7′	d 0.4′	m 0.44	ν 2.3′	d 0.1′ m -2.06	ν 2.2′	d 0.1′ m 0.71

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°33.5	204°31.2	N08°15.5	77°04.1	N13°37.8	87°38.4	N16°19.2	207°35.7	N06°22.6
1	243°36.0	219°30.8	16.7	92°05.7	37.4	102°40.7	19.1	222°37.9	22.7
2	258°38.5	234°30.4	17.8	107°07.3	37.1	117°42.9	19.0	237°40.1	22.9
3	273°40.9	249°30.0	·· 18.9	122°09.0	·· 36.7	132°45.2	·· 19.0	252°42.3	·· 23.0
4	288°43.4	264°29.6	20.0	137°10.6	36.3	147°47.5	18.9	267°44.5	23.1
5	303°45.9	279°29.2	21.1	152°12.3	35.9	162°49.7	18.8	282°46.7	23.2
6	318°48.3	294°28.8	N08°22.3	167°13.9	N13°35.6	177°52.0	N16°18.8	297°48.9	N06°23.3
7	333°50.8	309°28.4	23.4	182°15.6	35.2	192°54.3	18.7	312°51.1	23.4
8	348°53.3	324°28.1	24.5	197°17.2	34.8	207°56.5	18.6	327°53.3	23.5
9	3°55.7	339°27.7	·· 25.6	212°18.8	·· 34.4	222°58.8	·· 18.5	342°55.5	·· 23.6
10	18°58.2	354°27.3	26.7	227°20.5	34.1	238°01.0	18.5	357°57.6	23.7
11	34°00.6	9°26.9	27.9	242°22.1	33.7	253°03.3	18.4	12°59.8	23.8
12	49°03.1	24°26.5	N08°29.0	257°23.8	N13°33.3	268°05.6	N16°18.3	28°02.0	N06°23.9
13	64°05.6	39°26.1	30.1	272°25.4	32.9	283°07.8	18.3	43°04.2	24.0
14	79°08.0	54°25.7	31.2	287°27.1	32.6	298°10.1	18.2	58°06.4	24.1
15	94°10.5	69°25.3	·· 32.3	302°28.7	·· 32.2	313°12.3	·· 18.1	73°08.6	·· 24.2
16	109°13.0	84°24.9	33.4	317°30.3	31.8	328°14.6	18.1	88°10.8	24.3
17	124°15.4	99°24.5	34.6	332°32.0	31.4	343°16.9	18.0	103°13.0	24.4
18	139°17.9	114°24.1	N08°35.7	347°33.6	N13°31.1	358°19.1	N16°17.9	118°15.2	N06°24.5
19	154°20.4	129°23.8	36.8	2°35.2	30.7	13°21.4	17.9	133°17.4	24.6
20	169°22.8	144°23.4	37.9	17°36.9	30.3	28°23.6	17.8	148°19.6	24.7
21	184°25.3	159°23.0	·· 39.0	32°38.5	·· 29.9	43°25.9	·· 17.7	163°21.8	·· 24.8
22	199°27.8	174°22.6	40.1	47°40.1	29.5	58°28.1	17.7	178°23.9	24.9
23	214°30.2	189°22.2	41.2	62°41.8	29.2	73°30.4	17.6	193°26.1	25.0
Mer.pass. 08:44		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.46	ν 2.3′	d 0.1′ m -2.05	ν 2.2′	d 0.1′ m 0.71

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	229°32.7	204°21.8	N08°42.4	77°43.4	N13°28.8	88°32.7	N16°17.5	208°28.3	N06°25.1
1	244°35.1	219°21.4	43.5	92°45.0	28.4	103°34.9	17.5	223°30.5	25.2
2	259°37.6	234°21.0	44.6	107°46.7	28.0	118°37.2	17.4	238°32.7	25.3
3	274°40.1	249°20.6	·· 45.7	122°48.3	·· 27.6	133°39.4	·· 17.3	253°34.9	·· 25.4
4	289°42.5	264°20.2	46.8	137°49.9	27.3	148°41.7	17.2	268°37.1	25.5
5	304°45.0	279°19.8	47.9	152°51.6	26.9	163°43.9	17.2	283°39.3	25.6
6	319°47.5	294°19.4	N08°49.0	167°53.2	N13°26.5	178°46.2	N16°17.1	298°41.5	N06°25.7
7	334°49.9	309°19.0	50.1	182°54.8	26.1	193°48.5	17.0	313°43.7	25.8
8	349°52.4	324°18.6	51.3	197°56.5	25.7	208°50.7	17.0	328°45.9	26.0
9	4°54.9	339°18.2	·· 52.4	212°58.1	·· 25.4	223°53.0	·· 16.9	343°48.1	·· 26.1
10	19°57.3	354°17.8	53.5	227°59.7	25.0	238°55.2	16.8	358°50.3	26.2
11	34°59.8	9°17.4	54.6	243°01.3	24.6	253°57.5	16.8	13°52.5	26.3
12	50°02.3	24°17.0	N08°55.7	258°03.0	N13°24.2	268°59.7	N16°16.7	28°54.6	N06°26.4
13	65°04.7	39°16.6	56.8	273°04.6	23.8	284°02.0	16.6	43°56.8	26.5
14	80°07.2	54°16.2	57.9	288°06.2	23.5	299°04.2	16.5	58°59.0	26.6
15	95°09.6	69°15.8	08°59.0	303°07.9	·· 23.1	314°06.5	·· 16.5	74°01.2	·· 26.7
16	110°12.1	84°15.4	09°00.1	318°09.5	22.7	329°08.7	16.4	89°03.4	26.8
17	125°14.6	99°15.0	01.2	333°11.1	22.3	344°11.0	16.3	104°05.6	26.9
18	140°17.0	114°14.6	N09°02.3	348°12.7	N13°21.9	359°13.2	N16°16.3	119°07.8	N06°27.0
19	155°19.5	129°14.2	03.5	3°14.4	21.5	14°15.5	16.2	134°10.0	27.1
20	170°22.0	144°13.8	04.6	18°16.0	21.2	29°17.7	16.1	149°12.2	27.2
21	185°24.4	159°13.4	·· 05.7	33°17.6	·· 20.8	44°20.0	·· 16.0	164°14.4	·· 27.3
22	200°26.9	174°13.0	06.8	48°19.2	20.4	59°22.2	16.0	179°16.6	27.4
23	215°29.4	189°12.6	07.9	63°20.8	20.0	74°24.5	15.9	194°18.8	27.5
Mer.pass. 08:40		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.48	ν 2.3′	d 0.1′ m -2.04	ν 2.2′	d 0.1′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.6	-42°09.3
Schedar	349°29.3	56°41.1
Diphda	348°45.6	-17°50.1
Achernar	335°19.3	-57°05.7
Hamal	327°49.4	23°35.4
Polaris	313°31.1	89°22.7
Acamar	315°10.8	-40°11.7
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°51.9	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.6
Avior	234°14.1	-59°36.2
Suhail	222°44.9	-43°32.9
Miaplacidus	221°37.9	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.4	61°36.4
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.4	-63°15.4
Gacrux	171°49.0	-57°16.3
Alioth	166°10.9	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.4
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°37.0	-60°57.0
Kochab	137°18.7	74°02.5
Zuben'ubi	136°53.6	-16°09.5
Alphecca	126°01.8	26°37.2
Antares	112°13.1	-26°29.6
Atria	107°05.1	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.3
Rasalhague	95°56.5	12°32.3
Eltanin	90°40.9	51°28.9
Kaus Aust.	83°29.7	-34°22.2
Vega	80°31.6	38°48.3
Nunki	75°45.2	-26°15.7
Altair	61°58.0	8°56.4
Peacock	53°02.6	-56°38.5
Deneb	49°24.4	45°22.4
Enif	33°36.9	10°00.0
Al Na'ir	27°30.6	-46°49.4
Fomalhaut	15°12.6	-29°28.5
Scheat	13°43.5	28°13.7
Markab	13°28.1	15°21.1

May 10 Mon	SHA	Mer.pass
Venus	337°06.0	10:22
Mars	208°50.0	18:52
Jupiter	219°09.6	18:10
Saturn	339°08.8	10:12

May 11 Tue	SHA	Mer.pass
Venus	335°57.6	10:22
Mars	208°30.5	18:50
Jupiter	219°04.9	18:07
Saturn	339°02.2	10:08

May 12 Wed	SHA	Mer.pass
Venus	334°49.1	10:23
Mars	208°10.7	18:47
Jupiter	219°00.0	18:03
Saturn	338°55.7	10:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1332 sec ΔT = TT-UT1 = +69.3172 sec

2027 May 10 to May. 12 UT

h

Mon	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	180°53.3	N17°30.4	130°10.1	3.4′	N26°25.5	4.4′	59.7′
1	195°53.3	31.1	144°32.5	3.5′	26°21.1	4.6′	59.7′
2	210°53.3	31.7	158°54.9	3.5′	26°16.5	4.8′	59.7′
3	225°53.4	·· 32.4	173°17.4	3.6′	26°11.7	5.0′	59.7′
4	240°53.4	33.0	187°40.0	3.6′	26°06.7	5.1′	59.7′
5	255°53.4	33.7	202°02.6	3.7′	26°01.6	5.3′	59.7′
6	270°53.4	N17°34.3	216°25.3	3.8′	N25°56.3	5.5′	59.7′
7	285°53.5	35.0	230°48.1	3.8′	25°50.8	5.7′	59.7′
8	300°53.5	35.7	245°10.9	3.9′	25°45.1	5.9′	59.7′
9	315°53.5	·· 36.3	259°33.9	4.0′	25°39.2	6.0′	59.7′
10	330°53.5	37.0	273°56.8	4.1′	25°33.2	6.2′	59.7′
11	345°53.6	37.6	288°19.9	4.1′	25°27.0	6.4′	59.7′
12	0°53.6	N17°38.3	302°43.0	4.2′	N25°20.6	6.6′	59.7′
13	15°53.6	38.9	317°06.2	4.3′	25°14.0	6.7′	59.7′
14	30°53.6	39.6	331°29.5	4.4′	25°07.3	6.9′	59.7′
15	45°53.6	·· 40.2	345°52.9	4.5′	25°00.4	7.1′	59.7′
16	60°53.7	40.9	0°16.4	4.5′	24°53.3	7.2′	59.7′
17	75°53.7	41.5	14°39.9	4.6′	24°46.1	7.4′	59.7′
18	90°53.7	N17°42.2	29°03.6	4.7′	N24°38.7	7.6′	59.7′
19	105°53.7	42.8	43°27.3	4.8′	24°31.1	7.7′	59.7′
20	120°53.7	43.5	57°51.1	4.9′	24°23.4	7.9′	59.6′
21	135°53.8	·· 44.1	72°15.0	5.0′	24°15.5	8.1′	59.6′
22	150°53.8	44.8	86°39.0	5.1′	24°07.4	8.2′	59.6′
23	165°53.8	45.4	101°03.0	5.2′	23°59.2	8.4′	59.6′
	SD = 15.8′	d = 0.7′		SD = 16.3′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.8	N17°46.1	115°27.2	5.3′	N23°50.8	8.5′	59.6′
1	195°53.8	46.7	129°51.5	5.4′	23°42.3	8.7′	59.6′
2	210°53.9	47.4	144°15.9	5.5′	23°33.6	8.8′	59.6′
3	225°53.9	·· 48.0	158°40.3	5.6′	23°24.8	9.0′	59.6′
4	240°53.9	48.7	173°04.9	5.7′	23°15.8	9.1′	59.6′
5	255°53.9	49.3	187°29.5	5.8′	23°06.7	9.2′	59.6′
6	270°53.9	N17°50.0	201°54.3	5.9′	N22°57.5	9.5′	59.6′
7	285°53.9	50.6	216°19.2	6.0′	22°48.0	9.5′	59.6′
8	300°54.0	51.2	230°44.1	6.1′	22°38.5	9.7′	59.6′
9	315°54.0	·· 51.9	245°09.2	6.2′	22°28.8	9.9′	59.5′
10	330°54.0	52.5	259°34.3	6.3′	22°18.9	9.9′	59.5′
11	345°54.0	53.2	273°59.6	6.4′	22°09.0	10.2′	59.5′
12	0°54.0	N17°53.8	288°25.0	6.5′	N21°58.8	10.2′	59.5′
13	15°54.0	54.5	302°50.4	6.6′	21°48.6	10.4′	59.5′
14	30°54.1	55.1	317°16.0	6.7′	21°38.2	10.5′	59.5′
15	45°54.1	·· 55.7	331°41.7	6.8′	21°27.7	10.7′	59.5′
16	60°54.1	56.4	346°07.4	6.9′	21°17.0	10.7′	59.5′
17	75°54.1	57.0	0°33.3	7.0′	21°06.3	10.9′	59.5′
18	90°54.1	N17°57.6	14°59.3	7.1′	N20°55.4	11.1′	59.5′
19	105°54.1	58.3	29°25.4	7.2′	20°44.3	11.1′	59.4′
20	120°54.2	58.9	43°51.6	7.3′	20°33.2	11.3′	59.4′
21	135°54.2	17°59.6	58°17.9	7.4′	20°21.9	11.4′	59.4′
22	150°54.2	18°00.2	72°44.3	7.5′	20°10.5	11.5′	59.4′
23	165°54.2	00.8	87°10.8	7.6′	19°59.0	11.6′	59.4′
	SD = 15.8′	d = 0.6′		SD = 16.3′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.2	N18°01.5	101°37.4	7.7′	N19°47.4	11.7′	59.4′
1	195°54.2	02.1	116°04.1	7.8′	19°35.7	11.9′	59.4′
2	210°54.2	02.7	130°30.9	7.9′	19°23.8	11.9′	59.4′
3	225°54.2	·· 03.4	144°57.8	8.0′	19°11.9	12.1′	59.4′
4	240°54.3	04.0	159°24.8	8.1′	18°59.8	12.1′	59.3′
5	255°54.3	04.6	173°52.0	8.2′	18°47.7	12.3′	59.3′
6	270°54.3	N18°05.3	188°19.2	8.3′	N18°35.4	12.4′	59.3′
7	285°54.3	05.9	202°46.5	8.4′	18°23.0	12.5′	59.3′
8	300°54.3	06.5	217°13.9	8.5′	18°10.5	12.6′	59.3′
9	315°54.3	·· 07.2	231°41.5	8.6′	17°57.9	12.6′	59.3′
10	330°54.3	07.8	246°09.1	8.7′	17°45.3	12.8′	59.3′
11	345°54.3	08.4	260°36.8	8.8′	17°32.5	12.9′	59.2′
12	0°54.4	N18°09.0	275°04.6	8.9′	N17°19.6	12.9′	59.2′
13	15°54.4	09.7	289°32.6	9.0′	17°06.7	13.1′	59.2′
14	30°54.4	10.3	304°00.6	9.1′	16°53.6	13.1′	59.2′
15	45°54.4	·· 10.9	318°28.7	9.2′	16°40.5	13.3′	59.2′
16	60°54.4	11.6	332°56.9	9.3′	16°27.2	13.3′	59.2′
17	75°54.4	12.2	347°25.2	9.4′	16°13.9	13.4′	59.2′
18	90°54.4	N18°12.8	1°53.6	9.5′	N16°00.5	13.5′	59.1′
19	105°54.4	13.4	16°22.1	9.6′	15°47.0	13.5′	59.1′
20	120°54.4	14.1	30°50.7	9.7′	15°33.5	13.7′	59.1′
21	135°54.4	·· 14.7	45°19.4	9.8′	15°19.8	13.7′	59.1′
22	150°54.4	15.3	59°48.1	9.9′	15°06.1	13.8′	59.1′
23	165°54.5	15.9	74°17.0	9.9′	14°52.3	13.8′	59.1′
	SD = 15.8′	d = 0.6′		SD = 16.2′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	01:25	22:35	////	////
68°	////	////	02:10	21:47	////	////
66°	////	00:29	02:39	21:17	////	////
64°	////	01:35	03:01	20:54	22:22	////
62°	////	02:09	03:18	20:36	21:47	////
60°	00:26	02:33	03:33	20:22	21:22	////
N 58°	01:26	02:52	03:45	20:09	21:03	22:32
56°	01:56	03:07	03:55	19:59	20:47	21:59
54°	02:19	03:21	04:05	19:49	20:34	21:36
52°	02:37	03:32	04:13	19:41	20:22	21:18
50°	02:51	03:42	04:20	19:33	20:12	21:03
45°	03:20	04:03	04:36	19:17	19:51	20:34
N 40°	03:42	04:19	04:49	19:04	19:35	20:12
35°	03:59	04:32	05:00	18:53	19:21	19:55
30°	04:13	04:44	05:10	18:44	19:10	19:41
20°	04:35	05:02	05:26	18:27	18:51	19:18
N 10°	04:52	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:06	17:47	18:09	18:34
20°	05:30	05:56	06:20	17:33	17:56	18:23
30°	05:41	06:10	06:35	17:17	17:43	18:11
35°	05:47	06:17	06:44	17:08	17:35	18:06
40°	05:53	06:26	06:54	16:58	17:27	17:59
45°	05:59	06:35	07:06	16:46	17:18	17:53
S 50°	06:06	06:46	07:21	16:31	17:07	17:46
52°	06:09	06:50	07:28	16:25	17:02	17:43
54°	06:13	06:56	07:35	16:17	16:56	17:39
56°	06:16	07:02	07:43	16:09	16:50	17:36
58°	06:20	07:08	07:53	15:59	16:44	17:32
S 60°	06:24	07:15	08:04	15:48	16:37	17:28

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	07:11	▭	▭	04:01
68°	▭	▭	07:56	▭	▭	03:14
66°	▭	05:48	08:26	▭	03:23	02:44
64°	03:34	06:38	08:48	03:29	02:33	02:21
62°	05:09	07:09	09:05	01:53	02:01	02:02
60°	05:46	07:32	09:19	01:16	01:37	01:47
N 58°	06:13	07:51	09:32	00:49	01:18	01:33
56°	06:33	08:06	09:42	00:28	01:01	01:22
54°	06:51	08:19	09:51	00:11	00:48	01:12
52°	07:05	08:31	10:00	·· ··	00:35	01:03
50°	07:18	08:41	10:07	·· ··	00:25	00:55
45°	07:44	09:03	10:23	·· ··	00:02	00:38
N 40°	08:05	09:20	10:36	23:44	·· ··	00:23
35°	08:22	09:35	10:47	23:28	·· ··	00:11
30°	08:37	09:47	10:56	23:15	·· ··	00:01
20°	09:02	10:08	11:12	22:52	23:42	·· ··
N 10°	09:24	10:27	11:26	22:32	23:26	·· ··
0°	09:44	10:44	11:40	22:13	23:11	·· ··
S 10°	10:04	11:01	11:53	21:54	22:56	23:54
20°	10:26	11:19	12:07	21:34	22:39	23:42
30°	10:51	11:40	12:23	21:10	22:20	23:28
35°	11:06	11:53	12:32	20:56	22:09	23:20
40°	11:23	12:07	12:42	20:40	21:56	23:11
45°	11:43	12:23	12:54	20:21	21:41	23:00
S 50°	12:08	12:43	13:09	19:56	21:22	22:47
52°	12:20	12:53	13:16	19:44	21:13	22:41
54°	12:34	13:04	13:24	19:31	21:03	22:34
56°	12:50	13:16	13:32	19:15	20:51	22:27
58°	13:10	13:30	13:42	18:57	20:38	22:18
S 60°	13:33	13:46	13:52	18:33	20:22	22:09

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 16-37%
10	03:33	03:34	11:56	15:59	03:28	
11	03:35	03:36	11:56	16:58	04:29	
12	03:37	03:37	11:56	17:52	05:25	

May 13, 14, 15 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230°31.8	204°12.2	N09°09.0	78°22.5	N13°19.6	89°26.7	N16°15.8	209°21.0	N06°27.6
1	245°34.3	219°11.8	10.1	93°24.1	19.2	104°29.0	15.8	224°23.2	27.7
2	260°36.8	234°11.4	11.2	108°25.7	18.8	119°31.2	15.7	239°25.4	27.8
3	275°39.2	249°11.0	·· 12.3	123°27.3	·· 18.5	134°33.5	·· 15.6	254°27.5	·· 27.9
4	290°41.7	264°10.6	13.4	138°28.9	18.1	149°35.7	15.6	269°29.7	28.0
5	305°44.1	279°10.2	14.5	153°30.6	17.7	164°38.0	15.5	284°31.9	28.1
6	320°46.6	294°09.8	N09°15.6	168°32.2	N13°17.3	179°40.2	N16°15.4	299°34.1	N06°28.2
7	335°49.1	309°09.4	16.7	183°33.8	16.9	194°42.5	15.3	314°36.3	28.3
8	350°51.5	324°09.0	17.8	198°35.4	16.5	209°44.7	15.3	329°38.5	28.4
9	5°54.0	339°08.6	·· 18.9	213°37.0	·· 16.2	224°47.0	·· 15.2	344°40.7	·· 28.5
10	20°56.5	354°08.2	20.0	228°38.6	15.8	239°49.2	15.1	359°42.9	28.6
11	35°58.9	9°07.8	21.1	243°40.3	15.4	254°51.5	15.0	14°45.1	28.7
12	51°01.4	24°07.4	N09°22.2	258°41.9	N13°15.0	269°53.7	N16°15.0	29°47.3	N06°28.8
13	66°03.9	39°07.0	23.3	273°43.5	14.6	284°56.0	14.9	44°49.5	28.9
14	81°06.3	54°06.6	24.4	288°45.1	14.2	299°58.2	14.8	59°51.7	29.0
15	96°08.8	69°06.2	·· 25.5	303°46.7	·· 13.8	315°00.5	·· 14.8	74°53.9	·· 29.1
16	111°11.2	84°05.8	26.6	318°48.3	13.4	330°02.7	14.7	89°56.1	29.2
17	126°13.7	99°05.4	27.7	333°49.9	13.1	345°05.0	14.6	104°58.3	29.3
18	141°16.2	114°05.0	N09°28.8	348°51.5	N13°12.7	0°07.2	N16°14.5	120°00.5	N06°29.4
19	156°18.6	129°04.6	29.9	3°53.2	12.3	15°09.5	14.5	135°02.7	29.5
20	171°21.1	144°04.2	31.0	18°54.8	11.9	30°11.7	14.4	150°04.8	29.6
21	186°23.6	159°03.8	·· 32.1	33°56.4	·· 11.5	45°14.0	·· 14.3	165°07.0	·· 29.7
22	201°26.0	174°03.3	33.2	48°58.0	11.1	60°16.2	14.2	180°09.2	29.8
23	216°28.5	189°02.9	34.3	63°59.6	10.7	75°18.4	14.2	195°11.4	29.9
Mer.pass. 08:36		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.49	ν 2.3′	d 0.1′ m -2.04	ν 2.2′	d 0.1′ m 0.71

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231°31.0	204°02.5	N09°35.4	79°01.2	N13°10.3	90°20.7	N16°14.1	210°13.6	N06°30.0
1	246°33.4	219°02.1	36.5	94°02.8	09.9	105°22.9	14.0	225°15.8	30.1
2	261°35.9	234°01.7	37.6	109°04.4	09.6	120°25.2	14.0	240°18.0	30.2
3	276°38.4	249°01.3	·· 38.7	124°06.0	·· 09.2	135°27.4	·· 13.9	255°20.2	·· 30.3
4	291°40.8	264°00.9	39.8	139°07.6	08.8	150°29.7	13.8	270°22.4	30.4
5	306°43.3	279°00.5	40.9	154°09.2	08.4	165°31.9	13.7	285°24.6	30.5
6	321°45.7	294°00.1	N09°42.0	169°10.8	N13°08.0	180°34.1	N16°13.7	300°26.8	N06°30.6
7	336°48.2	308°59.7	43.1	184°12.5	07.6	195°36.4	13.6	315°29.0	30.7
8	351°50.7	323°59.3	44.2	199°14.1	07.2	210°38.6	13.5	330°31.2	30.9
9	6°53.1	338°58.8	·· 45.3	214°15.7	·· 06.8	225°40.9	·· 13.4	345°33.4	·· 31.0
10	21°55.6	353°58.4	46.4	229°17.3	06.4	240°43.1	13.4	0°35.6	31.1
11	36°58.1	8°58.0	47.5	244°18.9	06.0	255°45.4	13.3	15°37.8	31.2
12	52°00.5	23°57.6	N09°48.6	259°20.5	N13°05.6	270°47.6	N16°13.2	30°40.0	N06°31.3
13	67°03.0	38°57.2	49.7	274°22.1	05.3	285°49.8	13.1	45°42.2	31.4
14	82°05.5	53°56.8	50.8	289°23.7	04.9	300°52.1	13.1	60°44.4	31.5
15	97°07.9	68°56.4	·· 51.9	304°25.3	·· 04.5	315°54.3	·· 13.0	75°46.6	·· 31.6
16	112°10.4	83°56.0	52.9	319°26.9	04.1	330°56.6	12.9	90°48.8	31.7
17	127°12.8	98°55.6	54.0	334°28.5	03.7	345°58.8	12.8	105°51.0	31.8
18	142°15.3	113°55.1	N09°55.1	349°30.1	N13°03.3	1°01.0	N16°12.8	120°53.1	N06°31.9
19	157°17.8	128°54.7	56.2	4°31.7	02.9	16°03.3	12.7	135°55.3	32.0
20	172°20.2	143°54.3	57.3	19°33.3	02.5	31°05.5	12.6	150°57.5	32.1
21	187°22.7	158°53.9	·· 58.4	34°34.9	·· 02.1	46°07.8	·· 12.5	165°59.7	·· 32.2
22	202°25.2	173°53.5	09°59.5	49°36.5	01.7	61°10.0	12.5	181°01.9	32.3
23	217°27.6	188°53.1	10°00.6	64°38.1	01.3	76°12.2	12.4	196°04.1	32.4
Mer.pass. 08:33		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.51	ν 2.2′	d 0.1′ m -2.03	ν 2.2′	d 0.1′ m 0.71

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	232°30.1	203°52.6	N10°01.7	79°39.7	N13°00.9	91°14.5	N16°12.3	211°06.3	N06°32.5
1	247°32.6	218°52.2	02.8	94°41.3	00.5	106°16.7	12.2	226°08.5	32.6
2	262°35.0	233°51.8	03.8	109°42.8	13°00.1	121°19.0	12.2	241°10.7	32.7
3	277°37.5	248°51.4	·· 04.9	124°44.4	12°59.7	136°21.2	·· 12.1	256°12.9	·· 32.8
4	292°40.0	263°51.0	06.0	139°46.0	59.3	151°23.4	12.0	271°15.1	32.9
5	307°42.4	278°50.6	07.1	154°47.6	59.0	166°25.7	11.9	286°17.3	33.0
6	322°44.9	293°50.2	N10°08.2	169°49.2	N12°58.6	181°27.9	N16°11.9	301°19.5	N06°33.1
7	337°47.3	308°49.7	09.3	184°50.8	58.2	196°30.1	11.8	316°21.7	33.2
8	352°49.8	323°49.3	10.4	199°52.4	57.8	211°32.4	11.7	331°23.9	33.3
9	7°52.3	338°48.9	·· 11.5	214°54.0	·· 57.4	226°34.6	·· 11.6	346°26.1	·· 33.4
10	22°54.7	353°48.5	12.5	229°55.6	57.0	241°36.8	11.6	1°28.3	33.5
11	37°57.2	8°48.1	13.6	244°57.2	56.6	256°39.1	11.5	16°30.5	33.6
12	52°59.7	23°47.6	N10°14.7	259°58.8	N12°56.2	271°41.3	N16°11.4	31°32.7	N06°33.7
13	68°02.1	38°47.2	15.8	275°00.4	55.8	286°43.5	11.3	46°34.9	33.8
14	83°04.6	53°46.8	16.9	290°02.0	55.4	301°45.8	11.3	61°37.1	33.9
15	98°07.1	68°46.4	·· 18.0	305°03.5	·· 55.0	316°48.0	·· 11.2	76°39.3	·· 34.0
16	113°09.5	83°46.0	19.0	320°05.1	54.6	331°50.3	11.1	91°41.5	34.1
17	128°12.0	98°45.5	20.1	335°06.7	54.2	346°52.5	11.0	106°43.7	34.2
18	143°14.5	113°45.1	N10°21.2	350°08.3	N12°53.8	1°54.7	N16°11.0	121°45.9	N06°34.3
19	158°16.9	128°44.7	22.3	5°09.9	53.4	16°57.0	10.9	136°48.1	34.4
20	173°19.4	143°44.3	23.4	20°11.5	53.0	31°59.2	10.8	151°50.3	34.5
21	188°21.8	158°43.9	·· 24.5	35°13.1	·· 52.6	47°01.4	·· 10.7	166°52.5	·· 34.6
22	203°24.3	173°43.4	25.5	50°14.6	52.2	62°03.7	10.6	181°54.7	34.7
23	218°26.8	188°43.0	26.6	65°16.2	51.8	77°05.9	10.6	196°56.9	34.8
Mer.pass. 08:29		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.52	ν 2.2′	d 0.1′ m -2.02	ν 2.2′	d 0.1′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.6	-42°09.3
Schedar	349°29.2	56°41.1
Diphda	348°45.6	-17°50.1
Achernar	335°19.3	-57°05.7
Hamal	327°49.3	23°35.4
Polaris	313°30.9	89°22.7
Acamar	315°10.8	-40°11.7
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.2	-59°36.2
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.0	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.5	61°36.4
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.4	-63°15.4
Gacrux	171°49.0	-57°16.3
Alioth	166°10.9	55°48.7
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.5
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.7	74°02.5
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.8	26°37.2
Antares	112°13.1	-26°29.6
Atria	107°05.1	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.3
Rasalhague	95°56.5	12°32.3
Eltanin	90°40.9	51°28.9
Kaus Aust.	83°29.7	-34°22.2
Vega	80°31.6	38°48.3
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.4
Peacock	53°02.6	-56°38.5
Deneb	49°24.4	45°22.4
Enif	33°36.9	10°00.0
Al Na'ir	27°30.6	-46°49.4
Fomalhaut	15°12.5	-29°28.5
Scheat	13°43.5	28°13.7
Markab	13°28.1	15°21.1

May 13 Thu	SHA	Mer.pass
Venus	333°40.4	10:23
Mars	207°50.6	18:44
Jupiter	218°54.9	18:00
Saturn	338°49.1	10:01

May 14 Fri	SHA	Mer.pass
Venus	332°31.6	10:24
Mars	207°30.2	18:42
Jupiter	218°49.7	17:56
Saturn	338°42.7	09:58

May 15 Sat	SHA	Mer.pass
Venus	331°22.6	10:25
Mars	207°09.6	18:39
Jupiter	218°44.4	17:52
Saturn	338°36.2	09:54

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°54.5	N18°16.5	88°45.9	10.0′	N14°38.5	14.0′	59.1′
1	195°54.5	17.2	103°15.0	10.1′	14°24.5	14.0′	59.0′
2	210°54.5	17.8	117°44.1	10.2′	14°10.5	14.1′	59.0′
3	225°54.5	·· 18.4	132°13.3	10.3′	13°56.4	14.1′	59.0′
4	240°54.5	19.0	146°42.6	10.4′	13°42.3	14.2′	59.0′
5	255°54.5	19.6	161°12.0	10.5′	13°28.1	14.3′	59.0′
6	270°54.5	N18°20.3	175°41.5	10.5′	N13°13.8	14.4′	59.0′
7	285°54.5	20.9	190°11.0	10.6′	12°59.4	14.4′	58.9′
8	300°54.5	21.5	204°40.6	10.7′	12°45.0	14.4′	58.9′
9	315°54.5	·· 22.1	219°10.3	10.8′	12°30.6	14.5′	58.9′
10	330°54.5	22.7	233°40.1	10.9′	12°16.1	14.6′	58.9′
11	345°54.5	23.4	248°10.0	10.9′	12°01.5	14.6′	58.9′
12	0°54.5	N18°24.0	262°39.9	11.0′	N11°46.9	14.7′	58.9′
13	15°54.5	24.6	277°09.9	11.1′	11°32.2	14.8′	58.8′
14	30°54.5	25.2	291°40.0	11.2′	11°17.4	14.7′	58.8′
15	45°54.6	·· 25.8	306°10.2	11.2′	11°02.7	14.9′	58.8′
16	60°54.6	26.4	320°40.4	11.3′	10°47.8	14.9′	58.8′
17	75°54.6	27.0	335°10.7	11.4′	10°32.9	14.9′	58.8′
18	90°54.6	N18°27.7	349°41.1	11.4′	N10°18.0	15.0′	58.8′
19	105°54.6	28.3	4°11.6	11.5′	10°03.0	15.0′	58.7′
20	120°54.6	28.9	18°42.1	11.6′	09°48.0	15.0′	58.7′
21	135°54.6	·· 29.5	33°12.7	11.6′	09°33.0	15.1′	58.7′
22	150°54.6	30.1	47°43.3	11.7′	09°17.9	15.2′	58.7′
23	165°54.6	30.7	62°14.0	11.8′	09°02.7	15.1′	58.7′
	SD = 15.8′	d = 0.6′	SD = 16.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°54.6	N18°31.3	76°44.8	11.8′	N08°47.6	15.2′	58.7′
1	195°54.6	31.9	91°15.6	11.9′	08°32.4	15.3′	58.6′
2	210°54.6	32.5	105°46.5	12.0′	08°17.1	15.2′	58.6′
3	225°54.6	·· 33.1	120°17.5	12.0′	08°01.9	15.4′	58.6′
4	240°54.6	33.7	134°48.5	12.1′	07°46.5	15.3′	58.6′
5	255°54.6	34.4	149°19.5	12.1′	07°31.2	15.3′	58.6′
6	270°54.6	N18°35.0	163°50.6	12.2′	N07°15.9	15.4′	58.6′
7	285°54.6	35.6	178°21.8	12.2′	07°00.5	15.4′	58.5′
8	300°54.6	36.2	192°53.0	12.3′	06°45.1	15.5′	58.5′
9	315°54.6	·· 36.8	207°24.3	12.3′	06°29.6	15.4′	58.5′
10	330°54.6	37.4	221°55.6	12.4′	06°14.2	15.5′	58.5′
11	345°54.6	38.0	236°27.0	12.4′	05°58.7	15.5′	58.5′
12	0°54.6	N18°38.6	250°58.4	12.5′	N05°43.2	15.5′	58.4′
13	15°54.6	39.2	265°29.9	12.5′	05°27.7	15.6′	58.4′
14	30°54.6	39.8	280°01.4	12.6′	05°12.1	15.5′	58.4′
15	45°54.6	·· 40.4	294°33.0	12.6′	04°56.6	15.6′	58.4′
16	60°54.6	41.0	309°04.6	12.6′	04°41.0	15.6′	58.4′
17	75°54.6	41.6	323°36.2	12.7′	04°25.4	15.6′	58.4′
18	90°54.6	N18°42.2	338°07.9	12.7′	N04°09.8	15.6′	58.3′
19	105°54.6	42.8	352°39.6	12.8′	03°54.2	15.6′	58.3′
20	120°54.6	43.4	7°11.4	12.8′	03°38.6	15.6′	58.3′
21	135°54.6	·· 44.0	21°43.2	12.8′	03°23.0	15.6′	58.3′
22	150°54.6	44.6	36°15.0	12.9′	03°07.4	15.7′	58.3′
23	165°54.6	45.2	50°46.8	12.9′	02°51.7	15.6′	58.2′
	SD = 15.8′	d = 0.6′	SD = 16.0′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°54.6	N18°45.8	65°18.7	12.9′	N02°36.1	15.7′	58.2′
1	195°54.6	46.4	79°50.6	12.9′	02°20.4	15.6′	58.2′
2	210°54.5	47.0	94°22.6	13.0′	02°04.8	15.6′	58.2′
3	225°54.5	·· 47.6	108°54.6	13.0′	01°49.2	15.7′	58.2′
4	240°54.5	48.2	123°26.6	13.0′	01°33.5	15.6′	58.2′
5	255°54.5	48.7	137°58.6	13.1′	01°17.9	15.7′	58.1′
6	270°54.5	N18°49.3	152°30.7	13.1′	N01°02.2	15.6′	58.1′
7	285°54.5	49.9	167°02.7	13.1′	00°46.6	15.6′	58.1′
8	300°54.5	50.5	181°34.8	13.1′	00°31.0	15.6′	58.1′
9	315°54.5	·· 51.1	196°07.0	13.1′	N00°15.4	15.6′	58.1′
10	330°54.5	51.7	210°39.1	13.2′	S00°00.2	15.6′	58.0′
11	345°54.5	52.3	225°11.3	13.2′	00°15.8	15.6′	58.0′
12	0°54.5	N18°52.9	239°43.4	13.2′	S00°31.4	15.6′	58.0′
13	15°54.5	53.5	254°15.6	13.2′	00°47.0	15.6′	58.0′
14	30°54.5	54.1	268°47.8	13.2′	01°02.6	15.5′	58.0′
15	45°54.5	·· 54.6	283°20.0	13.2′	01°18.1	15.6′	57.9′
16	60°54.5	55.2	297°52.3	13.2′	01°33.7	15.5′	57.9′
17	75°54.5	55.8	312°24.5	13.2′	01°49.2	15.5′	57.9′
18	90°54.5	N18°56.4	326°56.8	13.3′	S02°04.7	15.5′	57.9′
19	105°54.4	57.0	341°29.0	13.3′	02°20.2	15.4′	57.9′
20	120°54.4	57.6	356°01.3	13.3′	02°35.6	15.5′	57.8′
21	135°54.4	·· 58.2	10°33.5	13.3′	02°51.1	15.4′	57.8′
22	150°54.4	58.7	25°05.8	13.3′	03°06.5	15.4′	57.8′
23	165°54.4	59.3	39°38.1	13.3′	03°21.9	15.3′	57.8′
	SD = 15.8′	d = 0.6′	SD = 15.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	00:57	23:08	////	////
68°	////	////	01:54	22:03	////	////
66°	////	////	02:27	21:29	////	////
64°	////	01:17	02:51	21:04	22:42	////
62°	////	01:57	03:10	20:45	22:00	////
60°	////	02:23	03:25	20:29	21:32	////
N 58°	01:09	02:44	03:38	20:16	21:11	22:49
56°	01:45	03:00	03:50	20:04	20:54	22:11
54°	02:10	03:14	03:59	19:54	20:40	21:45
52°	02:29	03:26	04:08	19:46	20:28	21:25
50°	02:45	03:37	04:16	19:38	20:17	21:09
45°	03:15	03:59	04:33	19:21	19:55	20:38
N 40°	03:38	04:16	04:46	19:07	19:38	20:16
35°	03:56	04:30	04:58	18:56	19:24	19:58
30°	04:10	04:41	05:07	18:46	19:12	19:43
20°	04:33	05:01	05:24	18:28	18:52	19:20
N 10°	04:51	05:17	05:39	18:14	18:36	19:02
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:58	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:15	17:41	18:10
35°	05:49	06:20	06:46	17:06	17:33	18:03
40°	05:55	06:28	06:57	16:55	17:24	17:57
45°	06:02	06:38	07:10	16:43	17:14	17:50
S 50°	06:10	06:49	07:25	16:27	17:03	17:42
52°	06:13	06:55	07:32	16:20	16:58	17:39
54°	06:17	07:00	07:40	16:12	16:52	17:35
56°	06:21	07:07	07:49	16:03	16:45	17:31
58°	06:25	07:14	07:59	15:53	16:39	17:27
S 60°	06:29	07:21	08:11	15:42	16:31	17:22

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	09:38	12:07	14:21	03:26	02:40	02:06
N 70°	10:01	12:15	14:19	03:01	02:29	02:04
68°	10:18	12:22	14:18	02:41	02:19	02:02
66°	10:33	12:27	14:17	02:25	02:12	02:00
64°	10:44	12:32	14:16	02:12	02:05	01:58
62°	10:54	12:36	14:15	02:01	01:59	01:57
60°	11:02	12:40	14:14	01:51	01:54	01:56
N 58°	11:09	12:43	14:13	01:43	01:50	01:55
56°	11:16	12:46	14:13	01:36	01:46	01:54
54°	11:21	12:48	14:12	01:29	01:42	01:53
52°	11:27	12:50	14:12	01:23	01:39	01:52
50°	11:31	12:52	14:11	01:18	01:36	01:51
45°	11:41	12:57	14:10	01:06	01:29	01:50
N 40°	11:49	13:00	14:09	00:56	01:24	01:49
35°	11:56	13:04	14:09	00:47	01:19	01:47
30°	12:02	13:06	14:08	00:40	01:14	01:46
20°	12:13	13:11	14:07	00:27	01:07	01:45
N 10°	12:22	13:15	14:06	00:15	01:00	01:43
0°	12:31	13:19	14:06	00:04	00:54	01:41
S 10°	12:40	13:23	14:05	·· ··	00:48	01:40
20°	12:49	13:27	14:04	·· ··	00:41	01:38
30°	12:59	13:32	14:03	·· ··	00:33	01:36
35°	13:05	13:35	14:03	·· ··	00:29	01:35
40°	13:12	13:38	14:02	·· ··	00:24	01:34
45°	13:20	13:41	14:01	·· ··	00:17	01:32
S 50°	13:29	13:46	14:01	·· ··	00:10	01:30
52°	13:33	13:47	14:00	·· ··	00:07	01:29
54°	13:38	13:50	14:00	·· ··	00:03	01:28
56°	13:43	13:52	14:00	23:59	·· ··	01:27
58°	13:49	13:54	13:59	23:54	·· ··	01:26
S 60°	13:56	13:57	13:59	23:49	·· ··	01:25

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 48-70%
13	03:38	03:38	11:56	18:43	06:18	
14	03:38	03:38	11:56	19:30	07:07	
15	03:38	03:38	11:56	20:16	07:53	

May 16, 17, 18 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	233°29.2	203°42.6	N10°27.7	80°17.8	N12°51.4	92°08.1	N16°10.5	211°59.1	N06°34.9
1	248°31.7	218°42.2	28.8	95°19.4	51.0	107°10.3	10.4	227°01.3	35.0
2	263°34.2	233°41.7	29.9	110°21.0	50.6	122°12.6	10.3	242°03.5	35.1
3	278°36.6	248°41.3	·· 30.9	125°22.6	·· 50.2	137°14.8	·· 10.3	257°05.7	·· 35.2
4	293°39.1	263°40.9	32.0	140°24.2	49.8	152°17.0	10.2	272°07.9	35.3
5	308°41.6	278°40.5	33.1	155°25.7	49.4	167°19.3	10.1	287°10.1	35.4
6	323°44.0	293°40.0	N10°34.2	170°27.3	N12°49.0	182°21.5	N16°10.0	302°12.2	N06°35.5
7	338°46.5	308°39.6	35.2	185°28.9	48.6	197°23.7	10.0	317°14.4	35.6
8	353°48.9	323°39.2	36.3	200°30.5	48.2	212°26.0	09.9	332°16.6	35.7
9	8°51.4	338°38.8	·· 37.4	215°32.1	·· 47.8	227°28.2	·· 09.8	347°18.8	·· 35.8
10	23°53.9	353°38.3	38.5	230°33.6	47.4	242°30.4	09.7	2°21.0	35.9
11	38°56.3	8°37.9	39.5	245°35.2	47.0	257°32.7	09.6	17°23.2	36.0
12	53°58.8	23°37.5	N10°40.6	260°36.8	N12°46.6	272°34.9	N16°09.6	32°25.4	N06°36.1
13	69°01.3	38°37.1	41.7	275°38.4	46.2	287°37.1	09.5	47°27.6	36.2
14	84°03.7	53°36.6	42.8	290°39.9	45.8	302°39.3	09.4	62°29.8	36.3
15	99°06.2	68°36.2	·· 43.8	305°41.5	·· 45.4	317°41.6	·· 09.3	77°32.0	·· 36.4
16	114°08.7	83°35.8	44.9	320°43.1	45.0	332°43.8	09.2	92°34.2	36.5
17	129°11.1	98°35.3	46.0	335°44.7	44.6	347°46.0	09.2	107°36.4	36.6
18	144°13.6	113°34.9	N10°47.1	350°46.3	N12°44.2	2°48.3	N16°09.1	122°38.6	N06°36.7
19	159°16.1	128°34.5	48.1	5°47.8	43.8	17°50.5	09.0	137°40.8	36.8
20	174°18.5	143°34.0	49.2	20°49.4	43.4	32°52.7	08.9	152°43.0	36.9
21	189°21.0	158°33.6	·· 50.3	35°51.0	·· 43.0	47°54.9	·· 08.9	167°45.2	·· 37.0
22	204°23.4	173°33.2	51.4	50°52.6	42.6	62°57.2	08.8	182°47.4	37.1
23	219°25.9	188°32.8	52.4	65°54.1	42.2	77°59.4	08.7	197°49.6	37.2
Mer.pass. 08:25		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.54	ν 2.2′	d 0.1′ m -2.02	ν 2.2′	d 0.1′ m 0.70

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	234°28.4	203°32.3	N10°53.5	80°55.7	N12°41.8	93°01.6	N16°08.6	212°51.8	N06°37.3
1	249°30.8	218°31.9	54.6	95°57.3	41.4	108°03.8	08.5	227°54.0	37.4
2	264°33.3	233°31.5	55.6	110°58.8	40.9	123°06.1	08.5	242°56.2	37.5
3	279°35.8	248°31.0	·· 56.7	126°00.4	·· 40.5	138°08.3	·· 08.4	257°58.4	·· 37.6
4	294°38.2	263°30.6	57.8	141°02.0	40.1	153°10.5	08.3	273°00.6	37.7
5	309°40.7	278°30.2	58.8	156°03.6	39.7	168°12.7	08.2	288°02.8	37.8
6	324°43.2	293°29.7	N10°59.9	171°05.1	N12°39.3	183°15.0	N16°08.1	303°05.0	N06°37.9
7	339°45.6	308°29.3	11°01.0	186°06.7	38.9	198°17.2	08.1	318°07.2	38.0
8	354°48.1	323°28.9	02.0	201°08.3	38.5	213°19.4	08.0	333°09.4	38.1
9	9°50.5	338°28.4	·· 03.1	216°09.8	·· 38.1	228°21.6	·· 07.9	348°11.6	·· 38.2
10	24°53.0	353°28.0	04.2	231°11.4	37.7	243°23.9	07.8	3°13.8	38.2
11	39°55.5	8°27.6	05.2	246°13.0	37.3	258°26.1	07.7	18°16.0	38.3
12	54°57.9	23°27.1	N11°06.3	261°14.5	N12°36.9	273°28.3	N16°07.7	33°18.2	N06°38.4
13	70°00.4	38°26.7	07.4	276°16.1	36.5	288°30.5	07.6	48°20.4	38.5
14	85°02.9	53°26.3	08.4	291°17.7	36.1	303°32.8	07.5	63°22.6	38.6
15	100°05.3	68°25.8	·· 09.5	306°19.2	·· 35.7	318°35.0	·· 07.4	78°24.8	·· 38.7
16	115°07.8	83°25.4	10.6	321°20.8	35.3	333°37.2	07.3	93°27.0	38.8
17	130°10.3	98°24.9	11.6	336°22.4	34.9	348°39.4	07.3	108°29.2	38.9
18	145°12.7	113°24.5	N11°12.7	351°23.9	N12°34.4	3°41.6	N16°07.2	123°31.4	N06°39.0
19	160°15.2	128°24.1	13.7	6°25.5	34.0	18°43.9	07.1	138°33.6	39.1
20	175°17.7	143°23.6	14.8	21°27.1	33.6	33°46.1	07.0	153°35.8	39.2
21	190°20.1	158°23.2	·· 15.9	36°28.6	·· 33.2	48°48.3	·· 06.9	168°38.0	·· 39.3
22	205°22.6	173°22.7	16.9	51°30.2	32.8	63°50.5	06.9	183°40.2	39.4
23	220°25.0	188°22.3	18.0	66°31.7	32.4	78°52.7	06.8	198°42.4	39.5
Mer.pass. 08:21		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.56	ν 2.2′	d 0.1′ m -2.01	ν 2.2′	d 0.1′ m 0.70

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	235°27.5	203°21.9	N11°19.1	81°33.3	N12°32.0	93°55.0	N16°06.7	213°44.6	N06°39.6
1	250°30.0	218°21.4	20.1	96°34.9	31.6	108°57.2	06.6	228°46.8	39.7
2	265°32.4	233°21.0	21.2	111°36.4	31.2	123°59.4	06.5	243°49.0	39.8
3	280°34.9	248°20.5	·· 22.2	126°38.0	·· 30.8	139°01.6	·· 06.4	258°51.2	·· 39.9
4	295°37.4	263°20.1	23.3	141°39.6	30.4	154°03.8	06.4	273°53.4	40.0
5	310°39.8	278°19.7	24.3	156°41.1	29.9	169°06.1	06.3	288°55.6	40.1
6	325°42.3	293°19.2	N11°25.4	171°42.7	N12°29.5	184°08.3	N16°06.2	303°57.8	N06°40.2
7	340°44.8	308°18.8	26.5	186°44.2	29.1	199°10.5	06.1	319°00.0	40.3
8	355°47.2	323°18.3	27.5	201°45.8	28.7	214°12.7	06.0	334°02.2	40.4
9	10°49.7	338°17.9	·· 28.6	216°47.3	·· 28.3	229°14.9	·· 06.0	349°04.4	·· 40.5
10	25°52.2	353°17.5	29.6	231°48.9	27.9	244°17.2	05.9	4°06.6	40.6
11	40°54.6	8°17.0	30.7	246°50.5	27.5	259°19.4	05.8	19°08.8	40.7
12	55°57.1	23°16.6	N11°31.7	261°52.0	N12°27.1	274°21.6	N16°05.7	34°11.1	N06°40.8
13	70°59.5	38°16.1	32.8	276°53.6	26.7	289°23.8	05.6	49°13.3	40.9
14	86°02.0	53°15.7	33.9	291°55.1	26.2	304°26.0	05.5	64°15.5	41.0
15	101°04.5	68°15.2	·· 34.9	306°56.7	·· 25.8	319°28.2	·· 05.5	79°17.7	·· 41.1
16	116°06.9	83°14.8	36.0	321°58.2	25.4	334°30.5	05.4	94°19.9	41.2
17	131°09.4	98°14.3	37.0	336°59.8	25.0	349°32.7	05.3	109°22.1	41.3
18	146°11.9	113°13.9	N11°38.1	352°01.3	N12°24.6	4°34.9	N16°05.2	124°24.3	N06°41.4
19	161°14.3	128°13.4	39.1	7°02.9	24.2	19°37.1	05.1	139°26.5	41.5
20	176°16.8	143°13.0	40.2	22°04.4	23.8	34°39.3	05.1	154°28.7	41.6
21	191°19.3	158°12.6	·· 41.2	37°06.0	·· 23.4	49°41.5	·· 05.0	169°30.9	·· 41.7
22	206°21.7	173°12.1	42.3	52°07.6	22.9	64°43.7	04.9	184°33.1	41.8
23	221°24.2	188°11.7	43.3	67°09.1	22.5	79°46.0	04.8	199°35.3	41.9
Mer.pass. 08:17		ν -0.4′	d 1.1′	m -3.86	ν 1.6′	d 0.4′	m 0.57	ν 2.2′	d 0.1′ m -2.01	ν 2.2′	d 0.1′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.6	-42°09.2
Schedar	349°29.2	56°41.1
Diphda	348°45.6	-17°50.1
Achernar	335°19.3	-57°05.7
Hamal	327°49.3	23°35.4
Polaris	313°30.6	89°22.7
Acamar	315°10.7	-40°11.7
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.2	-59°36.1
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.0	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.5	61°36.4
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.4	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°10.9	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.5
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.8	74°02.5
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.8	26°37.3
Antares	112°13.1	-26°29.6
Atria	107°05.0	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.3
Rasalhague	95°56.5	12°32.3
Eltanin	90°40.8	51°28.9
Kaus Aust.	83°29.7	-34°22.2
Vega	80°31.6	38°48.3
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.4
Peacock	53°02.5	-56°38.5
Deneb	49°24.3	45°22.4
Enif	33°36.9	10°00.0
Al Na'ir	27°30.6	-46°49.4
Fomalhaut	15°12.5	-29°28.5
Scheat	13°43.4	28°13.7
Markab	13°28.1	15°21.1

May 16 Sun	**SHA**	**Mer.pass**
Venus	330°13.3	10:25
Mars	206°48.6	18:37
Jupiter	218°38.9	17:49
Saturn	338°29.8	09:51

May 17 Mon	**SHA**	**Mer.pass**
Venus	329°04.0	10:26
Mars	206°27.3	18:34
Jupiter	218°33.2	17:45
Saturn	338°23.5	09:47

May 18 Tue	**SHA**	**Mer.pass**
Venus	327°54.4	10:27
Mars	206°05.8	18:32
Jupiter	218°27.5	17:42
Saturn	338°17.1	09:44

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1370 sec ΔT = TT-UT1 = +69.3210 sec

2027 May 16 to May. 18 UT

h

Sun	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°54.4	N18°59.9	54°10.4	13.3′	S03°37.2	15.4′	57.8′
1	195°54.4	19°00.5	68°42.7	13.3′	03°52.6	15.3′	57.7′
2	210°54.4	01.1	83°14.9	13.3′	04°07.9	15.3′	57.7′
3	225°54.4	·· 01.7	97°47.2	13.3′	04°23.2	15.2′	57.7′
4	240°54.4	02.2	112°19.5	13.3′	04°38.4	15.2′	57.7′
5	255°54.3	02.8	126°51.8	13.3′	04°53.6	15.2′	57.7′
6	270°54.3	N19°03.4	141°24.0	13.3′	S05°08.8	15.2′	57.6′
7	285°54.3	04.0	155°56.3	13.3′	05°24.0	15.1′	57.6′
8	300°54.3	04.6	170°28.6	13.3′	05°39.1	15.1′	57.6′
9	315°54.3	·· 05.1	185°00.8	13.2′	05°54.2	15.1′	57.6′
10	330°54.3	05.7	199°33.1	13.2′	06°09.3	15.0′	57.6′
11	345°54.3	06.3	214°05.3	13.2′	06°24.3	14.9′	57.5′
12	0°54.3	N19°06.9	228°37.5	13.2′	S06°39.2	15.0′	57.5′
13	15°54.3	07.4	243°09.7	13.2′	06°54.2	14.9′	57.5′
14	30°54.2	08.0	257°41.9	13.2′	07°09.1	14.8′	57.5′
15	45°54.2	·· 08.6	272°14.1	13.2′	07°23.9	14.8′	57.5′
16	60°54.2	09.2	286°46.3	13.1′	07°38.7	14.8′	57.4′
17	75°54.2	09.7	301°18.4	13.1′	07°53.5	14.7′	57.4′
18	90°54.2	N19°10.3	315°50.6	13.1′	S08°08.2	14.7′	57.4′
19	105°54.2	10.9	330°22.7	13.1′	08°22.9	14.6′	57.4′
20	120°54.2	11.5	344°54.8	13.1′	08°37.5	14.6′	57.4′
21	135°54.1	·· 12.0	359°26.8	13.1′	08°52.1	14.5′	57.3′
22	150°54.1	12.6	13°58.9	13.0′	09°06.6	14.5′	57.3′
23	165°54.1	13.2	28°30.9	13.0′	09°21.1	14.4′	57.3′
	SD = 15.8′	d = 0.6′	SD = 15.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.1	N19°13.7	43°02.9	13.0′	S09°35.5	14.3′	57.3′
1	195°54.1	14.3	57°34.9	13.0′	09°49.8	14.4′	57.3′
2	210°54.1	14.9	72°06.9	12.9′	10°04.2	14.2′	57.2′
3	225°54.1	·· 15.4	86°38.8	12.9′	10°18.4	14.2′	57.2′
4	240°54.0	16.0	101°10.7	12.9′	10°32.6	14.1′	57.2′
5	255°54.0	16.6	115°42.6	12.9′	10°46.7	14.1′	57.2′
6	270°54.0	N19°17.1	130°14.4	12.8′	S11°00.8	14.0′	57.2′
7	285°54.0	17.7	144°46.3	12.8′	11°14.8	14.0′	57.1′
8	300°54.0	18.3	159°18.1	12.8′	11°28.8	13.9′	57.1′
9	315°54.0	·· 18.8	173°49.8	12.7′	11°42.7	13.8′	57.1′
10	330°53.9	19.4	188°21.5	12.7′	11°56.5	13.8′	57.1′
11	345°53.9	20.0	202°53.2	12.7′	12°10.3	13.7′	57.1′
12	0°53.9	N19°20.5	217°24.9	12.6′	S12°24.0	13.6′	57.0′
13	15°53.9	21.1	231°56.5	12.6′	12°37.6	13.6′	57.0′
14	30°53.9	21.6	246°28.1	12.6′	12°51.2	13.5′	57.0′
15	45°53.8	·· 22.2	260°59.7	12.5′	13°04.7	13.4′	57.0′
16	60°53.8	22.8	275°31.2	12.5′	13°18.1	13.4′	57.0′
17	75°53.8	23.3	290°02.7	12.4′	13°31.5	13.2′	56.9′
18	90°53.8	N19°23.9	304°34.1	12.4′	S13°44.7	13.2′	56.9′
19	105°53.8	24.4	319°05.5	12.4′	13°57.9	13.2′	56.9′
20	120°53.8	25.0	333°36.9	12.3′	14°11.1	13.0′	56.9′
21	135°53.7	·· 25.6	348°08.2	12.3′	14°24.1	13.0′	56.9′
22	150°53.7	26.1	2°39.5	12.2′	14°37.1	12.9′	56.8′
23	165°53.7	26.7	17°10.8	12.2′	14°50.0	12.8′	56.8′
	SD = 15.8′	d = 0.6′	SD = 15.6′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.7	N19°27.2	31°42.0	12.2′	S15°02.8	12.8′	56.8′
1	195°53.6	27.8	46°13.2	12.1′	15°15.6	12.6′	56.8′
2	210°53.6	28.3	60°44.3	12.1′	15°28.2	12.6′	56.8′
3	225°53.6	·· 28.9	75°15.4	12.0′	15°40.8	12.5′	56.7′
4	240°53.6	29.4	89°46.4	12.0′	15°53.3	12.4′	56.7′
5	255°53.6	30.0	104°17.4	11.9′	16°05.7	12.3′	56.7′
6	270°53.5	N19°30.5	118°48.3	11.9′	S16°18.0	12.3′	56.7′
7	285°53.5	31.1	133°19.2	11.9′	16°30.3	12.1′	56.7′
8	300°53.5	31.6	147°50.1	11.8′	16°42.4	12.1′	56.6′
9	315°53.5	·· 32.2	162°20.9	11.8′	16°54.5	12.0′	56.6′
10	330°53.4	32.7	176°51.7	11.7′	17°06.5	11.9′	56.6′
11	345°53.4	33.3	191°22.4	11.7′	17°18.4	11.7′	56.6′
12	0°53.4	N19°33.8	205°53.0	11.6′	S17°30.1	11.7′	56.6′
13	15°53.4	34.4	220°23.7	11.6′	17°41.8	11.6′	56.5′
14	30°53.4	34.9	234°54.2	11.5′	17°53.4	11.6′	56.5′
15	45°53.3	·· 35.5	249°24.8	11.5′	18°05.0	11.4′	56.5′
16	60°53.3	36.0	263°55.3	11.4′	18°16.4	11.3′	56.5′
17	75°53.3	36.6	278°25.7	11.4′	18°27.7	11.2′	56.4′
18	90°53.3	N19°37.1	292°56.1	11.3′	S18°38.9	11.1′	56.4′
19	105°53.2	37.7	307°26.4	11.3′	18°50.0	11.0′	56.4′
20	120°53.2	38.2	321°56.7	11.2′	19°01.0	11.0′	56.4′
21	135°53.2	·· 38.8	336°26.9	11.2′	19°12.0	10.8′	56.4′
22	150°53.2	39.3	350°57.1	11.1′	19°22.8	10.7′	56.3′
23	165°53.1	39.8	5°27.3	11.1′	19°33.5	10.6′	56.3′
	SD = 15.8′	d = 0.6′	SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	01:37	22:21	////	////
66°	////	////	02:15	21:41	////	////
64°	////	00:55	02:42	21:14	23:07	////
62°	////	01:44	03:02	20:53	22:13	////
60°	////	02:14	03:18	20:36	21:42	////
N 58°	00:49	02:36	03:32	20:22	21:19	23:12
56°	01:34	02:54	03:44	20:10	21:01	22:23
54°	02:01	03:08	03:54	19:59	20:46	21:54
52°	02:22	03:21	04:04	19:50	20:33	21:33
50°	02:39	03:32	04:12	19:42	20:22	21:15
45°	03:11	03:55	04:29	19:24	19:59	20:43
N 40°	03:34	04:13	04:43	19:10	19:41	20:19
35°	03:53	04:27	04:55	18:58	19:26	20:01
30°	04:08	04:39	05:06	18:48	19:14	19:45
20°	04:32	05:00	05:23	18:30	18:53	19:22
N 10°	04:50	05:16	05:39	18:14	18:37	19:03
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:45	06:07	17:46	18:08	18:34
20°	05:32	05:59	06:22	17:31	17:54	18:21
30°	05:44	06:13	06:39	17:14	17:39	18:08
35°	05:51	06:22	06:49	17:04	17:31	18:02
40°	05:58	06:31	07:00	16:53	17:22	17:55
45°	06:05	06:41	07:13	16:39	17:11	17:47
S 50°	06:13	06:53	07:29	16:23	16:59	17:39
52°	06:17	06:59	07:37	16:16	16:54	17:35
54°	06:21	07:05	07:45	16:07	16:48	17:31
56°	06:25	07:11	07:54	15:58	16:41	17:27
58°	06:30	07:19	08:05	15:47	16:33	17:22
S 60°	06:35	07:27	08:17	15:35	16:25	17:18

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	16:35	19:07	▬	01:34	00:59	00:07
N 70°	16:23	18:36	21:38	01:40	01:14	00:39 23:18
68°	16:13	18:14	20:32	01:45	01:26	01:03
66°	16:05	17:56	19:57	01:48	01:36	01:22
64°	15:58	17:42	19:32	01:52	01:45	01:37
62°	15:52	17:31	19:12	01:55	01:52	01:50
60°	15:47	17:21	18:56	01:57	01:59	02:01
N 58°	15:43	17:12	18:43	01:59	02:05	02:11
56°	15:39	17:05	18:31	02:01	02:10	02:19
54°	15:35	16:58	18:21	02:03	02:14	02:27
52°	15:32	16:52	18:12	02:05	02:18	02:34
50°	15:29	16:47	18:04	02:06	02:22	02:40
45°	15:23	16:35	17:47	02:10	02:30	02:53
N 40°	15:18	16:26	17:34	02:13	02:37	03:04
35°	15:13	16:17	17:22	02:15	02:43	03:13
30°	15:09	16:10	17:12	02:17	02:48	03:22
20°	15:03	15:58	16:55	02:21	02:58	03:36
N 10°	14:57	15:48	16:40	02:24	03:06	03:49
0°	14:51	15:38	16:26	02:27	03:13	04:00
S 10°	14:46	15:28	16:12	02:30	03:21	04:12
20°	14:40	15:18	15:57	02:34	03:29	04:25
30°	14:34	15:06	15:40	02:37	03:38	04:40
35°	14:30	14:59	15:31	02:40	03:44	04:48
40°	14:26	14:52	15:20	02:42	03:50	04:58
45°	14:21	14:43	15:07	02:45	03:57	05:10
S 50°	14:16	14:32	14:51	02:48	04:06	05:24
52°	14:13	14:27	14:44	02:50	04:10	05:30
54°	14:10	14:22	14:36	02:52	04:15	05:38
56°	14:07	14:16	14:27	02:54	04:20	05:46
58°	14:04	14:10	14:17	02:56	04:25	05:55
S 60°	14:00	14:02	14:06	02:58	04:31	06:06

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 79-93%
16	03:38	03:37	11:56	21:02	08:39	
17	03:36	03:36	11:56	21:49	09:25	
18	03:35	03:34	11:56	22:37	10:13	

May 19, 20, 21 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°26.7	203°11.2	N11°44.4	82°10.7	N12°22.1	94°48.2	N16°04.7	214°37.5	N06°42.0
1	251°29.1	218°10.8	45.4	97°12.2	21.7	109°50.4	04.6	229°39.7	42.1
2	266°31.6	233°10.3	46.5	112°13.8	21.3	124°52.6	04.6	244°41.9	42.2
3	281°34.0	248°09.9	·· 47.5	127°15.3	·· 20.9	139°54.8	·· 04.5	259°44.1	·· 42.3
4	296°36.5	263°09.4	48.6	142°16.9	20.5	154°57.0	04.4	274°46.3	42.4
5	311°39.0	278°09.0	49.6	157°18.4	20.0	169°59.2	04.3	289°48.5	42.5
6	326°41.4	293°08.5	N11°50.7	172°20.0	N12°19.6	185°01.5	N16°04.2	304°50.7	N06°42.6
7	341°43.9	308°08.1	51.7	187°21.5	19.2	200°03.7	04.1	319°52.9	42.7
8	356°46.4	323°07.6	52.8	202°23.0	18.8	215°05.9	04.1	334°55.1	42.8
9	11°48.8	338°07.2	·· 53.8	217°24.6	·· 18.4	230°08.1	·· 04.0	349°57.3	·· 42.9
10	26°51.3	353°06.7	54.8	232°26.1	18.0	245°10.3	03.9	4°59.5	42.9
11	41°53.8	8°06.3	55.9	247°27.7	17.6	260°12.5	03.8	20°01.7	43.0
12	56°56.2	23°05.8	N11°56.9	262°29.2	N12°17.1	275°14.7	N16°03.7	35°03.9	N06°43.1
13	71°58.7	38°05.3	58.0	277°30.8	16.7	290°16.9	03.6	50°06.1	43.2
14	87°01.1	53°04.9	11°59.0	292°32.3	16.3	305°19.1	03.5	65°08.3	43.3
15	102°03.6	68°04.4	12°00.1	307°33.9	·· 15.9	320°21.4	·· 03.5	80°10.5	·· 43.4
16	117°06.1	83°04.0	01.1	322°35.4	15.5	335°23.6	03.4	95°12.7	43.5
17	132°08.5	98°03.5	02.1	337°37.0	15.1	350°25.8	03.3	110°14.9	43.6
18	147°11.0	113°03.1	N12°03.2	352°38.5	N12°14.6	5°28.0	N16°03.2	125°17.1	N06°43.7
19	162°13.5	128°02.6	04.2	7°40.0	14.2	20°30.2	03.1	140°19.3	43.8
20	177°15.9	143°02.2	05.3	22°41.6	13.8	35°32.4	03.0	155°21.5	43.9
21	192°18.4	158°01.7	·· 06.3	37°43.1	·· 13.4	50°34.6	·· 03.0	170°23.7	·· 44.0
22	207°20.9	173°01.2	07.3	52°44.7	13.0	65°36.8	02.9	185°26.0	44.1
23	222°23.3	188°00.8	08.4	67°46.2	12.5	80°39.0	02.8	200°28.2	44.2
Mer.pass. 08:13		ν -0.4′	d 1.0′	m -3.86	ν 1.6′	d 0.4′	m 0.59	ν 2.2′	d 0.1′ m -2.00	ν 2.2′	d 0.1′ m 0.70

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°25.8	203°00.3	N12°09.4	82°47.7	N12°12.1	95°41.2	N16°02.7	215°30.4	N06°44.3
1	252°28.3	217°59.9	10.5	97°49.3	11.7	110°43.5	02.6	230°32.6	44.4
2	267°30.7	232°59.4	11.5	112°50.8	11.3	125°45.7	02.5	245°34.8	44.5
3	282°33.2	247°59.0	·· 12.5	127°52.4	·· 10.9	140°47.9	·· 02.4	260°37.0	·· 44.6
4	297°35.6	262°58.5	13.6	142°53.9	10.5	155°50.1	02.4	275°39.2	44.7
5	312°38.1	277°58.0	14.6	157°55.4	10.0	170°52.3	02.3	290°41.4	44.8
6	327°40.6	292°57.6	N12°15.6	172°57.0	N12°09.6	185°54.5	N16°02.2	305°43.6	N06°44.9
7	342°43.0	307°57.1	16.7	187°58.5	09.2	200°56.7	02.1	320°45.8	45.0
8	357°45.5	322°56.7	17.7	203°00.0	08.8	215°58.9	02.0	335°48.0	45.1
9	12°48.0	337°56.2	·· 18.8	218°01.6	·· 08.4	231°01.1	·· 01.9	350°50.2	·· 45.2
10	27°50.4	352°55.7	19.8	233°03.1	07.9	246°03.3	01.8	5°52.4	45.3
11	42°52.9	7°55.3	20.8	248°04.7	07.5	261°05.5	01.8	20°54.6	45.4
12	57°55.4	22°54.8	N12°21.9	263°06.2	N12°07.1	276°07.7	N16°01.7	35°56.8	N06°45.5
13	72°57.8	37°54.3	22.9	278°07.7	06.7	291°09.9	01.6	50°59.0	45.6
14	88°00.3	52°53.9	23.9	293°09.3	06.2	306°12.1	01.5	66°01.2	45.7
15	103°02.8	67°53.4	·· 24.9	308°10.8	·· 05.8	321°14.3	·· 01.4	81°03.4	·· 45.7
16	118°05.2	82°53.0	26.0	323°12.3	05.4	336°16.5	01.3	96°05.6	45.8
17	133°07.7	97°52.5	27.0	338°13.9	05.0	351°18.8	01.2	111°07.8	45.9
18	148°10.1	112°52.0	N12°28.0	353°15.4	N12°04.6	6°21.0	N16°01.2	126°10.0	N06°46.0
19	163°12.6	127°51.6	29.1	8°16.9	04.1	21°23.2	01.1	141°12.3	46.1
20	178°15.1	142°51.1	30.1	23°18.5	03.7	36°25.4	01.0	156°14.5	46.2
21	193°17.5	157°50.6	·· 31.1	38°20.0	·· 03.3	51°27.6	·· 00.9	171°16.7	·· 46.3
22	208°20.0	172°50.2	32.2	53°21.5	02.9	66°29.8	00.8	186°18.9	46.4
23	223°22.5	187°49.7	33.2	68°23.0	02.4	81°32.0	00.7	201°21.1	46.5
Mer.pass. 08:09		ν -0.5′	d 1.0′	m -3.86	ν 1.5′	d 0.4′	m 0.60	ν 2.2′	d 0.1′ m -1.99	ν 2.2′	d 0.1′ m 0.70

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	238°24.9	202°49.2	N12°34.2	83°24.6	N12°02.0	96°34.2	N16°00.6	216°23.3	N06°46.6
1	253°27.4	217°48.8	35.2	98°26.1	01.6	111°36.4	00.6	231°25.5	46.7
2	268°29.9	232°48.3	36.3	113°27.6	01.2	126°38.6	00.5	246°27.7	46.8
3	283°32.3	247°47.8	·· 37.3	128°29.2	·· 00.8	141°40.8	·· 00.4	261°29.9	·· 46.9
4	298°34.8	262°47.4	38.3	143°30.7	12°00.3	156°43.0	00.3	276°32.1	47.0
5	313°37.3	277°46.9	39.3	158°32.2	11°59.9	171°45.2	00.2	291°34.3	47.1
6	328°39.7	292°46.4	N12°40.4	173°33.7	N11°59.5	186°47.4	N16°00.1	306°36.5	N06°47.2
7	343°42.2	307°46.0	41.4	188°35.3	59.1	201°49.6	16°00.0	321°38.7	47.3
8	358°44.6	322°45.5	42.4	203°36.8	58.6	216°51.8	15°59.9	336°40.9	47.4
9	13°47.1	337°45.0	·· 43.4	218°38.3	·· 58.2	231°54.0	·· 59.9	351°43.1	·· 47.5
10	28°49.6	352°44.5	44.5	233°39.9	57.8	246°56.2	59.8	6°45.3	47.6
11	43°52.0	7°44.1	45.5	248°41.4	57.4	261°58.4	59.7	21°47.5	47.7
12	58°54.5	22°43.6	N12°46.5	263°42.9	N11°56.9	277°00.6	N15°59.6	36°49.8	N06°47.8
13	73°57.0	37°43.1	47.5	278°44.4	56.5	292°02.8	59.5	51°52.0	47.9
14	88°59.4	52°42.7	48.5	293°45.9	56.1	307°05.0	59.4	66°54.2	47.9
15	104°01.9	67°42.2	·· 49.6	308°47.5	·· 55.7	322°07.2	·· 59.3	81°56.4	·· 48.0
16	119°04.4	82°41.7	50.6	323°49.0	55.2	337°09.4	59.2	96°58.6	48.1
17	134°06.8	97°41.2	51.6	338°50.5	54.8	352°11.6	59.1	112°00.8	48.2
18	149°09.3	112°40.8	N12°52.6	353°52.0	N11°54.4	7°13.8	N15°59.1	127°03.0	N06°48.3
19	164°11.7	127°40.3	53.6	8°53.6	53.9	22°16.0	59.0	142°05.2	48.4
20	179°14.2	142°39.8	54.6	23°55.1	53.5	37°18.2	58.9	157°07.4	48.5
21	194°16.7	157°39.3	·· 55.7	38°56.6	·· 53.1	52°20.4	·· 58.8	172°09.6	·· 48.6
22	209°19.1	172°38.9	56.7	53°58.1	52.7	67°22.6	58.7	187°11.8	48.7
23	224°21.6	187°38.4	57.7	68°59.6	52.2	82°24.8	58.6	202°14.0	48.8
Mer.pass. 08:05		ν -0.5′	d 1.0′	m -3.86	ν 1.5′	d 0.4′	m 0.61	ν 2.2′	d 0.1′ m -1.99	ν 2.2′	d 0.1′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.5	-42°09.2
Schedar	349°29.2	56°41.1
Diphda	348°45.6	-17°50.1
Achernar	335°19.3	-57°05.7
Hamal	327°49.3	23°35.4
Polaris	313°30.0	89°22.6
Acamar	315°10.7	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°26.0	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.8
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.2	-59°36.1
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.0	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.5	61°36.4
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.4	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°10.9	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.5
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.8	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.1	-26°29.6
Atria	107°05.0	-69°04.5
Sabik	102°00.2	-15°45.5
Shaula	96°07.4	-37°07.3
Rasalhague	95°56.4	12°32.3
Eltanin	90°40.8	51°28.9
Kaus Aust.	83°29.6	-34°22.2
Vega	80°31.6	38°48.4
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.4
Peacock	53°02.5	-56°38.5
Deneb	49°24.3	45°22.5
Enif	33°36.9	10°00.0
Al Na'ir	27°30.5	-46°49.4
Fomalhaut	15°12.5	-29°28.5
Scheat	13°43.4	28°13.7
Markab	13°28.1	15°21.1

May 19 Wed	SHA	Mer.pass
Venus	326°44.6	10:28
Mars	205°44.0	18:29
Jupiter	218°21.5	17:38
Saturn	338°10.8	09:40

May 20 Thu	SHA	Mer.pass
Venus	325°34.5	10:28
Mars	205°22.0	18:27
Jupiter	218°15.5	17:35
Saturn	338°04.6	09:37

May 21 Fri	SHA	Mer.pass
Venus	324°24.3	10:29
Mars	204°59.6	18:24
Jupiter	218°09.2	17:31
Saturn	337°58.4	09:33

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1385 sec ΔT = TT-UT1 = +69.3225 sec

2027 May 19 to May. 21 UT

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°53.1	N19°40.4	19°57.3	11.0′	S19°44.1	10.5′	56.3′
1	195°53.1	40.9	34°27.4	11.0′	19°54.6	10.4′	56.3′
2	210°53.0	41.5	48°57.4	10.9′	20°05.0	10.3′	56.3′
3	225°53.0	·· 42.0	63°27.3	10.9′	20°15.3	10.2′	56.2′
4	240°53.0	42.5	77°57.2	10.8′	20°25.5	10.1′	56.2′
5	255°53.0	43.1	92°27.0	10.8′	20°35.6	9.9′	56.2′
6	270°52.9	N19°43.6	106°56.8	10.7′	S20°45.5	9.9′	56.2′
7	285°52.9	44.2	121°26.6	10.7′	20°55.4	9.8′	56.2′
8	300°52.9	44.7	135°56.3	10.6′	21°05.2	9.6′	56.1′
9	315°52.9	·· 45.2	150°25.9	10.6′	21°14.8	9.5′	56.1′
10	330°52.8	45.8	164°55.5	10.6′	21°24.3	9.4′	56.1′
11	345°52.8	46.3	179°25.1	10.5′	21°33.7	9.3′	56.1′
12	0°52.8	N19°46.8	193°54.6	10.5′	S21°43.0	9.2′	56.1′
13	15°52.7	47.4	208°24.0	10.4′	21°52.2	9.0′	56.0′
14	30°52.7	47.9	222°53.4	10.4′	22°01.2	9.0′	56.0′
15	45°52.7	·· 48.4	237°22.8	10.3′	22°10.2	8.8′	56.0′
16	60°52.6	49.0	251°52.1	10.3′	22°19.0	8.7′	56.0′
17	75°52.6	49.5	266°21.4	10.2′	22°27.7	8.6′	56.0′
18	90°52.6	N19°50.0	280°50.6	10.2′	S22°36.3	8.5′	55.9′
19	105°52.6	50.6	295°19.8	10.1′	22°44.8	8.3′	55.9′
20	120°52.5	51.1	309°48.9	10.1′	22°53.1	8.2′	55.9′
21	135°52.5	·· 51.6	324°18.0	10.0′	23°01.3	8.1′	55.9′
22	150°52.5	52.2	338°47.0	10.0′	23°09.4	8.0′	55.9′
23	165°52.4	52.7	353°16.0	10.0′	23°17.4	7.9′	55.8′
	SD = 15.8′	*d* = 0.5′	SD = 15.4′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°52.4	N19°53.2	7°45.0	9.9′	S23°25.3	7.7′	55.8′
1	195°52.4	53.7	22°13.9	9.9′	23°33.0	7.6′	55.8′
2	210°52.3	54.3	36°42.8	9.8′	23°40.6	7.5′	55.8′
3	225°52.3	·· 54.8	51°11.6	9.8′	23°48.1	7.3′	55.8′
4	240°52.3	55.3	65°40.4	9.8′	23°55.4	7.2′	55.7′
5	255°52.2	55.8	80°09.2	9.7′	24°02.6	7.1′	55.7′
6	270°52.2	N19°56.4	94°37.9	9.7′	S24°09.7	7.0′	55.7′
7	285°52.2	56.9	109°06.6	9.6′	24°16.7	6.8′	55.7′
8	300°52.1	57.4	123°35.2	9.6′	24°23.5	6.7′	55.7′
9	315°52.1	·· 57.9	138°03.8	9.6′	24°30.2	6.6′	55.6′
10	330°52.1	58.5	152°32.4	9.5′	24°36.8	6.4′	55.6′
11	345°52.0	59.0	167°00.9	9.5′	24°43.2	6.3′	55.6′
12	0°52.0	N19°59.5	181°29.4	9.5′	S24°49.5	6.2′	55.6′
13	15°52.0	20°00.0	195°57.8	9.4′	24°55.7	6.0′	55.6′
14	30°51.9	00.5	210°26.3	9.4′	25°01.7	5.9′	55.5′
15	45°51.9	·· 01.1	224°54.7	9.4′	25°07.6	5.8′	55.5′
16	60°51.9	01.6	239°23.0	9.3′	25°13.4	5.7′	55.5′
17	75°51.8	02.1	253°51.4	9.3′	25°19.1	5.5′	55.5′
18	90°51.8	N20°02.6	268°19.7	9.3′	S25°24.6	5.3′	55.5′
19	105°51.7	03.1	282°48.0	9.3′	25°29.9	5.2′	55.4′
20	120°51.7	03.6	297°16.2	9.2′	25°35.1	5.1′	55.4′
21	135°51.7	·· 04.2	311°44.5	9.2′	25°40.2	5.0′	55.4′
22	150°51.6	04.7	326°12.7	9.2′	25°45.2	4.8′	55.4′
23	165°51.6	05.2	340°40.9	9.2′	25°50.0	4.7′	55.4′
	SD = 15.8′	*d* = 0.5′	SD = 15.2′				

Fri	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°51.6	N20°05.7	355°09.0	9.1′	S25°54.7	4.5′	55.3′
1	195°51.5	06.2	9°37.2	9.1′	25°59.2	4.4′	55.3′
2	210°51.5	06.7	24°05.3	9.1′	26°03.6	4.3′	55.3′
3	225°51.4	·· 07.2	38°33.4	9.1′	26°07.9	4.1′	55.3′
4	240°51.4	07.7	53°01.5	9.1′	26°12.0	4.0′	55.3′
5	255°51.4	08.3	67°29.5	9.1′	26°16.0	3.8′	55.3′
6	270°51.3	N20°08.8	81°57.6	9.0′	S26°19.8	3.8′	55.2′
7	285°51.3	09.3	96°25.6	9.0′	26°23.6	3.5′	55.2′
8	300°51.2	09.8	110°53.7	9.0′	26°27.1	3.4′	55.2′
9	315°51.2	·· 10.3	125°21.7	9.0′	26°30.5	3.3′	55.2′
10	330°51.2	10.8	139°49.7	9.0′	26°33.8	3.2′	55.2′
11	345°51.1	11.3	154°17.7	9.0′	26°37.0	3.0′	55.1′
12	0°51.1	N20°11.8	168°45.7	9.0′	S26°40.0	2.8′	55.1′
13	15°51.0	12.3	183°13.7	9.0′	26°42.8	2.7′	55.1′
14	30°51.0	12.8	197°41.6	9.0′	26°45.5	2.6′	55.1′
15	45°51.0	·· 13.3	212°09.6	9.0′	26°48.1	2.5′	55.1′
16	60°50.9	13.8	226°37.6	9.0′	26°50.6	2.3′	55.1′
17	75°50.9	14.3	241°05.6	9.0′	26°52.9	2.1′	55.0′
18	90°50.8	N20°14.8	255°33.5	9.0′	S26°55.0	2.0′	55.0′
19	105°50.8	15.3	270°01.5	9.0′	26°57.0	1.9′	55.0′
20	120°50.8	15.8	284°29.5	9.0′	26°58.9	1.7′	55.0′
21	135°50.7	·· 16.3	298°57.5	9.0′	27°00.6	1.6′	55.0′
22	150°50.7	16.8	313°25.5	9.0′	27°02.2	1.5′	55.0′
23	165°50.6	17.3	327°53.5	9.0′	27°03.7	1.3′	54.9′
	SD = 15.8′	*d* = 0.5′	SD = 15.1′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°						
N 70°						
68°	////	////	01:18	22:41	////	////
66°	////	////	02:03	21:53	////	////
64°	////	00:19	02:32	21:23	////	////
62°	////	01:30	02:54	21:01	22:27	////
60°	////	02:04	03:12	20:43	21:52	////
N 58°	00:17	02:28	03:26	20:28	21:27	////
56°	01:22	02:47	03:39	20:15	21:08	22:35
54°	01:53	03:03	03:50	20:04	20:52	22:03
52°	02:15	03:16	03:59	19:55	20:38	21:40
50°	02:33	03:28	04:08	19:46	20:26	21:22
45°	03:07	03:51	04:26	19:28	20:03	20:47
N 40°	03:31	04:10	04:41	19:13	19:44	20:23
35°	03:50	04:25	04:53	19:00	19:29	20:03
30°	04:06	04:38	05:04	18:49	19:16	19:48
20°	04:30	04:59	05:22	18:31	18:55	19:23
N 10°	04:49	05:16	05:38	18:15	18:37	19:04
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:45	06:08	17:45	18:08	18:33
20°	05:33	06:00	06:23	17:30	17:53	18:20
30°	05:46	06:15	06:41	17:12	17:38	18:07
35°	05:53	06:24	06:51	17:02	17:29	18:00
40°	06:00	06:33	07:03	16:50	17:20	17:53
45°	06:08	06:44	07:16	16:36	17:09	17:45
S 50°	06:17	06:57	07:33	16:20	16:56	17:36
52°	06:21	07:03	07:41	16:12	16:50	17:32
54°	06:25	07:09	07:50	16:03	16:44	17:28
56°	06:29	07:16	07:59	15:53	16:37	17:23
58°	06:34	07:24	08:11	15:42	16:29	17:18
S 60°	06:39	07:32	08:23	15:29	16:20	17:13

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°						
N 70°						
68°				00:26		
66°	22:28			01:02	00:16	
64°	21:30			01:28	01:15	
62°	20:56	22:41	·· ··	01:49	01:49	01:54
60°	20:32	22:04	23:20	02:06	02:14	02:31
N 58°	20:13	21:37	22:49	02:20	02:34	02:57
56°	19:57	21:17	22:25	02:32	02:51	03:18
54°	19:43	21:00	22:06	02:43	03:05	03:36
52°	19:31	20:45	21:50	02:52	03:17	03:51
50°	19:20	20:32	21:36	03:01	03:28	04:03
45°	18:59	20:06	21:08	03:19	03:51	04:30
N 40°	18:41	19:46	20:46	03:34	04:09	04:51
35°	18:26	19:29	20:27	03:47	04:25	05:09
30°	18:13	19:14	20:11	03:58	04:38	05:24
20°	17:52	18:49	19:45	04:17	05:02	05:50
N 10°	17:33	18:27	19:22	04:34	05:22	06:12
0°	17:16	18:07	19:00	04:49	05:40	06:33
S 10°	16:58	17:48	18:39	05:05	05:59	06:54
20°	16:40	17:26	18:16	05:22	06:19	07:16
30°	16:19	17:02	17:50	05:41	06:43	07:42
35°	16:06	16:47	17:34	05:53	06:56	07:57
40°	15:52	16:31	17:16	06:06	07:12	08:15
45°	15:36	16:11	16:54	06:22	07:31	08:37
S 50°	15:15	15:46	16:27	06:41	07:55	09:04
52°	15:06	15:35	16:13	06:50	08:07	09:17
54°	14:55	15:21	15:58	07:00	08:20	09:32
56°	14:43	15:05	15:40	07:12	08:35	09:50
58°	14:29	14:47	15:17	07:25	08:53	10:12
S 60°	14:12	14:24	14:49	07:41	09:16	10:41

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 13-15 98-100%
19	03:32	03:31	11:56	23:28	11:02	
20	03:30	03:28	11:57	–:–	11:54	
21	03:26	03:24	11:57	00:20	12:47	

May 22, 23, 24 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	239°24.1	202°37.9	N12°58.7	84°01.2	N11°51.8	97°27.0	N15°58.5	217°16.2	N06°48.9
1	254°26.5	217°37.4	12°59.7	99°02.7	51.4	112°29.2	58.4	232°18.4	49.0
2	269°29.0	232°37.0	13°00.7	114°04.2	51.0	127°31.4	58.3	247°20.7	49.1
3	284°31.5	247°36.5	·· 01.8	129°05.7	·· 50.5	142°33.6	·· 58.3	262°22.9	·· 49.2
4	299°33.9	262°36.0	02.8	144°07.2	50.1	157°35.8	58.2	277°25.1	49.3
5	314°36.4	277°35.5	03.8	159°08.8	49.7	172°38.0	58.1	292°27.3	49.4
6	329°38.9	292°35.0	N13°04.8	174°10.3	N11°49.2	187°40.1	N15°58.0	307°29.5	N06°49.5
7	344°41.3	307°34.6	05.8	189°11.8	48.8	202°42.3	57.9	322°31.7	49.6
8	359°43.8	322°34.1	06.8	204°13.3	48.4	217°44.5	57.8	337°33.9	49.7
9	14°46.2	337°33.6	·· 07.8	219°14.8	·· 47.9	232°46.7	·· 57.7	352°36.1	·· 49.7
10	29°48.7	352°33.1	08.8	234°16.3	47.5	247°48.9	57.6	7°38.3	49.8
11	44°51.2	7°32.6	09.8	249°17.9	47.1	262°51.1	57.5	22°40.5	49.9
12	59°53.6	22°32.2	N13°10.9	264°19.4	N11°46.7	277°53.3	N15°57.5	37°42.7	N06°50.0
13	74°56.1	37°31.7	11.9	279°20.9	46.2	292°55.5	57.4	52°44.9	50.1
14	89°58.6	52°31.2	12.9	294°22.4	45.8	307°57.7	57.3	67°47.2	50.2
15	105°01.0	67°30.7	·· 13.9	309°23.9	·· 45.4	322°59.9	·· 57.2	82°49.4	·· 50.3
16	120°03.5	82°30.2	14.9	324°25.4	44.9	338°02.1	57.1	97°51.6	50.4
17	135°06.0	97°29.7	15.9	339°26.9	44.5	353°04.3	57.0	112°53.8	50.5
18	150°08.4	112°29.3	N13°16.9	354°28.4	N11°44.1	8°06.5	N15°56.9	127°56.0	N06°50.6
19	165°10.9	127°28.8	17.9	9°30.0	43.6	23°08.7	56.8	142°58.2	50.7
20	180°13.4	142°28.3	18.9	24°31.5	43.2	38°10.9	56.7	158°00.4	50.8
21	195°15.8	157°27.8	·· 19.9	39°33.0	·· 42.8	53°13.1	·· 56.6	173°02.6	·· 50.9
22	210°18.3	172°27.3	20.9	54°34.5	42.3	68°15.2	56.6	188°04.8	51.0
23	225°20.7	187°26.8	21.9	69°36.0	41.9	83°17.4	56.5	203°07.0	51.1
Mer.pass. 08:01		ν -0.5′	d 1.0′	m -3.86	ν 1.5′	d 0.4′	m 0.63	ν 2.2′	d 0.1′ m -1.98	ν 2.2′	d 0.1′ m 0.70

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	240°23.2	202°26.4	N13°22.9	84°37.5	N11°41.5	98°19.6	N15°56.4	218°09.2	N06°51.2
1	255°25.7	217°25.9	23.9	99°39.0	41.0	113°21.8	56.3	233°11.5	51.3
2	270°28.1	232°25.4	24.9	114°40.5	40.6	128°24.0	56.2	248°13.7	51.3
3	285°30.6	247°24.9	·· 25.9	129°42.0	·· 40.2	143°26.2	·· 56.1	263°15.9	·· 51.4
4	300°33.1	262°24.4	26.9	144°43.5	39.8	158°28.4	56.0	278°18.1	51.5
5	315°35.5	277°23.9	27.9	159°45.1	39.3	173°30.6	55.9	293°20.3	51.6
6	330°38.0	292°23.4	N13°28.9	174°46.6	N11°38.9	188°32.8	N15°55.8	308°22.5	N06°51.7
7	345°40.5	307°22.9	29.9	189°48.1	38.5	203°35.0	55.7	323°24.7	51.8
8	0°42.9	322°22.4	30.9	204°49.6	38.0	218°37.2	55.6	338°26.9	51.9
9	15°45.4	337°22.0	·· 31.9	219°51.1	·· 37.6	233°39.3	·· 55.6	353°29.1	·· 52.0
10	30°47.9	352°21.5	32.9	234°52.6	37.1	248°41.5	55.5	8°31.3	52.1
11	45°50.3	7°21.0	33.9	249°54.1	36.7	263°43.7	55.4	23°33.6	52.2
12	60°52.8	22°20.5	N13°34.9	264°55.6	N11°36.3	278°45.9	N15°55.3	38°35.8	N06°52.3
13	75°55.2	37°20.0	35.9	279°57.1	35.8	293°48.1	55.2	53°38.0	52.4
14	90°57.7	52°19.5	36.9	294°58.6	35.4	308°50.3	55.1	68°40.2	52.5
15	106°00.2	67°19.0	·· 37.9	310°00.1	·· 35.0	323°52.5	·· 55.0	83°42.4	·· 52.6
16	121°02.6	82°18.5	38.9	325°01.6	34.5	338°54.7	54.9	98°44.6	52.7
17	136°05.1	97°18.0	39.9	340°03.1	34.1	353°56.9	54.8	113°46.8	52.8
18	151°07.6	112°17.5	N13°40.9	355°04.6	N11°33.7	8°59.0	N15°54.7	128°49.0	N06°52.8
19	166°10.0	127°17.0	41.9	10°06.1	33.2	24°01.2	54.6	143°51.2	52.9
20	181°12.5	142°16.5	42.9	25°07.6	32.8	39°03.4	54.5	158°53.4	53.0
21	196°15.0	157°16.0	·· 43.9	40°09.1	·· 32.4	54°05.6	·· 54.4	173°55.7	·· 53.1
22	211°17.4	172°15.5	44.8	55°10.6	31.9	69°07.8	54.4	188°57.9	53.2
23	226°19.9	187°15.0	45.8	70°12.1	31.5	84°10.0	54.3	204°00.1	53.3
Mer.pass. 07:57		ν -0.5′	d 1.0′	m -3.86	ν 1.5′	d 0.4′	m 0.64	ν 2.2′	d 0.1′ m -1.98	ν 2.2′	d 0.1′ m 0.70

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	241°22.4	202°14.6	N13°46.8	85°13.6	N11°31.0	99°12.2	N15°54.2	219°02.3	N06°53.4
1	256°24.8	217°14.1	47.8	100°15.1	30.6	114°14.3	54.1	234°04.5	53.5
2	271°27.3	232°13.6	48.8	115°16.6	30.2	129°16.5	54.0	249°06.7	53.6
3	286°29.7	247°13.1	·· 49.8	130°18.1	·· 29.7	144°18.7	·· 53.9	264°08.9	·· 53.7
4	301°32.2	262°12.6	50.8	145°19.6	29.3	159°20.9	53.8	279°11.1	53.8
5	316°34.7	277°12.1	51.8	160°21.1	28.9	174°23.1	53.7	294°13.3	53.9
6	331°37.1	292°11.6	N13°52.7	175°22.6	N11°28.4	189°25.3	N15°53.6	309°15.6	N06°54.0
7	346°39.6	307°11.1	53.7	190°24.1	28.0	204°27.5	53.5	324°17.8	54.1
8	1°42.1	322°10.6	54.7	205°25.6	27.5	219°29.6	53.4	339°20.0	54.1
9	16°44.5	337°10.1	·· 55.7	220°27.1	·· 27.1	234°31.8	·· 53.3	354°22.2	·· 54.2
10	31°47.0	352°09.6	56.7	235°28.6	26.7	249°34.0	53.2	9°24.4	54.3
11	46°49.5	7°09.1	57.7	250°30.1	26.2	264°36.2	53.1	24°26.6	54.4
12	61°51.9	22°08.6	N13°58.7	265°31.6	N11°25.8	279°38.4	N15°53.1	39°28.8	N06°54.5
13	76°54.4	37°08.1	13°59.6	280°33.1	25.4	294°40.6	53.0	54°31.0	54.6
14	91°56.9	52°07.6	14°00.6	295°34.6	24.9	309°42.7	52.9	69°33.3	54.7
15	106°59.3	67°07.1	·· 01.6	310°36.1	·· 24.5	324°44.9	·· 52.8	84°35.5	·· 54.8
16	122°01.8	82°06.5	02.6	325°37.6	24.0	339°47.1	52.7	99°37.7	54.9
17	137°04.2	97°06.0	03.6	340°39.1	23.6	354°49.3	52.6	114°39.9	55.0
18	152°06.7	112°05.5	N14°04.5	355°40.6	N11°23.2	9°51.5	N15°52.5	129°42.1	N06°55.1
19	167°09.2	127°05.0	05.5	10°42.0	22.7	24°53.6	52.4	144°44.3	55.2
20	182°11.6	142°04.5	06.5	25°43.5	22.3	39°55.8	52.3	159°46.5	55.3
21	197°14.1	157°04.0	·· 07.5	40°45.0	·· 21.8	54°58.0	·· 52.2	174°48.7	·· 55.3
22	212°16.6	172°03.5	08.5	55°46.5	21.4	70°00.2	52.1	189°50.9	55.4
23	227°19.0	187°03.0	09.4	70°48.0	20.9	85°02.4	52.0	204°53.2	55.5
Mer.pass. 07:53		ν -0.5′	d 1.0′	m -3.86	ν 1.5′	d 0.4′	m 0.66	ν 2.2′	d 0.1′ m -1.97	ν 2.2′	d 0.1′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.4
Ankaa	353°05.5	-42°09.2
Schedar	349°29.1	56°41.1
Diphda	348°45.6	-17°50.1
Achernar	335°19.3	-57°05.7
Hamal	327°49.3	23°35.4
Polaris	313°29.2	89°22.6
Acamar	315°10.7	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.2
Betelgeuse	270°50.3	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.2	-59°36.1
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.1	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.4
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.5	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°10.9	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.5
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°36.9	-60°57.1
Kochab	137°18.8	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.1	-26°29.6
Atria	107°05.0	-69°04.5
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.3
Rasalhague	95°56.4	12°32.3
Eltanin	90°40.8	51°28.9
Kaus Aust.	83°29.6	-34°22.2
Vega	80°31.6	38°48.4
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.4
Peacock	53°02.4	-56°38.5
Deneb	49°24.3	45°22.5
Enif	33°36.8	10°00.0
Al Na'ir	27°30.5	-46°49.4
Fomalhaut	15°12.5	-29°28.4
Scheat	13°43.4	28°13.7
Markab	13°28.0	15°21.1

May 22 Sat	SHA	Mer.pass
Venus	323°13.8	10:30
Mars	204°37.1	18:22
Jupiter	218°02.9	17:28
Saturn	337°52.2	09:30

May 23 Sun	SHA	Mer.pass
Venus	322°03.1	10:31
Mars	204°14.3	18:20
Jupiter	217°56.4	17:24
Saturn	337°46.0	09:26

May 24 Mon	SHA	Mer.pass
Venus	320°52.2	10:31
Mars	203°51.3	18:17
Jupiter	217°49.8	17:21
Saturn	337°39.9	09:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°50.6	N20°17.8	342°21.5	9.0′	S27°05.0	1.1′	54.9′
1	195°50.5	18.3	356°49.5	9.0′	27°06.1	1.1′	54.9′
2	210°50.5	18.8	11°17.5	9.0′	27°07.2	0.8′	54.9′
3	225°50.5	·· 19.3	25°45.5	9.1′	27°08.0	0.8′	54.9′
4	240°50.4	19.8	40°13.6	9.1′	27°08.8	0.6′	54.9′
5	255°50.4	20.3	54°41.7	9.1′	27°09.4	0.4′	54.8′
6	270°50.3	N20°20.8	69°09.7	9.1′	S27°09.8	0.4′	54.8′
7	285°50.3	21.3	83°37.8	9.1′	27°10.2	0.1′	54.8′
8	300°50.2	21.8	98°06.0	9.1′	27°10.3	0.1′	54.8′
9	315°50.2	·· 22.3	112°34.1	9.2′	27°10.4	0.1′	54.8′
10	330°50.1	22.8	127°02.3	9.2′	27°10.3	0.3′	54.8′
11	345°50.1	23.3	141°30.5	9.2′	27°10.0	0.3′	54.7′
12	0°50.0	N20°23.8	155°58.7	9.2′	S27°09.7	0.6′	54.7′
13	15°50.0	24.3	170°26.9	9.3′	27°09.1	0.6′	54.7′
14	30°50.0	24.8	184°55.2	9.3′	27°08.5	0.8′	54.7′
15	45°49.9	·· 25.3	199°23.5	9.3′	27°07.7	0.9′	54.7′
16	60°49.9	25.7	213°51.8	9.4′	27°06.8	1.1′	54.7′
17	75°49.8	26.2	228°20.1	9.4′	27°05.7	1.2′	54.7′
18	90°49.8	N20°26.7	242°48.5	9.4′	S27°04.5	1.3′	54.6′
19	105°49.7	27.2	257°16.9	9.4′	27°03.2	1.5′	54.6′
20	120°49.7	27.7	271°45.4	9.5′	27°01.7	1.6′	54.6′
21	135°49.6	·· 28.2	286°13.9	9.5′	27°00.1	1.8′	54.6′
22	150°49.6	28.7	300°42.4	9.6′	26°58.3	1.9′	54.6′
23	165°49.5	29.2	315°10.9	9.6′	26°56.4	2.0′	54.6′
	SD = 15.8′	d = 0.5′	SD = 15.0′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°49.5	N20°29.6	329°39.5	9.6′	S26°54.4	2.1′	54.6′
1	195°49.4	30.1	344°08.2	9.7′	26°52.3	2.3′	54.5′
2	210°49.4	30.6	358°36.8	9.7′	26°50.0	2.4′	54.5′
3	225°49.3	·· 31.1	13°05.6	9.8′	26°47.6	2.6′	54.5′
4	240°49.3	31.6	27°34.3	9.8′	26°45.0	2.6′	54.5′
5	255°49.2	32.1	42°03.1	9.9′	26°42.4	2.9′	54.5′
6	270°49.2	N20°32.5	56°32.0	9.9′	S26°39.5	2.9′	54.5′
7	285°49.1	33.0	71°00.9	9.9′	26°36.6	3.1′	54.5′
8	300°49.1	33.5	85°29.8	10.0′	26°33.5	3.2′	54.5′
9	315°49.0	·· 34.0	99°58.8	10.0′	26°30.3	3.3′	54.4′
10	330°49.0	34.4	114°27.9	10.1′	26°27.0	3.5′	54.4′
11	345°48.9	34.9	128°57.0	10.1′	26°23.5	3.5′	54.4′
12	0°48.9	N20°35.4	143°26.1	10.2′	S26°20.0	3.7′	54.4′
13	15°48.8	35.9	157°55.3	10.2′	26°16.3	3.9′	54.4′
14	30°48.8	36.4	172°24.5	10.3′	26°12.4	3.9′	54.4′
15	45°48.7	·· 36.8	186°53.8	10.4′	26°08.5	4.1′	54.4′
16	60°48.7	37.3	201°23.2	10.4′	26°04.4	4.2′	54.4′
17	75°48.6	37.8	215°52.6	10.5′	26°00.2	4.4′	54.4′
18	90°48.6	N20°38.3	230°22.1	10.5′	S25°55.8	4.4′	54.3′
19	105°48.5	38.7	244°51.6	10.6′	25°51.4	4.6′	54.3′
20	120°48.5	39.2	259°21.2	10.6′	25°46.8	4.7′	54.3′
21	135°48.4	·· 39.7	273°50.8	10.7′	25°42.1	4.8′	54.3′
22	150°48.3	40.1	288°20.5	10.8′	25°37.3	5.0′	54.3′
23	165°48.3	40.6	302°50.2	10.8′	25°32.3	5.0′	54.3′
	SD = 15.8′	d = 0.5′	SD = 14.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°48.2	N20°41.1	317°20.1	10.9′	S25°27.3	5.2′	54.3′
1	195°48.2	41.6	331°49.9	10.9′	25°22.1	5.3′	54.3′
2	210°48.1	42.0	346°19.9	11.0′	25°16.8	5.4′	54.3′
3	225°48.1	·· 42.5	0°49.8	11.1′	25°11.4	5.5′	54.3′
4	240°48.0	43.0	15°19.9	11.1′	25°05.9	5.7′	54.3′
5	255°48.0	43.4	29°50.0	11.2′	25°00.2	5.7′	54.2′
6	270°47.9	N20°43.9	44°20.2	11.2′	S24°54.5	5.9′	54.2′
7	285°47.9	44.4	58°50.4	11.3′	24°48.6	6.0′	54.2′
8	300°47.8	44.8	73°20.7	11.4′	24°42.6	6.1′	54.2′
9	315°47.7	·· 45.3	87°51.1	11.4′	24°36.5	6.2′	54.2′
10	330°47.7	45.7	102°21.5	11.5′	24°30.3	6.3′	54.2′
11	345°47.6	46.2	116°52.0	11.6′	24°24.0	6.5′	54.2′
12	0°47.6	N20°46.7	131°22.6	11.6′	S24°17.5	6.5′	54.2′
13	15°47.5	47.1	145°53.2	11.7′	24°11.0	6.6′	54.2′
14	30°47.5	47.6	160°23.9	11.8′	24°04.4	6.8′	54.2′
15	45°47.4	·· 48.1	174°54.7	11.8′	23°57.6	6.9′	54.2′
16	60°47.3	48.5	189°25.5	11.9′	23°50.7	6.9′	54.2′
17	75°47.3	49.0	203°56.4	12.0′	23°43.8	7.1′	54.2′
18	90°47.2	N20°49.4	218°27.3	12.0′	S23°36.7	7.2′	54.2′
19	105°47.2	49.9	232°58.3	12.1′	23°29.5	7.2′	54.2′
20	120°47.1	50.4	247°29.4	12.1′	23°22.3	7.4′	54.2′
21	135°47.0	·· 50.8	262°00.6	12.2′	23°14.9	7.5′	54.1′
22	150°47.0	51.3	276°31.8	12.3′	23°07.4	7.6′	54.1′
23	165°46.9	51.7	291°03.1	12.3′	22°59.8	7.7′	54.1′
	SD = 15.8′	d = 0.5′	SD = 14.8′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	00:56	23:06	////	////
66°	////	////	01:51	22:06	////	////
64°	////	////	02:23	21:33	////	////
62°	////	01:16	02:47	21:08	22:42	////
60°	////	01:54	03:06	20:49	22:02	////
N 58°	////	02:21	03:21	20:34	21:35	////
56°	01:09	02:41	03:34	20:20	21:14	22:49
54°	01:44	02:57	03:46	20:09	20:57	22:12
52°	02:08	03:11	03:56	19:59	20:43	21:47
50°	02:28	03:24	04:04	19:50	20:31	21:27
45°	03:03	03:48	04:23	19:31	20:06	20:52
N 40°	03:28	04:07	04:39	19:15	19:47	20:26
35°	03:48	04:23	04:51	19:02	19:31	20:06
30°	04:04	04:36	05:03	18:51	19:18	19:50
20°	04:29	04:58	05:22	18:32	18:56	19:25
N 10°	04:49	05:15	05:38	18:16	18:38	19:05
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:46	06:08	17:45	18:08	18:33
20°	05:34	06:01	06:24	17:29	17:53	18:20
30°	05:48	06:17	06:43	17:11	17:36	18:06
35°	05:55	06:26	06:53	17:00	17:27	17:58
40°	06:02	06:36	07:05	16:48	17:18	17:51
45°	06:11	06:47	07:19	16:34	17:06	17:42
S 50°	06:20	07:00	07:37	16:16	16:53	17:33
52°	06:24	07:06	07:45	16:08	16:47	17:29
54°	06:28	07:13	07:54	15:59	16:40	17:24
56°	06:33	07:20	08:04	15:49	16:33	17:20
58°	06:38	07:28	08:16	15:37	16:25	17:14
S 60°	06:44	07:38	08:30	15:23	16:15	17:09

Lat.	**Moonrise** Sat	**Moonrise** Sun	**Moonrise** Mon	**Moonset** Sat	**Moonset** Sun	**Moonset** Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	02:01	▬	▬	04:00
62°	00:11	00:56	01:07	02:14	03:19	04:53
60°	·· ··	00:09	00:35	03:05	04:05	05:25
N 58°	23:39	·· ··	00:10	03:36	04:35	05:49
56°	23:16	23:51	·· ··	04:00	04:58	06:08
54°	22:58	23:35	·· ··	04:19	05:16	06:24
52°	22:42	23:21	23:49	04:35	05:32	06:38
50°	22:28	23:08	23:39	04:49	05:45	06:50
45°	22:00	22:43	23:17	05:18	06:13	07:14
N 40°	21:38	22:23	23:00	05:40	06:35	07:34
35°	21:20	22:06	22:45	05:58	06:53	07:51
30°	21:04	21:51	22:32	06:14	07:08	08:05
20°	20:38	21:26	22:10	06:41	07:35	08:29
N 10°	20:15	21:05	21:51	07:04	07:57	08:49
0°	19:53	20:45	21:33	07:26	08:18	09:08
S 10°	19:32	20:24	21:16	07:47	08:39	09:28
20°	19:09	20:03	20:56	08:11	09:02	09:48
30°	18:42	19:37	20:34	08:37	09:27	10:11
35°	18:26	19:23	20:21	08:53	09:43	10:25
40°	18:08	19:05	20:06	09:12	10:00	10:41
45°	17:46	18:45	19:48	09:34	10:21	11:00
S 50°	17:18	18:18	19:25	10:02	10:48	11:23
52°	17:04	18:06	19:14	10:16	11:01	11:34
54°	16:48	17:51	19:02	10:32	11:16	11:47
56°	16:29	17:34	18:48	10:51	11:33	12:02
58°	16:06	17:13	18:31	11:14	11:54	12:19
S 60°	15:35	16:47	18:11	11:45	12:21	12:39

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 16-18 98-88%
22	03:22	03:20	11:57	01:13	13:40	
23	03:18	03:15	11:57	02:06	14:31	
24	03:13	03:10	11:57	02:57	15:21	

May 25, 26, 27 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	242°21.5	202°02.5	N14°10.4	85°49.5	N11°20.5	100°04.6	N15°51.9	219°55.4	N06°55.6
1	257°24.0	217°02.0	11.4	100°51.0	20.1	115°06.7	51.8	234°57.6	55.7
2	272°26.4	232°01.5	12.4	115°52.5	19.6	130°08.9	51.7	249°59.8	55.8
3	287°28.9	247°01.0	·· 13.3	130°54.0	·· 19.2	145°11.1	·· 51.6	265°02.0	·· 55.9
4	302°31.3	262°00.5	14.3	145°55.5	18.7	160°13.3	51.5	280°04.2	56.0
5	317°33.8	277°00.0	15.3	160°57.0	18.3	175°15.5	51.5	295°06.4	56.1
6	332°36.3	291°59.5	N14°16.2	175°58.4	N11°17.9	190°17.6	N15°51.4	310°08.7	N06°56.2
7	347°38.7	306°58.9	17.2	190°59.9	17.4	205°19.8	51.3	325°10.9	56.3
8	2°41.2	321°58.4	18.2	206°01.4	17.0	220°22.0	51.2	340°13.1	56.4
9	17°43.7	336°57.9	·· 19.2	221°02.9	·· 16.5	235°24.2	·· 51.1	355°15.3	·· 56.5
10	32°46.1	351°57.4	20.1	236°04.4	16.1	250°26.3	51.0	10°17.5	56.5
11	47°48.6	6°56.9	21.1	251°05.9	15.6	265°28.5	50.9	25°19.7	56.6
12	62°51.1	21°56.4	N14°22.1	266°07.4	N11°15.2	280°30.7	N15°50.8	40°21.9	N06°56.7
13	77°53.5	36°55.9	23.0	281°08.8	14.7	295°32.9	50.7	55°24.1	56.8
14	92°56.0	51°55.4	24.0	296°10.3	14.3	310°35.1	50.6	70°26.4	56.9
15	107°58.5	66°54.9	·· 25.0	311°11.8	·· 13.9	325°37.2	·· 50.5	85°28.6	·· 57.0
16	123°00.9	81°54.3	25.9	326°13.3	13.4	340°39.4	50.4	100°30.8	57.1
17	138°03.4	96°53.8	26.9	341°14.8	13.0	355°41.6	50.3	115°33.0	57.2
18	153°05.8	111°53.3	N14°27.9	356°16.3	N11°12.5	10°43.8	N15°50.2	130°35.2	N06°57.3
19	168°08.3	126°52.8	28.8	11°17.7	12.1	25°45.9	50.1	145°37.4	57.4
20	183°10.8	141°52.3	29.8	26°19.2	11.6	40°48.1	50.0	160°39.6	57.5
21	198°13.2	156°51.8	·· 30.8	41°20.7	·· 11.2	55°50.3	·· 49.9	175°41.9	·· 57.6
22	213°15.7	171°51.2	31.7	56°22.2	10.7	70°52.5	49.8	190°44.1	57.6
23	228°18.2	186°50.7	32.7	71°23.7	10.3	85°54.6	49.7	205°46.3	57.7
Mer.pass. 07:49		ν -0.5′	d 1.0′	ν 1.5′	d 0.4′	ν 2.2′	d 0.1′	ν 2.2′	d 0.1′
		m -3.86		m 0.67		m -1.96		m 0.69	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	243°20.6	201°50.2	N14°33.7	86°25.2	N11°09.9	100°56.8	N15°49.6	220°48.5	N06°57.8
1	258°23.1	216°49.7	34.6	101°26.6	09.4	115°59.0	49.5	235°50.7	57.9
2	273°25.6	231°49.2	35.6	116°28.1	09.0	131°01.2	49.4	250°52.9	58.0
3	288°28.0	246°48.7	·· 36.5	131°29.6	·· 08.5	146°03.3	·· 49.3	265°55.2	·· 58.1
4	303°30.5	261°48.1	37.5	146°31.1	08.1	161°05.5	49.3	280°57.4	58.2
5	318°33.0	276°47.6	38.5	161°32.6	07.6	176°07.7	49.2	295°59.6	58.3
6	333°35.4	291°47.1	N14°39.4	176°34.0	N11°07.2	191°09.9	N15°49.1	311°01.8	N06°58.4
7	348°37.9	306°46.6	40.4	191°35.5	06.7	206°12.0	49.0	326°04.0	58.5
8	3°40.3	321°46.1	41.3	206°37.0	06.3	221°14.2	48.9	341°06.2	58.6
9	18°42.8	336°45.5	·· 42.3	221°38.5	·· 05.8	236°16.4	·· 48.8	356°08.4	·· 58.6
10	33°45.3	351°45.0	43.2	236°40.0	05.4	251°18.6	48.7	11°10.7	58.7
11	48°47.7	6°44.5	44.2	251°41.4	04.9	266°20.7	48.6	26°12.9	58.8
12	63°50.2	21°44.0	N14°45.2	266°42.9	N11°04.5	281°22.9	N15°48.5	41°15.1	N06°58.9
13	78°52.7	36°43.4	46.1	281°44.4	04.0	296°25.1	48.4	56°17.3	59.0
14	93°55.1	51°42.9	47.1	296°45.9	03.6	311°27.2	48.3	71°19.5	59.1
15	108°57.6	66°42.4	·· 48.0	311°47.3	·· 03.1	326°29.4	·· 48.2	86°21.7	·· 59.2
16	124°00.1	81°41.9	49.0	326°48.8	02.7	341°31.6	48.1	101°24.0	59.3
17	139°02.5	96°41.3	49.9	341°50.3	02.2	356°33.8	48.0	116°26.2	59.4
18	154°05.0	111°40.8	N14°50.9	356°51.8	N11°01.8	11°35.9	N15°47.9	131°28.4	N06°59.5
19	169°07.5	126°40.3	51.8	11°53.2	01.3	26°38.1	47.8	146°30.6	59.5
20	184°09.9	141°39.8	52.8	26°54.7	00.9	41°40.3	47.7	161°32.8	59.6
21	199°12.4	156°39.2	·· 53.7	41°56.2	·· 00.4	56°42.4	·· 47.6	176°35.0	·· 59.7
22	214°14.8	171°38.7	54.7	56°57.6	11°00.0	71°44.6	47.5	191°37.2	59.8
23	229°17.3	186°38.2	55.6	71°59.1	10°59.5	86°46.8	47.4	206°39.5	59.9
Mer.pass. 07:45		ν -0.5′	d 1.0′	ν 1.5′	d 0.4′	ν 2.2′	d 0.1′	ν 2.2′	d 0.1′
		m -3.86		m 0.68		m -1.96		m 0.69	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	244°19.8	201°37.7	N14°56.6	87°00.6	N10°59.1	101°49.0	N15°47.3	221°41.7	N07°00.0
1	259°22.2	216°37.1	57.5	102°02.1	58.6	116°51.1	47.2	236°43.9	00.1
2	274°24.7	231°36.6	58.5	117°03.5	58.2	131°53.3	47.1	251°46.1	00.2
3	289°27.2	246°36.1	14°59.4	132°05.0	·· 57.7	146°55.5	·· 47.0	266°48.3	·· 00.3
4	304°29.6	261°35.5	15°00.4	147°06.5	57.3	161°57.6	46.9	281°50.6	00.4
5	319°32.1	276°35.0	01.3	162°07.9	56.8	176°59.8	46.8	296°52.8	00.5
6	334°34.6	291°34.5	N15°02.2	177°09.4	N10°56.4	192°02.0	N15°46.7	311°55.0	N07°00.5
7	349°37.0	306°33.9	03.2	192°10.9	55.9	207°04.1	46.6	326°57.2	00.6
8	4°39.5	321°33.4	04.1	207°12.4	55.5	222°06.3	46.5	341°59.4	00.7
9	19°41.9	336°32.9	·· 05.1	222°13.8	·· 55.0	237°08.5	·· 46.4	357°01.6	·· 00.8
10	34°44.4	351°32.4	06.0	237°15.3	54.6	252°10.6	46.3	12°03.9	00.9
11	49°46.9	6°31.8	07.0	252°16.8	54.1	267°12.8	46.2	27°06.1	01.0
12	64°49.3	21°31.3	N15°07.9	267°18.2	N10°53.7	282°15.0	N15°46.1	42°08.3	N07°01.1
13	79°51.8	36°30.8	08.8	282°19.7	53.2	297°17.1	46.0	57°10.5	01.2
14	94°54.3	51°30.2	09.8	297°21.2	52.8	312°19.3	45.9	72°12.7	01.3
15	109°56.7	66°29.7	·· 10.7	312°22.6	·· 52.3	327°21.5	·· 45.8	87°14.9	·· 01.3
16	124°59.2	81°29.1	11.6	327°24.1	51.9	342°23.6	45.7	102°17.2	01.4
17	140°01.7	96°28.6	12.6	342°25.6	51.4	357°25.8	45.6	117°19.4	01.5
18	155°04.1	111°28.1	N15°13.5	357°27.0	N10°51.0	12°28.0	N15°45.5	132°21.6	N07°01.6
19	170°06.6	126°27.5	14.5	12°28.5	50.5	27°30.1	45.4	147°23.8	01.7
20	185°09.1	141°27.0	15.4	27°30.0	50.1	42°32.3	45.3	162°26.0	01.8
21	200°11.5	156°26.5	·· 16.3	42°31.4	·· 49.6	57°34.5	·· 45.2	177°28.2	·· 01.9
22	215°14.0	171°25.9	17.3	57°32.9	49.1	72°36.6	45.1	192°30.5	02.0
23	230°16.4	186°25.4	18.2	72°34.3	48.7	87°38.8	45.0	207°32.7	02.1
Mer.pass. 07:41		ν -0.5′	d 0.9′	ν 1.5′	d 0.5′	ν 2.2′	d 0.1′	ν 2.2′	d 0.1′
		m -3.86		m 0.70		m -1.95		m 0.69	

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.4
Ankaa	353°05.5	-42°09.2
Schedar	349°29.1	56°41.1
Diphda	348°45.6	-17°50.1
Achernar	335°19.2	-57°05.6
Hamal	327°49.3	23°35.4
Polaris	313°28.5	89°22.6
Acamar	315°10.7	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.3	-59°36.1
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.1	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.4
Denebola	182°22.8	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.5	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°10.9	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.6
Hadar	148°32.6	-60°30.5
Menkent	147°54.9	-36°30.5
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°36.9	-60°57.1
Kochab	137°18.8	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.1	-26°29.6
Atria	107°04.9	-69°04.5
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.4
Rasalhague	95°56.4	12°32.3
Eltanin	90°40.8	51°29.0
Kaus Aust.	83°29.6	-34°22.2
Vega	80°31.5	38°48.4
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.4
Peacock	53°02.4	-56°38.5
Deneb	49°24.3	45°22.5
Enif	33°36.8	10°00.0
Al Na'ir	27°30.5	-46°49.4
Fomalhaut	15°12.4	-29°28.4
Scheat	13°43.4	28°13.8
Markab	13°28.0	15°21.1

May 25 Tue	SHA	Mer.pass
Venus	319°41.0	10:32
Mars	203°28.0	18:15
Jupiter	217°43.1	17:17
Saturn	337°33.9	09:19

May 26 Wed	SHA	Mer.pass
Venus	318°29.6	10:33
Mars	203°04.5	18:13
Jupiter	217°36.2	17:14
Saturn	337°27.9	09:15

May 27 Thu	SHA	Mer.pass
Venus	317°17.9	10:34
Mars	202°40.8	18:10
Jupiter	217°29.2	17:10
Saturn	337°21.9	09:12

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°46.9	N20°52.2	305°34.4	12.4′	S22°52.1	7.8′	54.1′
1	195°46.8	52.6	320°05.8	12.5′	22°44.3	7.8′	54.1′
2	210°46.7	53.1	334°37.3	12.5′	22°36.5	8.0′	54.1′
3	225°46.7	·· 53.5	349°08.8	12.6′	22°28.5	8.1′	54.1′
4	240°46.6	54.0	3°40.5	12.7′	22°20.4	8.2′	54.1′
5	255°46.6	54.4	18°12.1	12.7′	22°12.2	8.2′	54.1′
6	270°46.5	N20°54.9	32°43.9	12.8′	S22°04.0	8.4′	54.1′
7	285°46.4	55.3	47°15.7	12.9′	21°55.6	8.4′	54.1′
8	300°46.4	55.8	61°47.5	12.9′	21°47.2	8.6′	54.1′
9	315°46.3	·· 56.2	76°19.5	13.0′	21°38.6	8.6′	54.1′
10	330°46.3	56.7	90°51.5	13.1′	21°30.0	8.7′	54.1′
11	345°46.2	57.1	105°23.6	13.1′	21°21.3	8.9′	54.1′
12	0°46.1	N20°57.6	119°55.7	13.2′	S21°12.4	8.9′	54.1′
13	15°46.1	58.0	134°27.9	13.3′	21°03.5	9.0′	54.1′
14	30°46.0	58.5	149°00.1	13.3′	20°54.5	9.1′	54.1′
15	45°45.9	·· 58.9	163°32.5	13.4′	20°45.4	9.1′	54.1′
16	60°45.9	59.4	178°04.8	13.4′	20°36.3	9.3′	54.1′
17	75°45.8	20°59.8	192°37.3	13.5′	20°27.0	9.3′	54.1′
18	90°45.8	N21°00.3	207°09.8	13.6′	S20°17.7	9.4′	54.1′
19	105°45.7	00.7	221°42.4	13.6′	20°08.3	9.6′	54.1′
20	120°45.6	01.1	236°15.0	13.7′	19°58.7	9.6′	54.1′
21	135°45.6	·· 01.6	250°47.7	13.8′	19°49.1	9.6′	54.1′
22	150°45.5	02.0	265°20.5	13.8′	19°39.5	9.8′	54.1′
23	165°45.4	02.5	279°53.3	13.9′	19°29.7	9.8′	54.1′
	SD = 15.8′	*d* = 0.5′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°45.4	N21°02.9	294°26.2	13.9′	S19°19.9	9.9′	54.1′
1	195°45.3	03.4	308°59.1	14.0′	19°10.0	10.0′	54.1′
2	210°45.2	03.8	323°32.1	14.1′	19°00.0	10.1′	54.1′
3	225°45.2	·· 04.2	338°05.1	14.1′	18°49.9	10.2′	54.1′
4	240°45.1	04.7	352°38.2	14.2′	18°39.7	10.2′	54.1′
5	255°45.0	05.1	7°11.4	14.2′	18°29.5	10.3′	54.1′
6	270°45.0	N21°05.5	21°44.6	14.3′	S18°19.2	10.4′	54.1′
7	285°44.9	06.0	36°17.9	14.3′	18°08.8	10.4′	54.1′
8	300°44.8	06.4	50°51.2	14.4′	17°58.4	10.5′	54.1′
9	315°44.8	·· 06.8	65°24.6	14.4′	17°47.9	10.6′	54.1′
10	330°44.7	07.3	79°58.1	14.5′	17°37.3	10.7′	54.2′
11	345°44.6	07.7	94°31.6	14.5′	17°26.6	10.8′	54.2′
12	0°44.6	N21°08.1	109°05.1	14.6′	S17°15.8	10.8′	54.2′
13	15°44.5	08.6	123°38.7	14.7′	17°05.0	10.9′	54.2′
14	30°44.4	09.0	138°12.4	14.7′	16°54.1	10.9′	54.2′
15	45°44.4	·· 09.4	152°46.1	14.8′	16°43.2	11.0′	54.2′
16	60°44.3	09.9	167°19.8	14.8′	16°32.2	11.1′	54.2′
17	75°44.2	10.3	181°53.6	14.9′	16°21.1	11.2′	54.2′
18	90°44.2	N21°10.7	196°27.5	14.9′	S16°09.9	11.2′	54.2′
19	105°44.1	11.2	211°01.4	14.9′	15°58.7	11.3′	54.2′
20	120°44.0	11.6	225°35.3	15.0′	15°47.4	11.3′	54.2′
21	135°44.0	·· 12.0	240°09.3	15.0′	15°36.1	11.4′	54.2′
22	150°43.9	12.4	254°43.4	15.1′	15°24.7	11.5′	54.2′
23	165°43.8	12.9	269°17.5	15.1′	15°13.2	11.6′	54.2′
	SD = 15.8′	*d* = 0.4′	SD = 14.8′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°43.8	N21°13.3	283°51.6	15.2′	S15°01.6	11.6′	54.3′
1	195°43.7	13.7	298°25.8	15.2′	14°50.0	11.6′	54.3′
2	210°43.6	14.1	313°00.0	15.3′	14°38.4	11.8′	54.3′
3	225°43.5	·· 14.6	327°34.2	15.3′	14°26.6	11.7′	54.3′
4	240°43.5	15.0	342°08.5	15.3′	14°14.9	11.9′	54.3′
5	255°43.4	15.4	356°42.9	15.4′	14°03.0	11.9′	54.3′
6	270°43.3	N21°15.8	11°17.2	15.4′	S13°51.1	11.9′	54.3′
7	285°43.3	16.2	25°51.6	15.4′	13°39.2	12.1′	54.3′
8	300°43.2	16.7	40°26.1	15.5′	13°27.1	12.0′	54.3′
9	315°43.1	·· 17.1	55°00.6	15.5′	13°15.1	12.2′	54.3′
10	330°43.0	17.5	69°35.1	15.6′	13°02.9	12.1′	54.4′
11	345°43.0	17.9	84°09.7	15.6′	12°50.8	12.3′	54.4′
12	0°42.9	N21°18.3	98°44.2	15.6′	S12°38.5	12.3′	54.4′
13	15°42.8	18.8	113°18.9	15.7′	12°26.2	12.3′	54.4′
14	30°42.7	19.2	127°53.5	15.7′	12°13.9	12.4′	54.4′
15	45°42.7	·· 19.6	142°28.2	15.7′	12°01.5	12.4′	54.4′
16	60°42.6	20.0	157°02.9	15.7′	11°49.1	12.5′	54.4′
17	75°42.5	20.4	171°37.7	15.8′	11°36.6	12.6′	54.4′
18	90°42.5	N21°20.8	186°12.4	15.8′	S11°24.0	12.6′	54.5′
19	105°42.4	21.2	200°47.2	15.8′	11°11.4	12.6′	54.5′
20	120°42.3	21.6	215°22.1	15.9′	10°58.8	12.7′	54.5′
21	135°42.2	·· 22.1	229°56.9	15.9′	10°46.1	12.8′	54.5′
22	150°42.2	22.5	244°31.8	15.9′	10°33.3	12.7′	54.5′
23	165°42.1	22.9	259°06.7	15.9′	10°20.6	12.9′	54.5′
	SD = 15.8′	*d* = 0.4′	SD = 14.8′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	00:22	////	////	////
66°	////	////	01:39	22:19	////	////
64°	////	////	02:15	21:42	////	////
62°	////	01:00	02:40	21:16	23:00	////
60°	////	01:45	03:00	20:56	22:12	////
N 58°	////	02:14	03:16	20:39	21:42	////
56°	00:54	02:35	03:30	20:25	21:20	23:05
54°	01:36	02:53	03:42	20:13	21:03	22:21
52°	02:02	03:07	03:52	20:03	20:48	21:54
50°	02:22	03:20	04:01	19:53	20:35	21:33
45°	02:59	03:45	04:21	19:34	20:10	20:56
N 40°	03:25	04:05	04:37	19:18	19:50	20:29
35°	03:46	04:21	04:50	19:05	19:33	20:09
30°	04:02	04:35	05:01	18:53	19:20	19:52
20°	04:28	04:57	05:21	18:33	18:57	19:26
N 10°	04:49	05:15	05:38	18:16	18:39	19:06
0°	05:06	05:31	05:53	18:01	18:23	18:49
S 10°	05:21	05:47	06:09	17:45	18:07	18:33
20°	05:35	06:02	06:25	17:28	17:52	18:19
30°	05:49	06:18	06:44	17:10	17:35	18:05
35°	05:57	06:28	06:55	16:59	17:26	17:57
40°	06:05	06:38	07:08	16:46	17:16	17:49
45°	06:13	06:50	07:22	16:31	17:04	17:41
S 50°	06:23	07:03	07:40	16:13	16:50	17:31
52°	06:27	07:10	07:49	16:05	16:44	17:26
54°	06:32	07:17	07:58	15:55	16:37	17:22
56°	06:37	07:24	08:09	15:45	16:29	17:17
58°	06:42	07:33	08:21	15:32	16:21	17:11
S 60°	06:48	07:43	08:35	15:18	16:11	17:05

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	▬	02:42	▬	▬	08:08
N 70°	▬	03:08	02:13	▬	06:10	08:35
68°	▬	02:21	01:51	▬	06:56	08:56
66°	02:21	01:50	01:33	05:21	07:26	09:12
64°	01:38	01:27	01:19	06:03	07:48	09:25
62°	01:09	01:08	01:07	06:31	08:06	09:36
60°	00:47	00:53	00:56	06:53	08:20	09:45
N 58°	00:29	00:40	00:47	07:10	08:32	09:53
56°	00:14	00:29	00:39	07:25	08:43	10:01
54°	00:00	00:19	00:32	07:37	08:52	10:07
52°	·· ··	00:10	00:26	07:48	09:01	10:13
50°	·· ··	00:02	00:20	07:58	09:08	10:18
45°	23:45	·· ··	00:08	08:19	09:24	10:29
N 40°	23:31	23:57	·· ··	08:35	09:37	10:38
35°	23:19	23:48	·· ··	08:49	09:48	10:46
30°	23:08	23:40	·· ··	09:01	09:57	10:52
20°	22:50	23:27	·· ··	09:22	10:14	11:04
N 10°	22:34	23:15	23:53	09:40	10:28	11:14
0°	22:20	23:03	23:45	09:56	10:41	11:24
S 10°	22:05	22:52	23:38	10:12	10:54	11:33
20°	21:49	22:40	23:30	10:30	11:08	11:43
30°	21:30	22:26	23:21	10:50	11:24	11:54
35°	21:20	22:18	23:15	11:02	11:33	12:01
40°	21:07	22:08	23:09	11:15	11:43	12:08
45°	20:53	21:58	23:02	11:30	11:55	12:17
S 50°	20:35	21:44	22:54	11:50	12:10	12:27
52°	20:26	21:38	22:50	11:59	12:17	12:31
54°	20:16	21:31	22:45	12:09	12:24	12:37
56°	20:06	21:23	22:40	12:20	12:33	12:42
58°	19:53	21:15	22:35	12:33	12:42	12:49
S 60°	19:39	21:05	22:29	12:48	12:53	12:56

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Mer.Pass. Lower hh:mm	Age 19-21 82-65%
25	03:07	03:05	11:57	03:45	16:08	
26	03:01	02:58	11:57	04:30	16:52	
27	02:55	02:52	11:57	05:14	17:34	

May 28, 29, 30 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	245°18.9	201°24.8	N15°19.1	87°35.8	N10°48.2	102°41.0	N15°44.9	222°34.9	N07°02.2
1	260°21.4	216°24.3	20.1	102°37.3	47.8	117°43.1	44.8	237°37.1	02.2
2	275°23.8	231°23.8	21.0	117°38.7	47.3	132°45.3	44.7	252°39.3	02.3
3	290°26.3	246°23.2	·· 21.9	132°40.2	·· 46.9	147°47.5	·· 44.6	267°41.6	·· 02.4
4	305°28.8	261°22.7	22.8	147°41.7	46.4	162°49.6	44.5	282°43.8	02.5
5	320°31.2	276°22.1	23.8	162°43.1	46.0	177°51.8	44.4	297°46.0	02.6
6	335°33.7	291°21.6	N15°24.7	177°44.6	N10°45.5	192°54.0	N15°44.3	312°48.2	N07°02.7
7	350°36.2	306°21.1	25.6	192°46.0	45.1	207°56.1	44.2	327°50.4	02.8
8	5°38.6	321°20.5	26.6	207°47.5	44.6	222°58.3	44.1	342°52.7	02.9
9	20°41.1	336°20.0	·· 27.5	222°49.0	·· 44.1	238°00.4	·· 44.0	357°54.9	·· 03.0
10	35°43.6	351°19.4	28.4	237°50.4	43.7	253°02.6	43.9	12°57.1	03.0
11	50°46.0	6°18.9	29.3	252°51.9	43.2	268°04.8	43.8	27°59.3	03.1
12	65°48.5	21°18.3	N15°30.3	267°53.3	N10°42.8	283°06.9	N15°43.7	43°01.5	N07°03.2
13	80°50.9	36°17.8	31.2	282°54.8	42.3	298°09.1	43.6	58°03.8	03.3
14	95°53.4	51°17.3	32.1	297°56.3	41.9	313°11.3	43.5	73°06.0	03.4
15	110°55.9	66°16.7	·· 33.0	312°57.7	·· 41.4	328°13.4	·· 43.4	88°08.2	·· 03.5
16	125°58.3	81°16.2	34.0	327°59.2	40.9	343°15.6	43.3	103°10.4	03.6
17	141°00.8	96°15.6	34.9	343°00.6	40.5	358°17.7	43.2	118°12.6	03.7
18	156°03.3	111°15.1	N15°35.8	358°02.1	N10°40.0	13°19.9	N15°43.1	133°14.9	N07°03.8
19	171°05.7	126°14.5	36.7	13°03.5	39.6	28°22.1	43.0	148°17.1	03.8
20	186°08.2	141°14.0	37.6	28°05.0	39.1	43°24.2	42.9	163°19.3	03.9
21	201°10.7	156°13.4	·· 38.6	43°06.5	·· 38.6	58°26.4	·· 42.8	178°21.5	·· 04.0
22	216°13.1	171°12.9	39.5	58°07.9	38.2	73°28.5	42.7	193°23.7	04.1
23	231°15.6	186°12.3	40.4	73°09.4	37.7	88°30.7	42.6	208°26.0	04.2
Mer.pass. 07:37		ν -0.5′	d 0.9′	ν 1.5′	d 0.5′ m 0.71	ν 2.2′	d 0.1′ m -1.95	ν 2.2′	d 0.1′ m 0.69

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	246°18.0	201°11.8	N15°41.3	88°10.8	N10°37.3	103°32.9	N15°42.5	223°28.2	N07°04.3
1	261°20.5	216°11.2	42.2	103°12.3	36.8	118°35.0	42.4	238°30.4	04.4
2	276°23.0	231°10.7	43.1	118°13.7	36.4	133°37.2	42.3	253°32.6	04.5
3	291°25.4	246°10.1	·· 44.1	133°15.2	·· 35.9	148°39.3	·· 42.2	268°34.8	·· 04.5
4	306°27.9	261°09.6	45.0	148°16.6	35.4	163°41.5	42.1	283°37.1	04.6
5	321°30.4	276°09.0	45.9	163°18.1	35.0	178°43.6	42.0	298°39.3	04.7
6	336°32.8	291°08.5	N15°46.8	178°19.5	N10°34.5	193°45.8	N15°41.9	313°41.5	N07°04.8
7	351°35.3	306°07.9	47.7	193°21.0	34.1	208°48.0	41.8	328°43.7	04.9
8	6°37.8	321°07.4	48.6	208°22.4	33.6	223°50.1	41.7	343°45.9	05.0
9	21°40.2	336°06.8	·· 49.5	223°23.9	·· 33.1	238°52.3	·· 41.6	358°48.2	·· 05.1
10	36°42.7	351°06.2	50.4	238°25.3	32.7	253°54.4	41.5	13°50.4	05.2
11	51°45.2	6°05.7	51.4	253°26.8	32.2	268°56.6	41.4	28°52.6	05.2
12	66°47.6	21°05.1	N15°52.3	268°28.2	N10°31.7	283°58.8	N15°41.3	43°54.8	N07°05.3
13	81°50.1	36°04.6	53.2	283°29.7	31.3	299°00.9	41.2	58°57.0	05.4
14	96°52.5	51°04.0	54.1	298°31.1	30.8	314°03.1	41.1	73°59.3	05.5
15	111°55.0	66°03.5	·· 55.0	313°32.6	·· 30.4	329°05.2	·· 41.0	89°01.5	·· 05.6
16	126°57.5	81°02.9	55.9	328°34.0	29.9	344°07.4	40.9	104°03.7	05.7
17	141°59.9	96°02.3	56.8	343°35.5	29.4	359°09.5	40.8	119°05.9	05.8
18	157°02.4	111°01.8	N15°57.7	358°36.9	N10°29.0	14°11.7	N15°40.7	134°08.2	N07°05.9
19	172°04.9	126°01.2	58.6	13°38.4	28.5	29°13.8	40.6	149°10.4	05.9
20	187°07.3	141°00.7	15°59.5	28°39.8	28.1	44°16.0	40.5	164°12.6	06.0
21	202°09.8	156°00.1	16°00.4	43°41.3	·· 27.6	59°18.2	·· 40.4	179°14.8	·· 06.1
22	217°12.3	170°59.5	01.3	58°42.7	27.1	74°20.3	40.3	194°17.0	06.2
23	232°14.7	185°59.0	02.2	73°44.2	26.7	89°22.5	40.1	209°19.3	06.3
Mer.pass. 07:34		ν -0.6′	d 0.9′	ν 1.5′	d 0.5′ m 0.72	ν 2.2′	d 0.1′ m -1.94	ν 2.2′	d 0.1′ m 0.69

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	247°17.2	200°58.4	N16°03.1	88°45.6	N10°26.2	104°24.6	N15°40.0	224°21.5	N07°06.4
1	262°19.6	215°57.9	04.0	103°47.1	25.7	119°26.8	39.9	239°23.7	06.5
2	277°22.1	230°57.3	04.9	118°48.5	25.3	134°28.9	39.8	254°25.9	06.6
3	292°24.6	245°56.7	·· 05.8	133°50.0	·· 24.8	149°31.1	·· 39.7	269°28.2	·· 06.6
4	307°27.0	260°56.2	06.7	148°51.4	24.3	164°33.2	39.6	284°30.4	06.7
5	322°29.5	275°55.6	07.6	163°52.8	23.9	179°35.4	39.5	299°32.6	06.8
6	337°32.0	290°55.0	N16°08.5	178°54.3	N10°23.4	194°37.5	N15°39.4	314°34.8	N07°06.9
7	352°34.4	305°54.5	09.4	193°55.7	23.0	209°39.7	39.3	329°37.1	07.0
8	7°36.9	320°53.9	10.3	208°57.2	22.5	224°41.8	39.2	344°39.3	07.1
9	22°39.4	335°53.4	·· 11.2	223°58.6	·· 22.0	239°44.0	·· 39.1	359°41.5	·· 07.2
10	37°41.8	350°52.8	12.1	239°00.1	21.6	254°46.2	39.0	14°43.7	07.3
11	52°44.3	5°52.2	13.0	254°01.5	21.1	269°48.3	38.9	29°45.9	07.3
12	67°46.8	20°51.7	N16°13.9	269°02.9	N10°20.6	284°50.5	N15°38.8	44°48.2	N07°07.4
13	82°49.2	35°51.1	14.8	284°04.4	20.2	299°52.6	38.7	59°50.4	07.5
14	97°51.7	50°50.5	15.7	299°05.8	19.7	314°54.8	38.6	74°52.6	07.6
15	112°54.1	65°49.9	·· 16.6	314°07.3	·· 19.2	329°56.9	·· 38.5	89°54.8	·· 07.7
16	127°56.6	80°49.4	17.4	329°08.7	18.8	344°59.1	38.4	104°57.1	07.8
17	142°59.1	95°48.8	18.3	344°10.1	18.3	0°01.2	38.3	119°59.3	07.9
18	158°01.5	110°48.2	N16°19.2	359°11.6	N10°17.8	15°03.4	N15°38.2	135°01.5	N07°07.9
19	173°04.0	125°47.7	20.1	14°13.0	17.4	30°05.5	38.1	150°03.7	08.0
20	188°06.5	140°47.1	21.0	29°14.5	16.9	45°07.7	38.0	165°06.0	08.1
21	203°08.9	155°46.5	·· 21.9	44°15.9	·· 16.4	60°09.8	·· 37.9	180°08.2	·· 08.2
22	218°11.4	170°46.0	22.8	59°17.3	16.0	75°12.0	37.8	195°10.4	08.3
23	233°13.9	185°45.4	23.7	74°18.8	15.5	90°14.1	37.6	210°12.6	08.4
Mer.pass. 07:30		ν -0.6′	d 0.9′	ν 1.4′	d 0.5′ m 0.74	ν 2.2′	d 0.1′ m -1.94	ν 2.2′	d 0.1′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.4
Ankaa	353°05.5	-42°09.2
Schedar	349°29.1	56°41.1
Diphda	348°45.5	-17°50.1
Achernar	335°19.2	-57°05.6
Hamal	327°49.3	23°35.4
Polaris	313°28.0	89°22.6
Acamar	315°10.7	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.8
Sirius	258°24.8	-16°45.4
Adhara	255°04.6	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.3	-59°36.1
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.2	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.5	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°11.0	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.7
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.5
Arcturus	145°45.8	19°02.3
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.8	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.1	-26°29.6
Atria	107°04.9	-69°04.5
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.4
Rasalhague	95°56.4	12°32.3
Eltanin	90°40.8	51°29.0
Kaus Aust.	83°29.6	-34°22.2
Vega	80°31.5	38°48.4
Nunki	75°45.0	-26°15.7
Altair	61°57.8	8°56.4
Peacock	53°02.4	-56°38.5
Deneb	49°24.2	45°22.5
Enif	33°36.8	10°00.0
Al Na'ir	27°30.4	-46°49.4
Fomalhaut	15°12.4	-29°28.4
Scheat	13°43.3	28°13.8
Markab	13°28.0	15°21.1

May 28 Fri	SHA	Mer.pass
Venus	316°05.9	10:35
Mars	202°16.9	18:08
Jupiter	217°22.1	17:07
Saturn	337°16.0	09:08

May 29 Sat	SHA	Mer.pass
Venus	314°53.7	10:36
Mars	201°52.8	18:06
Jupiter	217°14.8	17:03
Saturn	337°10.1	09:05

May 30 Sun	SHA	Mer.pass
Venus	313°41.2	10:37
Mars	201°28.4	18:03
Jupiter	217°07.4	17:00
Saturn	337°04.3	09:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1356 sec ΔT = TT-UT1 = +69.3196 sec

2027 May 28 to May. 30 UT

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.0	N21°23.3	273°41.6	15.9′	S10°07.7	12.9′	54.6′
1	195°41.9	23.7	288°16.6	16.0′	09°54.8	12.9′	54.6′
2	210°41.9	24.1	302°51.5	16.0′	09°41.9	13.0′	54.6′
3	225°41.8	·· 24.5	317°26.5	16.0′	09°28.9	13.0′	54.6′
4	240°41.7	24.9	332°01.5	16.0′	09°15.9	13.0′	54.6′
5	255°41.6	25.3	346°36.5	16.0′	09°02.9	13.1′	54.6′
6	270°41.5	N21°25.7	1°11.6	16.0′	S08°49.8	13.2′	54.7′
7	285°41.5	26.1	15°46.6	16.1′	08°36.6	13.1′	54.7′
8	300°41.4	26.5	30°21.7	16.1′	08°23.5	13.3′	54.7′
9	315°41.3	·· 26.9	44°56.7	16.1′	08°10.2	13.2′	54.7′
10	330°41.2	27.4	59°31.8	16.1′	07°57.0	13.3′	54.7′
11	345°41.2	27.8	74°06.9	16.1′	07°43.7	13.3′	54.7′
12	0°41.1	N21°28.2	88°42.0	16.1′	S07°30.4	13.4′	54.8′
13	15°41.0	28.6	103°17.2	16.1′	07°17.0	13.4′	54.8′
14	30°40.9	29.0	117°52.3	16.1′	07°03.6	13.5′	54.8′
15	45°40.9	·· 29.4	132°27.4	16.1′	06°50.1	13.5′	54.8′
16	60°40.8	29.8	147°02.5	16.1′	06°36.6	13.5′	54.8′
17	75°40.7	30.2	161°37.7	16.1′	06°23.1	13.5′	54.9′
18	90°40.6	N21°30.6	176°12.8	16.1′	S06°09.6	13.6′	54.9′
19	105°40.5	31.0	190°48.0	16.1′	05°56.0	13.6′	54.9′
20	120°40.5	31.3	205°23.1	16.1′	05°42.4	13.7′	54.9′
21	135°40.4	·· 31.7	219°58.3	16.1′	05°28.7	13.7′	54.9′
22	150°40.3	32.1	234°33.4	16.1′	05°15.0	13.7′	55.0′
23	165°40.2	32.5	249°08.6	16.1′	05°01.3	13.7′	55.0′
	SD = 15.8′	d = 0.4′	SD = 14.9′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°40.1	N21°32.9	263°43.7	16.1′	S04°47.6	13.8′	55.0′
1	195°40.1	33.3	278°18.8	16.1′	04°33.8	13.8′	55.0′
2	210°40.0	33.7	292°54.0	16.1′	04°20.0	13.8′	55.1′
3	225°39.9	·· 34.1	307°29.1	16.1′	04°06.2	13.9′	55.1′
4	240°39.8	34.5	322°04.2	16.1′	03°52.3	13.9′	55.1′
5	255°39.7	34.9	336°39.3	16.1′	03°38.4	13.9′	55.1′
6	270°39.7	N21°35.3	351°14.4	16.1′	S03°24.5	13.9′	55.2′
7	285°39.6	35.7	5°49.5	16.1′	03°10.6	14.0′	55.2′
8	300°39.5	36.1	20°24.6	16.1′	02°56.6	14.0′	55.2′
9	315°39.4	·· 36.4	34°59.6	16.0′	02°42.6	14.0′	55.2′
10	330°39.3	36.8	49°34.7	16.0′	02°28.6	14.0′	55.3′
11	345°39.2	37.2	64°09.7	16.0′	02°14.6	14.1′	55.3′
12	0°39.2	N21°37.6	78°44.7	16.0′	S02°00.5	14.0′	55.3′
13	15°39.1	38.0	93°19.7	16.0′	01°46.5	14.1′	55.3′
14	30°39.0	38.4	107°54.7	15.9′	01°32.4	14.1′	55.4′
15	45°38.9	·· 38.8	122°29.6	15.9′	01°18.3	14.2′	55.4′
16	60°38.8	39.1	137°04.5	15.9′	01°04.1	14.1′	55.4′
17	75°38.7	39.5	151°39.4	15.9′	00°50.0	14.2′	55.4′
18	90°38.7	N21°39.9	166°14.3	15.9′	S00°35.8	14.2′	55.5′
19	105°38.6	40.3	180°49.2	15.8′	00°21.6	14.2′	55.5′
20	120°38.5	40.7	195°24.0	15.8′	S00°07.4	14.2′	55.5′
21	135°38.4	·· 41.1	209°58.8	15.8′	N00°06.8	14.2′	55.5′
22	150°38.3	41.4	224°33.6	15.7′	00°21.0	14.3′	55.6′
23	165°38.2	41.8	239°08.3	15.7′	00°35.3	14.2′	55.6′
	SD = 15.8′	d = 0.4′	SD = 15.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.2	N21°42.2	253°43.0	15.7′	N00°49.5	14.3′	55.6′
1	195°38.1	42.6	268°17.7	15.6′	01°03.8	14.3′	55.7′
2	210°38.0	42.9	282°52.3	15.6′	01°18.1	14.3′	55.7′
3	225°37.9	·· 43.3	297°26.9	15.6′	01°32.4	14.3′	55.7′
4	240°37.8	43.7	312°01.5	15.5′	01°46.7	14.3′	55.8′
5	255°37.7	44.1	326°36.0	15.5′	02°01.0	14.3′	55.8′
6	270°37.6	N21°44.4	341°10.5	15.4′	N02°15.3	14.3′	55.8′
7	285°37.6	44.8	355°44.9	15.4′	02°29.6	14.4′	55.8′
8	300°37.5	45.2	10°19.3	15.4′	02°44.0	14.3′	55.9′
9	315°37.4	·· 45.6	24°53.7	15.3′	02°58.3	14.3′	55.9′
10	330°37.3	45.9	39°28.0	15.3′	03°12.6	14.4′	55.9′
11	345°37.2	46.3	54°02.3	15.2′	03°27.0	14.3′	56.0′
12	0°37.1	N21°46.7	68°36.5	15.2′	N03°41.3	14.4′	56.0′
13	15°37.0	47.1	83°10.7	15.1′	03°55.7	14.3′	56.0′
14	30°36.9	47.4	97°44.8	15.1′	04°10.0	14.4′	56.1′
15	45°36.9	·· 47.8	112°18.9	15.0′	04°24.4	14.3′	56.1′
16	60°36.8	48.2	126°52.9	15.0′	04°38.7	14.4′	56.1′
17	75°36.7	48.5	141°26.9	14.9′	04°53.1	14.3′	56.2′
18	90°36.6	N21°48.9	156°00.8	14.9′	N05°07.4	14.4′	56.2′
19	105°36.5	49.3	170°34.6	14.8′	05°21.8	14.3′	56.2′
20	120°36.4	49.6	185°08.4	14.7′	05°36.1	14.3′	56.3′
21	135°36.3	·· 50.0	199°42.2	14.7′	05°50.4	14.3′	56.3′
22	150°36.2	50.4	214°15.8	14.6′	06°04.7	14.4′	56.3′
23	165°36.1	50.7	228°49.4	14.6′	06°19.1	14.3′	56.4′
	SD = 15.8′	d = 0.4′	SD = 15.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:26	22:32	////	////
64°	////	////	02:06	21:51	////	////
62°	////	00:41	02:34	21:23	23:22	////
60°	////	01:36	02:54	21:02	22:22	////
N 58°	////	02:07	03:12	20:44	21:50	////
56°	00:37	02:30	03:26	20:30	21:26	23:25
54°	01:27	02:48	03:38	20:17	21:08	22:30
52°	01:56	03:03	03:49	20:07	20:52	22:00
50°	02:18	03:16	03:59	19:57	20:39	21:39
45°	02:56	03:43	04:19	19:37	20:13	21:00
N 40°	03:23	04:03	04:35	19:20	19:52	20:32
35°	03:44	04:20	04:48	19:07	19:36	20:11
30°	04:01	04:33	05:00	18:55	19:22	19:54
20°	04:28	04:56	05:20	18:35	18:59	19:27
N 10°	04:48	05:15	05:38	18:17	18:40	19:07
0°	05:06	05:32	05:54	18:01	18:23	18:49
S 10°	05:21	05:47	06:10	17:45	18:08	18:34
20°	05:36	06:03	06:27	17:28	17:52	18:19
30°	05:51	06:20	06:46	17:09	17:35	18:04
35°	05:58	06:30	06:57	16:57	17:25	17:56
40°	06:07	06:40	07:10	16:44	17:14	17:48
45°	06:16	06:52	07:25	16:29	17:02	17:39
S 50°	06:26	07:06	07:44	16:11	16:48	17:29
52°	06:30	07:13	07:52	16:02	16:41	17:24
54°	06:35	07:20	08:02	15:52	16:34	17:19
56°	06:40	07:28	08:13	15:41	16:26	17:14
58°	06:46	07:37	08:26	15:28	16:17	17:08
S 60°	06:53	07:47	08:41	15:13	16:07	17:02

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	01:57	01:24	00:55	10:20	12:20	14:21
N 70°	01:42	01:18	00:56	10:33	12:23	14:15
68°	01:30	01:13	00:57	10:43	12:26	14:10
66°	01:20	01:09	00:58	10:51	12:28	14:06
64°	01:12	01:05	00:59	10:58	12:29	14:03
62°	01:04	01:02	01:00	11:04	12:31	14:00
60°	00:58	00:59	01:00	11:09	12:32	13:57
N 58°	00:53	00:57	01:01	11:13	12:33	13:55
56°	00:48	00:55	01:01	11:17	12:34	13:53
54°	00:43	00:53	01:02	11:21	12:35	13:51
52°	00:39	00:51	01:02	11:24	12:36	13:49
50°	00:35	00:49	01:02	11:27	12:36	13:48
45°	00:27	00:45	01:03	11:33	12:38	13:44
N 40°	00:21	00:42	01:04	11:38	12:39	13:42
35°	00:15	00:40	01:04	11:43	12:40	13:39
30°	00:10	00:37	01:05	11:47	12:41	13:37
20°	00:01	00:33	01:06	11:54	12:43	13:34
N 10°	·· ··	00:30	01:07	11:59	12:45	13:31
0°	·· ··	00:26	01:07	12:05	12:46	13:28
S 10°	·· ··	00:23	01:08	12:10	12:47	13:25
20°	·· ··	00:19	01:09	12:16	12:49	13:22
30°	·· ··	00:15	01:10	12:23	12:50	13:18
35°	·· ··	00:13	01:11	12:26	12:51	13:16
40°	·· ··	00:10	01:11	12:31	12:52	13:14
45°	·· ··	00:07	01:12	12:35	12:53	13:11
S 50°	·· ··	00:03	01:13	12:41	12:54	13:08
52°	·· ··	00:01	01:14	12:44	12:55	13:06
54°	23:59	·· ··	01:14	12:47	12:56	13:05
56°	23:57	·· ··	01:15	12:50	12:56	13:03
58°	23:55	·· ··	01:15	12:53	12:57	13:01
S 60°	23:52	·· ··	01:16	12:57	12:58	12:59

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 56-36%
28	02:48	02:44	11:57	05:55	18:16	
29	02:41	02:37	11:57	06:36	18:57	
30	02:33	02:28	11:58	07:18	19:39	

May 31, 01, 02 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	248°16.3	200°44.8	N16°24.5	89°20.2	N10°15.0	105°16.3	N15°37.5	225°14.9	N07°08.5
1	263°18.8	215°44.2	25.4	104°21.6	14.6	120°18.4	37.4	240°17.1	08.6
2	278°21.3	230°43.7	26.3	119°23.1	14.1	135°20.6	37.3	255°19.3	08.6
3	293°23.7	245°43.1	·· 27.2	134°24.5	·· 13.6	150°22.7	·· 37.2	270°21.5	·· 08.7
4	308°26.2	260°42.5	28.1	149°26.0	13.2	165°24.9	37.1	285°23.8	08.8
5	323°28.6	275°41.9	29.0	164°27.4	12.7	180°27.0	37.0	300°26.0	08.9
6	338°31.1	290°41.4	N16°29.8	179°28.8	N10°12.2	195°29.2	N15°36.9	315°28.2	N07°09.0
7	353°33.6	305°40.8	30.7	194°30.3	11.8	210°31.3	36.8	330°30.4	09.1
8	8°36.0	320°40.2	31.6	209°31.7	11.3	225°33.4	36.7	345°32.7	09.2
9	23°38.5	335°39.6	·· 32.5	224°33.1	·· 10.8	240°35.6	·· 36.6	0°34.9	·· 09.2
10	38°41.0	350°39.1	33.4	239°34.6	10.3	255°37.7	36.5	15°37.1	09.3
11	53°43.4	5°38.5	34.2	254°36.0	09.9	270°39.9	36.4	30°39.3	09.4
12	68°45.9	20°37.9	N16°35.1	269°37.4	N10°09.4	285°42.0	N15°36.3	45°41.6	N07°09.5
13	83°48.4	35°37.3	36.0	284°38.9	08.9	300°44.2	36.2	60°43.8	09.6
14	98°50.8	50°36.7	36.9	299°40.3	08.5	315°46.3	36.1	75°46.0	09.7
15	113°53.3	65°36.2	·· 37.7	314°41.7	·· 08.0	330°48.5	·· 36.0	90°48.2	·· 09.8
16	128°55.7	80°35.6	38.6	329°43.2	07.5	345°50.6	35.8	105°50.5	09.8
17	143°58.2	95°35.0	39.5	344°44.6	07.1	0°52.8	35.7	120°52.7	09.9
18	159°00.7	110°34.4	N16°40.3	359°46.0	N10°06.6	15°54.9	N15°35.6	135°54.9	N07°10.0
19	174°03.1	125°33.8	41.2	14°47.5	06.1	30°57.1	35.5	150°57.1	10.1
20	189°05.6	140°33.3	42.1	29°48.9	05.6	45°59.2	35.4	165°59.4	10.2
21	204°08.1	155°32.7	·· 43.0	44°50.3	·· 05.2	61°01.3	·· 35.3	181°01.6	·· 10.3
22	219°10.5	170°32.1	43.8	59°51.7	04.7	76°03.5	35.2	196°03.8	10.3
23	234°13.0	185°31.5	44.7	74°53.2	04.2	91°05.6	35.1	211°06.0	10.4
Mer.pass. 07:26		ν -0.6′	d 0.9′	m -3.86	ν 1.4′	d 0.5′	m 0.75	ν 2.1′	d 0.1′ m -1.93	ν 2.2′	d 0.1′ m 0.68

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	249°15.5	200°30.9	N16°45.6	89°54.6	N10°03.8	106°07.8	N15°35.0	226°08.3	N07°10.5
1	264°17.9	215°30.3	46.4	104°56.0	03.3	121°09.9	34.9	241°10.5	10.6
2	279°20.4	230°29.8	47.3	119°57.5	02.8	136°12.1	34.8	256°12.7	10.7
3	294°22.9	245°29.2	·· 48.2	134°58.9	·· 02.3	151°14.2	·· 34.7	271°15.0	·· 10.8
4	309°25.3	260°28.6	49.0	150°00.3	01.9	166°16.4	34.6	286°17.2	10.9
5	324°27.8	275°28.0	49.9	165°01.7	01.4	181°18.5	34.5	301°19.4	10.9
6	339°30.2	290°27.4	N16°50.8	180°03.2	N10°00.9	196°20.6	N15°34.3	316°21.6	N07°11.0
7	354°32.7	305°26.8	51.6	195°04.6	00.4	211°22.8	34.2	331°23.9	11.1
8	9°35.2	320°26.2	52.5	210°06.0	10°00.0	226°24.9	34.1	346°26.1	11.2
9	24°37.6	335°25.6	·· 53.3	225°07.4	09°59.5	241°27.1	·· 34.0	1°28.3	·· 11.3
10	39°40.1	350°25.1	54.2	240°08.9	59.0	256°29.2	33.9	16°30.5	11.4
11	54°42.6	5°24.5	55.1	255°10.3	58.6	271°31.4	33.8	31°32.8	11.5
12	69°45.0	20°23.9	N16°55.9	270°11.7	N09°58.1	286°33.5	N15°33.7	46°35.0	N07°11.5
13	84°47.5	35°23.3	56.8	285°13.1	57.6	301°35.6	33.6	61°37.2	11.6
14	99°50.0	50°22.7	57.6	300°14.6	57.1	316°37.8	33.5	76°39.5	11.7
15	114°52.4	65°22.1	·· 58.5	315°16.0	·· 56.7	331°39.9	·· 33.4	91°41.7	·· 11.8
16	129°54.9	80°21.5	16°59.3	330°17.4	56.2	346°42.1	33.3	106°43.9	11.9
17	144°57.4	95°20.9	17°00.2	345°18.8	55.7	1°44.2	33.2	121°46.1	12.0
18	159°59.8	110°20.3	N17°01.1	0°20.3	N09°55.2	16°46.3	N15°33.1	136°48.4	N07°12.0
19	175°02.3	125°19.7	01.9	15°21.7	54.8	31°48.5	32.9	151°50.6	12.1
20	190°04.7	140°19.1	02.8	30°23.1	54.3	46°50.6	32.8	166°52.8	12.2
21	205°07.2	155°18.5	·· 03.6	45°24.5	·· 53.8	61°52.8	·· 32.7	181°55.1	·· 12.3
22	220°09.7	170°17.9	04.5	60°26.0	53.3	76°54.9	32.6	196°57.3	12.4
23	235°12.1	185°17.4	05.3	75°27.4	52.9	91°57.0	32.5	211°59.5	12.5
Mer.pass. 07:22		ν -0.6′	d 0.9′	m -3.87	ν 1.4′	d 0.5′	m 0.76	ν 2.1′	d 0.1′ m -1.93	ν 2.2′	d 0.1′ m 0.68

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	250°14.6	200°16.8	N17°06.2	90°28.8	N09°52.4	106°59.2	N15°32.4	227°01.7	N07°12.6
1	265°17.1	215°16.2	07.0	105°30.2	51.9	122°01.3	32.3	242°04.0	12.6
2	280°19.5	230°15.6	07.9	120°31.6	51.4	137°03.5	32.2	257°06.2	12.7
3	295°22.0	245°15.0	·· 08.7	135°33.1	·· 50.9	152°05.6	·· 32.1	272°08.4	·· 12.8
4	310°24.5	260°14.4	09.6	150°34.5	50.5	167°07.7	32.0	287°10.7	12.9
5	325°26.9	275°13.8	10.4	165°35.9	50.0	182°09.9	31.9	302°12.9	13.0
6	340°29.4	290°13.2	N17°11.3	180°37.3	N09°49.5	197°12.0	N15°31.7	317°15.1	N07°13.1
7	355°31.8	305°12.6	12.1	195°38.7	49.0	212°14.2	31.6	332°17.3	13.1
8	10°34.3	320°12.0	12.9	210°40.2	48.6	227°16.3	31.5	347°19.6	13.2
9	25°36.8	335°11.4	·· 13.8	225°41.6	·· 48.1	242°18.4	·· 31.4	2°21.8	·· 13.3
10	40°39.2	350°10.8	14.6	240°43.0	47.6	257°20.6	31.3	17°24.0	13.4
11	55°41.7	5°10.2	15.5	255°44.4	47.1	272°22.7	31.2	32°26.3	13.5
12	70°44.2	20°09.6	N17°16.3	270°45.8	N09°46.7	287°24.8	N15°31.1	47°28.5	N07°13.6
13	85°46.6	35°09.0	17.2	285°47.2	46.2	302°27.0	31.0	62°30.7	13.6
14	100°49.1	50°08.4	18.0	300°48.7	45.7	317°29.1	30.9	77°33.0	13.7
15	115°51.6	65°07.8	·· 18.8	315°50.1	·· 45.2	332°31.3	·· 30.8	92°35.2	·· 13.8
16	130°54.0	80°07.2	19.7	330°51.5	44.7	347°33.4	30.6	107°37.4	13.9
17	145°56.5	95°06.6	20.5	345°52.9	44.3	2°35.5	30.5	122°39.6	14.0
18	160°59.0	110°06.0	N17°21.3	0°54.3	N09°43.8	17°37.7	N15°30.4	137°41.9	N07°14.1
19	176°01.4	125°05.3	22.2	15°55.7	43.3	32°39.8	30.3	152°44.1	14.1
20	191°03.9	140°04.7	23.0	30°57.1	42.8	47°41.9	30.2	167°46.3	14.2
21	206°06.3	155°04.1	·· 23.9	45°58.6	·· 42.3	62°44.1	·· 30.1	182°48.6	·· 14.3
22	221°08.8	170°03.5	24.7	61°00.0	41.9	77°46.2	30.0	197°50.8	14.4
23	236°11.3	185°02.9	25.5	76°01.4	41.4	92°48.3	29.9	212°53.0	14.5
Mer.pass. 07:18		ν -0.6′	d 0.8′	m -3.87	ν 1.4′	d 0.5′	m 0.77	ν 2.1′	d 0.1′ m -1.92	ν 2.2′	d 0.1′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.4
Ankaa	353°05.4	-42°09.2
Schedar	349°29.0	56°41.1
Diphda	348°45.5	-17°50.1
Achernar	335°19.2	-57°05.6
Hamal	327°49.3	23°35.4
Polaris	313°27.3	89°22.6
Acamar	315°10.7	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.3	-59°36.1
Suhail	222°45.0	-43°32.9
Miaplacidus	221°38.2	-69°50.1
Alphard	217°45.9	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.6	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.5	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°11.0	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.7
Hadar	148°32.6	-60°30.5
Menkent	147°55.0	-36°30.5
Arcturus	145°45.8	19°02.4
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.9	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.6
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.4
Rasalhague	95°56.4	12°32.4
Eltanin	90°40.8	51°29.0
Kaus Aust.	83°29.6	-34°22.2
Vega	80°31.5	38°48.4
Nunki	75°45.0	-26°15.7
Altair	61°57.8	8°56.4
Peacock	53°02.3	-56°38.5
Deneb	49°24.2	45°22.5
Enif	33°36.8	10°00.0
Al Na'ir	27°30.4	-46°49.4
Fomalhaut	15°12.4	-29°28.4
Scheat	13°43.3	28°13.8
Markab	13°28.0	15°21.1

May 31 Mon	SHA	Mer.pass
Venus	312°28.5	10:37
Mars	201°03.9	18:01
Jupiter	216°59.9	16:56
Saturn	336°58.5	08:58

Jun 01 Tue	SHA	Mer.pass
Venus	311°15.5	10:38
Mars	200°39.1	17:59
Jupiter	216°52.3	16:53
Saturn	336°52.8	08:54

Jun 02 Wed	SHA	Mer.pass
Venus	310°02.2	10:39
Mars	200°14.2	17:56
Jupiter	216°44.6	16:50
Saturn	336°47.1	08:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°36.1	N21°51.1	243°23.0	14.5′	N06°33.4	14.3′	56.4′
1	195°36.0	51.4	257°56.5	14.4′	06°47.7	14.3′	56.4′
2	210°35.9	51.8	272°29.9	14.4′	07°02.0	14.2′	56.5′
3	225°35.8	·· 52.2	287°03.3	14.3′	07°16.2	14.3′	56.5′
4	240°35.7	52.5	301°36.6	14.2′	07°30.5	14.2′	56.5′
5	255°35.6	52.9	316°09.8	14.1′	07°44.7	14.3′	56.6′
6	270°35.5	N21°53.2	330°42.9	14.1′	N07°59.0	14.2′	56.6′
7	285°35.4	53.6	345°16.0	14.0′	08°13.2	14.2′	56.6′
8	300°35.3	54.0	359°49.0	13.9′	08°27.4	14.2′	56.7′
9	315°35.2	·· 54.3	14°21.9	13.9′	08°41.6	14.1′	56.7′
10	330°35.2	54.7	28°54.8	13.8′	08°55.7	14.2′	56.7′
11	345°35.1	55.0	43°27.6	13.7′	09°09.9	14.1′	56.8′
12	0°35.0	N21°55.4	58°00.3	13.6′	N09°24.0	14.1′	56.8′
13	15°34.9	55.7	72°32.9	13.5′	09°38.1	14.0′	56.8′
14	30°34.8	56.1	87°05.4	13.5′	09°52.1	14.1′	56.9′
15	45°34.7	·· 56.4	101°37.9	13.4′	10°06.2	14.0′	56.9′
16	60°34.6	56.8	116°10.3	13.3′	10°20.2	14.0′	56.9′
17	75°34.5	57.1	130°42.5	13.2′	10°34.2	13.9′	57.0′
18	90°34.4	N21°57.5	145°14.7	13.1′	N10°48.1	14.0′	57.0′
19	105°34.3	57.8	159°46.9	13.0′	11°02.1	13.9′	57.0′
20	120°34.2	58.2	174°18.9	12.9′	11°16.0	13.8′	57.1′
21	135°34.1	·· 58.5	188°50.8	12.8′	11°29.8	13.8′	57.1′
22	150°34.0	58.9	203°22.7	12.8′	11°43.6	13.8′	57.2′
23	165°33.9	59.2	217°54.4	12.7′	11°57.4	13.8′	57.2′
	SD = 15.8′	*d* = 0.4′	SD = 15.4′				

Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°33.9	N21°59.6	232°26.1	12.6′	N12°11.2	13.7′	57.2′
1	195°33.8	21°59.9	246°57.6	12.5′	12°24.9	13.7′	57.3′
2	210°33.7	22°00.3	261°29.1	12.4′	12°38.6	13.6′	57.3′
3	225°33.6	·· 00.6	276°00.5	12.3′	12°52.2	13.6′	57.3′
4	240°33.5	01.0	290°31.8	12.2′	13°05.8	13.5′	57.4′
5	255°33.4	01.3	305°02.9	12.1′	13°19.3	13.5′	57.4′
6	270°33.3	N22°01.7	319°34.0	12.0′	N13°32.8	13.5′	57.4′
7	285°33.2	02.0	334°05.0	11.9′	13°46.3	13.4′	57.5′
8	300°33.1	02.3	348°35.8	11.8′	13°59.7	13.3′	57.5′
9	315°33.0	·· 02.7	3°06.6	11.7′	14°13.0	13.3′	57.6′
10	330°32.9	03.0	17°37.3	11.6′	14°26.3	13.3′	57.6′
11	345°32.8	03.4	32°07.8	11.4′	14°39.6	13.2′	57.6′
12	0°32.7	N22°03.7	46°38.2	11.3′	N14°52.8	13.1′	57.7′
13	15°32.6	04.0	61°08.6	11.2′	15°05.9	13.1′	57.7′
14	30°32.5	04.4	75°38.8	11.1′	15°19.0	13.0′	57.7′
15	45°32.4	·· 04.7	90°08.9	11.0′	15°32.0	12.9′	57.8′
16	60°32.3	05.0	104°38.9	10.9′	15°44.9	12.9′	57.8′
17	75°32.2	05.4	119°08.8	10.8′	15°57.8	12.9′	57.8′
18	90°32.1	N22°05.7	133°38.6	10.7′	N16°10.7	12.7′	57.9′
19	105°32.0	06.0	148°08.3	10.5′	16°23.4	12.7′	57.9′
20	120°31.9	06.4	162°37.8	10.4′	16°36.1	12.6′	58.0′
21	135°31.8	·· 06.7	177°07.2	10.3′	16°48.7	12.6′	58.0′
22	150°31.7	07.0	191°36.5	10.2′	17°01.3	12.4′	58.0′
23	165°31.6	07.4	206°05.7	10.1′	17°13.7	12.4′	58.1′
	SD = 15.8′	*d* = 0.3′	SD = 15.6′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°31.5	N22°07.7	220°34.8	10.0′	N17°26.1	12.4′	58.1′
1	195°31.4	08.0	235°03.8	9.8′	17°38.5	12.2′	58.1′
2	210°31.3	08.4	249°32.6	9.7′	17°50.7	12.2′	58.2′
3	225°31.2	·· 08.7	264°01.3	9.6′	18°02.9	12.1′	58.2′
4	240°31.1	09.0	278°29.9	9.5′	18°15.0	12.0′	58.2′
5	255°31.0	09.3	292°58.4	9.3′	18°27.0	11.9′	58.3′
6	270°30.9	N22°09.7	307°26.7	9.2′	N18°38.9	11.8′	58.3′
7	285°30.8	10.0	321°54.9	9.1′	18°50.7	11.7′	58.4′
8	300°30.7	10.3	336°23.0	9.0′	19°02.4	11.7′	58.4′
9	315°30.6	·· 10.7	350°51.0	8.8′	19°14.1	11.5′	58.4′
10	330°30.5	11.0	5°18.8	8.7′	19°25.6	11.5′	58.5′
11	345°30.4	11.3	19°46.6	8.6′	19°37.1	11.3′	58.5′
12	0°30.3	N22°11.6	34°14.2	8.5′	N19°48.4	11.3′	58.5′
13	15°30.2	11.9	48°41.6	8.3′	19°59.7	11.1′	58.6′
14	30°30.1	12.3	63°09.0	8.2′	20°10.8	11.1′	58.6′
15	45°30.0	·· 12.6	77°36.2	8.1′	20°21.9	10.9′	58.6′
16	60°29.9	12.9	92°03.3	8.0′	20°32.8	10.9′	58.7′
17	75°29.8	13.2	106°30.2	7.8′	20°43.7	10.7′	58.7′
18	90°29.7	N22°13.5	120°57.0	7.7′	N20°54.4	10.6′	58.7′
19	105°29.6	13.9	135°23.7	7.6′	21°05.0	10.5′	58.8′
20	120°29.5	14.2	149°50.3	7.4′	21°15.5	10.4′	58.8′
21	135°29.4	·· 14.5	164°16.7	7.3′	21°25.9	10.3′	58.8′
22	150°29.3	14.8	178°43.0	7.2′	21°36.2	10.1′	58.9′
23	165°29.2	15.1	193°09.2	7.1′	21°46.3	10.1′	58.9′
	SD = 15.8′	*d* = 0.3′	SD = 15.8′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:13	22:46	////	////
64°	////	////	01:59	21:59	////	////
62°	////	00:04	02:28	21:29	////	////
60°	////	01:27	02:50	21:07	22:31	////
N 58°	////	02:01	03:07	20:49	21:57	////
56°	00:03	02:25	03:22	20:34	21:32	////
54°	01:19	02:44	03:35	20:21	21:13	22:39
52°	01:51	03:00	03:46	20:10	20:57	22:07
50°	02:13	03:13	03:56	20:00	20:43	21:44
45°	02:53	03:41	04:17	19:39	20:16	21:03
N 40°	03:21	04:01	04:33	19:23	19:55	20:35
35°	03:42	04:18	04:47	19:09	19:38	20:14
30°	04:00	04:32	04:59	18:56	19:23	19:56
20°	04:27	04:56	05:20	18:36	19:00	19:29
N 10°	04:48	05:15	05:38	18:18	18:41	19:08
0°	05:06	05:32	05:54	18:01	18:24	18:50
S 10°	05:22	05:48	06:10	17:45	18:08	18:34
20°	05:37	06:04	06:28	17:28	17:51	18:19
30°	05:52	06:22	06:48	17:08	17:34	18:04
35°	06:00	06:31	06:59	16:56	17:24	17:55
40°	06:09	06:42	07:12	16:43	17:13	17:47
45°	06:18	06:55	07:28	16:28	17:01	17:38
S 50°	06:28	07:09	07:47	16:09	16:46	17:27
52°	06:33	07:16	07:56	15:59	16:39	17:22
54°	06:38	07:23	08:06	15:49	16:32	17:17
56°	06:44	07:32	08:17	15:38	16:24	17:12
58°	06:50	07:41	08:31	15:25	16:14	17:06
S 60°	06:56	07:51	08:46	15:09	16:04	16:59

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	00:25 23:46	22:34	▭	16:33	19:26	▭
N 70°	00:34	00:06 23:24	▭	16:15	18:38	▭
68°	00:41	00:22 23:56	22:53	16:01	18:08	21:02
66°	00:47	00:35	00:20 23:54	15:50	17:45	20:01
64°	00:53	00:46	00:39	15:41	17:27	19:27
62°	00:57	00:56	00:54	15:33	17:13	19:03
60°	01:02	01:04	01:07	15:26	17:01	18:43
N 58°	01:05	01:11	01:19	15:20	16:51	18:27
56°	01:08	01:17	01:29	15:15	16:42	18:14
54°	01:11	01:23	01:37	15:10	16:34	18:02
52°	01:14	01:28	01:45	15:06	16:27	17:52
50°	01:16	01:33	01:52	15:02	16:20	17:42
45°	01:22	01:43	02:08	14:54	16:06	17:23
N 40°	01:26	01:51	02:20	14:47	15:55	17:08
35°	01:30	01:59	02:31	14:41	15:46	16:54
30°	01:34	02:05	02:41	14:36	15:37	16:43
20°	01:40	02:16	02:57	14:27	15:23	16:23
N 10°	01:45	02:26	03:12	14:19	15:10	16:07
0°	01:50	02:36	03:25	14:11	14:59	15:51
S 10°	01:55	02:45	03:39	14:04	14:47	15:35
20°	02:01	02:55	03:54	13:56	14:35	15:18
30°	02:07	03:07	04:11	13:48	14:21	14:59
35°	02:11	03:14	04:21	13:43	14:13	14:48
40°	02:15	03:22	04:33	13:37	14:04	14:36
45°	02:20	03:31	04:46	13:30	13:53	14:21
S 50°	02:26	03:42	05:03	13:23	13:40	14:02
52°	02:29	03:47	05:11	13:19	13:34	13:54
54°	02:32	03:53	05:20	13:15	13:28	13:44
56°	02:35	04:00	05:30	13:11	13:20	13:34
58°	02:39	04:07	05:41	13:06	13:12	13:22
S 60°	02:43	04:15	05:54	13:00	13:03	13:07

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 25-27 27-11%
31	02:24	02:20	11:58	08:01	20:23	
01	02:15	02:11	11:58	08:47	21:12	
02	02:06	02:01	11:58	09:38	22:05	

June 03, 04, 05 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	251°13.7	200°02.3	N17°26.3	91°02.8	N09°40.9	107°50.5	N15°29.8	227°55.3	N07°14.6
1	266°16.2	215°01.7	27.2	106°04.2	40.4	122°52.6	29.7	242°57.5	14.6
2	281°18.7	230°01.1	28.0	121°05.6	39.9	137°54.7	29.5	257°59.7	14.7
3	296°21.1	245°00.5	·· 28.8	136°07.0	·· 39.5	152°56.9	·· 29.4	273°02.0	·· 14.8
4	311°23.6	259°59.9	29.7	151°08.4	39.0	167°59.0	29.3	288°04.2	14.9
5	326°26.1	274°59.3	30.5	166°09.9	38.5	183°01.1	29.2	303°06.4	15.0
6	341°28.5	289°58.7	N17°31.3	181°11.3	N09°38.0	198°03.3	N15°29.1	318°08.6	N07°15.1
7	356°31.0	304°58.1	32.2	196°12.7	37.5	213°05.4	29.0	333°10.9	15.1
8	11°33.5	319°57.4	33.0	211°14.1	37.1	228°07.5	28.9	348°13.1	15.2
9	26°35.9	334°56.8	·· 33.8	226°15.5	·· 36.6	243°09.7	·· 28.8	3°15.3	·· 15.3
10	41°38.4	349°56.2	34.6	241°16.9	36.1	258°11.8	28.7	18°17.6	15.4
11	56°40.8	4°55.6	35.5	256°18.3	35.6	273°13.9	28.5	33°19.8	15.5
12	71°43.3	19°55.0	N17°36.3	271°19.7	N09°35.1	288°16.1	N15°28.4	48°22.0	N07°15.5
13	86°45.8	34°54.4	37.1	286°21.1	34.6	303°18.2	28.3	63°24.3	15.6
14	101°48.2	49°53.8	37.9	301°22.5	34.2	318°20.3	28.2	78°26.5	15.7
15	116°50.7	64°53.2	·· 38.7	316°24.0	·· 33.7	333°22.5	·· 28.1	93°28.7	·· 15.8
16	131°53.2	79°52.5	39.6	331°25.4	33.2	348°24.6	28.0	108°31.0	15.9
17	146°55.6	94°51.9	40.4	346°26.8	32.7	3°26.7	27.9	123°33.2	16.0
18	161°58.1	109°51.3	N17°41.2	1°28.2	N09°32.2	18°28.9	N15°27.8	138°35.4	N07°16.0
19	177°00.6	124°50.7	42.0	16°29.6	31.7	33°31.0	27.6	153°37.7	16.1
20	192°03.0	139°50.1	42.8	31°31.0	31.3	48°33.1	27.5	168°39.9	16.2
21	207°05.5	154°49.5	·· 43.6	46°32.4	·· 30.8	63°35.2	·· 27.4	183°42.1	·· 16.3
22	222°08.0	169°48.8	44.5	61°33.8	30.3	78°37.4	27.3	198°44.4	16.4
23	237°10.4	184°48.2	45.3	76°35.2	29.8	93°39.5	27.2	213°46.6	16.5
Mer.pass. 07:14		ν -0.6′ d 0.8′	m -3.87	ν 1.4′ d 0.5′	m 0.79	ν 2.1′ d 0.1′	m -1.92	ν 2.2′ d 0.1′	m 0.68

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	252°12.9	199°47.6	N17°46.1	91°36.6	N09°29.3	108°41.6	N15°27.1	228°48.8	N07°16.5
1	267°15.3	214°47.0	46.9	106°38.0	28.8	123°43.8	27.0	243°51.1	16.6
2	282°17.8	229°46.4	47.7	121°39.4	28.4	138°45.9	26.9	258°53.3	16.7
3	297°20.3	244°45.7	·· 48.5	136°40.8	·· 27.9	153°48.0	·· 26.7	273°55.5	·· 16.8
4	312°22.7	259°45.1	49.3	151°42.2	27.4	168°50.2	26.6	288°57.8	16.9
5	327°25.2	274°44.5	50.1	166°43.6	26.9	183°52.3	26.5	304°00.0	16.9
6	342°27.7	289°43.9	N17°51.0	181°45.0	N09°26.4	198°54.4	N15°26.4	319°02.2	N07°17.0
7	357°30.1	304°43.3	51.8	196°46.4	25.9	213°56.5	26.3	334°04.5	17.1
8	12°32.6	319°42.6	52.6	211°47.8	25.4	228°58.7	26.2	349°06.7	17.2
9	27°35.1	334°42.0	·· 53.4	226°49.2	·· 25.0	244°00.8	·· 26.1	4°08.9	·· 17.3
10	42°37.5	349°41.4	54.2	241°50.6	24.5	259°02.9	26.0	19°11.2	17.4
11	57°40.0	4°40.8	55.0	256°52.0	24.0	274°05.1	25.8	34°13.4	17.4
12	72°42.5	19°40.1	N17°55.8	271°53.4	N09°23.5	289°07.2	N15°25.7	49°15.6	N07°17.5
13	87°44.9	34°39.5	56.6	286°54.8	23.0	304°09.3	25.6	64°17.9	17.6
14	102°47.4	49°38.9	57.4	301°56.2	22.5	319°11.4	25.5	79°20.1	17.7
15	117°49.8	64°38.3	·· 58.2	316°57.6	·· 22.0	334°13.6	·· 25.4	94°22.3	·· 17.8
16	132°52.3	79°37.6	59.0	331°59.0	21.6	349°15.7	25.3	109°24.6	17.8
17	147°54.8	94°37.0	17°59.8	347°00.4	21.1	4°17.8	25.2	124°26.8	17.9
18	162°57.2	109°36.4	N18°00.6	2°01.8	N09°20.6	19°19.9	N15°25.1	139°29.0	N07°18.0
19	177°59.7	124°35.8	01.4	17°03.2	20.1	34°22.1	24.9	154°31.3	18.1
20	193°02.2	139°35.1	02.2	32°04.6	19.6	49°24.2	24.8	169°33.5	18.2
21	208°04.6	154°34.5	·· 03.0	47°06.0	·· 19.1	64°26.3	·· 24.7	184°35.8	·· 18.2
22	223°07.1	169°33.9	03.8	62°07.4	18.6	79°28.4	24.6	199°38.0	18.3
23	238°09.6	184°33.2	04.6	77°08.8	18.1	94°30.6	24.5	214°40.2	18.4
Mer.pass. 07:10		ν -0.6′ d 0.8′	m -3.87	ν 1.4′ d 0.5′	m 0.80	ν 2.1′ d 0.1′	m -1.91	ν 2.2′ d 0.1′	m 0.68

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	253°12.0	199°32.6	N18°05.4	92°10.2	N09°17.6	109°32.7	N15°24.4	229°42.5	N07°18.5
1	268°14.5	214°32.0	06.2	107°11.6	17.2	124°34.8	24.3	244°44.7	18.6
2	283°16.9	229°31.3	07.0	122°13.0	16.7	139°36.9	24.1	259°46.9	18.7
3	298°19.4	244°30.7	·· 07.8	137°14.4	·· 16.2	154°39.1	·· 24.0	274°49.2	·· 18.7
4	313°21.9	259°30.1	08.6	152°15.8	15.7	169°41.2	23.9	289°51.4	18.8
5	328°24.3	274°29.4	09.3	167°17.2	15.2	184°43.3	23.8	304°53.6	18.9
6	343°26.8	289°28.8	N18°10.1	182°18.6	N09°14.7	199°45.4	N15°23.7	319°55.9	N07°19.0
7	358°29.3	304°28.2	10.9	197°20.0	14.2	214°47.6	23.6	334°58.1	19.1
8	13°31.7	319°27.5	11.7	212°21.4	13.7	229°49.7	23.5	350°00.3	19.1
9	28°34.2	334°26.9	·· 12.5	227°22.8	·· 13.2	244°51.8	·· 23.3	5°02.6	·· 19.2
10	43°36.7	349°26.3	13.3	242°24.2	12.8	259°53.9	23.2	20°04.8	19.3
11	58°39.1	4°25.6	14.1	257°25.6	12.3	274°56.1	23.1	35°07.1	19.4
12	73°41.6	19°25.0	N18°14.9	272°27.0	N09°11.8	289°58.2	N15°23.0	50°09.3	N07°19.5
13	88°44.1	34°24.4	15.6	287°28.4	11.3	305°00.3	22.9	65°11.5	19.5
14	103°46.5	49°23.7	16.4	302°29.8	10.8	320°02.4	22.8	80°13.8	19.6
15	118°49.0	64°23.1	·· 17.2	317°31.2	·· 10.3	335°04.5	·· 22.6	95°16.0	·· 19.7
16	133°51.4	79°22.5	18.0	332°32.5	09.8	350°06.7	22.5	110°18.2	19.8
17	148°53.9	94°21.8	18.8	347°33.9	09.3	5°08.8	22.4	125°20.5	19.9
18	163°56.4	109°21.2	N18°19.6	2°35.3	N09°08.8	20°10.9	N15°22.3	140°22.7	N07°19.9
19	178°58.8	124°20.5	20.3	17°36.7	08.3	35°13.0	22.2	155°25.0	20.0
20	194°01.3	139°19.9	21.1	32°38.1	07.8	50°15.2	22.1	170°27.2	20.1
21	209°03.8	154°19.3	·· 21.9	47°39.5	·· 07.4	65°17.3	·· 22.0	185°29.4	·· 20.2
22	224°06.2	169°18.6	22.7	62°40.9	06.9	80°19.4	21.8	200°31.7	20.3
23	239°08.7	184°18.0	23.4	77°42.3	06.4	95°21.5	21.7	215°33.9	20.3
Mer.pass. 07:06		ν -0.6′ d 0.8′	m -3.87	ν 1.4′ d 0.5′	m 0.81	ν 2.1′ d 0.1′	m -1.91	ν 2.2′ d 0.1′	m 0.68

Stars

	SHA	Dec
Alpheratz	357°32.8	29°14.4
Ankaa	353°05.4	-42°09.2
Schedar	349°29.0	56°41.1
Diphda	348°45.5	-17°50.0
Achernar	335°19.2	-57°05.6
Hamal	327°49.2	23°35.4
Polaris	313°26.2	89°22.6
Acamar	315°10.7	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.3
Capella	280°19.5	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.7	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.3	-59°36.1
Suhail	222°45.1	-43°32.9
Miaplacidus	221°38.2	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.7	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.5	-63°15.4
Gacrux	171°49.1	-57°16.3
Alioth	166°11.0	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.7
Hadar	148°32.6	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.9	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.6
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.4
Rasalhague	95°56.4	12°32.4
Eltanin	90°40.7	51°29.0
Kaus Aust.	83°29.5	-34°22.2
Vega	80°31.5	38°48.4
Nunki	75°45.0	-26°15.6
Altair	61°57.8	8°56.4
Peacock	53°02.3	-56°38.5
Deneb	49°24.2	45°22.5
Enif	33°36.8	10°00.0
Al Na'ir	27°30.4	-46°49.4
Fomalhaut	15°12.4	-29°28.4
Scheat	13°43.3	28°13.8
Markab	13°27.9	15°21.1

Jun 03 Thu	SHA	Mer.pass
Venus	308°48.6	10:40
Mars	199°49.1	17:54
Jupiter	216°36.7	16:46
Saturn	336°41.5	08:47

Jun 04 Fri	SHA	Mer.pass
Venus	307°34.7	10:41
Mars	199°23.7	17:52
Jupiter	216°28.8	16:43
Saturn	336°36.0	08:43

Jun 05 Sat	SHA	Mer.pass
Venus	306°20.6	10:42
Mars	198°58.2	17:50
Jupiter	216°20.7	16:39
Saturn	336°30.4	08:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.1362 sec ΔT = TT-UT1 = +69.3202 sec

2027 June 03 to Jun. 05 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°29.1	N22°15.4	207°35.3	6.9′	N21°56.4	9.9′	58.9′
1	195°29.0	15.8	222°01.2	6.8′	22°06.3	9.8′	59.0′
2	210°28.9	16.1	236°27.0	6.7′	22°16.1	9.6′	59.0′
3	225°28.8	·· 16.4	250°52.7	6.5′	22°25.7	9.6′	59.0′
4	240°28.7	16.7	265°18.2	6.4′	22°35.3	9.4′	59.1′
5	255°28.6	17.0	279°43.6	6.3′	22°44.7	9.2′	59.1′
6	270°28.5	N22°17.3	294°08.9	6.2′	N22°53.9	9.2′	59.1′
7	285°28.4	17.6	308°34.1	6.0′	23°03.1	9.0′	59.2′
8	300°28.3	17.9	322°59.1	5.9′	23°12.1	8.8′	59.2′
9	315°28.2	·· 18.2	337°24.0	5.8′	23°20.9	8.8′	59.2′
10	330°28.1	18.6	351°48.8	5.7′	23°29.7	8.5′	59.3′
11	345°28.0	18.9	6°13.5	5.5′	23°38.2	8.5′	59.3′
12	0°27.9	N22°19.2	20°38.0	5.4′	N23°46.7	8.3′	59.3′
13	15°27.8	19.5	35°02.4	5.3′	23°55.0	8.1′	59.4′
14	30°27.7	19.8	49°26.7	5.2′	24°03.1	8.0′	59.4′
15	45°27.6	·· 20.1	63°50.9	5.1′	24°11.1	7.8′	59.4′
16	60°27.5	20.4	78°15.0	4.9′	24°18.9	7.7′	59.4′
17	75°27.4	20.7	92°38.9	4.8′	24°26.6	7.5′	59.5′
18	90°27.3	N22°21.0	107°02.7	4.7′	N24°34.1	7.4′	59.5′
19	105°27.2	21.3	121°26.4	4.6′	24°41.5	7.2′	59.5′
20	120°27.0	21.6	135°50.0	4.5′	24°48.7	7.1′	59.6′
21	135°26.9	·· 21.9	150°13.5	4.4′	24°55.8	6.8′	59.6′
22	150°26.8	22.2	164°36.9	4.3′	25°02.6	6.8′	59.6′
23	165°26.7	22.5	179°00.1	4.2′	25°09.4	6.5′	59.6′
	SD = 15.8′	d = 0.3′	SD = 16.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°26.6	N22°22.8	193°23.3	4.0′	N25°15.9	6.4′	59.7′
1	195°26.5	23.1	207°46.3	3.9′	25°22.3	6.2′	59.7′
2	210°26.4	23.4	222°09.3	3.8′	25°28.5	6.1′	59.7′
3	225°26.3	·· 23.7	236°32.1	3.7′	25°34.6	5.8′	59.7′
4	240°26.2	24.0	250°54.9	3.6′	25°40.4	5.7′	59.8′
5	255°26.1	24.3	265°17.5	3.5′	25°46.1	5.5′	59.8′
6	270°26.0	N22°24.6	279°40.0	3.4′	N25°51.6	5.4′	59.8′
7	285°25.9	24.9	294°02.5	3.4′	25°57.0	5.1′	59.8′
8	300°25.8	25.2	308°24.8	3.3′	26°02.1	5.0′	59.9′
9	315°25.7	·· 25.4	322°47.1	3.2′	26°07.1	4.8′	59.9′
10	330°25.6	25.7	337°09.3	3.1′	26°11.9	4.6′	59.9′
11	345°25.4	26.0	351°31.4	3.0′	26°16.5	4.4′	59.9′
12	0°25.3	N22°26.3	5°53.4	2.9′	N26°20.9	4.3′	60.0′
13	15°25.2	26.6	20°15.3	2.8′	26°25.2	4.0′	60.0′
14	30°25.1	26.9	34°37.2	2.8′	26°29.2	3.9′	60.0′
15	45°25.0	·· 27.2	48°58.9	2.7′	26°33.1	3.7′	60.0′
16	60°24.9	27.5	63°20.6	2.6′	26°36.8	3.5′	60.0′
17	75°24.8	27.8	77°42.2	2.6′	26°40.3	3.2′	60.1′
18	90°24.7	N22°28.0	92°03.8	2.5′	N26°43.5	3.1′	60.1′
19	105°24.6	28.3	106°25.3	2.4′	26°46.6	2.9′	60.1′
20	120°24.5	28.6	120°46.7	2.4′	26°49.5	2.7′	60.1′
21	135°24.4	·· 28.9	135°08.1	2.3′	26°52.2	2.5′	60.1′
22	150°24.2	29.2	149°29.4	2.3′	26°54.7	2.3′	60.2′
23	165°24.1	29.5	163°50.7	2.2′	26°57.0	2.1′	60.2′
	SD = 15.8′	d = 0.3′	SD = 16.3′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°24.0	N22°29.7	178°11.9	2.2′	N26°59.1	2.0′	60.2′
1	195°23.9	30.0	192°33.0	2.1′	27°01.1	1.7′	60.2′
2	210°23.8	30.3	206°54.1	2.1′	27°02.8	1.5′	60.2′
3	225°23.7	·· 30.6	221°15.2	2.0′	27°04.3	1.3′	60.3′
4	240°23.6	30.9	235°36.2	2.0′	27°05.6	1.1′	60.3′
5	255°23.5	31.1	249°57.2	2.0′	27°06.7	0.9′	60.3′
6	270°23.4	N22°31.4	264°18.2	1.9′	N27°07.6	0.7′	60.3′
7	285°23.3	31.7	278°39.1	1.9′	27°08.3	0.5′	60.3′
8	300°23.1	32.0	293°00.0	1.9′	27°08.8	0.2′	60.3′
9	315°23.0	·· 32.3	307°20.9	1.9′	27°09.0	0.1′	60.3′
10	330°22.9	32.5	321°41.7	1.8′	27°09.1	0.1′	60.4′
11	345°22.8	32.8	336°02.6	1.8′	27°09.0	0.3′	60.4′
12	0°22.7	N22°33.1	350°23.4	1.8′	N27°08.7	0.6′	60.4′
13	15°22.6	33.3	4°44.2	1.8′	27°08.1	0.7′	60.4′
14	30°22.5	33.6	19°05.0	1.8′	27°07.4	0.9′	60.4′
15	45°22.4	·· 33.9	33°25.8	1.8′	27°06.5	1.2′	60.4′
16	60°22.2	34.2	47°46.6	1.8′	27°05.3	1.4′	60.4′
17	75°22.1	34.4	62°07.5	1.8′	27°03.9	1.5′	60.4′
18	90°22.0	N22°34.7	76°28.3	1.8′	N27°02.4	1.8′	60.4′
19	105°21.9	35.0	90°49.1	1.8′	27°00.6	2.0′	60.5′
20	120°21.8	35.2	105°09.9	1.8′	26°58.6	2.1′	60.5′
21	135°21.7	·· 35.5	119°30.8	1.9′	26°56.5	2.4′	60.5′
22	150°21.6	35.8	133°51.6	1.9′	26°54.1	2.6′	60.5′
23	165°21.5	36.0	148°12.5	1.9′	26°51.5	2.8′	60.5′
	SD = 15.8′	d = 0.3′	SD = 16.4′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:00	23:01	////	////
64°	////	////	01:51	22:07	////	////
62°	////	////	02:23	21:35	////	////
60°	////	01:18	02:46	21:12	22:41	////
N 58°	////	01:55	03:04	20:53	22:03	////
56°	////	02:21	03:19	20:38	21:37	////
54°	01:11	02:41	03:33	20:25	21:17	22:48
52°	01:46	02:57	03:44	20:13	21:00	22:13
50°	02:09	03:11	03:54	20:03	20:46	21:48
45°	02:51	03:39	04:15	19:42	20:18	21:07
N 40°	03:19	04:00	04:32	19:25	19:57	20:38
35°	03:41	04:17	04:47	19:10	19:40	20:16
30°	03:59	04:32	04:59	18:58	19:25	19:58
20°	04:27	04:56	05:20	18:37	19:01	19:30
N 10°	04:48	05:15	05:38	18:19	18:42	19:09
0°	05:06	05:32	05:55	18:02	18:24	18:50
S 10°	05:22	05:49	06:11	17:45	18:08	18:34
20°	05:38	06:05	06:29	17:28	17:51	18:19
30°	05:53	06:23	06:49	17:07	17:34	18:03
35°	06:02	06:33	07:01	16:56	17:23	17:55
40°	06:10	06:44	07:14	16:42	17:12	17:46
45°	06:20	06:57	07:30	16:26	17:00	17:36
S 50°	06:31	07:12	07:50	16:07	16:44	17:26
52°	06:36	07:19	07:59	15:57	16:37	17:21
54°	06:41	07:26	08:09	15:47	16:30	17:15
56°	06:47	07:35	08:21	15:35	16:21	17:10
58°	06:53	07:44	08:35	15:22	16:12	17:03
S 60°	07:00	07:55	08:51	15:06	16:01	16:57

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	00:29	00:11	▭	21:48	▭	▭
62°	00:55	01:00	01:21	21:00	22:51	23:52
60°	01:15	01:31	02:07	20:29	22:06	23:10
N 58°	01:32	01:55	02:37	20:06	21:36	22:41
56°	01:46	02:14	03:00	19:47	21:13	22:18
54°	01:58	02:30	03:19	19:32	20:54	22:00
52°	02:09	02:44	03:35	19:18	20:39	21:44
50°	02:19	02:56	03:48	19:06	20:25	21:31
45°	02:39	03:21	04:16	18:42	19:57	21:03
N 40°	02:56	03:42	04:39	18:22	19:35	20:41
35°	03:10	03:59	04:57	18:06	19:17	20:23
30°	03:23	04:13	05:13	17:52	19:01	20:07
20°	03:44	04:38	05:40	17:28	18:35	19:40
N 10°	04:03	05:00	06:03	17:07	18:12	19:17
0°	04:20	05:20	06:25	16:48	17:51	18:56
S 10°	04:38	05:41	06:46	16:29	17:29	18:34
20°	04:57	06:03	07:10	16:09	17:07	18:11
30°	05:19	06:28	07:37	15:45	16:40	17:44
35°	05:32	06:44	07:53	15:31	16:24	17:28
40°	05:47	07:01	08:12	15:16	16:06	17:09
45°	06:05	07:23	08:34	14:57	15:45	16:47
S 50°	06:27	07:50	09:03	14:33	15:17	16:18
52°	06:38	08:03	09:17	14:22	15:04	16:04
54°	06:50	08:18	09:33	14:09	14:48	15:48
56°	07:04	08:36	09:53	13:55	14:30	15:28
58°	07:20	08:58	10:17	13:38	14:08	15:04
S 60°	07:40	09:26	10:49	13:17	13:40	14:32

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-1 5-0%
03	01:57	01:52	11:58	10:34	23:04	
04	01:46	01:41	11:58	11:35	–:–	
05	01:36	01:31	11:58	12:40	00:08	

June 06, 07, 08 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	254°11.2	199°17.3	N18°24.2	92°43.7	N09°05.9	110°23.6	N15°21.6	230°36.1	N07°20.4
1	269°13.6	214°16.7	25.0	107°45.1	05.4	125°25.8	21.5	245°38.4	20.5
2	284°16.1	229°16.1	25.8	122°46.5	04.9	140°27.9	21.4	260°40.6	20.6
3	299°18.6	244°15.4	·· 26.5	137°47.8	·· 04.4	155°30.0	·· 21.3	275°42.9	·· 20.7
4	314°21.0	259°14.8	27.3	152°49.2	03.9	170°32.1	21.1	290°45.1	20.7
5	329°23.5	274°14.1	28.1	167°50.6	03.4	185°34.2	21.0	305°47.3	20.8
6	344°25.9	289°13.5	N18°28.9	182°52.0	N09°02.9	200°36.4	N15°20.9	320°49.6	N07°20.9
7	359°28.4	304°12.8	29.6	197°53.4	02.4	215°38.5	20.8	335°51.8	21.0
8	14°30.9	319°12.2	30.4	212°54.8	01.9	230°40.6	20.7	350°54.1	21.1
9	29°33.3	334°11.5	·· 31.2	227°56.2	·· 01.4	245°42.7	·· 20.6	5°56.3	·· 21.1
10	44°35.8	349°10.9	31.9	242°57.6	00.9	260°44.8	20.4	20°58.5	21.2
11	59°38.3	4°10.2	32.7	257°58.9	00.4	275°47.0	20.3	36°00.8	21.3
12	74°40.7	19°09.6	N18°33.5	273°00.3	N09°00.0	290°49.1	N15°20.2	51°03.0	N07°21.4
13	89°43.2	34°09.0	34.2	288°01.7	08°59.5	305°51.2	20.1	66°05.2	21.5
14	104°45.7	49°08.3	35.0	303°03.1	59.0	320°53.3	20.0	81°07.5	21.5
15	119°48.1	64°07.7	·· 35.8	318°04.5	·· 58.5	335°55.4	·· 19.9	96°09.7	·· 21.6
16	134°50.6	79°07.0	36.5	333°05.9	58.0	350°57.5	19.7	111°12.0	21.7
17	149°53.1	94°06.4	37.3	348°07.3	57.5	5°59.7	19.6	126°14.2	21.8
18	164°55.5	109°05.7	N18°38.0	3°08.6	N08°57.0	21°01.8	N15°19.5	141°16.4	N07°21.8
19	179°58.0	124°05.1	38.8	18°10.0	56.5	36°03.9	19.4	156°18.7	21.9
20	195°00.4	139°04.4	39.6	33°11.4	56.0	51°06.0	19.3	171°20.9	22.0
21	210°02.9	154°03.7	·· 40.3	48°12.8	·· 55.5	66°08.1	·· 19.2	186°23.2	·· 22.1
22	225°05.4	169°03.1	41.1	63°14.2	55.0	81°10.2	19.0	201°25.4	22.2
23	240°07.8	184°02.4	41.8	78°15.6	54.5	96°12.4	18.9	216°27.6	22.2
Mer.pass. 07:02		ν -0.6′	d 0.8′	m -3.87	ν 1.4′	d 0.5′	m 0.82	ν 2.1′	d 0.1′ m -1.90	ν 2.2′	d 0.1′ m 0.67

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	255°10.3	199°01.8	N18°42.6	93°16.9	N08°54.0	111°14.5	N15°18.8	231°29.9	N07°22.3
1	270°12.8	214°01.1	43.3	108°18.3	53.5	126°16.6	18.7	246°32.1	22.4
2	285°15.2	229°00.5	44.1	123°19.7	53.0	141°18.7	18.6	261°34.4	22.5
3	300°17.7	243°59.8	·· 44.8	138°21.1	·· 52.5	156°20.8	·· 18.5	276°36.6	·· 22.6
4	315°20.2	258°59.2	45.6	153°22.5	52.0	171°22.9	18.3	291°38.8	22.6
5	330°22.6	273°58.5	46.3	168°23.8	51.5	186°25.1	18.2	306°41.1	22.7
6	345°25.1	288°57.9	N18°47.1	183°25.2	N08°51.0	201°27.2	N15°18.1	321°43.3	N07°22.8
7	0°27.6	303°57.2	47.8	198°26.6	50.5	216°29.3	18.0	336°45.6	22.9
8	15°30.0	318°56.5	48.6	213°28.0	50.0	231°31.4	17.9	351°47.8	22.9
9	30°32.5	333°55.9	·· 49.3	228°29.4	·· 49.5	246°33.5	·· 17.8	6°50.1	·· 23.0
10	45°34.9	348°55.2	50.1	243°30.7	49.0	261°35.6	17.6	21°52.3	23.1
11	60°37.4	3°54.6	50.8	258°32.1	48.5	276°37.7	17.5	36°54.5	23.2
12	75°39.9	18°53.9	N18°51.6	273°33.5	N08°48.0	291°39.9	N15°17.4	51°56.8	N07°23.3
13	90°42.3	33°53.3	52.3	288°34.9	47.5	306°42.0	17.3	66°59.0	23.3
14	105°44.8	48°52.6	53.1	303°36.3	47.0	321°44.1	17.2	82°01.3	23.4
15	120°47.3	63°51.9	·· 53.8	318°37.6	·· 46.5	336°46.2	·· 17.0	97°03.5	·· 23.5
16	135°49.7	78°51.3	54.6	333°39.0	46.0	351°48.3	16.9	112°05.7	23.6
17	150°52.2	93°50.6	55.3	348°40.4	45.5	6°50.4	16.8	127°08.0	23.7
18	165°54.7	108°50.0	N18°56.0	3°41.8	N08°45.0	21°52.5	N15°16.7	142°10.2	N07°23.7
19	180°57.1	123°49.3	56.8	18°43.1	44.5	36°54.6	16.6	157°12.5	23.8
20	195°59.6	138°48.6	57.5	33°44.5	44.0	51°56.8	16.4	172°14.7	23.9
21	211°02.1	153°48.0	·· 58.3	48°45.9	·· 43.5	66°58.9	·· 16.3	187°17.0	·· 24.0
22	226°04.5	168°47.3	59.0	63°47.3	43.0	82°01.0	16.2	202°19.2	24.0
23	241°07.0	183°46.6	59.7	78°48.7	42.5	97°03.1	16.1	217°21.4	24.1
Mer.pass. 06:58		ν -0.7′	d 0.8′	m -3.87	ν 1.4′	d 0.5′	m 0.83	ν 2.1′	d 0.1′ m -1.90	ν 2.2′	d 0.1′ m 0.67

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	256°09.4	198°46.0	N19°00.5	93°50.0	N08°42.0	112°05.2	N15°16.0	232°23.7	N07°24.2
1	271°11.9	213°45.3	01.2	108°51.4	41.5	127°07.3	15.9	247°25.9	24.3
2	286°14.4	228°44.6	01.9	123°52.8	41.0	142°09.4	15.7	262°28.2	24.4
3	301°16.8	243°44.0	·· 02.7	138°54.2	·· 40.5	157°11.5	·· 15.6	277°30.4	·· 24.4
4	316°19.3	258°43.3	03.4	153°55.5	40.0	172°13.6	15.5	292°32.7	24.5
5	331°21.8	273°42.6	04.1	168°56.9	39.5	187°15.8	15.4	307°34.9	24.6
6	346°24.2	288°42.0	N19°04.9	183°58.3	N08°39.0	202°17.9	N15°15.3	322°37.1	N07°24.7
7	1°26.7	303°41.3	05.6	198°59.6	38.5	217°20.0	15.1	337°39.4	24.7
8	16°29.2	318°40.6	06.3	214°01.0	38.0	232°22.1	15.0	352°41.6	24.8
9	31°31.6	333°40.0	·· 07.0	229°02.4	·· 37.5	247°24.2	·· 14.9	7°43.9	·· 24.9
10	46°34.1	348°39.3	07.8	244°03.8	37.0	262°26.3	14.8	22°46.1	25.0
11	61°36.6	3°38.6	08.5	259°05.1	36.5	277°28.4	14.7	37°48.4	25.0
12	76°39.0	18°38.0	N19°09.2	274°06.5	N08°36.0	292°30.5	N15°14.5	52°50.6	N07°25.1
13	91°41.5	33°37.3	09.9	289°07.9	35.5	307°32.6	14.4	67°52.8	25.2
14	106°43.9	48°36.6	10.7	304°09.2	35.0	322°34.7	14.3	82°55.1	25.3
15	121°46.4	63°35.9	·· 11.4	319°10.6	·· 34.5	337°36.9	·· 14.2	97°57.3	·· 25.4
16	136°48.9	78°35.3	12.1	334°12.0	34.0	352°39.0	14.1	112°59.6	25.4
17	151°51.3	93°34.6	12.8	349°13.4	33.5	7°41.1	13.9	128°01.8	25.5
18	166°53.8	108°33.9	N19°13.6	4°14.7	N08°33.0	22°43.2	N15°13.8	143°04.1	N07°25.6
19	181°56.3	123°33.3	14.3	19°16.1	32.5	37°45.3	13.7	158°06.3	25.7
20	196°58.7	138°32.6	15.0	34°17.5	32.0	52°47.4	13.6	173°08.6	25.7
21	212°01.2	153°31.9	·· 15.7	49°18.8	·· 31.5	67°49.5	·· 13.5	188°10.8	·· 25.8
22	227°03.7	168°31.2	16.4	64°20.2	31.0	82°51.6	13.3	203°13.0	25.9
23	242°06.1	183°30.6	17.1	79°21.6	30.5	97°53.7	13.2	218°15.3	26.0
Mer.pass. 06:54		ν -0.7′	d 0.7′	m -3.87	ν 1.4′	d 0.5′	m 0.85	ν 2.1′	d 0.1′ m -1.89	ν 2.2′	d 0.1′ m 0.67

Stars

	SHA	Dec
Alpheratz	357°32.8	29°14.4
Ankaa	353°05.4	-42°09.1
Schedar	349°29.0	56°41.1
Diphda	348°45.5	-17°50.0
Achernar	335°19.1	-57°05.6
Hamal	327°49.2	23°35.4
Polaris	313°25.1	89°22.6
Acamar	315°10.7	-40°11.5
Menkar	314°04.4	4°11.8
Mirfak	308°25.8	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.2
Capella	280°19.4	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.1	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.3	-59°36.1
Suhail	222°45.1	-43°32.9
Miaplacidus	221°38.3	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.7	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.6	-63°15.4
Gacrux	171°49.2	-57°16.4
Alioth	166°11.0	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.1	49°10.7
Hadar	148°32.6	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.1
Kochab	137°18.9	74°02.6
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.6
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.4
Rasalhague	95°56.4	12°32.4
Eltanin	90°40.7	51°29.0
Kaus Aust.	83°29.5	-34°22.2
Vega	80°31.5	38°48.5
Nunki	75°45.0	-26°15.6
Altair	61°57.8	8°56.4
Peacock	53°02.3	-56°38.5
Deneb	49°24.1	45°22.5
Enif	33°36.7	10°00.0
Al Na'ir	27°30.3	-46°49.4
Fomalhaut	15°12.3	-29°28.4
Scheat	13°43.3	28°13.8
Markab	13°27.9	15°21.1

Jun 06 Sun	**SHA**	**Mer.pass**
Venus	305°06.2	10:43
Mars	198°32.5	17:47
Jupiter	216°12.5	16:36
Saturn	336°25.0	08:36

Jun 07 Mon	**SHA**	**Mer.pass**
Venus	303°51.5	10:44
Mars	198°06.6	17:45
Jupiter	216°04.2	16:33
Saturn	336°19.6	08:33

Jun 08 Tue	**SHA**	**Mer.pass**
Venus	302°36.5	10:45
Mars	197°40.6	17:43
Jupiter	215°55.8	16:29
Saturn	336°14.2	08:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°21.3	N22°36.3	162°33.4	1.9′	N26°48.7	3.0′	60.5′
1	195°21.2	36.6	176°54.4	2.0′	26°45.7	3.2′	60.5′
2	210°21.1	36.8	191°15.3	2.0′	26°42.5	3.4′	60.5′
3	225°21.0	·· 37.1	205°36.3	2.0′	26°39.1	3.5′	60.5′
4	240°20.9	37.4	219°57.4	2.1′	26°35.6	3.8′	60.5′
5	255°20.8	37.6	234°18.5	2.1′	26°31.8	4.0′	60.5′
6	270°20.7	N22°37.9	248°39.6	2.2′	N26°27.8	4.2′	60.5′
7	285°20.6	38.1	263°00.7	2.2′	26°23.6	4.4′	60.5′
8	300°20.4	38.4	277°22.0	2.3′	26°19.2	4.6′	60.5′
9	315°20.3	·· 38.7	291°43.2	2.3′	26°14.6	4.8′	60.5′
10	330°20.2	38.9	306°04.5	2.4′	26°09.8	5.0′	60.5′
11	345°20.1	39.2	320°25.9	2.4′	26°04.8	5.2′	60.5′
12	0°20.0	N22°39.4	334°47.3	2.5′	N25°59.6	5.3′	60.5′
13	15°19.9	39.7	349°08.8	2.6′	25°54.3	5.6′	60.5′
14	30°19.7	39.9	3°30.4	2.6′	25°48.7	5.7′	60.5′
15	45°19.6	·· 40.2	17°52.0	2.7′	25°43.0	6.0′	60.5′
16	60°19.5	40.5	32°13.7	2.8′	25°37.0	6.1′	60.5′
17	75°19.4	40.7	46°35.5	2.8′	25°30.9	6.3′	60.5′
18	90°19.3	N22°41.0	60°57.3	2.9′	N25°24.6	6.5′	60.5′
19	105°19.2	41.2	75°19.3	3.0′	25°18.1	6.7′	60.5′
20	120°19.1	41.5	89°41.2	3.1′	25°11.4	6.9′	60.5′
21	135°18.9	·· 41.7	104°03.3	3.2′	25°04.5	7.0′	60.5′
22	150°18.8	42.0	118°25.5	3.2′	24°57.5	7.2′	60.5′
23	165°18.7	42.2	132°47.7	3.3′	24°50.3	7.4′	60.5′
	SD = 15.8′	d = 0.3′	SD = 16.5′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°18.6	N22°42.5	147°10.0	3.4′	N24°42.9	7.6′	60.5′
1	195°18.5	42.7	161°32.5	3.5′	24°35.3	7.8′	60.5′
2	210°18.4	43.0	175°55.0	3.6′	24°27.5	7.9′	60.5′
3	225°18.2	·· 43.2	190°17.6	3.7′	24°19.6	8.1′	60.5′
4	240°18.1	43.5	204°40.3	3.8′	24°11.5	8.3′	60.5′
5	255°18.0	43.7	219°03.0	3.9′	24°03.2	8.4′	60.5′
6	270°17.9	N22°43.9	233°25.9	4.0′	N23°54.8	8.6′	60.5′
7	285°17.8	44.2	247°48.9	4.1′	23°46.2	8.8′	60.5′
8	300°17.7	44.4	262°12.0	4.2′	23°37.4	8.9′	60.5′
9	315°17.5	·· 44.7	276°35.2	4.3′	23°28.5	9.1′	60.5′
10	330°17.4	44.9	290°58.5	4.4′	23°19.4	9.3′	60.5′
11	345°17.3	45.2	305°21.9	4.5′	23°10.1	9.4′	60.5′
12	0°17.2	N22°45.4	319°45.3	4.6′	N23°00.7	9.6′	60.4′
13	15°17.1	45.6	334°08.9	4.7′	22°51.1	9.7′	60.4′
14	30°16.9	45.9	348°32.6	4.8′	22°41.4	9.8′	60.4′
15	45°16.8	·· 46.1	2°56.5	4.9′	22°31.6	10.1′	60.4′
16	60°16.7	46.4	17°20.4	5.0′	22°21.5	10.1′	60.4′
17	75°16.6	46.6	31°44.4	5.1′	22°11.4	10.3′	60.4′
18	90°16.5	N22°46.8	46°08.5	5.2′	N22°01.1	10.5′	60.4′
19	105°16.4	47.1	60°32.8	5.4′	21°50.6	10.6′	60.4′
20	120°16.2	47.3	74°57.2	5.5′	21°40.0	10.7′	60.4′
21	135°16.1	·· 47.5	89°21.6	5.6′	21°29.3	10.9′	60.3′
22	150°16.0	47.8	103°46.2	5.7′	21°18.4	11.0′	60.3′
23	165°15.9	48.0	118°10.9	5.8′	21°07.4	11.2′	60.3′
	SD = 15.8′	d = 0.2′	SD = 16.5′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°15.8	N22°48.2	132°35.7	5.9′	N20°56.2	11.3′	60.3′
1	195°15.6	48.5	147°00.6	6.0′	20°44.9	11.4′	60.3′
2	210°15.5	48.7	161°25.7	6.2′	20°33.5	11.5′	60.3′
3	225°15.4	·· 48.9	175°50.8	6.3′	20°22.0	11.7′	60.3′
4	240°15.3	49.2	190°16.1	6.4′	20°10.3	11.7′	60.3′
5	255°15.2	49.4	204°41.5	6.5′	19°58.6	11.9′	60.2′
6	270°15.0	N22°49.6	219°07.0	6.6′	N19°46.7	12.1′	60.2′
7	285°14.9	49.8	233°32.6	6.7′	19°34.6	12.1′	60.2′
8	300°14.8	50.1	247°58.3	6.8′	19°22.5	12.3′	60.2′
9	315°14.7	·· 50.3	262°24.1	7.0′	19°10.2	12.3′	60.2′
10	330°14.6	50.5	276°50.1	7.1′	18°57.9	12.5′	60.2′
11	345°14.4	50.7	291°16.2	7.2′	18°45.4	12.6′	60.1′
12	0°14.3	N22°51.0	305°42.3	7.3′	N18°32.8	12.7′	60.1′
13	15°14.2	51.2	320°08.6	7.4′	18°20.1	12.8′	60.1′
14	30°14.1	51.4	334°35.0	7.5′	18°07.3	12.9′	60.1′
15	45°14.0	·· 51.6	349°01.5	7.6′	17°54.4	13.0′	60.1′
16	60°13.8	51.9	3°28.2	7.7′	17°41.4	13.1′	60.0′
17	75°13.7	52.1	17°54.9	7.9′	17°28.3	13.2′	60.0′
18	90°13.6	N22°52.3	32°21.8	8.0′	N17°15.1	13.3′	60.0′
19	105°13.5	52.5	46°48.7	8.1′	17°01.8	13.4′	60.0′
20	120°13.4	52.7	61°15.8	8.2′	16°48.4	13.5′	60.0′
21	135°13.2	·· 53.0	75°43.0	8.3′	16°34.9	13.6′	59.9′
22	150°13.1	53.2	90°10.3	8.4′	16°21.3	13.6′	59.9′
23	165°13.0	53.4	104°37.7	8.5′	16°07.7	13.8′	59.9′
	SD = 15.8′	d = 0.2′	SD = 16.4′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	00:46	23:16	////	////
64°	////	////	01:45	22:14	////	////
62°	////	////	02:18	21:41	////	////
60°	////	01:10	02:42	21:17	22:50	////
N 58°	////	01:50	03:01	20:57	22:09	////
56°	////	02:17	03:17	20:41	21:42	////
54°	01:04	02:38	03:30	20:28	21:21	22:56
52°	01:41	02:55	03:42	20:16	21:04	22:18
50°	02:06	03:09	03:53	20:06	20:49	21:52
45°	02:49	03:37	04:14	19:44	20:21	21:10
N 40°	03:18	03:59	04:31	19:27	19:59	20:40
35°	03:40	04:17	04:46	19:12	19:41	20:18
30°	03:58	04:31	04:59	18:59	19:27	20:00
20°	04:26	04:55	05:20	18:38	19:02	19:31
N 10°	04:48	05:15	05:38	18:20	18:43	19:09
0°	05:07	05:33	05:55	18:03	18:25	18:51
S 10°	05:23	05:49	06:12	17:46	18:08	18:35
20°	05:39	06:06	06:30	17:28	17:52	18:19
30°	05:55	06:24	06:51	17:07	17:33	18:03
35°	06:03	06:35	07:02	16:55	17:23	17:55
40°	06:12	06:46	07:16	16:41	17:12	17:46
45°	06:22	06:59	07:32	16:25	16:59	17:36
S 50°	06:33	07:14	07:52	16:05	16:43	17:24
52°	06:38	07:21	08:02	15:56	16:36	17:19
54°	06:43	07:29	08:12	15:45	16:28	17:14
56°	06:49	07:38	08:24	15:33	16:20	17:08
58°	06:56	07:48	08:38	15:19	16:10	17:02
S 60°	07:03	07:59	08:55	15:03	15:59	16:55

Lat.	**Moonrise** Sun	**Moonrise** Mon	**Moonrise** Tue	**Moonset** Sun	**Moonset** Mon	**Moonset** Tue
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	05:10	▭	▭	01:43
66°	▭	▭	05:50	▭	▭	01:02
64°	▭	03:57	06:17	▭	00:48	00:33
62°	02:38	04:36	06:38	·· ··	00:08	00:12
60°	03:20	05:04	06:55	23:40	23:54	·· ··
N 58°	03:49	05:25	07:09	23:18	23:39	23:51
56°	04:11	05:42	07:21	23:00	23:26	23:42
54°	04:29	05:57	07:32	22:45	23:15	23:34
52°	04:45	06:10	07:41	22:32	23:05	23:28
50°	04:58	06:21	07:50	22:20	22:56	23:21
45°	05:25	06:45	08:07	21:56	22:37	23:08
N 40°	05:47	07:03	08:22	21:36	22:21	22:57
35°	06:05	07:19	08:34	21:20	22:08	22:47
30°	06:20	07:32	08:44	21:06	21:56	22:39
20°	06:47	07:55	09:02	20:41	21:36	22:24
N 10°	07:09	08:15	09:18	20:20	21:18	22:11
0°	07:30	08:33	09:32	20:01	21:02	21:59
S 10°	07:51	08:52	09:47	19:41	20:45	21:46
20°	08:13	09:11	10:02	19:19	20:27	21:33
30°	08:39	09:34	10:20	18:54	20:07	21:18
35°	08:55	09:47	10:30	18:39	19:54	21:09
40°	09:12	10:02	10:42	18:22	19:40	20:58
45°	09:34	10:20	10:55	18:02	19:23	20:46
S 50°	10:00	10:42	11:12	17:36	19:03	20:31
52°	10:14	10:53	11:20	17:23	18:53	20:24
54°	10:28	11:04	11:28	17:08	18:41	20:16
56°	10:46	11:18	11:38	16:51	18:28	20:08
58°	11:07	11:34	11:49	16:30	18:13	19:58
S 60°	11:34	11:52	12:01	16:04	17:55	19:46

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 2-4 2-14%
06	01:25	01:20	11:59	13:45	01:13	
07	01:14	01:09	11:59	14:48	02:17	
08	01:03	00:57	11:59	15:46	03:17	

June 09, 10, 11 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	257°08.6	198°29.9	N19°17.8	94°22.9	N08°30.0	112°55.8	N15°13.1	233°17.5	N07°26.0
1	272°11.1	213°29.2	18.6	109°24.3	29.5	127°57.9	13.0	248°19.8	26.1
2	287°13.5	228°28.5	19.3	124°25.7	29.0	143°00.0	12.9	263°22.0	26.2
3	302°16.0	243°27.9	·· 20.0	139°27.0	·· 28.5	158°02.1	·· 12.7	278°24.3	·· 26.3
4	317°18.4	258°27.2	20.7	154°28.4	28.0	173°04.3	12.6	293°26.5	26.3
5	332°20.9	273°26.5	21.4	169°29.8	27.5	188°06.4	12.5	308°28.8	26.4
6	347°23.4	288°25.8	N19°22.1	184°31.1	N08°27.0	203°08.5	N15°12.4	323°31.0	N07°26.5
7	2°25.8	303°25.1	22.8	199°32.5	26.5	218°10.6	12.2	338°33.3	26.6
8	17°28.3	318°24.5	23.5	214°33.9	26.0	233°12.7	12.1	353°35.5	26.7
9	32°30.8	333°23.8	·· 24.2	229°35.2	·· 25.4	248°14.8	·· 12.0	8°37.7	·· 26.7
10	47°33.2	348°23.1	24.9	244°36.6	24.9	263°16.9	11.9	23°40.0	26.8
11	62°35.7	3°22.4	25.7	259°38.0	24.4	278°19.0	11.8	38°42.2	26.9
12	77°38.2	18°21.7	N19°26.4	274°39.3	N08°23.9	293°21.1	N15°11.6	53°44.5	N07°27.0
13	92°40.6	33°21.1	27.1	289°40.7	23.4	308°23.2	11.5	68°46.7	27.0
14	107°43.1	48°20.4	27.8	304°42.1	22.9	323°25.3	11.4	83°49.0	27.1
15	122°45.5	63°19.7	·· 28.5	319°43.4	·· 22.4	338°27.4	·· 11.3	98°51.2	·· 27.2
16	137°48.0	78°19.0	29.2	334°44.8	21.9	353°29.5	11.2	113°53.5	27.3
17	152°50.5	93°18.3	29.9	349°46.2	21.4	8°31.6	11.0	128°55.7	27.3
18	167°52.9	108°17.6	N19°30.6	4°47.5	N08°20.9	23°33.7	N15°10.9	143°58.0	N07°27.4
19	182°55.4	123°17.0	31.3	19°48.9	20.4	38°35.8	10.8	159°00.2	27.5
20	197°57.9	138°16.3	32.0	34°50.2	19.9	53°37.9	10.7	174°02.5	27.6
21	213°00.3	153°15.6	·· 32.6	49°51.6	·· 19.4	68°40.0	·· 10.5	189°04.7	·· 27.6
22	228°02.8	168°14.9	33.3	64°53.0	18.9	83°42.1	10.4	204°07.0	27.7
23	243°05.3	183°14.2	34.0	79°54.3	18.4	98°44.2	10.3	219°09.2	27.8
Mer.pass. 06:50		ν -0.7′	d 0.7′	m -3.87	ν 1.4′	d 0.5′	m 0.86	ν 2.1′	d 0.1′ m -1.89	ν 2.2′	d 0.1′ m 0.67

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	258°07.7	198°13.5	N19°34.7	94°55.7	N08°17.8	113°46.3	N15°10.2	234°11.5	N07°27.9
1	273°10.2	213°12.8	35.4	109°57.1	17.3	128°48.4	10.1	249°13.7	27.9
2	288°12.7	228°12.1	36.1	124°58.4	16.8	143°50.5	09.9	264°15.9	28.0
3	303°15.1	243°11.5	·· 36.8	139°59.8	·· 16.3	158°52.6	·· 09.8	279°18.2	·· 28.1
4	318°17.6	258°10.8	37.5	155°01.1	15.8	173°54.8	09.7	294°20.4	28.2
5	333°20.0	273°10.1	38.2	170°02.5	15.3	188°56.9	09.6	309°22.7	28.2
6	348°22.5	288°09.4	N19°38.9	185°03.9	N08°14.8	203°59.0	N15°09.4	324°24.9	N07°28.3
7	3°25.0	303°08.7	39.6	200°05.2	14.3	219°01.1	09.3	339°27.2	28.4
8	18°27.4	318°08.0	40.2	215°06.6	13.8	234°03.2	09.2	354°29.4	28.5
9	33°29.9	333°07.3	·· 40.9	230°07.9	·· 13.3	249°05.3	·· 09.1	9°31.7	·· 28.5
10	48°32.4	348°06.6	41.6	245°09.3	12.8	264°07.4	08.9	24°33.9	28.6
11	63°34.8	3°05.9	42.3	260°10.7	12.3	279°09.5	08.8	39°36.2	28.7
12	78°37.3	18°05.2	N19°43.0	275°12.0	N08°11.7	294°11.6	N15°08.7	54°38.4	N07°28.8
13	93°39.8	33°04.5	43.7	290°13.4	11.2	309°13.7	08.6	69°40.7	28.8
14	108°42.2	48°03.9	44.3	305°14.7	10.7	324°15.8	08.5	84°42.9	28.9
15	123°44.7	63°03.2	·· 45.0	320°16.1	·· 10.2	339°17.9	·· 08.3	99°45.2	·· 29.0
16	138°47.2	78°02.5	45.7	335°17.4	09.7	354°20.0	08.2	114°47.4	29.1
17	153°49.6	93°01.8	46.4	350°18.8	09.2	9°22.1	08.1	129°49.7	29.1
18	168°52.1	108°01.1	N19°47.1	5°20.2	N08°08.7	24°24.2	N15°08.0	144°51.9	N07°29.2
19	183°54.5	123°00.4	47.7	20°21.5	08.2	39°26.3	07.8	159°54.2	29.3
20	198°57.0	137°59.7	48.4	35°22.9	07.7	54°28.4	07.7	174°56.4	29.4
21	213°59.5	152°59.0	·· 49.1	50°24.2	·· 07.2	69°30.5	·· 07.6	189°58.7	·· 29.4
22	229°01.9	167°58.3	49.8	65°25.6	06.6	84°32.6	07.5	205°00.9	29.5
23	244°04.4	182°57.6	50.4	80°26.9	06.1	99°34.7	07.3	220°03.2	29.6
Mer.pass. 06:46		ν -0.7′	d 0.7′	m -3.87	ν 1.4′	d 0.5′	m 0.87	ν 2.1′	d 0.1′ m -1.88	ν 2.2′	d 0.1′ m 0.67

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	259°06.9	197°56.9	N19°51.1	95°28.3	N08°05.6	114°36.8	N15°07.2	235°05.4	N07°29.7
1	274°09.3	212°56.2	51.8	110°29.6	05.1	129°38.9	07.1	250°07.7	29.7
2	289°11.8	227°55.5	52.4	125°31.0	04.6	144°41.0	07.0	265°09.9	29.8
3	304°14.3	242°54.8	·· 53.1	140°32.3	·· 04.1	159°43.1	·· 06.8	280°12.2	·· 29.9
4	319°16.7	257°54.1	53.8	155°33.7	03.6	174°45.2	06.7	295°14.4	30.0
5	334°19.2	272°53.4	54.4	170°35.1	03.1	189°47.2	06.6	310°16.7	30.0
6	349°21.6	287°52.7	N19°55.1	185°36.4	N08°02.5	204°49.3	N15°06.5	325°18.9	N07°30.1
7	4°24.1	302°52.0	55.8	200°37.8	02.0	219°51.4	06.4	340°21.2	30.2
8	19°26.6	317°51.3	56.4	215°39.1	01.5	234°53.5	06.2	355°23.4	30.2
9	34°29.0	332°50.6	·· 57.1	230°40.5	·· 01.0	249°55.6	·· 06.1	10°25.7	·· 30.3
10	49°31.5	347°49.9	57.8	245°41.8	00.5	264°57.7	06.0	25°27.9	30.4
11	64°34.0	2°49.2	58.4	260°43.2	08°00.0	279°59.8	05.9	40°30.2	30.5
12	79°36.4	17°48.5	N19°59.1	275°44.5	N07°59.5	295°01.9	N15°05.7	55°32.4	N07°30.5
13	94°38.9	32°47.8	19°59.7	290°45.9	59.0	310°04.0	05.6	70°34.7	30.6
14	109°41.4	47°47.1	20°00.4	305°47.2	58.4	325°06.1	05.5	85°36.9	30.7
15	124°43.8	62°46.4	·· 01.1	320°48.6	·· 57.9	340°08.2	·· 05.4	100°39.2	·· 30.8
16	139°46.3	77°45.7	01.7	335°49.9	57.4	355°10.3	05.2	115°41.4	30.8
17	154°48.8	92°45.0	02.4	350°51.3	56.9	10°12.4	05.1	130°43.7	30.9
18	169°51.2	107°44.2	N20°03.0	5°52.6	N07°56.4	25°14.5	N15°05.0	145°45.9	N07°31.0
19	184°53.7	122°43.5	03.7	20°54.0	55.9	40°16.6	04.9	160°48.2	31.1
20	199°56.1	137°42.8	04.3	35°55.3	55.4	55°18.7	04.7	175°50.5	31.1
21	214°58.6	152°42.1	·· 05.0	50°56.7	·· 54.8	70°20.8	·· 04.6	190°52.7	·· 31.2
22	230°01.1	167°41.4	05.6	65°58.0	54.3	85°22.9	04.5	205°55.0	31.3
23	245°03.5	182°40.7	06.3	80°59.4	53.8	100°25.0	04.4	220°57.2	31.3
Mer.pass. 06:42		ν -0.7′	d 0.7′	m -3.88	ν 1.4′	d 0.5′	m 0.88	ν 2.1′	d 0.1′ m -1.88	ν 2.3′	d 0.1′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°32.8	29°14.4
Ankaa	353°05.3	-42°09.1
Schedar	349°28.9	56°41.1
Diphda	348°45.4	-17°50.0
Achernar	335°19.1	-57°05.6
Hamal	327°49.2	23°35.4
Polaris	313°24.2	89°22.6
Acamar	315°10.6	-40°11.5
Menkar	314°04.3	4°11.8
Mirfak	308°25.8	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.2
Capella	280°19.4	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.4	-59°36.1
Suhail	222°45.1	-43°32.9
Miaplacidus	221°38.3	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.4	11°49.9
Dubhe	193°38.7	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.4	-17°41.9
Acrux	172°57.6	-63°15.4
Gacrux	171°49.2	-57°16.4
Alioth	166°11.0	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.2
Kochab	137°19.0	74°02.7
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.3
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.6
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.4	12°32.4
Eltanin	90°40.7	51°29.0
Kaus Aust.	83°29.5	-34°22.2
Vega	80°31.5	38°48.5
Nunki	75°45.0	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.2	-56°38.5
Deneb	49°24.1	45°22.5
Enif	33°36.7	10°00.0
Al Na'ir	27°30.3	-46°49.4
Fomalhaut	15°12.3	-29°28.4
Scheat	13°43.2	28°13.8
Markab	13°27.9	15°21.1

Jun 09 Wed	SHA	Mer.pass
Venus	301°21.3	10:46
Mars	197°14.4	17:41
Jupiter	215°47.2	16:26
Saturn	336°09.0	08:26

Jun 10 Thu	SHA	Mer.pass
Venus	300°05.8	10:48
Mars	196°48.0	17:39
Jupiter	215°38.6	16:23
Saturn	336°03.7	08:22

Jun 11 Fri	SHA	Mer.pass
Venus	298°50.0	10:49
Mars	196°21.4	17:37
Jupiter	215°29.9	16:19
Saturn	335°58.6	08:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°12.9	N22°53.6	119°05.2	8.6′	N15°53.9	13.8′	59.9′
1	195°12.7	53.8	133°32.8	8.7′	15°40.1	13.9′	59.9′
2	210°12.6	54.0	148°00.5	8.8′	15°26.2	14.0′	59.8′
3	225°12.5	·· 54.2	162°28.3	8.9′	15°12.2	14.1′	59.8′
4	240°12.4	54.5	176°56.2	9.0′	14°58.1	14.1′	59.8′
5	255°12.3	54.7	191°24.3	9.1′	14°44.0	14.2′	59.8′
6	270°12.1	N22°54.9	205°52.4	9.2′	N14°29.8	14.3′	59.8′
7	285°12.0	55.1	220°20.6	9.3′	14°15.5	14.3′	59.7′
8	300°11.9	55.3	234°49.0	9.4′	14°01.2	14.5′	59.7′
9	315°11.8	·· 55.5	249°17.4	9.5′	13°46.7	14.5′	59.7′
10	330°11.6	55.7	263°45.9	9.6′	13°32.2	14.5′	59.7′
11	345°11.5	55.9	278°14.5	9.7′	13°17.7	14.6′	59.6′
12	0°11.4	N22°56.1	292°43.3	9.8′	N13°03.1	14.7′	59.6′
13	15°11.3	56.3	307°12.1	9.9′	12°48.4	14.7′	59.6′
14	30°11.2	56.5	321°41.0	10.0′	12°33.7	14.8′	59.6′
15	45°11.0	·· 56.7	336°10.0	10.1′	12°18.9	14.9′	59.5′
16	60°10.9	57.0	350°39.1	10.2′	12°04.0	14.9′	59.5′
17	75°10.8	57.2	5°08.3	10.3′	11°49.1	14.9′	59.5′
18	90°10.7	N22°57.4	19°37.5	10.4′	N11°34.2	15.0′	59.5′
19	105°10.5	57.6	34°06.9	10.5′	11°19.2	15.1′	59.5′
20	120°10.4	57.8	48°36.4	10.5′	11°04.1	15.0′	59.4′
21	135°10.3	·· 58.0	63°05.9	10.6′	10°49.1	15.2′	59.4′
22	150°10.2	58.2	77°35.5	10.7′	10°33.9	15.2′	59.4′
23	165°10.0	58.4	92°05.2	10.8′	10°18.7	15.2′	59.4′
	SD = 15.7′	*d* = 0.2′	SD = 16.3′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°09.9	N22°58.6	106°35.0	10.9′	N10°03.5	15.2′	59.3′
1	195°09.8	58.8	121°04.9	10.9′	09°48.3	15.3′	59.3′
2	210°09.7	59.0	135°34.8	11.0′	09°33.0	15.4′	59.3′
3	225°09.5	·· 59.2	150°04.8	11.1′	09°17.6	15.4′	59.2′
4	240°09.4	59.3	164°35.0	11.2′	09°02.2	15.4′	59.2′
5	255°09.3	59.5	179°05.1	11.3′	08°46.8	15.4′	59.2′
6	270°09.2	N22°59.7	193°35.4	11.3′	N08°31.4	15.5′	59.2′
7	285°09.1	22°59.9	208°05.7	11.4′	08°15.9	15.5′	59.1′
8	300°08.9	23°00.1	222°36.1	11.5′	08°00.4	15.5′	59.1′
9	315°08.8	·· 00.3	237°06.6	11.5′	07°44.9	15.5′	59.1′
10	330°08.7	00.5	251°37.1	11.6′	07°29.4	15.6′	59.1′
11	345°08.6	00.7	266°07.7	11.7′	07°13.8	15.6′	59.0′
12	0°08.4	N23°00.9	280°38.4	11.7′	N06°58.2	15.6′	59.0′
13	15°08.3	01.1	295°09.1	11.8′	06°42.6	15.6′	59.0′
14	30°08.2	01.3	309°39.9	11.9′	06°27.0	15.7′	59.0′
15	45°08.1	·· 01.5	324°10.8	11.9′	06°11.3	15.6′	58.9′
16	60°07.9	01.6	338°41.7	12.0′	05°55.7	15.7′	58.9′
17	75°07.8	01.8	353°12.7	12.0′	05°40.0	15.7′	58.9′
18	90°07.7	N23°02.0	7°43.7	12.1′	N05°24.3	15.7′	58.8′
19	105°07.5	02.2	22°14.8	12.2′	05°08.6	15.7′	58.8′
20	120°07.4	02.4	36°46.0	12.2′	04°52.9	15.8′	58.8′
21	135°07.3	·· 02.6	51°17.2	12.3′	04°37.1	15.7′	58.8′
22	150°07.2	02.8	65°48.5	12.3′	04°21.4	15.7′	58.7′
23	165°07.0	02.9	80°19.8	12.4′	04°05.7	15.8′	58.7′
	SD = 15.7′	*d* = 0.2′	SD = 16.2′				

Fri	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°06.9	N23°03.1	94°51.2	12.4′	N03°49.9	15.7′	58.7′
1	195°06.8	03.3	109°22.6	12.5′	03°34.2	15.8′	58.7′
2	210°06.7	03.5	123°54.0	12.5′	03°18.4	15.7′	58.6′
3	225°06.5	·· 03.7	138°25.5	12.6′	03°02.7	15.8′	58.6′
4	240°06.4	03.8	152°57.1	12.6′	02°46.9	15.7′	58.6′
5	255°06.3	04.0	167°28.7	12.6′	02°31.2	15.8′	58.5′
6	270°06.2	N23°04.2	182°00.3	12.7′	N02°15.4	15.7′	58.5′
7	285°06.0	04.4	196°32.0	12.7′	01°59.7	15.8′	58.5′
8	300°05.9	04.5	211°03.7	12.8′	01°43.9	15.7′	58.5′
9	315°05.8	·· 04.7	225°35.5	12.8′	01°28.2	15.7′	58.4′
10	330°05.7	04.9	240°07.3	12.8′	01°12.5	15.7′	58.4′
11	345°05.5	05.1	254°39.1	12.9′	00°56.8	15.7′	58.4′
12	0°05.4	N23°05.2	269°11.0	12.9′	N00°41.1	15.7′	58.3′
13	15°05.3	05.4	283°42.8	12.9′	00°25.4	15.7′	58.3′
14	30°05.1	05.6	298°14.8	13.0′	N00°09.7	15.7′	58.3′
15	45°05.0	·· 05.8	312°46.7	13.0′	S00°06.0	15.6′	58.3′
16	60°04.9	05.9	327°18.7	13.0′	00°21.6	15.6′	58.2′
17	75°04.8	06.1	341°50.7	13.0′	00°37.2	15.7′	58.2′
18	90°04.6	N23°06.3	356°22.8	13.1′	S00°52.9	15.6′	58.2′
19	105°04.5	06.4	10°54.8	13.1′	01°08.5	15.5′	58.2′
20	120°04.4	06.6	25°26.9	13.1′	01°24.0	15.6′	58.1′
21	135°04.3	·· 06.8	39°59.0	13.1′	01°39.6	15.5′	58.1′
22	150°04.1	06.9	54°31.1	13.1′	01°55.1	15.5′	58.1′
23	165°04.0	07.1	69°03.3	13.2′	02°10.6	15.5′	58.0′
	SD = 15.7′	*d* = 0.2′	SD = 16.0′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:30	23:35	////	////
64°	////	////	01:40	22:21	////	////
62°	////	////	02:14	21:45	////	////
60°	////	01:03	02:39	21:20	22:58	////
N 58°	////	01:46	02:59	21:01	22:14	////
56°	////	02:14	03:15	20:44	21:45	////
54°	00:58	02:35	03:29	20:31	21:24	23:03
52°	01:38	02:53	03:41	20:19	21:07	22:22
50°	02:04	03:07	03:51	20:08	20:52	21:56
45°	02:47	03:36	04:13	19:46	20:23	21:12
N 40°	03:17	03:58	04:31	19:28	20:01	20:42
35°	03:40	04:16	04:46	19:13	19:43	20:20
30°	03:58	04:31	04:58	19:01	19:28	20:01
20°	04:26	04:55	05:20	18:39	19:03	19:33
N 10°	04:49	05:16	05:39	18:20	18:43	19:10
0°	05:07	05:33	05:56	18:03	18:26	18:52
S 10°	05:24	05:50	06:13	17:46	18:09	18:35
20°	05:40	06:07	06:31	17:28	17:52	18:19
30°	05:56	06:26	06:52	17:07	17:33	18:03
35°	06:04	06:36	07:04	16:55	17:23	17:54
40°	06:13	06:47	07:18	16:41	17:11	17:45
45°	06:24	07:01	07:34	16:24	16:58	17:35
S 50°	06:35	07:16	07:55	16:04	16:42	17:24
52°	06:40	07:24	08:04	15:55	16:35	17:19
54°	06:46	07:32	08:15	15:44	16:27	17:13
56°	06:52	07:40	08:27	15:31	16:18	17:07
58°	06:58	07:50	08:41	15:17	16:08	17:01
S 60°	07:05	08:02	08:58	15:00	15:57	16:53

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	06:56	09:38	11:56	01:57	01:02	00:26 23:54
N 70°	07:27	09:50	11:57	01:24	00:47	00:21 23:57
68°	07:49	09:59	11:58	00:59	00:35	00:17
66°	08:07	10:07	11:58	00:40	00:26	00:14
64°	08:21	10:13	11:59	00:25	00:17	00:11
62°	08:33	10:19	11:59	00:12	00:10	00:08
60°	08:43	10:24	12:00	00:00	00:04	00:06
N 58°	08:51	10:28	12:00	23:58	·· ··	00:04
56°	08:59	10:32	12:00	23:53	·· ··	00:02
54°	09:05	10:35	12:00	23:49	·· ··	00:01
52°	09:11	10:38	12:01	23:45	23:59	·· ··
50°	09:17	10:41	12:01	23:41	23:58	·· ··
45°	09:28	10:47	12:01	23:33	23:55	·· ··
N 40°	09:38	10:51	12:02	23:26	23:53	·· ··
35°	09:46	10:56	12:02	23:21	23:50	·· ··
30°	09:53	10:59	12:02	23:15	23:49	·· ··
20°	10:06	11:06	12:03	23:06	23:45	·· ··
N 10°	10:16	11:11	12:03	22:58	23:42	·· ··
0°	10:27	11:17	12:04	22:51	23:39	·· ··
S 10°	10:36	11:22	12:04	22:43	23:36	·· ··
20°	10:47	11:27	12:05	22:35	23:33	·· ··
30°	10:59	11:34	12:06	22:25	23:30	·· ··
35°	11:06	11:37	12:06	22:20	23:28	·· ··
40°	11:14	11:41	12:06	22:13	23:25	·· ··
45°	11:23	11:46	12:07	22:06	23:23	·· ··
S 50°	11:34	11:52	12:07	21:57	23:19	·· ··
52°	11:39	11:54	12:08	21:53	23:18	·· ··
54°	11:45	11:57	12:08	21:48	23:16	·· ··
56°	11:51	12:00	12:08	21:43	23:14	·· ··
58°	11:58	12:04	12:09	21:38	23:12	·· ··
S 60°	12:05	12:08	12:09	21:31	23:10	·· ··

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Mer.Pass. Lower hh:mm	Age 5-7 23-45%
09	00:51	00:46	11:59	16:39	04:13	
10	00:40	00:34	11:59	17:28	05:04	
11	00:28	00:22	12:00	18:15	05:52	

June 12, 13, 14 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	260°06.0	197°40.0	N20°06.9	96°00.7	N07°53.3	115°27.1	N15°04.2	235°59.5	N07°31.4
1	275°08.5	212°39.3	07.6	111°02.1	52.8	130°29.2	04.1	251°01.7	31.5
2	290°10.9	227°38.6	08.2	126°03.4	52.3	145°31.3	04.0	266°04.0	31.6
3	305°13.4	242°37.9	·· 08.9	141°04.8	·· 51.8	160°33.4	·· 03.8	281°06.2	·· 31.6
4	320°15.9	257°37.2	09.5	156°06.1	51.2	175°35.5	03.7	296°08.5	31.7
5	335°18.3	272°36.4	10.2	171°07.4	50.7	190°37.5	03.6	311°10.7	31.8
6	350°20.8	287°35.7	N20°10.8	186°08.8	N07°50.2	205°39.6	N15°03.5	326°13.0	N07°31.9
7	5°23.2	302°35.0	11.5	201°10.1	49.7	220°41.7	03.3	341°15.2	31.9
8	20°25.7	317°34.3	12.1	216°11.5	49.2	235°43.8	03.2	356°17.5	32.0
9	35°28.2	332°33.6	·· 12.7	231°12.8	·· 48.7	250°45.9	·· 03.1	11°19.7	·· 32.1
10	50°30.6	347°32.9	13.4	246°14.2	48.1	265°48.0	03.0	26°22.0	32.1
11	65°33.1	2°32.2	14.0	261°15.5	47.6	280°50.1	02.8	41°24.3	32.2
12	80°35.6	17°31.5	N20°14.7	276°16.9	N07°47.1	295°52.2	N15°02.7	56°26.5	N07°32.3
13	95°38.0	32°30.7	15.3	291°18.2	46.6	310°54.3	02.6	71°28.8	32.4
14	110°40.5	47°30.0	15.9	306°19.6	46.1	325°56.4	02.5	86°31.0	32.4
15	125°43.0	62°29.3	·· 16.6	321°20.9	·· 45.6	340°58.5	·· 02.3	101°33.3	·· 32.5
16	140°45.4	77°28.6	17.2	336°22.2	45.0	356°00.6	02.2	116°35.5	32.6
17	155°47.9	92°27.9	17.8	351°23.6	44.5	11°02.7	02.1	131°37.8	32.6
18	170°50.4	107°27.2	N20°18.5	6°24.9	N07°44.0	26°04.7	N15°02.0	146°40.0	N07°32.7
19	185°52.8	122°26.4	19.1	21°26.3	43.5	41°06.8	01.8	161°42.3	32.8
20	200°55.3	137°25.7	19.7	36°27.6	43.0	56°08.9	01.7	176°44.5	32.9
21	215°57.7	152°25.0	·· 20.4	51°29.0	·· 42.4	71°11.0	·· 01.6	191°46.8	·· 32.9
22	231°00.2	167°24.3	21.0	66°30.3	41.9	86°13.1	01.4	206°49.1	33.0
23	246°02.7	182°23.6	21.6	81°31.6	41.4	101°15.2	01.3	221°51.3	33.1
Mer.pass. 06:39		ν -0.7′	d 0.6′	m -3.88	ν 1.3′	d 0.5′	m 0.89	ν 2.1′	d 0.1′ m -1.87	ν 2.3′	d 0.1′ m 0.66

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	261°05.1	197°22.8	N20°22.2	96°33.0	N07°40.9	116°17.3	N15°01.2	236°53.6	N07°33.2
1	276°07.6	212°22.1	22.9	111°34.3	40.4	131°19.4	01.1	251°55.8	33.2
2	291°10.1	227°21.4	23.5	126°35.7	39.9	146°21.5	00.9	266°58.1	33.3
3	306°12.5	242°20.7	·· 24.1	141°37.0	·· 39.3	161°23.6	·· 00.8	282°00.3	·· 33.4
4	321°15.0	257°20.0	24.7	156°38.3	38.8	176°25.7	00.7	297°02.6	33.4
5	336°17.5	272°19.2	25.4	171°39.7	38.3	191°27.7	00.6	312°04.8	33.5
6	351°19.9	287°18.5	N20°26.0	186°41.0	N07°37.8	206°29.8	N15°00.4	327°07.1	N07°33.6
7	6°22.4	302°17.8	26.6	201°42.4	37.3	221°31.9	00.3	342°09.4	33.7
8	21°24.9	317°17.1	27.2	216°43.7	36.7	236°34.0	00.2	357°11.6	33.7
9	36°27.3	332°16.3	·· 27.8	231°45.0	·· 36.2	251°36.1	15°00.0	12°13.9	·· 33.8
10	51°29.8	347°15.6	28.5	246°46.4	35.7	266°38.2	14°59.9	27°16.1	33.9
11	66°32.2	2°14.9	29.1	261°47.7	35.2	281°40.3	59.8	42°18.4	33.9
12	81°34.7	17°14.2	N20°29.7	276°49.1	N07°34.7	296°42.4	N14°59.7	57°20.6	N07°34.0
13	96°37.2	32°13.4	30.3	291°50.4	34.1	311°44.5	59.5	72°22.9	34.1
14	111°39.6	47°12.7	30.9	306°51.7	33.6	326°46.5	59.4	87°25.2	34.2
15	126°42.1	62°12.0	·· 31.5	321°53.1	·· 33.1	341°48.6	·· 59.3	102°27.4	·· 34.2
16	141°44.6	77°11.3	32.1	336°54.4	32.6	356°50.7	59.2	117°29.7	34.3
17	156°47.0	92°10.5	32.8	351°55.8	32.1	11°52.8	59.0	132°31.9	34.4
18	171°49.5	107°09.8	N20°33.4	6°57.1	N07°31.5	26°54.9	N14°58.9	147°34.2	N07°34.4
19	186°52.0	122°09.1	34.0	21°58.4	31.0	41°57.0	58.8	162°36.4	34.5
20	201°54.4	137°08.4	34.6	36°59.8	30.5	56°59.1	58.6	177°38.7	34.6
21	216°56.9	152°07.6	·· 35.2	52°01.1	·· 30.0	72°01.2	·· 58.5	192°41.0	·· 34.6
22	231°59.3	167°06.9	35.8	67°02.4	29.4	87°03.2	58.4	207°43.2	34.7
23	247°01.8	182°06.2	36.4	82°03.8	28.9	102°05.3	58.3	222°45.5	34.8
Mer.pass. 06:35		ν -0.7′	d 0.6′	m -3.88	ν 1.3′	d 0.5′	m 0.90	ν 2.1′	d 0.1′ m -1.87	ν 2.3′	d 0.1′ m 0.66

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	262°04.3	197°05.4	N20°37.0	97°05.1	N07°28.4	117°07.4	N14°58.1	237°47.7	N07°34.9
1	277°06.7	212°04.7	37.6	112°06.4	27.9	132°09.5	58.0	252°50.0	34.9
2	292°09.2	227°04.0	38.2	127°07.8	27.4	147°11.6	57.9	267°52.2	35.0
3	307°11.7	242°03.2	·· 38.8	142°09.1	·· 26.8	162°13.7	·· 57.7	282°54.5	·· 35.1
4	322°14.1	257°02.5	39.4	157°10.4	26.3	177°15.8	57.6	297°56.8	35.1
5	337°16.6	272°01.8	40.0	172°11.8	25.8	192°17.8	57.5	312°59.0	35.2
6	352°19.1	287°01.0	N20°40.6	187°13.1	N07°25.3	207°19.9	N14°57.4	328°01.3	N07°35.3
7	7°21.5	302°00.3	41.2	202°14.4	24.7	222°22.0	57.2	343°03.5	35.4
8	22°24.0	316°59.6	41.8	217°15.8	24.2	237°24.1	57.1	358°05.8	35.4
9	37°26.5	331°58.8	·· 42.4	232°17.1	·· 23.7	252°26.2	·· 57.0	13°08.1	·· 35.5
10	52°28.9	346°58.1	43.0	247°18.4	23.2	267°28.3	56.8	28°10.3	35.6
11	67°31.4	1°57.4	43.6	262°19.8	22.6	282°30.4	56.7	43°12.6	35.6
12	82°33.8	16°56.6	N20°44.2	277°21.1	N07°22.1	297°32.4	N14°56.6	58°14.8	N07°35.7
13	97°36.3	31°55.9	44.8	292°22.4	21.6	312°34.5	56.4	73°17.1	35.8
14	112°38.8	46°55.2	45.4	307°23.8	21.1	327°36.6	56.3	88°19.3	35.8
15	127°41.2	61°54.4	·· 45.9	322°25.1	·· 20.6	342°38.7	·· 56.2	103°21.6	·· 35.9
16	142°43.7	76°53.7	46.5	337°26.4	20.0	357°40.8	56.1	118°23.9	36.0
17	157°46.2	91°52.9	47.1	352°27.8	19.5	12°42.9	55.9	133°26.1	36.1
18	172°48.6	106°52.2	N20°47.7	7°29.1	N07°19.0	27°44.9	N14°55.8	148°28.4	N07°36.1
19	187°51.1	121°51.5	48.3	22°30.4	18.5	42°47.0	55.7	163°30.6	36.2
20	202°53.6	136°50.7	48.9	37°31.8	17.9	57°49.1	55.5	178°32.9	36.3
21	217°56.0	151°50.0	·· 49.5	52°33.1	·· 17.4	72°51.2	·· 55.4	193°35.2	·· 36.3
22	232°58.5	166°49.3	50.0	67°34.4	16.9	87°53.3	55.3	208°37.4	36.4
23	248°01.0	181°48.5	50.6	82°35.7	16.4	102°55.4	55.1	223°39.7	36.5
Mer.pass. 06:31		ν -0.7′	d 0.6′	m -3.88	ν 1.3′	d 0.5′	m 0.91	ν 2.1′	d 0.1′ m -1.86	ν 2.3′	d 0.1′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°32.8	29°14.4
Ankaa	353°05.3	-42°09.1
Schedar	349°28.9	56°41.1
Diphda	348°45.4	-17°50.0
Achernar	335°19.1	-57°05.5
Hamal	327°49.2	23°35.5
Polaris	313°23.3	89°22.5
Acamar	315°10.6	-40°11.5
Menkar	314°04.3	4°11.8
Mirfak	308°25.8	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.2
Capella	280°19.4	46°01.5
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.7	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.4	-59°36.1
Suhail	222°45.1	-43°32.9
Miaplacidus	221°38.4	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°49.9
Dubhe	193°38.7	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.9
Acrux	172°57.6	-63°15.4
Gacrux	171°49.2	-57°16.4
Alioth	166°11.1	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.2
Kochab	137°19.0	74°02.7
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.6
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.4	12°32.4
Eltanin	90°40.7	51°29.1
Kaus Aust.	83°29.5	-34°22.2
Vega	80°31.5	38°48.5
Nunki	75°44.9	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.2	-56°38.5
Deneb	49°24.1	45°22.6
Enif	33°36.7	10°00.1
Al Na'ir	27°30.3	-46°49.4
Fomalhaut	15°12.3	-29°28.4
Scheat	13°43.2	28°13.8
Markab	13°27.9	15°21.2

Jun 12 Sat	SHA	Mer.pass
Venus	297°34.0	10:50
Mars	195°54.7	17:34
Jupiter	215°21.1	16:16
Saturn	335°53.5	08:15

Jun 13 Sun	SHA	Mer.pass
Venus	296°17.7	10:51
Mars	195°27.8	17:32
Jupiter	215°12.2	16:13
Saturn	335°48.4	08:11

Jun 14 Mon	SHA	Mer.pass
Venus	295°01.2	10:52
Mars	195°00.8	17:30
Jupiter	215°03.1	16:09
Saturn	335°43.4	08:08

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°03.9	N23°07.3	83°35.5	13.2′	S02°26.1	15.5′	58.0′
1	195°03.7	07.4	98°07.6	13.2′	02°41.6	15.4′	58.0′
2	210°03.6	07.6	112°39.8	13.2′	02°57.0	15.4′	58.0′
3	225°03.5	·· 07.8	127°12.1	13.2′	03°12.4	15.4′	57.9′
4	240°03.4	07.9	141°44.3	13.2′	03°27.8	15.3′	57.9′
5	255°03.2	08.1	156°16.5	13.2′	03°43.1	15.3′	57.9′
6	270°03.1	N23°08.2	170°48.8	13.3′	S03°58.4	15.3′	57.8′
7	285°03.0	08.4	185°21.0	13.3′	04°13.7	15.2′	57.8′
8	300°02.8	08.6	199°53.3	13.3′	04°28.9	15.2′	57.8′
9	315°02.7	·· 08.7	214°25.6	13.3′	04°44.1	15.2′	57.8′
10	330°02.6	08.9	228°57.9	13.3′	04°59.3	15.1′	57.7′
11	345°02.5	09.0	243°30.1	13.3′	05°14.4	15.1′	57.7′
12	0°02.3	N23°09.2	258°02.4	13.3′	S05°29.5	15.1′	57.7′
13	15°02.2	09.3	272°34.7	13.3′	05°44.6	15.0′	57.7′
14	30°02.1	09.5	287°07.0	13.3′	05°59.6	15.0′	57.6′
15	45°01.9	·· 09.6	301°39.3	13.3′	06°14.6	14.9′	57.6′
16	60°01.8	09.8	316°11.6	13.3′	06°29.5	14.9′	57.6′
17	75°01.7	10.0	330°43.9	13.3′	06°44.4	14.9′	57.5′
18	90°01.6	N23°10.1	345°16.2	13.3′	S06°59.3	14.8′	57.5′
19	105°01.4	10.3	359°48.4	13.3′	07°14.1	14.7′	57.5′
20	120°01.3	10.4	14°20.7	13.3′	07°28.8	14.7′	57.5′
21	135°01.2	·· 10.6	28°53.0	13.3′	07°43.5	14.7′	57.4′
22	150°01.0	10.7	43°25.2	13.2′	07°58.2	14.6′	57.4′
23	165°00.9	10.9	57°57.5	13.2′	08°12.8	14.5′	57.4′
	SD = 15.7′	d = 0.2′		SD = 15.8′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°00.8	N23°11.0	72°29.7	13.2′	S08°27.3	14.5′	57.4′
1	195°00.6	11.2	87°02.0	13.2′	08°41.8	14.5′	57.3′
2	210°00.5	11.3	101°34.2	13.2′	08°56.3	14.4′	57.3′
3	225°00.4	·· 11.4	116°06.4	13.2′	09°10.7	14.3′	57.3′
4	240°00.3	11.6	130°38.6	13.2′	09°25.0	14.3′	57.2′
5	255°00.1	11.7	145°10.7	13.2′	09°39.3	14.3′	57.2′
6	270°00.0	N23°11.9	159°42.9	13.1′	S09°53.6	14.1′	57.2′
7	284°59.9	12.0	174°15.0	13.1′	10°07.7	14.2′	57.2′
8	299°59.7	12.2	188°47.1	13.1′	10°21.9	14.0′	57.1′
9	314°59.6	·· 12.3	203°19.2	13.1′	10°35.9	14.0′	57.1′
10	329°59.5	12.4	217°51.3	13.1′	10°49.9	13.9′	57.1′
11	344°59.3	12.6	232°23.4	13.0′	11°03.8	13.9′	57.1′
12	359°59.2	N23°12.7	246°55.4	13.0′	S11°17.7	13.8′	57.0′
13	14°59.1	12.9	261°27.4	13.0′	11°31.5	13.8′	57.0′
14	29°59.0	13.0	275°59.4	13.0′	11°45.3	13.7′	57.0′
15	44°58.8	·· 13.1	290°31.4	12.9′	11°59.0	13.6′	57.0′
16	59°58.7	13.3	305°03.3	12.9′	12°12.6	13.5′	56.9′
17	74°58.6	13.4	319°35.2	12.9′	12°26.1	13.5′	56.9′
18	89°58.4	N23°13.5	334°07.1	12.9′	S12°39.6	13.4′	56.9′
19	104°58.3	13.7	348°39.0	12.8′	12°53.0	13.3′	56.9′
20	119°58.2	13.8	3°10.8	12.8′	13°06.3	13.3′	56.8′
21	134°58.0	·· 13.9	17°42.6	12.8′	13°19.6	13.2′	56.8′
22	149°57.9	14.1	32°14.3	12.7′	13°32.8	13.1′	56.8′
23	164°57.8	14.2	46°46.1	12.7′	13°45.9	13.0′	56.8′
	SD = 15.7′	d = 0.1′		SD = 15.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°57.6	N23°14.3	61°17.8	12.7′	S13°58.9	13.0′	56.7′
1	194°57.5	14.5	75°49.4	12.6′	14°11.9	12.9′	56.7′
2	209°57.4	14.6	90°21.1	12.6′	14°24.8	12.8′	56.7′
3	224°57.3	·· 14.7	104°52.7	12.6′	14°37.6	12.8′	56.7′
4	239°57.1	14.9	119°24.2	12.5′	14°50.4	12.6′	56.6′
5	254°57.0	15.0	133°55.8	12.5′	15°03.0	12.6′	56.6′
6	269°56.9	N23°15.1	148°27.2	12.5′	S15°15.6	12.5′	56.6′
7	284°56.7	15.2	162°58.7	12.4′	15°28.1	12.4′	56.6′
8	299°56.6	15.4	177°30.1	12.4′	15°40.5	12.3′	56.5′
9	314°56.5	·· 15.5	192°01.5	12.3′	15°52.8	12.3′	56.5′
10	329°56.3	15.6	206°32.8	12.3′	16°05.1	12.2′	56.5′
11	344°56.2	15.7	221°04.1	12.3′	16°17.3	12.0′	56.5′
12	359°56.1	N23°15.8	235°35.4	12.2′	S16°29.3	12.0′	56.4′
13	14°55.9	16.0	250°06.6	12.2′	16°41.3	11.9′	56.4′
14	29°55.8	16.1	264°37.8	12.1′	16°53.2	11.8′	56.4′
15	44°55.7	·· 16.2	279°08.9	12.1′	17°05.0	11.8′	56.4′
16	59°55.5	16.3	293°40.0	12.0′	17°16.8	11.6′	56.4′
17	74°55.4	16.4	308°11.0	12.0′	17°28.4	11.6′	56.3′
18	89°55.3	N23°16.6	322°42.0	12.0′	S17°40.0	11.4′	56.3′
19	104°55.1	16.7	337°13.0	11.9′	17°51.4	11.4′	56.3′
20	119°55.0	16.8	351°43.9	11.9′	18°02.8	11.2′	56.3′
21	134°54.9	·· 16.9	6°14.8	11.8′	18°14.0	11.2′	56.2′
22	149°54.7	17.0	20°45.6	11.8′	18°25.2	11.1′	56.2′
23	164°54.6	17.1	35°16.4	11.7′	18°36.3	11.0′	56.2′
	SD = 15.7′	d = 0.1′		SD = 15.5′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:36	22:26	////	////
62°	////	////	02:12	21:49	////	////
60°	////	00:57	02:37	21:23	23:05	////
N 58°	////	01:43	02:57	21:03	22:18	////
56°	////	02:12	03:14	20:47	21:49	////
54°	00:52	02:34	03:28	20:33	21:27	23:10
52°	01:35	02:51	03:40	20:21	21:09	22:26
50°	02:02	03:06	03:51	20:10	20:54	21:59
45°	02:46	03:36	04:13	19:47	20:25	21:14
N 40°	03:16	03:58	04:31	19:30	20:02	20:44
35°	03:39	04:16	04:46	19:15	19:44	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:03
20°	04:27	04:56	05:20	18:40	19:04	19:34
N 10°	04:49	05:16	05:39	18:21	18:44	19:11
0°	05:08	05:34	05:56	18:04	18:26	18:52
S 10°	05:25	05:51	06:14	17:46	18:09	18:36
20°	05:41	06:08	06:32	17:28	17:52	18:20
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:06	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°	06:25	07:02	07:36	16:24	16:58	17:35
S 50°	06:37	07:18	07:56	16:04	16:42	17:23
52°	06:42	07:25	08:06	15:54	16:35	17:18
54°	06:47	07:33	08:17	15:43	16:26	17:13
56°	06:53	07:42	08:30	15:30	16:18	17:07
58°	07:00	07:53	08:44	15:16	16:07	17:00
S 60°	07:07	08:04	09:01	14:59	15:56	16:52

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	14:10	16:32		23:20	22:36	
N 70°	14:00	16:08	18:41	23:32	23:02	22:08
68°	13:53	15:50	17:59	00:00 23:42	23:22	22:51
66°	13:46	15:36	17:31	00:02 23:51	23:38	23:20
64°	13:41	15:24	17:10	00:04 23:58	23:51	23:43
62°	13:37	15:14	16:53	00:06	00:04	00:02
60°	13:33	15:06	16:39	00:08	00:09	00:12
N 58°	13:29	14:58	16:27	00:09	00:14	00:20
56°	13:26	14:52	16:17	00:10	00:18	00:27
54°	13:24	14:46	16:08	00:11	00:22	00:34
52°	13:21	14:41	16:00	00:12	00:26	00:40
50°	13:19	14:36	15:53	00:13	00:29	00:46
45°	13:14	14:26	15:37	00:15	00:36	00:57
N 40°	13:10	14:18	15:25	00:17	00:41	01:07
35°	13:07	14:11	15:14	00:18	00:46	01:16
30°	13:04	14:04	15:05	00:20	00:51	01:23
20°	12:59	13:54	14:49	00:22	00:59	01:36
N 10°	12:54	13:44	14:35	00:24	01:05	01:47
0°	12:50	13:36	14:23	00:26	01:12	01:58
S 10°	12:46	13:27	14:10	00:28	01:18	02:09
20°	12:41	13:18	13:57	00:30	01:25	02:20
30°	12:36	13:08	13:41	00:32	01:33	02:33
35°	12:34	13:02	13:32	00:33	01:37	02:41
40°	12:31	12:55	13:22	00:35	01:43	02:50
45°	12:27	12:48	13:11	00:36	01:49	03:00
S 50°	12:23	12:38	12:57	00:38	01:56	03:13
52°	12:21	12:34	12:50	00:39	01:59	03:19
54°	12:18	12:30	12:43	00:40	02:03	03:25
56°	12:16	12:25	12:35	00:41	02:07	03:32
58°	12:13	12:19	12:26	00:43	02:12	03:41
S 60°	12:11	12:12	12:15	00:44	02:17	03:50

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 56-76%
12	00:15	00:09	12:00	19:01	06:38	
13	00:03	00:03	12:00	19:47	07:24	
14	00:09	00:16	12:00	20:34	08:10	

June 15, 16, 17 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	263°03.4	196°47.8	N20°51.2	97°37.1	N07°15.8	117°57.4	N14°55.0	238°42.0	N07°36.5
1	278°05.9	211°47.0	51.8	112°38.4	15.3	132°59.5	54.9	253°44.2	36.6
2	293°08.3	226°46.3	52.4	127°39.7	14.8	148°01.6	54.8	268°46.5	36.7
3	308°10.8	241°45.5	·· 52.9	142°41.1	·· 14.2	163°03.7	·· 54.6	283°48.7	·· 36.7
4	323°13.3	256°44.8	53.5	157°42.4	13.7	178°05.8	54.5	298°51.0	36.8
5	338°15.7	271°44.1	54.1	172°43.7	13.2	193°07.9	54.4	313°53.3	36.9
6	353°18.2	286°43.3	N20°54.7	187°45.0	N07°12.7	208°09.9	N14°54.2	328°55.5	N07°37.0
7	8°20.7	301°42.6	55.2	202°46.4	12.1	223°12.0	54.1	343°57.8	37.0
8	23°23.1	316°41.8	55.8	217°47.7	11.6	238°14.1	54.0	359°00.0	37.1
9	38°25.6	331°41.1	·· 56.4	232°49.0	·· 11.1	253°16.2	·· 53.8	14°02.3	·· 37.2
10	53°28.1	346°40.3	57.0	247°50.4	10.6	268°18.3	53.7	29°04.6	37.2
11	68°30.5	1°39.6	57.5	262°51.7	10.0	283°20.3	53.6	44°06.8	37.3
12	83°33.0	16°38.8	N20°58.1	277°53.0	N07°09.5	298°22.4	N14°53.5	59°09.1	N07°37.4
13	98°35.5	31°38.1	58.7	292°54.3	09.0	313°24.5	53.3	74°11.3	37.4
14	113°37.9	46°37.3	59.2	307°55.7	08.5	328°26.6	53.2	89°13.6	37.5
15	128°40.4	61°36.6	20°59.8	322°57.0	·· 07.9	343°28.7	·· 53.1	104°15.9	·· 37.6
16	143°42.8	76°35.9	21°00.4	337°58.3	07.4	358°30.7	52.9	119°18.1	37.6
17	158°45.3	91°35.1	00.9	352°59.6	06.9	13°32.8	52.8	134°20.4	37.7
18	173°47.8	106°34.4	N21°01.5	8°01.0	N07°06.3	28°34.9	N14°52.7	149°22.7	N07°37.8
19	188°50.2	121°33.6	02.0	23°02.3	05.8	43°37.0	52.5	164°24.9	37.8
20	203°52.7	136°32.9	02.6	38°03.6	05.3	58°39.1	52.4	179°27.2	37.9
21	218°55.2	151°32.1	·· 03.2	53°04.9	·· 04.8	73°41.1	·· 52.3	194°29.5	·· 38.0
22	233°57.6	166°31.4	03.7	68°06.3	04.2	88°43.2	52.1	209°31.7	38.0
23	249°00.1	181°30.6	04.3	83°07.6	03.7	103°45.3	52.0	224°34.0	38.1
Mer.pass. 06:27		ν -0.7′	d 0.6′	m -3.88	ν 1.3′	d 0.5′	m 0.92	ν 2.1′	d 0.1′ m -1.86	ν 2.3′	d 0.1′ m 0.65

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	264°02.6	196°29.9	N21°04.8	98°08.9	N07°03.2	118°47.4	N14°51.9	239°36.2	N07°38.2
1	279°05.0	211°29.1	05.4	113°10.2	02.6	133°49.5	51.7	254°38.5	38.3
2	294°07.5	226°28.4	05.9	128°11.5	02.1	148°51.5	51.6	269°40.8	38.3
3	309°09.9	241°27.6	·· 06.5	143°12.9	·· 01.6	163°53.6	·· 51.5	284°43.0	·· 38.4
4	324°12.4	256°26.8	07.1	158°14.2	01.1	178°55.7	51.3	299°45.3	38.5
5	339°14.9	271°26.1	07.6	173°15.5	00.5	193°57.8	51.2	314°47.6	38.5
6	354°17.3	286°25.3	N21°08.2	188°16.8	N07°00.0	208°59.8	N14°51.1	329°49.8	N07°38.6
7	9°19.8	301°24.6	08.7	203°18.2	06°59.5	224°01.9	51.0	344°52.1	38.7
8	24°22.3	316°23.8	09.3	218°19.5	58.9	239°04.0	50.8	359°54.4	38.7
9	39°24.7	331°23.1	·· 09.8	233°20.8	·· 58.4	254°06.1	·· 50.7	14°56.6	·· 38.8
10	54°27.2	346°22.3	10.4	248°22.1	57.9	269°08.2	50.6	29°58.9	38.9
11	69°29.7	1°21.6	10.9	263°23.4	57.3	284°10.2	50.4	45°01.1	38.9
12	84°32.1	16°20.8	N21°11.4	278°24.8	N06°56.8	299°12.3	N14°50.3	60°03.4	N07°39.0
13	99°34.6	31°20.0	12.0	293°26.1	56.3	314°14.4	50.2	75°05.7	39.1
14	114°37.1	46°19.3	12.5	308°27.4	55.8	329°16.5	50.0	90°07.9	39.1
15	129°39.5	61°18.5	·· 13.1	323°28.7	·· 55.2	344°18.5	·· 49.9	105°10.2	·· 39.2
16	144°42.0	76°17.8	13.6	338°30.0	54.7	359°20.6	49.8	120°12.5	39.3
17	159°44.4	91°17.0	14.2	353°31.4	54.2	14°22.7	49.6	135°14.7	39.3
18	174°46.9	106°16.3	N21°14.7	8°32.7	N06°53.6	29°24.8	N14°49.5	150°17.0	N07°39.4
19	189°49.4	121°15.5	15.2	23°34.0	53.1	44°26.8	49.4	165°19.3	39.5
20	204°51.8	136°14.7	15.8	38°35.3	52.6	59°28.9	49.2	180°21.5	39.5
21	219°54.3	151°14.0	·· 16.3	53°36.6	·· 52.0	74°31.0	·· 49.1	195°23.8	·· 39.6
22	234°56.8	166°13.2	16.8	68°37.9	51.5	89°33.1	49.0	210°26.1	39.7
23	249°59.2	181°12.5	17.4	83°39.3	51.0	104°35.1	48.8	225°28.3	39.7
Mer.pass. 06:23		ν -0.8′	d 0.6′	m -3.88	ν 1.3′	d 0.5′	m 0.93	ν 2.1′	d 0.1′ m -1.86	ν 2.3′	d 0.1′ m 0.65

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	265°01.7	196°11.7	N21°17.9	98°40.6	N06°50.4	119°37.2	N14°48.7	240°30.6	N07°39.8
1	280°04.2	211°10.9	18.4	113°41.9	49.9	134°39.3	48.6	255°32.9	39.9
2	295°06.6	226°10.2	19.0	128°43.2	49.4	149°41.4	48.4	270°35.1	39.9
3	310°09.1	241°09.4	·· 19.5	143°44.5	·· 48.8	164°43.4	·· 48.3	285°37.4	·· 40.0
4	325°11.6	256°08.6	20.0	158°45.8	48.3	179°45.5	48.2	300°39.7	40.1
5	340°14.0	271°07.9	20.5	173°47.2	47.8	194°47.6	48.0	315°41.9	40.1
6	355°16.5	286°07.1	N21°21.1	188°48.5	N06°47.2	209°49.7	N14°47.9	330°44.2	N07°40.2
7	10°18.9	301°06.4	21.6	203°49.8	46.7	224°51.7	47.8	345°46.5	40.3
8	25°21.4	316°05.6	22.1	218°51.1	46.2	239°53.8	47.6	0°48.7	40.3
9	40°23.9	331°04.8	·· 22.6	233°52.4	·· 45.6	254°55.9	·· 47.5	15°51.0	·· 40.4
10	55°26.3	346°04.1	23.2	248°53.7	45.1	269°58.0	47.4	30°53.3	40.5
11	70°28.8	1°03.3	23.7	263°55.1	44.6	285°00.0	47.2	45°55.5	40.5
12	85°31.3	16°02.5	N21°24.2	278°56.4	N06°44.0	300°02.1	N14°47.1	60°57.8	N07°40.6
13	100°33.7	31°01.8	24.7	293°57.7	43.5	315°04.2	47.0	76°00.1	40.7
14	115°36.2	46°01.0	25.3	308°59.0	43.0	330°06.3	46.8	91°02.3	40.7
15	130°38.7	61°00.2	·· 25.8	324°00.3	·· 42.4	345°08.3	·· 46.7	106°04.6	·· 40.8
16	145°41.1	75°59.5	26.3	339°01.6	41.9	0°10.4	46.6	121°06.9	40.9
17	160°43.6	90°58.7	26.8	354°02.9	41.4	15°12.5	46.4	136°09.1	40.9
18	175°46.1	105°57.9	N21°27.3	9°04.2	N06°40.8	30°14.5	N14°46.3	151°11.4	N07°41.0
19	190°48.5	120°57.2	27.8	24°05.6	40.3	45°16.6	46.2	166°13.7	41.1
20	205°51.0	135°56.4	28.3	39°06.9	39.8	60°18.7	46.0	181°15.9	41.1
21	220°53.4	150°55.6	·· 28.9	54°08.2	·· 39.2	75°20.8	·· 45.9	196°18.2	·· 41.2
22	235°55.9	165°54.8	29.4	69°09.5	38.7	90°22.8	45.7	211°20.5	41.3
23	250°58.4	180°54.1	29.9	84°10.8	38.2	105°24.9	45.6	226°22.7	41.3
Mer.pass. 06:19		ν -0.8′	d 0.5′	m -3.88	ν 1.3′	d 0.5′	m 0.94	ν 2.1′	d 0.1′ m -1.85	ν 2.3′	d 0.1′ m 0.65

Stars

	SHA	Dec
Alpheratz	357°32.7	29°14.4
Ankaa	353°05.3	-42°09.1
Schedar	349°28.9	56°41.1
Diphda	348°45.4	-17°50.0
Achernar	335°19.1	-57°05.5
Hamal	327°49.1	23°35.5
Polaris	313°22.0	89°22.5
Acamar	315°10.6	-40°11.5
Menkar	314°04.3	4°11.8
Mirfak	308°25.8	49°57.4
Aldebaran	290°37.7	16°33.8
Rigel	281°02.3	-8°10.2
Capella	280°19.4	46°01.4
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.3	7°24.7
Canopus	263°52.1	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.7	-29°00.7
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.4	-59°36.1
Suhail	222°45.1	-43°32.9
Miaplacidus	221°38.4	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°49.9
Dubhe	193°38.8	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.6	-63°15.4
Gacrux	171°49.2	-57°16.4
Alioth	166°11.1	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.2
Kochab	137°19.0	74°02.7
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.6
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.4
Eltanin	90°40.7	51°29.1
Kaus Aust.	83°29.5	-34°22.2
Vega	80°31.4	38°48.5
Nunki	75°44.9	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.2	-56°38.5
Deneb	49°24.1	45°22.6
Enif	33°36.7	10°00.1
Al Na'ir	27°30.3	-46°49.4
Fomalhaut	15°12.3	-29°28.4
Scheat	13°43.2	28°13.8
Markab	13°27.8	15°21.2

Jun 15 Tue	SHA	Mer.pass
Venus	293°44.4	10:53
Mars	194°33.7	17:28
Jupiter	214°54.0	16:06
Saturn	335°38.5	08:04

Jun 16 Wed	SHA	Mer.pass
Venus	292°27.3	10:55
Mars	194°06.3	17:26
Jupiter	214°44.8	16:03
Saturn	335°33.7	08:00

Jun 17 Thu	SHA	Mer.pass
Venus	291°10.0	10:56
Mars	193°38.9	17:24
Jupiter	214°35.5	15:59
Saturn	335°28.9	07:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°54.5	N23°17.3	49°47.1	11.7′	S18°47.3	10.8′	56.2′
1	194°54.4	17.4	64°17.8	11.6′	18°58.1	10.8′	56.1′
2	209°54.2	17.5	78°48.4	11.6′	19°08.9	10.7′	56.1′
3	224°54.1	·· 17.6	93°19.0	11.5′	19°19.6	10.6′	56.1′
4	239°54.0	17.7	107°49.6	11.5′	19°30.2	10.5′	56.1′
5	254°53.8	17.8	122°20.1	11.5′	19°40.7	10.4′	56.1′
6	269°53.7	N23°17.9	136°50.5	11.4′	S19°51.1	10.2′	56.0′
7	284°53.6	18.0	151°20.9	11.4′	20°01.3	10.2′	56.0′
8	299°53.4	18.1	165°51.3	11.3′	20°11.5	10.1′	56.0′
9	314°53.3	·· 18.2	180°21.6	11.3′	20°21.6	9.9′	56.0′
10	329°53.2	18.4	194°51.9	11.2′	20°31.5	9.9′	55.9′
11	344°53.0	18.5	209°22.1	11.2′	20°41.4	9.8′	55.9′
12	359°52.9	N23°18.6	223°52.2	11.1′	S20°51.2	9.6′	55.9′
13	14°52.8	18.7	238°22.4	11.1′	21°00.8	9.5′	55.9′
14	29°52.6	18.8	252°52.4	11.0′	21°10.3	9.5′	55.9′
15	44°52.5	·· 18.9	267°22.5	11.0′	21°19.8	9.3′	55.8′
16	59°52.4	19.0	281°52.5	10.9′	21°29.1	9.2′	55.8′
17	74°52.2	19.1	296°22.4	10.9′	21°38.3	9.1′	55.8′
18	89°52.1	N23°19.2	310°52.3	10.8′	S21°47.4	8.9′	55.8′
19	104°52.0	19.3	325°22.1	10.8′	21°56.3	8.9′	55.8′
20	119°51.8	19.4	339°51.9	10.7′	22°05.2	8.8′	55.7′
21	134°51.7	·· 19.5	354°21.7	10.7′	22°14.0	8.6′	55.7′
22	149°51.6	19.6	8°51.4	10.7′	22°22.6	8.5′	55.7′
23	164°51.4	19.7	23°21.0	10.6′	22°31.1	8.4′	55.7′
	SD = 15.7′	*d* = 0.1′	SD = 15.3′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°51.3	N23°19.8	37°50.6	10.6′	S22°39.5	8.3′	55.7′
1	194°51.2	19.9	52°20.2	10.5′	22°47.8	8.2′	55.6′
2	209°51.0	20.0	66°49.7	10.5′	22°56.0	8.0′	55.6′
3	224°50.9	·· 20.1	81°19.2	10.4′	23°04.0	7.9′	55.6′
4	239°50.8	20.2	95°48.6	10.4′	23°11.9	7.8′	55.6′
5	254°50.6	20.2	110°18.0	10.3′	23°19.7	7.7′	55.6′
6	269°50.5	N23°20.3	124°47.3	10.3′	S23°27.4	7.6′	55.5′
7	284°50.4	20.4	139°16.6	10.3′	23°35.0	7.4′	55.5′
8	299°50.2	20.5	153°45.9	10.2′	23°42.4	7.4′	55.5′
9	314°50.1	·· 20.6	168°15.1	10.2′	23°49.8	7.2′	55.5′
10	329°50.0	20.7	182°44.2	10.1′	23°57.0	7.0′	55.5′
11	344°49.8	20.8	197°13.4	10.1′	24°04.0	7.0′	55.4′
12	359°49.7	N23°20.9	211°42.5	10.0′	S24°11.0	6.8′	55.4′
13	14°49.6	21.0	226°11.5	10.0′	24°17.8	6.7′	55.4′
14	29°49.4	21.0	240°40.5	10.0′	24°24.5	6.6′	55.4′
15	44°49.3	·· 21.1	255°09.5	9.9′	24°31.1	6.4′	55.4′
16	59°49.2	21.2	269°38.4	9.9′	24°37.5	6.3′	55.4′
17	74°49.0	21.3	284°07.3	9.9′	24°43.8	6.2′	55.3′
18	89°48.9	N23°21.4	298°36.2	9.8′	S24°50.0	6.0′	55.3′
19	104°48.8	21.5	313°05.0	9.8′	24°56.0	6.0′	55.3′
20	119°48.6	21.6	327°33.8	9.8′	25°02.0	5.8′	55.3′
21	134°48.5	·· 21.6	342°02.6	9.7′	25°07.8	5.6′	55.3′
22	149°48.4	21.7	356°31.3	9.7′	25°13.4	5.6′	55.2′
23	164°48.2	21.8	11°00.0	9.7′	25°19.0	5.4′	55.2′
	SD = 15.7′	*d* = 0.1′	SD = 15.2′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°48.1	N23°21.9	25°28.6	9.6′	S25°24.4	5.2′	55.2′
1	194°48.0	22.0	39°57.3	9.6′	25°29.6	5.2′	55.2′
2	209°47.8	22.0	54°25.9	9.6′	25°34.8	5.0′	55.2′
3	224°47.7	·· 22.1	68°54.5	9.5′	25°39.8	4.8′	55.2′
4	239°47.5	22.2	83°23.0	9.5′	25°44.6	4.8′	55.1′
5	254°47.4	22.3	97°51.5	9.5′	25°49.4	4.6′	55.1′
6	269°47.3	N23°22.3	112°20.0	9.5′	S25°54.0	4.4′	55.1′
7	284°47.1	22.4	126°48.5	9.4′	25°58.4	4.3′	55.1′
8	299°47.0	22.5	141°16.9	9.4′	26°02.7	4.2′	55.1′
9	314°46.9	·· 22.6	155°45.3	9.4′	26°06.9	4.1′	55.1′
10	329°46.7	22.6	170°13.7	9.4′	26°11.0	3.9′	55.0′
11	344°46.6	22.7	184°42.1	9.4′	26°14.9	3.8′	55.0′
12	359°46.5	N23°22.8	199°10.5	9.3′	S26°18.7	3.7′	55.0′
13	14°46.3	22.8	213°38.8	9.3′	26°22.4	3.5′	55.0′
14	29°46.2	22.9	228°07.2	9.3′	26°25.9	3.3′	55.0′
15	44°46.1	·· 23.0	242°35.5	9.3′	26°29.2	3.3′	55.0′
16	59°45.9	23.0	257°03.8	9.3′	26°32.5	3.1′	54.9′
17	74°45.8	23.1	271°32.1	9.3′	26°35.6	2.9′	54.9′
18	89°45.7	N23°23.2	286°00.3	9.3′	S26°38.5	2.9′	54.9′
19	104°45.5	23.2	300°28.6	9.3′	26°41.4	2.6′	54.9′
20	119°45.4	23.3	314°56.8	9.2′	26°44.0	2.6′	54.9′
21	134°45.3	·· 23.4	329°25.1	9.2′	26°46.6	2.4′	54.9′
22	149°45.1	23.4	343°53.3	9.2′	26°49.0	2.3′	54.8′
23	164°45.0	23.5	358°21.6	9.2′	26°51.3	2.1′	54.8′
	SD = 15.7′	*d* = 0.1′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:33	22:29	////	////
62°	////	////	02:10	21:52	////	////
60°	////	00:52	02:36	21:26	23:10	////
N 58°	////	01:41	02:56	21:05	22:21	////
56°	////	02:11	03:13	20:49	21:51	////
54°	00:48	02:33	03:27	20:34	21:29	23:15
52°	01:33	02:51	03:39	20:22	21:11	22:29
50°	02:00	03:06	03:50	20:11	20:56	22:01
45°	02:46	03:35	04:13	19:49	20:26	21:16
N 40°	03:16	03:58	04:31	19:31	20:04	20:45
35°	03:39	04:16	04:46	19:16	19:46	20:22
30°	03:58	04:31	04:59	19:03	19:30	20:04
20°	04:27	04:56	05:21	18:41	19:05	19:35
N 10°	04:49	05:16	05:39	18:22	18:45	19:12
0°	05:08	05:34	05:57	18:04	18:27	18:53
S 10°	05:25	05:52	06:14	17:47	18:10	18:36
20°	05:41	06:09	06:33	17:28	17:52	18:20
30°	05:58	06:28	06:54	17:07	17:34	18:04
35°	06:07	06:38	07:06	16:55	17:23	17:55
40°	06:16	06:50	07:21	16:41	17:11	17:45
45°	06:26	07:03	07:37	16:24	16:58	17:35
S 50°	06:38	07:19	07:58	16:03	16:42	17:23
52°	06:43	07:27	08:08	15:54	16:34	17:18
54°	06:49	07:35	08:19	15:42	16:26	17:12
56°	06:55	07:44	08:31	15:30	16:17	17:06
58°	07:02	07:54	08:46	15:15	16:07	17:00
S 60°	07:09	08:06	09:04	14:58	15:55	16:52

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°	19:45			22:49		
64°	19:03	21:13		23:31	23:08	
62°	18:35	20:19	21:55	00:00	00:00	00:03
60°	18:14	19:46	21:08	00:15	00:22	00:36
N 58°	17:57	19:22	20:38	00:28	00:40	01:00
56°	17:42	19:03	20:15	00:39	00:55	01:19
54°	17:29	18:47	19:57	00:49	01:08	01:36
52°	17:18	18:33	19:41	00:58	01:20	01:50
50°	17:09	18:21	19:27	01:05	01:30	02:02
45°	16:48	17:56	19:00	01:22	01:52	02:28
N 40°	16:32	17:37	18:38	01:36	02:09	02:48
35°	16:18	17:20	18:20	01:48	02:24	03:05
30°	16:06	17:06	18:04	01:58	02:37	03:20
20°	15:45	16:42	17:38	02:16	02:59	03:45
N 10°	15:28	16:21	17:15	02:31	03:18	04:07
0°	15:11	16:02	16:54	02:46	03:35	04:27
S 10°	14:55	15:43	16:33	03:00	03:53	04:47
20°	14:38	15:22	16:11	03:16	04:13	05:09
30°	14:18	14:59	15:45	03:34	04:35	05:34
35°	14:06	14:45	15:29	03:45	04:48	05:49
40°	13:53	14:29	15:12	03:57	05:03	06:06
45°	13:38	14:10	14:51	04:11	05:21	06:27
S 50°	13:19	13:47	14:24	04:29	05:44	06:54
52°	13:10	13:36	14:11	04:38	05:55	07:06
54°	13:00	13:23	13:56	04:47	06:07	07:21
56°	12:49	13:08	13:38	04:58	06:21	07:38
58°	12:36	12:51	13:17	05:10	06:38	07:59
S 60°	12:21	12:31	12:50	05:24	06:58	08:26

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 84-96%
15	00:22	00:28	12:00	21:23	08:59	
16	00:35	00:41	12:01	22:14	09:49	
17	00:48	00:54	12:01	23:07	10:41	

June 18, 19, 20 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	266°00.8	195°53.3	N21°30.4	99°12.1	N06°37.6	120°27.0	N14°45.5	241°25.0	N07°41.4
1	281°03.3	210°52.5	30.9	114°13.4	37.1	135°29.0	45.3	256°27.3	41.5
2	296°05.8	225°51.8	31.4	129°14.7	36.5	150°31.1	45.2	271°29.6	41.5
3	311°08.2	240°51.0	·· 31.9	144°16.1	·· 36.0	165°33.2	·· 45.1	286°31.8	·· 41.6
4	326°10.7	255°50.2	32.4	159°17.4	35.5	180°35.3	44.9	301°34.1	41.7
5	341°13.2	270°49.4	32.9	174°18.7	34.9	195°37.3	44.8	316°36.4	41.7
6	356°15.6	285°48.7	N21°33.4	189°20.0	N06°34.4	210°39.4	N14°44.7	331°38.6	N07°41.8
7	11°18.1	300°47.9	33.9	204°21.3	33.9	225°41.5	44.5	346°40.9	41.9
8	26°20.6	315°47.1	34.4	219°22.6	33.3	240°43.5	44.4	1°43.2	41.9
9	41°23.0	330°46.3	·· 34.9	234°23.9	·· 32.8	255°45.6	·· 44.3	16°45.4	·· 42.0
10	56°25.5	345°45.6	35.4	249°25.2	32.3	270°47.7	44.1	31°47.7	42.1
11	71°27.9	0°44.8	35.9	264°26.5	31.7	285°49.7	44.0	46°50.0	42.1
12	86°30.4	15°44.0	N21°36.4	279°27.8	N06°31.2	300°51.8	N14°43.9	61°52.3	N07°42.2
13	101°32.9	30°43.2	36.9	294°29.1	30.6	315°53.9	43.7	76°54.5	42.2
14	116°35.3	45°42.5	37.4	309°30.5	30.1	330°56.0	43.6	91°56.8	42.3
15	131°37.8	60°41.7	·· 37.9	324°31.8	·· 29.6	345°58.0	·· 43.5	106°59.1	·· 42.4
16	146°40.3	75°40.9	38.4	339°33.1	29.0	1°00.1	43.3	122°01.3	42.4
17	161°42.7	90°40.1	38.9	354°34.4	28.5	16°02.2	43.2	137°03.6	42.5
18	176°45.2	105°39.4	N21°39.4	9°35.7	N06°28.0	31°04.2	N14°43.0	152°05.9	N07°42.6
19	191°47.7	120°38.6	39.8	24°37.0	27.4	46°06.3	42.9	167°08.1	42.6
20	206°50.1	135°37.8	40.3	39°38.3	26.9	61°08.4	42.8	182°10.4	42.7
21	221°52.6	150°37.0	·· 40.8	54°39.6	·· 26.3	76°10.4	·· 42.6	197°12.7	·· 42.8
22	236°55.0	165°36.2	41.3	69°40.9	25.8	91°12.5	42.5	212°15.0	42.8
23	251°57.5	180°35.5	41.8	84°42.2	25.3	106°14.6	42.4	227°17.2	42.9
Mer.pass. 06:15		ν -0.8′ d 0.5′		m -3.88	ν 1.3′ d 0.5′		m 0.95	ν 2.1′ d 0.1′	m -1.85	ν 2.3′ d 0.1′	m 0.65

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	267°00.0	195°34.7	N21°42.3	99°43.5	N06°24.7	121°16.6	N14°42.2	242°19.5	N07°43.0
1	282°02.4	210°33.9	42.8	114°44.8	24.2	136°18.7	42.1	257°21.8	43.0
2	297°04.9	225°33.1	43.2	129°46.1	23.7	151°20.8	42.0	272°24.0	43.1
3	312°07.4	240°32.3	·· 43.7	144°47.4	·· 23.1	166°22.8	·· 41.8	287°26.3	·· 43.2
4	327°09.8	255°31.6	44.2	159°48.7	22.6	181°24.9	41.7	302°28.6	43.2
5	342°12.3	270°30.8	44.7	174°50.0	22.0	196°27.0	41.5	317°30.9	43.3
6	357°14.8	285°30.0	N21°45.1	189°51.4	N06°21.5	211°29.0	N14°41.4	332°33.1	N07°43.3
7	12°17.2	300°29.2	45.6	204°52.7	21.0	226°31.1	41.3	347°35.4	43.4
8	27°19.7	315°28.4	46.1	219°54.0	20.4	241°33.2	41.1	2°37.7	43.5
9	42°22.2	330°27.6	·· 46.6	234°55.3	·· 19.9	256°35.2	·· 41.0	17°40.0	·· 43.5
10	57°24.6	345°26.9	47.0	249°56.6	19.3	271°37.3	40.9	32°42.2	43.6
11	72°27.1	0°26.1	47.5	264°57.9	18.8	286°39.4	40.7	47°44.5	43.7
12	87°29.5	15°25.3	N21°48.0	279°59.2	N06°18.3	301°41.4	N14°40.6	62°46.8	N07°43.7
13	102°32.0	30°24.5	48.5	295°00.5	17.7	316°43.5	40.5	77°49.0	43.8
14	117°34.5	45°23.7	48.9	310°01.8	17.2	331°45.6	40.3	92°51.3	43.9
15	132°36.9	60°22.9	·· 49.4	325°03.1	·· 16.6	346°47.6	·· 40.2	107°53.6	·· 43.9
16	147°39.4	75°22.1	49.9	340°04.4	16.1	1°49.7	40.0	122°55.9	44.0
17	162°41.9	90°21.3	50.3	355°05.7	15.5	16°51.8	39.9	137°58.1	44.0
18	177°44.3	105°20.6	N21°50.8	10°07.0	N06°15.0	31°53.8	N14°39.8	153°00.4	N07°44.1
19	192°46.8	120°19.8	51.3	25°08.3	14.5	46°55.9	39.6	168°02.7	44.2
20	207°49.3	135°19.0	51.7	40°09.6	13.9	61°58.0	39.5	183°05.0	44.2
21	222°51.7	150°18.2	·· 52.2	55°10.9	·· 13.4	77°00.0	·· 39.4	198°07.2	·· 44.3
22	237°54.2	165°17.4	52.6	70°12.2	12.8	92°02.1	39.2	213°09.5	44.4
23	252°56.7	180°16.6	53.1	85°13.5	12.3	107°04.1	39.1	228°11.8	44.4
Mer.pass. 06:11		ν -0.8′ d 0.5′		m -3.88	ν 1.3′ d 0.5′		m 0.96	ν 2.1′ d 0.1′	m -1.84	ν 2.3′ d 0.1′	m 0.64

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	267°59.1	195°15.8	N21°53.6	100°14.8	N06°11.8	122°06.2	N14°38.9	243°14.1	N07°44.5
1	283°01.6	210°15.0	54.0	115°16.1	11.2	137°08.3	38.8	258°16.3	44.6
2	298°04.0	225°14.2	54.5	130°17.4	10.7	152°10.3	38.7	273°18.6	44.6
3	313°06.5	240°13.5	·· 54.9	145°18.7	·· 10.1	167°12.4	·· 38.5	288°20.9	·· 44.7
4	328°09.0	255°12.7	55.4	160°20.0	09.6	182°14.5	38.4	303°23.2	44.7
5	343°11.4	270°11.9	55.8	175°21.3	09.0	197°16.5	38.3	318°25.4	44.8
6	358°13.9	285°11.1	N21°56.3	190°22.6	N06°08.5	212°18.6	N14°38.1	333°27.7	N07°44.9
7	13°16.4	300°10.3	56.7	205°23.9	08.0	227°20.7	38.0	348°30.0	44.9
8	28°18.8	315°09.5	57.2	220°25.2	07.4	242°22.7	37.8	3°32.3	45.0
9	43°21.3	330°08.7	·· 57.6	235°26.5	·· 06.9	257°24.8	·· 37.7	18°34.5	·· 45.1
10	58°23.8	345°07.9	58.1	250°27.8	06.3	272°26.8	37.6	33°36.8	45.1
11	73°26.2	0°07.1	58.5	265°29.1	05.8	287°28.9	37.4	48°39.1	45.2
12	88°28.7	15°06.3	N21°59.0	280°30.4	N06°05.2	302°31.0	N14°37.3	63°41.4	N07°45.2
13	103°31.2	30°05.5	59.4	295°31.7	04.7	317°33.0	37.1	78°43.6	45.3
14	118°33.6	45°04.7	21°59.9	310°33.0	04.2	332°35.1	37.0	93°45.9	45.4
15	133°36.1	60°03.9	22°00.3	325°34.3	·· 03.6	347°37.2	·· 36.9	108°48.2	·· 45.4
16	148°38.5	75°03.1	00.7	340°35.6	03.1	2°39.2	36.7	123°50.5	45.5
17	163°41.0	90°02.3	01.2	355°36.8	02.5	17°41.3	36.6	138°52.7	45.6
18	178°43.5	105°01.6	N22°01.6	10°38.1	N06°02.0	32°43.3	N14°36.5	153°55.0	N07°45.6
19	193°45.9	120°00.8	02.1	25°39.4	01.4	47°45.4	36.3	168°57.3	45.7
20	208°48.4	135°00.0	02.5	40°40.7	00.9	62°47.5	36.2	183°59.6	45.7
21	223°50.9	149°59.2	·· 02.9	55°42.0	06°00.3	77°49.5	·· 36.0	199°01.9	·· 45.8
22	238°53.3	164°58.4	03.4	70°43.3	05°59.8	92°51.6	35.9	214°04.1	45.9
23	253°55.8	179°57.6	03.8	85°44.6	59.3	107°53.6	35.8	229°06.4	45.9
Mer.pass. 06:07		ν -0.8′ d 0.5′		m -3.89	ν 1.3′ d 0.5′		m 0.97	ν 2.1′ d 0.1′	m -1.84	ν 2.3′ d 0.1′	m 0.64

Stars

	SHA	Dec
Alpheratz	357°32.7	29°14.4
Ankaa	353°05.3	-42°09.1
Schedar	349°28.8	56°41.1
Diphda	348°45.4	-17°50.0
Achernar	335°19.0	-57°05.5
Hamal	327°49.1	23°35.5
Polaris	313°20.7	89°22.5
Acamar	315°10.6	-40°11.5
Menkar	314°04.3	4°11.9
Mirfak	308°25.8	49°57.4
Aldebaran	290°37.6	16°33.8
Rigel	281°02.3	-8°10.2
Capella	280°19.4	46°01.4
Bellatrix	278°21.1	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.1	-52°42.7
Sirius	258°24.8	-16°45.3
Adhara	255°04.7	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.4	-59°36.1
Suhail	222°45.1	-43°32.8
Miaplacidus	221°38.4	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°49.9
Dubhe	193°38.8	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.6	-63°15.4
Gacrux	171°49.2	-57°16.4
Alioth	166°11.1	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.2
Kochab	137°19.1	74°02.7
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.6
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.4
Eltanin	90°40.7	51°29.1
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.5
Nunki	75°44.9	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.1	-56°38.5
Deneb	49°24.1	45°22.6
Enif	33°36.6	10°00.1
Al Na'ir	27°30.2	-46°49.4
Fomalhaut	15°12.2	-29°28.4
Scheat	13°43.2	28°13.8
Markab	13°27.8	15°21.2

Jun 18 Fri	SHA	Mer.pass
Venus	289°52.5	10:57
Mars	193°11.3	17:22
Jupiter	214°26.1	15:56
Saturn	335°24.2	07:53

Jun 19 Sat	SHA	Mer.pass
Venus	288°34.7	10:58
Mars	192°43.5	17:20
Jupiter	214°16.7	15:53
Saturn	335°19.5	07:50

Jun 20 Sun	SHA	Mer.pass
Venus	287°16.7	11:00
Mars	192°15.7	17:18
Jupiter	214°07.1	15:49
Saturn	335°14.9	07:46

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°44.9	N23°23.6	12°49.8	9.2′	S26°53.4	2.0′	54.8′
1	194°44.7	23.6	27°18.0	9.2′	26°55.4	1.8′	54.8′
2	209°44.6	23.7	41°46.2	9.2′	26°57.2	1.7′	54.8′
3	224°44.5	·· 23.7	56°14.5	9.2′	26°58.9	1.6′	54.8′
4	239°44.3	23.8	70°42.7	9.2′	27°00.5	1.4′	54.8′
5	254°44.2	23.9	85°10.9	9.2′	27°01.9	1.3′	54.7′
6	269°44.0	N23°23.9	99°39.1	9.2′	S27°03.2	1.2′	54.7′
7	284°43.9	24.0	114°07.4	9.2′	27°04.4	1.0′	54.7′
8	299°43.8	24.0	128°35.6	9.2′	27°05.4	0.9′	54.7′
9	314°43.6	·· 24.1	143°03.8	9.3′	27°06.3	0.7′	54.7′
10	329°43.5	24.1	157°32.1	9.3′	27°07.0	0.6′	54.7′
11	344°43.4	24.2	172°00.4	9.3′	27°07.6	0.5′	54.7′
12	359°43.2	N23°24.3	186°28.6	9.3′	S27°08.1	0.3′	54.6′
13	14°43.1	24.3	200°56.9	9.3′	27°08.4	0.2′	54.6′
14	29°43.0	24.4	215°25.2	9.3′	27°08.6	0.0′	54.6′
15	44°42.8	·· 24.4	229°53.5	9.3′	27°08.6	0.0′	54.6′
16	59°42.7	24.5	244°21.9	9.4′	27°08.6	0.3′	54.6′
17	74°42.6	24.5	258°50.2	9.4′	27°08.3	0.3′	54.6′
18	89°42.4	N23°24.6	273°18.6	9.4′	S27°08.0	0.5′	54.6′
19	104°42.3	24.6	287°47.0	9.4′	27°07.5	0.7′	54.6′
20	119°42.2	24.7	302°15.4	9.4′	27°06.8	0.8′	54.5′
21	134°42.0	·· 24.7	316°43.8	9.5′	27°06.0	0.9′	54.5′
22	149°41.9	24.8	331°12.3	9.5′	27°05.1	1.0′	54.5′
23	164°41.8	24.8	345°40.8	9.5′	27°04.1	1.2′	54.5′
	SD = 15.7′	d = 0.1′	SD = 15.0′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°41.6	N23°24.8	0°09.3	9.5′	S27°02.9	1.3′	54.5′
1	194°41.5	24.9	14°37.8	9.6′	27°01.6	1.5′	54.5′
2	209°41.3	24.9	29°06.4	9.6′	27°00.1	1.6′	54.5′
3	224°41.2	·· 25.0	43°35.0	9.6′	26°58.5	1.7′	54.5′
4	239°41.1	25.0	58°03.6	9.7′	26°56.8	1.9′	54.4′
5	254°40.9	25.1	72°32.3	9.7′	26°54.9	2.0′	54.4′
6	269°40.8	N23°25.1	87°01.0	9.7′	S26°52.9	2.1′	54.4′
7	284°40.7	25.1	101°29.7	9.8′	26°50.8	2.2′	54.4′
8	299°40.5	25.2	115°58.5	9.8′	26°48.6	2.4′	54.4′
9	314°40.4	·· 25.2	130°27.3	9.8′	26°46.2	2.6′	54.4′
10	329°40.3	25.3	144°56.1	9.9′	26°43.6	2.6′	54.4′
11	344°40.1	25.3	159°25.0	9.9′	26°41.0	2.8′	54.4′
12	359°40.0	N23°25.3	173°53.9	10.0′	S26°38.2	2.9′	54.4′
13	14°39.9	25.4	188°22.9	10.0′	26°35.3	3.1′	54.3′
14	29°39.7	25.4	202°51.9	10.0′	26°32.2	3.1′	54.3′
15	44°39.6	·· 25.4	217°20.9	10.1′	26°29.1	3.3′	54.3′
16	59°39.5	25.5	231°50.0	10.1′	26°25.8	3.5′	54.3′
17	74°39.3	25.5	246°19.2	10.2′	26°22.3	3.5′	54.3′
18	89°39.2	N23°25.5	260°48.3	10.2′	S26°18.8	3.7′	54.3′
19	104°39.0	25.6	275°17.6	10.3′	26°15.1	3.8′	54.3′
20	119°38.9	25.6	289°46.9	10.3′	26°11.3	3.9′	54.3′
21	134°38.8	·· 25.6	304°16.2	10.4′	26°07.4	4.1′	54.3′
22	149°38.6	25.7	318°45.6	10.4′	26°03.3	4.2′	54.3′
23	164°38.5	25.7	333°15.0	10.5′	25°59.1	4.3′	54.2′
	SD = 15.7′	d = 0.0′	SD = 14.9′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°38.4	N23°25.7	347°44.5	10.5′	S25°54.8	4.4′	54.2′
1	194°38.2	25.7	2°14.0	10.6′	25°50.4	4.6′	54.2′
2	209°38.1	25.8	16°43.6	10.6′	25°45.8	4.7′	54.2′
3	224°38.0	·· 25.8	31°13.3	10.7′	25°41.1	4.8′	54.2′
4	239°37.8	25.8	45°43.0	10.8′	25°36.3	4.9′	54.2′
5	254°37.7	25.8	60°12.7	10.8′	25°31.4	5.0′	54.2′
6	269°37.6	N23°25.9	74°42.5	10.9′	S25°26.4	5.2′	54.2′
7	284°37.4	25.9	89°12.4	10.9′	25°21.2	5.2′	54.2′
8	299°37.3	25.9	103°42.3	11.0′	25°16.0	5.4′	54.2′
9	314°37.2	·· 25.9	118°12.3	11.0′	25°10.6	5.5′	54.2′
10	329°37.0	25.9	132°42.4	11.1′	25°05.1	5.6′	54.2′
11	344°36.9	26.0	147°12.5	11.2′	24°59.5	5.8′	54.1′
12	359°36.7	N23°26.0	161°42.6	11.2′	S24°53.7	5.8′	54.1′
13	14°36.6	26.0	176°12.9	11.3′	24°47.9	6.0′	54.1′
14	29°36.5	26.0	190°43.2	11.3′	24°41.9	6.1′	54.1′
15	44°36.3	·· 26.0	205°13.5	11.4′	24°35.8	6.1′	54.1′
16	59°36.2	26.1	219°43.9	11.5′	24°29.7	6.3′	54.1′
17	74°36.1	26.1	234°14.4	11.5′	24°23.4	6.5′	54.1′
18	89°35.9	N23°26.1	248°44.9	11.6′	S24°16.9	6.5′	54.1′
19	104°35.8	26.1	263°15.5	11.7′	24°10.4	6.6′	54.1′
20	119°35.7	26.1	277°46.2	11.7′	24°03.8	6.7′	54.1′
21	134°35.5	·· 26.1	292°16.9	11.8′	23°57.1	6.9′	54.1′
22	149°35.4	26.1	306°47.7	11.9′	23°50.2	6.9′	54.1′
23	164°35.3	26.1	321°18.6	11.9′	23°43.3	7.1′	54.1′
	SD = 15.7′	d = 0.0′	SD = 14.8′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	////	////	01:31	22:32	////	////
62°	////	////	02:09	21:54	////	////
60°	////	00:50	02:36	21:27	23:14	////
N 58°	////	01:40	02:56	21:07	22:23	////
56°	////	02:10	03:13	20:50	21:53	////
54°	00:45	02:33	03:27	20:36	21:30	23:18
52°	01:32	02:51	03:39	20:23	21:12	22:31
50°	02:00	03:06	03:50	20:12	20:57	22:03
45°	02:46	03:35	04:13	19:50	20:27	21:17
N 40°	03:16	03:58	04:31	19:32	20:05	20:46
35°	03:40	04:16	04:46	19:17	19:46	20:23
30°	03:58	04:32	04:59	19:04	19:31	20:05
20°	04:27	04:57	05:21	18:42	19:06	19:35
N 10°	04:50	05:17	05:40	18:23	18:46	19:13
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	05:26	05:52	06:15	17:48	18:10	18:37
20°	05:42	06:10	06:34	17:29	17:53	18:21
30°	05:59	06:29	06:55	17:08	17:34	18:04
35°	06:07	06:39	07:07	16:55	17:24	17:55
40°	06:17	06:51	07:21	16:41	17:12	17:46
45°	06:27	07:04	07:38	16:24	16:58	17:35
S 50°	06:39	07:21	07:59	16:04	16:42	17:24
52°	06:44	07:28	08:09	15:54	16:35	17:18
54°	06:50	07:36	08:20	15:43	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:06
58°	07:03	07:56	08:48	15:15	16:07	17:00
S 60°	07:10	08:07	09:05	14:58	15:55	16:52

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	00:36 23:53	▬	▬	01:11
62°	22:56	23:15	23:19	00:16	01:04	02:32
60°	22:07	22:39	22:54	01:03	01:54	03:08
N 58°	21:35	22:12	22:34	01:33	02:25	03:34
56°	21:12	21:52	22:18	01:56	02:48	03:55
54°	20:53	21:34	22:04	02:15	03:07	04:12
52°	20:37	21:20	21:51	02:31	03:23	04:26
50°	20:23	21:07	21:40	02:44	03:37	04:39
45°	19:55	20:40	21:17	03:12	04:05	05:05
N 40°	19:32	20:20	20:59	03:34	04:27	05:25
35°	19:14	20:02	20:43	03:53	04:45	05:42
30°	18:58	19:47	20:30	04:08	05:01	05:57
20°	18:31	19:21	20:07	04:35	05:28	06:22
N 10°	18:08	18:59	19:47	04:58	05:51	06:43
0°	17:47	18:39	19:28	05:20	06:12	07:03
S 10°	17:25	18:18	19:10	05:41	06:33	07:23
20°	17:02	17:56	18:49	06:04	06:56	07:44
30°	16:35	17:30	18:26	06:31	07:22	08:08
35°	16:20	17:15	18:12	06:46	07:38	08:22
40°	16:01	16:57	17:56	07:05	07:56	08:39
45°	15:39	16:36	17:37	07:27	08:17	08:59
S 50°	15:11	16:08	17:14	07:55	08:45	09:23
52°	14:57	15:55	17:02	08:09	08:58	09:35
54°	14:41	15:40	16:49	08:25	09:13	09:49
56°	14:22	15:22	16:34	08:43	09:32	10:04
58°	13:59	15:00	16:16	09:07	09:54	10:22
S 60°	13:29	14:32	15:54	09:37	10:22	10:45

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 99-99%
18	01:01	01:07	12:01	23:59	11:33	
19	01:14	01:20	12:01	–:–	12:25	
20	01:27	01:33	12:02	00:51	13:16	

June 21, 22, 23 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	268°58.3	194°56.8	N22°04.2	100°45.9	N05°58.7	122°55.7	N14°35.6	244°08.7	N07°46.0
1	284°00.7	209°56.0	04.7	115°47.2	58.2	137°57.8	35.5	259°11.0	46.1
2	299°03.2	224°55.2	05.1	130°48.5	57.6	152°59.8	35.3	274°13.2	46.1
3	314°05.7	239°54.4	·· 05.5	145°49.8	·· 57.1	168°01.9	·· 35.2	289°15.5	·· 46.2
4	329°08.1	254°53.6	06.0	160°51.1	56.5	183°03.9	35.1	304°17.8	46.2
5	344°10.6	269°52.8	06.4	175°52.4	56.0	198°06.0	34.9	319°20.1	46.3
6	359°13.0	284°52.0	N22°06.8	190°53.7	N05°55.4	213°08.1	N14°34.8	334°22.4	N07°46.4
7	14°15.5	299°51.2	07.2	205°55.0	54.9	228°10.1	34.6	349°24.6	46.4
8	29°18.0	314°50.4	07.7	220°56.3	54.3	243°12.2	34.5	4°26.9	46.5
9	44°20.4	329°49.6	·· 08.1	235°57.6	·· 53.8	258°14.2	·· 34.4	19°29.2	·· 46.5
10	59°22.9	344°48.8	08.5	250°58.8	53.3	273°16.3	34.2	34°31.5	46.6
11	74°25.4	359°48.0	08.9	266°00.1	52.7	288°18.4	34.1	49°33.7	46.7
12	89°27.8	14°47.2	N22°09.3	281°01.4	N05°52.2	303°20.4	N14°33.9	64°36.0	N07°46.7
13	104°30.3	29°46.4	09.8	296°02.7	51.6	318°22.5	33.8	79°38.3	46.8
14	119°32.8	44°45.5	10.2	311°04.0	51.1	333°24.5	33.7	94°40.6	46.9
15	134°35.2	59°44.7	·· 10.6	326°05.3	·· 50.5	348°26.6	·· 33.5	109°42.9	·· 46.9
16	149°37.7	74°43.9	11.0	341°06.6	50.0	3°28.7	33.4	124°45.1	47.0
17	164°40.2	89°43.1	11.4	356°07.9	49.4	18°30.7	33.2	139°47.4	47.0
18	179°42.6	104°42.3	N22°11.8	11°09.2	N05°48.9	33°32.8	N14°33.1	154°49.7	N07°47.1
19	194°45.1	119°41.5	12.3	26°10.5	48.3	48°34.8	33.0	169°52.0	47.2
20	209°47.5	134°40.7	12.7	41°11.8	47.8	63°36.9	32.8	184°54.3	47.2
21	224°50.0	149°39.9	·· 13.1	56°13.0	·· 47.2	78°38.9	·· 32.7	199°56.5	·· 47.3
22	239°52.5	164°39.1	13.5	71°14.3	46.7	93°41.0	32.5	214°58.8	47.3
23	254°54.9	179°38.3	13.9	86°15.6	46.1	108°43.1	32.4	230°01.1	47.4
Mer.pass. 06:03		ν -0.8′	d 0.4′	m -3.89	ν 1.3′	d 0.5′	m 0.98	ν 2.1′	d 0.1′ m -1.84	ν 2.3′	d 0.1′ m 0.64

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	269°57.4	194°37.5	N22°14.3	101°16.9	N05°45.6	123°45.1	N14°32.3	245°03.4	N07°47.5
1	284°59.9	209°36.7	14.7	116°18.2	45.0	138°47.2	32.1	260°05.7	47.5
2	300°02.3	224°35.9	15.1	131°19.5	44.5	153°49.2	32.0	275°07.9	47.6
3	315°04.8	239°35.1	·· 15.5	146°20.8	·· 44.0	168°51.3	·· 31.8	290°10.2	·· 47.6
4	330°07.3	254°34.3	15.9	161°22.1	43.4	183°53.3	31.7	305°12.5	47.7
5	345°09.7	269°33.5	16.3	176°23.3	42.9	198°55.4	31.6	320°14.8	47.8
6	0°12.2	284°32.6	N22°16.7	191°24.6	N05°42.3	213°57.5	N14°31.4	335°17.1	N07°47.8
7	15°14.6	299°31.8	17.1	206°25.9	41.8	228°59.5	31.3	350°19.3	47.9
8	30°17.1	314°31.0	17.5	221°27.2	41.2	244°01.6	31.1	5°21.6	47.9
9	45°19.6	329°30.2	·· 17.9	236°28.5	·· 40.7	259°03.6	·· 31.0	20°23.9	·· 48.0
10	60°22.0	344°29.4	18.3	251°29.8	40.1	274°05.7	30.9	35°26.2	48.1
11	75°24.5	359°28.6	18.7	266°31.1	39.6	289°07.7	30.7	50°28.5	48.1
12	90°27.0	14°27.8	N22°19.1	281°32.4	N05°39.0	304°09.8	N14°30.6	65°30.8	N07°48.2
13	105°29.4	29°27.0	19.5	296°33.6	38.5	319°11.8	30.4	80°33.0	48.2
14	120°31.9	44°26.2	19.9	311°34.9	37.9	334°13.9	30.3	95°35.3	48.3
15	135°34.4	59°25.3	·· 20.3	326°36.2	·· 37.4	349°16.0	·· 30.1	110°37.6	·· 48.4
16	150°36.8	74°24.5	20.7	341°37.5	36.8	4°18.0	30.0	125°39.9	48.4
17	165°39.3	89°23.7	21.0	356°38.8	36.3	19°20.1	29.9	140°42.2	48.5
18	180°41.8	104°22.9	N22°21.4	11°40.1	N05°35.7	34°22.1	N14°29.7	155°44.4	N07°48.5
19	195°44.2	119°22.1	21.8	26°41.4	35.2	49°24.2	29.6	170°46.7	48.6
20	210°46.7	134°21.3	22.2	41°42.6	34.6	64°26.2	29.4	185°49.0	48.7
21	225°49.1	149°20.5	·· 22.6	56°43.9	·· 34.1	79°28.3	·· 29.3	200°51.3	·· 48.7
22	240°51.6	164°19.6	23.0	71°45.2	33.5	94°30.3	29.2	215°53.6	48.8
23	255°54.1	179°18.8	23.3	86°46.5	33.0	109°32.4	29.0	230°55.9	48.8
Mer.pass. 05:59		ν -0.8′	d 0.4′	m -3.89	ν 1.3′	d 0.5′	m 0.99	ν 2.1′	d 0.1′ m -1.83	ν 2.3′	d 0.1′ m 0.63

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	270°56.5	194°18.0	N22°23.7	101°47.8	N05°32.4	124°34.4	N14°28.9	245°58.1	N07°48.9
1	285°59.0	209°17.2	24.1	116°49.1	31.9	139°36.5	28.7	261°00.4	49.0
2	301°01.5	224°16.4	24.5	131°50.3	31.3	154°38.5	28.6	276°02.7	49.0
3	316°03.9	239°15.6	·· 24.9	146°51.6	·· 30.8	169°40.6	·· 28.4	291°05.0	·· 49.1
4	331°06.4	254°14.8	25.2	161°52.9	30.2	184°42.7	28.3	306°07.3	49.1
5	346°08.9	269°13.9	25.6	176°54.2	29.6	199°44.7	28.2	321°09.6	49.2
6	1°11.3	284°13.1	N22°26.0	191°55.5	N05°29.1	214°46.8	N14°28.0	336°11.8	N07°49.3
7	16°13.8	299°12.3	26.4	206°56.7	28.5	229°48.8	27.9	351°14.1	49.3
8	31°16.3	314°11.5	26.7	221°58.0	28.0	244°50.9	27.7	6°16.4	49.4
9	46°18.7	329°10.7	·· 27.1	236°59.3	·· 27.4	259°52.9	·· 27.6	21°18.7	·· 49.4
10	61°21.2	344°09.9	27.5	252°00.6	26.9	274°55.0	27.5	36°21.0	49.5
11	76°23.6	359°09.0	27.8	267°01.9	26.3	289°57.0	27.3	51°23.3	49.6
12	91°26.1	14°08.2	N22°28.2	282°03.2	N05°25.8	304°59.1	N14°27.2	66°25.6	N07°49.6
13	106°28.6	29°07.4	28.6	297°04.4	25.2	320°01.1	27.0	81°27.8	49.7
14	121°31.0	44°06.6	28.9	312°05.7	24.7	335°03.2	26.9	96°30.1	49.7
15	136°33.5	59°05.8	·· 29.3	327°07.0	·· 24.1	350°05.2	·· 26.7	111°32.4	·· 49.8
16	151°36.0	74°04.9	29.7	342°08.3	23.6	5°07.3	26.6	126°34.7	49.8
17	166°38.4	89°04.1	30.0	357°09.6	23.0	20°09.3	26.5	141°37.0	49.9
18	181°40.9	104°03.3	N22°30.4	12°10.8	N05°22.5	35°11.4	N14°26.3	156°39.3	N07°50.0
19	196°43.4	119°02.5	30.8	27°12.1	21.9	50°13.4	26.2	171°41.6	50.0
20	211°45.8	134°01.6	31.1	42°13.4	21.4	65°15.5	26.0	186°43.8	50.1
21	226°48.3	149°00.8	·· 31.5	57°14.7	·· 20.8	80°17.5	·· 25.9	201°46.1	·· 50.1
22	241°50.7	164°00.0	31.8	72°15.9	20.2	95°19.6	25.7	216°48.4	50.2
23	256°53.2	178°59.2	32.2	87°17.2	19.7	110°21.6	25.6	231°50.7	50.3
Mer.pass. 05:55		ν -0.8′	d 0.4′	m -3.89	ν 1.3′	d 0.6′	m 1.00	ν 2.1′	d 0.1′ m -1.83	ν 2.3′	d 0.1′ m 0.63

Stars

	SHA	Dec
Alpheratz	357°32.7	29°14.4
Ankaa	353°05.2	-42°09.1
Schedar	349°28.8	56°41.1
Diphda	348°45.3	-17°50.0
Achernar	335°19.0	-57°05.5
Hamal	327°49.1	23°35.5
Polaris	313°19.4	89°22.5
Acamar	315°10.6	-40°11.5
Menkar	314°04.3	4°11.9
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.6	16°33.8
Rigel	281°02.3	-8°10.2
Capella	280°19.4	46°01.4
Bellatrix	278°21.0	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.6
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.4	-59°36.1
Suhail	222°45.1	-43°32.8
Miaplacidus	221°38.5	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°49.9
Dubhe	193°38.8	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.7	-63°15.5
Gacrux	171°49.2	-57°16.4
Alioth	166°11.1	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.2
Kochab	137°19.1	74°02.7
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.6
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.4
Eltanin	90°40.7	51°29.1
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.5
Nunki	75°44.9	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.1	-56°38.5
Deneb	49°24.0	45°22.6
Enif	33°36.6	10°00.1
Al Na'ir	27°30.2	-46°49.4
Fomalhaut	15°12.2	-29°28.3
Scheat	13°43.1	28°13.8
Markab	13°27.8	15°21.2

Jun 21 Mon	SHA	Mer.pass
Venus	285°58.5	11:01
Mars	191°47.7	17:15
Jupiter	213°57.4	15:46
Saturn	335°10.4	07:42

Jun 22 Tue	SHA	Mer.pass
Venus	284°40.1	11:02
Mars	191°19.5	17:13
Jupiter	213°47.7	15:43
Saturn	335°06.0	07:39

Jun 23 Wed	SHA	Mer.pass
Venus	283°21.5	11:03
Mars	190°51.2	17:11
Jupiter	213°37.9	15:40
Saturn	335°01.6	07:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°35.1	N23°26.2	335°49.5	12.0′	S23°36.2	7.1′	54.1′
1	194°35.0	26.2	350°20.5	12.1′	23°29.1	7.3′	54.1′
2	209°34.9	26.2	4°51.5	12.1′	23°21.8	7.4′	54.1′
3	224°34.7	·· 26.2	19°22.6	12.2′	23°14.4	7.4′	54.0′
4	239°34.6	26.2	33°53.8	12.2′	23°07.0	7.6′	54.0′
5	254°34.4	26.2	48°25.1	12.3′	22°59.4	7.6′	54.0′
6	269°34.3	N23°26.2	62°56.4	12.4′	S22°51.8	7.8′	54.0′
7	284°34.2	26.2	77°27.8	12.4′	22°44.0	7.9′	54.0′
8	299°34.0	26.2	91°59.2	12.5′	22°36.1	7.9′	54.0′
9	314°33.9	·· 26.2	106°30.7	12.6′	22°28.2	8.1′	54.0′
10	329°33.8	26.2	121°02.3	12.6′	22°20.1	8.2′	54.0′
11	344°33.6	26.2	135°33.9	12.7′	22°11.9	8.2′	54.0′
12	359°33.5	N23°26.2	150°05.7	12.8′	S22°03.7	8.3′	54.0′
13	14°33.4	26.2	164°37.4	12.8′	21°55.4	8.5′	54.0′
14	29°33.2	26.2	179°09.3	12.9′	21°46.9	8.5′	54.0′
15	44°33.1	·· 26.2	193°41.2	13.0′	21°38.4	8.6′	54.0′
16	59°33.0	26.2	208°13.2	13.0′	21°29.8	8.7′	54.0′
17	74°32.8	26.2	222°45.2	13.1′	21°21.1	8.8′	54.0′
18	89°32.7	N23°26.2	237°17.3	13.2′	S21°12.3	8.9′	54.0′
19	104°32.6	26.2	251°49.5	13.2′	21°03.4	9.0′	54.0′
20	119°32.4	26.2	266°21.7	13.3′	20°54.4	9.1′	54.0′
21	134°32.3	·· 26.2	280°54.0	13.4′	20°45.3	9.1′	54.0′
22	149°32.1	26.2	295°26.4	13.4′	20°36.2	9.3′	54.0′
23	164°32.0	26.2	309°58.8	13.5′	20°26.9	9.3′	54.0′
	SD = 15.7′	*d* = 0.0′	SD = 14.7′				

Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°31.9	N23°26.2	324°31.3	13.6′	S20°17.6	9.4′	54.0′
1	194°31.7	26.2	339°03.9	13.6′	20°08.2	9.5′	54.0′
2	209°31.6	26.2	353°36.5	13.7′	19°58.7	9.6′	54.0′
3	224°31.5	·· 26.2	8°09.2	13.7′	19°49.1	9.6′	54.0′
4	239°31.3	26.2	22°41.9	13.8′	19°39.5	9.8′	54.0′
5	254°31.2	26.2	37°14.7	13.9′	19°29.7	9.8′	54.0′
6	269°31.1	N23°26.1	51°47.6	13.9′	S19°19.9	9.9′	54.0′
7	284°30.9	26.1	66°20.5	14.0′	19°10.0	9.9′	54.0′
8	299°30.8	26.1	80°53.5	14.1′	19°00.1	10.1′	54.0′
9	314°30.7	·· 26.1	95°26.6	14.1′	18°50.0	10.1′	54.0′
10	329°30.5	26.1	109°59.7	14.2′	18°39.9	10.2′	54.0′
11	344°30.4	26.1	124°32.9	14.2′	18°29.7	10.3′	54.0′
12	359°30.3	N23°26.1	139°06.1	14.3′	S18°19.4	10.4′	54.0′
13	14°30.1	26.0	153°39.4	14.4′	18°09.0	10.4′	54.0′
14	29°30.0	26.0	168°12.7	14.4′	17°58.6	10.5′	54.0′
15	44°29.9	·· 26.0	182°46.1	14.5′	17°48.1	10.5′	54.0′
16	59°29.7	26.0	197°19.6	14.5′	17°37.6	10.7′	54.0′
17	74°29.6	26.0	211°53.1	14.6′	17°26.9	10.7′	54.0′
18	89°29.4	N23°26.0	226°26.7	14.6′	S17°16.2	10.8′	54.0′
19	104°29.3	25.9	241°00.4	14.7′	17°05.4	10.8′	54.0′
20	119°29.2	25.9	255°34.0	14.7′	16°54.6	10.9′	54.0′
21	134°29.0	·· 25.9	270°07.8	14.8′	16°43.7	11.0′	54.0′
22	149°28.9	25.9	284°41.6	14.9′	16°32.7	11.0′	54.0′
23	164°28.8	25.9	299°15.4	14.9′	16°21.7	11.2′	54.0′
	SD = 15.7′	*d* = 0.0′	SD = 14.7′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°28.6	N23°25.8	313°49.4	15.0′	S16°10.5	11.1′	54.0′
1	194°28.5	25.8	328°23.3	15.0′	15°59.4	11.3′	54.0′
2	209°28.4	25.8	342°57.3	15.1′	15°48.1	11.3′	54.0′
3	224°28.2	·· 25.8	357°31.4	15.1′	15°36.8	11.3′	54.0′
4	239°28.1	25.7	12°05.5	15.2′	15°25.5	11.4′	54.0′
5	254°28.0	25.7	26°39.6	15.2′	15°14.1	11.5′	54.0′
6	269°27.8	N23°25.7	41°13.9	15.3′	S15°02.6	11.6′	54.1′
7	284°27.7	25.6	55°48.1	15.3′	14°51.0	11.6′	54.1′
8	299°27.6	25.6	70°22.4	15.3′	14°39.4	11.6′	54.1′
9	314°27.4	·· 25.6	84°56.8	15.4′	14°27.8	11.8′	54.1′
10	329°27.3	25.5	99°31.1	15.4′	14°16.0	11.7′	54.1′
11	344°27.2	25.5	114°05.6	15.5′	14°04.3	11.9′	54.1′
12	359°27.0	N23°25.5	128°40.1	15.5′	S13°52.4	11.8′	54.1′
13	14°26.9	25.5	143°14.6	15.6′	13°40.6	12.0′	54.1′
14	29°26.8	25.4	157°49.2	15.6′	13°28.6	12.0′	54.1′
15	44°26.6	·· 25.4	172°23.8	15.6′	13°16.6	12.0′	54.1′
16	59°26.5	25.3	186°58.4	15.7′	13°04.6	12.1′	54.1′
17	74°26.4	25.3	201°33.1	15.7′	12°52.5	12.2′	54.1′
18	89°26.2	N23°25.3	216°07.8	15.8′	S12°40.3	12.2′	54.1′
19	104°26.1	25.2	230°42.6	15.8′	12°28.1	12.2′	54.1′
20	119°25.9	25.2	245°17.4	15.8′	12°15.9	12.3′	54.1′
21	134°25.8	·· 25.2	259°52.2	15.9′	12°03.6	12.4′	54.2′
22	149°25.7	25.1	274°27.1	15.9′	11°51.2	12.4′	54.2′
23	164°25.5	25.1	289°02.0	15.9′	11°38.8	12.4′	54.2′
	SD = 15.7′	*d* = 0.0′	SD = 14.7′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:31	22:33	////	////
62°	////	////	02:10	21:54	////	////
60°	////	00:49	02:36	21:28	23:14	////
N 58°	////	01:41	02:57	21:07	22:23	////
56°	////	02:11	03:13	20:51	21:53	////
54°	00:45	02:33	03:28	20:36	21:31	23:18
52°	01:33	02:51	03:40	20:24	21:13	22:31
50°	02:00	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:13	19:51	20:28	21:18
N 40°	03:17	03:59	04:31	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:51	05:18	05:41	18:23	18:46	19:13
0°	05:10	05:36	05:58	18:06	18:28	18:54
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:18	06:52	07:22	16:42	17:12	17:46
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:30	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°			01:15			05:26
N 70°		02:24	00:37		02:44	06:03
68°		00:47	00:09 23:47		04:20	06:29
66°	00:53	00:08 23:49	23:35	02:37	04:59	06:49
64°	23:41	23:32	23:25	03:37	05:25	07:04
62°	23:19	23:18	23:16	04:10	05:46	07:17
60°	23:02	23:06	23:08	04:35	06:02	07:28
N 58°	22:47	22:56	23:02	04:54	06:16	07:38
56°	22:35	22:47	22:56	05:10	06:28	07:46
54°	22:24	22:39	22:50	05:24	06:39	07:53
52°	22:14	22:32	22:46	05:36	06:48	08:00
50°	22:05	22:25	22:41	05:46	06:56	08:06
45°	21:47	22:11	22:32	06:08	07:13	08:18
N 40°	21:32	21:59	22:24	06:26	07:27	08:28
35°	21:19	21:50	22:17	06:41	07:39	08:37
30°	21:08	21:41	22:11	06:53	07:50	08:45
20°	20:48	21:26	22:00	07:15	08:07	08:58
N 10°	20:31	21:12	21:51	07:34	08:23	09:10
0°	20:15	21:00	21:42	07:51	08:37	09:20
S 10°	19:59	20:47	21:33	08:09	08:51	09:31
20°	19:42	20:34	21:24	08:27	09:07	09:42
30°	19:23	20:18	21:13	08:48	09:24	09:55
35°	19:11	20:09	21:07	09:01	09:34	10:03
40°	18:58	19:59	21:00	09:15	09:45	10:11
45°	18:42	19:47	20:51	09:32	09:58	10:21
S 50°	18:22	19:32	20:41	09:52	10:15	10:32
52°	18:13	19:25	20:37	10:02	10:22	10:38
54°	18:03	19:17	20:31	10:13	10:30	10:44
56°	17:51	19:09	20:26	10:25	10:40	10:50
58°	17:37	18:59	20:19	10:40	10:50	10:57
S 60°	17:21	18:47	20:12	10:57	11:03	11:06

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 17-19 96-86%
21	01:40	01:46	12:02	01:40	14:03	
22	01:52	01:59	12:02	02:26	14:49	
23	02:05	02:12	12:02	03:10	15:31	

June 24, 25, 26 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	271°55.7	193°58.4	N22°32.5	102°18.5	N05°19.1	125°23.7	N14°25.5	246°53.0	N07°50.3
1	286°58.1	208°57.5	32.9	117°19.8	18.6	140°25.7	25.3	261°55.3	50.4
2	302°00.6	223°56.7	33.2	132°21.1	18.0	155°27.8	25.2	276°57.6	50.4
3	317°03.1	238°55.9	·· 33.6	147°22.3	·· 17.5	170°29.8	·· 25.0	291°59.8	·· 50.5
4	332°05.5	253°55.1	33.9	162°23.6	16.9	185°31.9	24.9	307°02.1	50.5
5	347°08.0	268°54.2	34.3	177°24.9	16.4	200°33.9	24.7	322°04.4	50.6
6	2°10.5	283°53.4	N22°34.6	192°26.2	N05°15.8	215°36.0	N14°24.6	337°06.7	N07°50.7
7	17°12.9	298°52.6	35.0	207°27.4	15.3	230°38.0	24.4	352°09.0	50.7
8	32°15.4	313°51.8	35.3	222°28.7	14.7	245°40.1	24.3	7°11.3	50.8
9	47°17.9	328°50.9	·· 35.7	237°30.0	·· 14.1	260°42.1	·· 24.2	22°13.6	·· 50.8
10	62°20.3	343°50.1	36.0	252°31.3	13.6	275°44.2	24.0	37°15.9	50.9
11	77°22.8	358°49.3	36.4	267°32.5	13.0	290°46.2	23.9	52°18.1	51.0
12	92°25.2	13°48.5	N22°36.7	282°33.8	N05°12.5	305°48.3	N14°23.7	67°20.4	N07°51.0
13	107°27.7	28°47.6	37.0	297°35.1	11.9	320°50.3	23.6	82°22.7	51.1
14	122°30.2	43°46.8	37.4	312°36.4	11.4	335°52.4	23.4	97°25.0	51.1
15	137°32.6	58°46.0	·· 37.7	327°37.6	·· 10.8	350°54.4	·· 23.3	112°27.3	·· 51.2
16	152°35.1	73°45.2	38.0	342°38.9	10.3	5°56.5	23.1	127°29.6	51.2
17	167°37.6	88°44.3	38.4	357°40.2	09.7	20°58.5	23.0	142°31.9	51.3
18	182°40.0	103°43.5	N22°38.7	12°41.5	N05°09.1	36°00.6	N14°22.9	157°34.2	N07°51.4
19	197°42.5	118°42.7	39.0	27°42.7	08.6	51°02.6	22.7	172°36.4	51.4
20	212°45.0	133°41.8	39.4	42°44.0	08.0	66°04.7	22.6	187°38.7	51.5
21	227°47.4	148°41.0	·· 39.7	57°45.3	·· 07.5	81°06.7	·· 22.4	202°41.0	·· 51.5
22	242°49.9	163°40.2	40.0	72°46.6	06.9	96°08.8	22.3	217°43.3	51.6
23	257°52.4	178°39.3	40.4	87°47.8	06.4	111°10.8	22.1	232°45.6	51.6
Mer.pass.	05:51	ν -0.8′	d 0.4′	m -3.89	ν 1.3′	d 0.6′	m 1.01	ν 2.1′	d 0.1′ m -1.82	ν 2.3′	d 0.1′ m 0.63

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	272°54.8	193°38.5	N22°40.7	102°49.1	N05°05.8	126°12.9	N14°22.0	247°47.9	N07°51.7
1	287°57.3	208°37.7	41.0	117°50.4	05.2	141°14.9	21.8	262°50.2	51.7
2	302°59.7	223°36.9	41.3	132°51.6	04.7	156°17.0	21.7	277°52.5	51.8
3	318°02.2	238°36.0	·· 41.7	147°52.9	·· 04.1	171°19.0	·· 21.6	292°54.8	·· 51.9
4	333°04.7	253°35.2	42.0	162°54.2	03.6	186°21.0	21.4	307°57.1	51.9
5	348°07.1	268°34.4	42.3	177°55.5	03.0	201°23.1	21.3	322°59.3	52.0
6	3°09.6	283°33.5	N22°42.6	192°56.7	N05°02.5	216°25.1	N14°21.1	338°01.6	N07°52.0
7	18°12.1	298°32.7	43.0	207°58.0	01.9	231°27.2	21.0	353°03.9	52.1
8	33°14.5	313°31.9	43.3	222°59.3	01.3	246°29.2	20.8	8°06.2	52.1
9	48°17.0	328°31.0	·· 43.6	238°00.5	·· 00.8	261°31.3	·· 20.7	23°08.5	·· 52.2
10	63°19.5	343°30.2	43.9	253°01.8	05°00.2	276°33.3	20.5	38°10.8	52.3
11	78°21.9	358°29.4	44.2	268°03.1	04°59.7	291°35.4	20.4	53°13.1	52.3
12	93°24.4	13°28.5	N22°44.5	283°04.4	N04°59.1	306°37.4	N14°20.3	68°15.4	N07°52.4
13	108°26.8	28°27.7	44.8	298°05.6	58.6	321°39.5	20.1	83°17.7	52.4
14	123°29.3	43°26.9	45.2	313°06.9	58.0	336°41.5	20.0	98°20.0	52.5
15	138°31.8	58°26.0	·· 45.5	328°08.2	·· 57.4	351°43.5	·· 19.8	113°22.2	·· 52.5
16	153°34.2	73°25.2	45.8	343°09.4	56.9	6°45.6	19.7	128°24.5	52.6
17	168°36.7	88°24.4	46.1	358°10.7	56.3	21°47.6	19.5	143°26.8	52.6
18	183°39.2	103°23.5	N22°46.4	13°12.0	N04°55.8	36°49.7	N14°19.4	158°29.1	N07°52.7
19	198°41.6	118°22.7	46.7	28°13.2	55.2	51°51.7	19.2	173°31.4	52.8
20	213°44.1	133°21.9	47.0	43°14.5	54.6	66°53.8	19.1	188°33.7	52.8
21	228°46.6	148°21.0	·· 47.3	58°15.8	·· 54.1	81°55.8	·· 18.9	203°36.0	·· 52.9
22	243°49.0	163°20.2	47.6	73°17.0	53.5	96°57.9	18.8	218°38.3	52.9
23	258°51.5	178°19.3	47.9	88°18.3	53.0	111°59.9	18.6	233°40.6	53.0
Mer.pass.	05:47	ν -0.8′	d 0.3′	m -3.89	ν 1.3′	d 0.6′	m 1.02	ν 2.0′	d 0.1′ m -1.82	ν 2.3′	d 0.1′ m 0.62

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°54.0	193°18.5	N22°48.2	103°19.6	N04°52.4	127°01.9	N14°18.5	248°42.9	N07°53.0
1	288°56.4	208°17.7	48.5	118°20.8	51.8	142°04.0	18.4	263°45.2	53.1
2	303°58.9	223°16.8	48.8	133°22.1	51.3	157°06.0	18.2	278°47.5	53.1
3	319°01.3	238°16.0	·· 49.1	148°23.4	·· 50.7	172°08.1	·· 18.1	293°49.8	·· 53.2
4	334°03.8	253°15.2	49.4	163°24.6	50.2	187°10.1	17.9	308°52.0	53.3
5	349°06.3	268°14.3	49.7	178°25.9	49.6	202°12.2	17.8	323°54.3	53.3
6	4°08.7	283°13.5	N22°50.0	193°27.2	N04°49.0	217°14.2	N14°17.6	338°56.6	N07°53.4
7	19°11.2	298°12.6	50.3	208°28.4	48.5	232°16.3	17.5	353°58.9	53.4
8	34°13.7	313°11.8	50.6	223°29.7	47.9	247°18.3	17.3	9°01.2	53.5
9	49°16.1	328°11.0	·· 50.9	238°31.0	·· 47.4	262°20.3	·· 17.2	24°03.5	·· 53.5
10	64°18.6	343°10.1	51.2	253°32.2	46.8	277°22.4	17.0	39°05.8	53.6
11	79°21.1	358°09.3	51.4	268°33.5	46.2	292°24.4	16.9	54°08.1	53.6
12	94°23.5	13°08.4	N22°51.7	283°34.8	N04°45.7	307°26.5	N14°16.7	69°10.4	N07°53.7
13	109°26.0	28°07.6	52.0	298°36.0	45.1	322°28.5	16.6	84°12.7	53.8
14	124°28.5	43°06.8	52.3	313°37.3	44.5	337°30.5	16.5	99°15.0	53.8
15	139°30.9	58°05.9	·· 52.6	328°38.6	·· 44.0	352°32.6	·· 16.3	114°17.3	·· 53.9
16	154°33.4	73°05.1	52.9	343°39.8	43.4	7°34.6	16.2	129°19.6	53.9
17	169°35.8	88°04.2	53.1	358°41.1	42.9	22°36.7	16.0	144°21.9	54.0
18	184°38.3	103°03.4	N22°53.4	13°42.3	N04°42.3	37°38.7	N14°15.9	159°24.2	N07°54.0
19	199°40.8	118°02.6	53.7	28°43.6	41.7	52°40.8	15.7	174°26.5	54.1
20	214°43.2	133°01.7	54.0	43°44.9	41.2	67°42.8	15.6	189°28.8	54.1
21	229°45.7	148°00.9	·· 54.3	58°46.1	·· 40.6	82°44.8	·· 15.4	204°31.0	·· 54.2
22	244°48.2	163°00.0	54.5	73°47.4	40.1	97°46.9	15.3	219°33.3	54.2
23	259°50.6	177°59.2	54.8	88°48.7	39.5	112°48.9	15.1	234°35.6	54.3
Mer.pass.	05:43	ν -0.8′	d 0.3′	m -3.89	ν 1.3′	d 0.6′	m 1.02	ν 2.0′	d 0.1′ m -1.82	ν 2.3′	d 0.1′ m 0.62

Stars

	SHA	Dec
Alpheratz	357°32.6	29°14.5
Ankaa	353°05.2	-42°09.1
Schedar	349°28.7	56°41.1
Diphda	348°45.3	-17°50.0
Achernar	335°19.0	-57°05.5
Hamal	327°49.1	23°35.5
Polaris	313°18.3	89°22.5
Acamar	315°10.5	-40°11.4
Menkar	314°04.3	4°11.9
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.2
Capella	280°19.4	46°01.4
Bellatrix	278°21.0	6°22.4
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.6
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.4	-59°36.0
Suhail	222°45.1	-43°32.8
Miaplacidus	221°38.5	-69°50.1
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°49.9
Dubhe	193°38.8	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.7	-63°15.5
Gacrux	171°49.3	-57°16.4
Alioth	166°11.1	55°48.8
Spica	158°20.0	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.0	-60°57.2
Kochab	137°19.2	74°02.7
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°01.7	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.4
Eltanin	90°40.7	51°29.1
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.5
Nunki	75°44.9	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.1	-56°38.5
Deneb	49°24.0	45°22.6
Enif	33°36.6	10°00.1
Al Na'ir	27°30.2	-46°49.4
Fomalhaut	15°12.2	-29°28.3
Scheat	13°43.1	28°13.9
Markab	13°27.8	15°21.2

Jun 24 Thu	SHA	Mer.pass
Venus	282°02.7	11:05
Mars	190°22.8	17:09
Jupiter	213°28.0	15:36
Saturn	334°57.3	07:31

Jun 25 Fri	SHA	Mer.pass
Venus	280°43.7	11:06
Mars	189°54.3	17:07
Jupiter	213°18.0	15:33
Saturn	334°53.1	07:28

Jun 26 Sat	SHA	Mer.pass
Venus	279°24.6	11:07
Mars	189°25.6	17:05
Jupiter	213°08.0	15:30
Saturn	334°48.9	07:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°25.4	N23°25.0	303°37.0	16.0′	S11°26.4	12.5′	54.2′
1	194°25.3	25.0	318°11.9	16.0′	11°13.9	12.5′	54.2′
2	209°25.1	25.0	332°46.9	16.0′	11°01.4	12.6′	54.2′
3	224°25.0	·· 24.9	347°22.0	16.1′	10°48.8	12.6′	54.2′
4	239°24.9	24.9	1°57.0	16.1′	10°36.2	12.7′	54.2′
5	254°24.7	24.8	16°32.1	16.1′	10°23.5	12.7′	54.2′
6	269°24.6	N23°24.8	31°07.3	16.2′	S10°10.8	12.8′	54.2′
7	284°24.5	24.7	45°42.4	16.2′	09°58.0	12.8′	54.3′
8	299°24.3	24.7	60°17.6	16.2′	09°45.2	12.8′	54.3′
9	314°24.2	·· 24.6	74°52.8	16.2′	09°32.4	12.9′	54.3′
10	329°24.1	24.6	89°28.0	16.3′	09°19.5	12.9′	54.3′
11	344°23.9	24.5	104°03.3	16.3′	09°06.6	13.0′	54.3′
12	359°23.8	N23°24.5	118°38.6	16.3′	S08°53.6	12.9′	54.3′
13	14°23.7	24.4	133°13.9	16.3′	08°40.7	13.1′	54.3′
14	29°23.5	24.4	147°49.2	16.3′	08°27.6	13.0′	54.3′
15	44°23.4	·· 24.3	162°24.5	16.4′	08°14.6	13.1′	54.4′
16	59°23.3	24.3	176°59.9	16.4′	08°01.5	13.2′	54.4′
17	74°23.1	24.2	191°35.2	16.4′	07°48.3	13.2′	54.4′
18	89°23.0	N23°24.2	206°10.6	16.4′	S07°35.1	13.2′	54.4′
19	104°22.9	24.1	220°46.0	16.4′	07°21.9	13.2′	54.4′
20	119°22.7	24.1	235°21.4	16.4′	07°08.7	13.3′	54.4′
21	134°22.6	·· 24.0	249°56.9	16.4′	06°55.4	13.3′	54.4′
22	149°22.5	24.0	264°32.3	16.5′	06°42.1	13.3′	54.5′
23	164°22.3	23.9	279°07.8	16.5′	06°28.8	13.4′	54.5′
	SD = 15.7′	d = 0.0′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°22.2	N23°23.8	293°43.2	16.5′	S06°15.4	13.4′	54.5′
1	194°22.1	23.8	308°18.7	16.5′	06°02.0	13.4′	54.5′
2	209°21.9	23.7	322°54.2	16.5′	05°48.6	13.5′	54.5′
3	224°21.8	·· 23.7	337°29.7	16.5′	05°35.1	13.5′	54.5′
4	239°21.7	23.6	352°05.2	16.5′	05°21.6	13.5′	54.6′
5	254°21.5	23.5	6°40.7	16.5′	05°08.1	13.5′	54.6′
6	269°21.4	N23°23.5	21°16.2	16.5′	S04°54.6	13.6′	54.6′
7	284°21.3	23.4	35°51.7	16.5′	04°41.0	13.6′	54.6′
8	299°21.1	23.4	50°27.2	16.5′	04°27.4	13.6′	54.6′
9	314°21.0	·· 23.3	65°02.7	16.5′	04°13.8	13.6′	54.6′
10	329°20.9	23.2	79°38.2	16.5′	04°00.2	13.7′	54.7′
11	344°20.7	23.2	94°13.7	16.5′	03°46.5	13.6′	54.7′
12	359°20.6	N23°23.1	108°49.2	16.5′	S03°32.9	13.8′	54.7′
13	14°20.5	23.0	123°24.7	16.5′	03°19.1	13.7′	54.7′
14	29°20.3	23.0	138°00.2	16.5′	03°05.4	13.7′	54.7′
15	44°20.2	·· 22.9	152°35.7	16.5′	02°51.7	13.8′	54.8′
16	59°20.1	22.8	167°11.1	16.5′	02°37.9	13.8′	54.8′
17	74°19.9	22.7	181°46.6	16.5′	02°24.1	13.8′	54.8′
18	89°19.8	N23°22.7	196°22.1	16.4′	S02°10.3	13.8′	54.8′
19	104°19.7	22.6	210°57.5	16.4′	01°56.5	13.8′	54.8′
20	119°19.6	22.5	225°32.9	16.4′	01°42.7	13.9′	54.9′
21	134°19.4	·· 22.5	240°08.4	16.4′	01°28.8	13.9′	54.9′
22	149°19.3	22.4	254°43.8	16.4′	01°14.9	13.9′	54.9′
23	164°19.2	22.3	269°19.2	16.4′	01°01.0	13.9′	54.9′
	SD = 15.7′	d = 0.1′	SD = 14.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°19.0	N23°22.2	283°54.5	16.4′	S00°47.1	13.9′	55.0′
1	194°18.9	22.2	298°29.9	16.3′	00°33.2	13.9′	55.0′
2	209°18.8	22.1	313°05.2	16.3′	00°19.3	14.0′	55.0′
3	224°18.6	·· 22.0	327°40.6	16.3′	S00°05.3	13.9′	55.0′
4	239°18.5	21.9	342°15.9	16.3′	N00°08.6	14.0′	55.0′
5	254°18.4	21.8	356°51.1	16.3′	00°22.6	13.9′	55.1′
6	269°18.2	N23°21.8	11°26.4	16.2′	N00°36.5	14.0′	55.1′
7	284°18.1	21.7	26°01.6	16.2′	00°50.5	14.0′	55.1′
8	299°18.0	21.6	40°36.8	16.2′	01°04.5	14.0′	55.1′
9	314°17.8	·· 21.5	55°12.0	16.1′	01°18.5	14.0′	55.2′
10	329°17.7	21.4	69°47.1	16.1′	01°32.5	14.0′	55.2′
11	344°17.6	21.4	84°22.2	16.1′	01°46.5	14.1′	55.2′
12	359°17.4	N23°21.3	98°57.3	16.0′	N02°00.6	14.0′	55.2′
13	14°17.3	21.2	113°32.4	16.0′	02°14.6	14.0′	55.3′
14	29°17.2	21.1	128°07.4	16.0′	02°28.6	14.1′	55.3′
15	44°17.0	·· 21.0	142°42.4	15.9′	02°42.7	14.0′	55.3′
16	59°16.9	20.9	157°17.3	15.9′	02°56.7	14.0′	55.3′
17	74°16.8	20.8	171°52.2	15.9′	03°10.7	14.1′	55.4′
18	89°16.7	N23°20.8	186°27.1	15.8′	N03°24.8	14.0′	55.4′
19	104°16.5	20.7	201°01.9	15.8′	03°38.8	14.0′	55.4′
20	119°16.4	20.6	215°36.7	15.7′	03°52.8	14.1′	55.5′
21	134°16.3	·· 20.5	230°11.4	15.7′	04°06.9	14.0′	55.5′
22	149°16.1	20.4	244°46.1	15.7′	04°20.9	14.0′	55.5′
23	164°16.0	20.3	259°20.8	15.6′	04°34.9	14.1′	55.5′
	SD = 15.7′	d = 0.1′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:33	22:32	////	////
62°	////	////	02:11	21:54	////	////
60°	////	00:52	02:37	21:28	23:13	////
N 58°	////	01:42	02:58	21:07	22:23	////
56°	////	02:12	03:14	20:51	21:53	////
54°	00:47	02:34	03:29	20:36	21:31	23:17
52°	01:34	02:52	03:41	20:24	21:13	22:31
50°	02:02	03:07	03:52	20:13	20:58	22:03
45°	02:47	03:37	04:14	19:51	20:28	21:18
N 40°	03:18	03:59	04:32	19:33	20:06	20:47
35°	03:41	04:18	04:47	19:18	19:48	20:24
30°	04:00	04:33	05:00	19:05	19:32	20:06
20°	04:29	04:58	05:22	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:36	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	06:16	17:49	18:12	18:38
20°	05:43	06:11	06:35	17:30	17:54	18:22
30°	06:00	06:30	06:56	17:09	17:36	18:05
35°	06:09	06:40	07:08	16:57	17:25	17:57
40°	06:18	06:52	07:23	16:43	17:13	17:47
45°	06:28	07:06	07:39	16:26	17:00	17:37
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:29	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:32	16:19	17:08
58°	07:04	07:57	08:49	15:17	16:09	17:01
S 60°	07:12	08:08	09:06	14:59	15:57	16:54

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	00:21 23:46	23:16	22:47	07:49	09:50	11:47
N 70°	00:02 23:37	23:15	22:53	08:05	09:56	11:44
68°	23:29	23:14	22:58	08:18	10:01	11:42
66°	23:23	23:13	23:02	08:29	10:05	11:40
64°	23:18	23:12	23:06	08:38	10:08	11:38
62°	23:14	23:11	23:09	08:45	10:11	11:37
60°	23:10	23:11	23:12	08:52	10:14	11:36
N 58°	23:06	23:10	23:14	08:57	10:16	11:35
56°	23:03	23:10	23:16	09:02	10:18	11:34
54°	23:00	23:09	23:18	09:07	10:20	11:33
52°	22:58	23:09	23:20	09:11	10:21	11:33
50°	22:55	23:08	23:22	09:14	10:23	11:32
45°	22:50	23:07	23:25	09:22	10:26	11:30
N 40°	22:46	23:07	23:28	09:29	10:29	11:29
35°	22:42	23:06	23:31	09:34	10:31	11:28
30°	22:39	23:06	23:33	09:39	10:33	11:27
20°	22:33	23:05	23:37	09:48	10:36	11:26
N 10°	22:28	23:04	23:41	09:55	10:39	11:24
0°	22:23	23:03	23:44	10:02	10:42	11:23
S 10°	22:18	23:02	23:48	10:09	10:45	11:21
20°	22:13	23:02	23:52	10:16	10:48	11:20
30°	22:07	23:01	23:56	10:24	10:51	11:18
35°	22:04	23:00	23:58	10:29	10:53	11:17
40°	22:00	23:00	·· ··	10:34	10:55	11:16
45°	21:55	22:59	·· ··	10:40	10:58	11:15
S 50°	21:50	22:58	·· ··	10:47	11:01	11:14
52°	21:47	22:58	·· ··	10:50	11:02	11:13
54°	21:45	22:58	·· ··	10:54	11:03	11:12
56°	21:41	22:57	·· ··	10:58	11:05	11:11
58°	21:38	22:57	·· ··	11:03	11:07	11:10
S 60°	21:34	22:56	·· ··	11:08	11:09	11:09

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 20-22 79-62%
24	02:18	02:25	12:02	03:52	16:12	
25	02:31	02:38	12:03	04:33	16:53	
26	02:44	02:50	12:03	05:13	17:33	

June 27, 28, 29 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	274°53.1	192°58.3	N22°55.1	103°49.9	N04°38.9	127°51.0	N14°15.0	249°37.9	N07°54.4
1	289°55.6	207°57.5	55.3	118°51.2	38.4	142°53.0	14.8	264°40.2	54.4
2	304°58.0	222°56.7	55.6	133°52.4	37.8	157°55.0	14.7	279°42.5	54.5
3	320°00.5	237°55.8	·· 55.9	148°53.7	·· 37.2	172°57.1	·· 14.5	294°44.8	·· 54.5
4	335°02.9	252°55.0	56.2	163°55.0	36.7	187°59.1	14.4	309°47.1	54.6
5	350°05.4	267°54.1	56.4	178°56.2	36.1	203°01.2	14.2	324°49.4	54.6
6	5°07.9	282°53.3	N22°56.7	193°57.5	N04°35.5	218°03.2	N14°14.1	339°51.7	N07°54.7
7	20°10.3	297°52.4	57.0	208°58.8	35.0	233°05.2	13.9	354°54.0	54.7
8	35°12.8	312°51.6	57.2	224°00.0	34.4	248°07.3	13.8	9°56.3	54.8
9	50°15.3	327°50.7	·· 57.5	239°01.3	·· 33.9	263°09.3	·· 13.6	24°58.6	·· 54.8
10	65°17.7	342°49.9	57.7	254°02.5	33.3	278°11.4	13.5	40°00.9	54.9
11	80°20.2	357°49.0	58.0	269°03.8	32.7	293°13.4	13.4	55°03.2	54.9
12	95°22.7	12°48.2	N22°58.3	284°05.0	N04°32.2	308°15.4	N14°13.2	70°05.5	N07°55.0
13	110°25.1	27°47.4	58.5	299°06.3	31.6	323°17.5	13.1	85°07.8	55.1
14	125°27.6	42°46.5	58.8	314°07.6	31.0	338°19.5	12.9	100°10.1	55.1
15	140°30.1	57°45.7	·· 59.0	329°08.8	·· 30.5	353°21.6	·· 12.8	115°12.4	·· 55.2
16	155°32.5	72°44.8	59.3	344°10.1	29.9	8°23.6	12.6	130°14.7	55.2
17	170°35.0	87°44.0	59.5	359°11.3	29.3	23°25.6	12.5	145°17.0	55.3
18	185°37.4	102°43.1	N22°59.8	14°12.6	N04°28.8	38°27.7	N14°12.3	160°19.3	N07°55.3
19	200°39.9	117°42.3	23°00.0	29°13.9	28.2	53°29.7	12.2	175°21.6	55.4
20	215°42.4	132°41.4	00.3	44°15.1	27.6	68°31.7	12.0	190°23.9	55.4
21	230°44.8	147°40.6	·· 00.5	59°16.4	·· 27.1	83°33.8	·· 11.9	205°26.2	·· 55.5
22	245°47.3	162°39.7	00.8	74°17.6	26.5	98°35.8	11.7	220°28.5	55.5
23	260°49.8	177°38.9	01.0	89°18.9	25.9	113°37.9	11.6	235°30.8	55.6
Mer.pass. 05:40		ν -0.8′	d 0.3′	ν 1.3′	d 0.6′	ν 2.0′	d 0.1′	ν 2.3′	d 0.1′
		m -3.89		m 1.03		m -1.81		m 0.62	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	275°52.2	192°38.0	N23°01.3	104°20.1	N04°25.4	128°39.9	N14°11.4	250°33.1	N07°55.6
1	290°54.7	207°37.2	01.5	119°21.4	24.8	143°41.9	11.3	265°35.4	55.7
2	305°57.2	222°36.3	01.8	134°22.7	24.3	158°44.0	11.1	280°37.7	55.7
3	320°59.6	237°35.5	·· 02.0	149°23.9	·· 23.7	173°46.0	·· 11.0	295°40.0	·· 55.8
4	336°02.1	252°34.6	02.3	164°25.2	23.1	188°48.0	10.8	310°42.3	55.8
5	351°04.6	267°33.8	02.5	179°26.4	22.6	203°50.1	10.7	325°44.6	55.9
6	6°07.0	282°32.9	N23°02.7	194°27.7	N04°22.0	218°52.1	N14°10.5	340°46.9	N07°56.0
7	21°09.5	297°32.1	03.0	209°28.9	21.4	233°54.2	10.4	355°49.2	56.0
8	36°11.9	312°31.2	03.2	224°30.2	20.9	248°56.2	10.2	10°51.5	56.1
9	51°14.4	327°30.4	·· 03.4	239°31.4	·· 20.3	263°58.2	·· 10.1	25°53.8	·· 56.1
10	66°16.9	342°29.5	03.7	254°32.7	19.7	279°00.3	09.9	40°56.1	56.2
11	81°19.3	357°28.7	03.9	269°33.9	19.2	294°02.3	09.8	55°58.4	56.2
12	96°21.8	12°27.8	N23°04.1	284°35.2	N04°18.6	309°04.3	N14°09.6	71°00.7	N07°56.3
13	111°24.3	27°27.0	04.4	299°36.5	18.0	324°06.4	09.5	86°03.0	56.3
14	126°26.7	42°26.1	04.6	314°37.7	17.5	339°08.4	09.3	101°05.3	56.4
15	141°29.2	57°25.3	·· 04.8	329°39.0	·· 16.9	354°10.4	·· 09.2	116°07.6	·· 56.4
16	156°31.7	72°24.4	05.1	344°40.2	16.3	9°12.5	09.0	131°09.9	56.5
17	171°34.1	87°23.6	05.3	359°41.5	15.7	24°14.5	08.9	146°12.2	56.5
18	186°36.6	102°22.7	N23°05.5	14°42.7	N04°15.2	39°16.6	N14°08.7	161°14.5	N07°56.6
19	201°39.0	117°21.8	05.7	29°44.0	14.6	54°18.6	08.6	176°16.8	56.6
20	216°41.5	132°21.0	05.9	44°45.2	14.0	69°20.6	08.4	191°19.1	56.7
21	231°44.0	147°20.1	·· 06.2	59°46.5	·· 13.5	84°22.7	·· 08.3	206°21.4	·· 56.7
22	246°46.4	162°19.3	06.4	74°47.7	12.9	99°24.7	08.1	221°23.7	56.8
23	261°48.9	177°18.4	06.6	89°49.0	12.3	114°26.7	08.0	236°26.0	56.8
Mer.pass. 05:36		ν -0.8′	d 0.2′	ν 1.3′	d 0.6′	ν 2.0′	d 0.1′	ν 2.3′	d 0.1′
		m -3.89		m 1.04		m -1.81		m 0.62	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	276°51.4	192°17.6	N23°06.8	104°50.2	N04°11.8	129°28.8	N14°07.8	251°28.3	N07°56.9
1	291°53.8	207°16.7	07.0	119°51.5	11.2	144°30.8	07.7	266°30.6	56.9
2	306°56.3	222°15.9	07.3	134°52.7	10.6	159°32.8	07.5	281°32.9	57.0
3	321°58.8	237°15.0	·· 07.5	149°54.0	·· 10.1	174°34.9	·· 07.4	296°35.2	·· 57.0
4	337°01.2	252°14.2	07.7	164°55.2	09.5	189°36.9	07.2	311°37.5	57.1
5	352°03.7	267°13.3	07.9	179°56.5	08.9	204°38.9	07.1	326°39.8	57.1
6	7°06.2	282°12.4	N23°08.1	194°57.7	N04°08.4	219°41.0	N14°06.9	341°42.1	N07°57.2
7	22°08.6	297°11.6	08.3	209°59.0	07.8	234°43.0	06.8	356°44.4	57.2
8	37°11.1	312°10.7	08.5	225°00.2	07.2	249°45.0	06.6	11°46.7	57.3
9	52°13.5	327°09.9	·· 08.7	240°01.5	·· 06.7	264°47.1	·· 06.5	26°49.0	·· 57.3
10	67°16.0	342°09.0	08.9	255°02.7	06.1	279°49.1	06.3	41°51.3	57.4
11	82°18.5	357°08.2	09.1	270°04.0	05.5	294°51.1	06.2	56°53.6	57.4
12	97°20.9	12°07.3	N23°09.3	285°05.2	N04°04.9	309°53.2	N14°06.0	71°55.9	N07°57.5
13	112°23.4	27°06.4	09.5	300°06.5	04.4	324°55.2	05.9	86°58.2	57.5
14	127°25.9	42°05.6	09.7	315°07.7	03.8	339°57.2	05.7	102°00.5	57.6
15	142°28.3	57°04.7	·· 09.9	330°09.0	·· 03.2	354°59.3	·· 05.6	117°02.8	·· 57.6
16	157°30.8	72°03.9	10.1	345°10.2	02.7	10°01.3	05.4	132°05.1	57.7
17	172°33.3	87°03.0	10.3	0°11.5	02.1	25°03.3	05.3	147°07.4	57.8
18	187°35.7	102°02.2	N23°10.5	15°12.7	N04°01.5	40°05.4	N14°05.1	162°09.7	N07°57.8
19	202°38.2	117°01.3	10.7	30°14.0	01.0	55°07.4	05.0	177°12.0	57.9
20	217°40.7	132°00.4	10.9	45°15.2	04°00.4	70°09.4	04.8	192°14.3	57.9
21	232°43.1	146°59.6	·· 11.1	60°16.5	03°59.8	85°11.5	·· 04.7	207°16.6	·· 58.0
22	247°45.6	161°58.7	11.3	75°17.7	59.2	100°13.5	04.5	222°18.9	58.0
23	262°48.0	176°57.9	11.5	90°19.0	58.7	115°15.5	04.4	237°21.3	58.1
Mer.pass. 05:32		ν -0.9′	d 0.2′	ν 1.3′	d 0.6′	ν 2.0′	d 0.2′	ν 2.3′	d 0.1′
		m -3.90		m 1.05		m -1.81		m 0.61	

Stars

	SHA	**Dec**
Alpheratz	357°32.6	29°14.5
Ankaa	353°05.2	-42°09.1
Schedar	349°28.7	56°41.1
Diphda	348°45.3	-17°50.0
Achernar	335°18.9	-57°05.5
Hamal	327°49.0	23°35.5
Polaris	313°17.1	89°22.5
Acamar	315°10.5	-40°11.4
Menkar	314°04.2	4°11.9
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.2
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.6
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.5	-59°36.0
Suhail	222°45.1	-43°32.8
Miaplacidus	221°38.5	-69°50.0
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°50.0
Dubhe	193°38.8	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.7	-63°15.5
Gacrux	171°49.3	-57°16.4
Alioth	166°11.2	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.2	49°10.7
Hadar	148°32.7	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.1	-60°57.2
Kochab	137°19.2	74°02.7
Zuben'ubi	136°53.5	-16°09.4
Alphecca	126°01.7	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.4
Eltanin	90°40.7	51°29.1
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.6
Nunki	75°44.9	-26°15.6
Altair	61°57.7	8°56.5
Peacock	53°02.0	-56°38.5
Deneb	49°24.0	45°22.6
Enif	33°36.6	10°00.1
Al Na'ir	27°30.1	-46°49.4
Fomalhaut	15°12.2	-29°28.3
Scheat	13°43.1	28°13.9
Markab	13°27.7	15°21.2

Jun 27 Sun	**SHA**	**Mer.pass**
Venus	278°05.2	11:09
Mars	188°56.8	17:03
Jupiter	212°57.9	15:27
Saturn	334°44.8	07:20

Jun 28 Mon	**SHA**	**Mer.pass**
Venus	276°45.8	11:10
Mars	188°27.9	17:01
Jupiter	212°47.7	15:23
Saturn	334°40.8	07:17

Jun 29 Tue	**SHA**	**Mer.pass**
Venus	275°26.2	11:11
Mars	187°58.9	16:59
Jupiter	212°37.4	15:20
Saturn	334°36.9	07:13

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.9	N23°20.2	273°55.4	15.6′	N04°49.0	14.0′	55.6′
1	194°15.7	20.1	288°30.0	15.5′	05°03.0	14.0′	55.6′
2	209°15.6	20.0	303°04.5	15.5′	05°17.0	14.0′	55.6′
3	224°15.5	·· 19.9	317°38.9	15.4′	05°31.0	14.0′	55.7′
4	239°15.3	19.8	332°13.3	15.4′	05°45.0	14.0′	55.7′
5	254°15.2	19.7	346°47.7	15.3′	05°59.0	14.0′	55.7′
6	269°15.1	N23°19.6	1°22.0	15.2′	N06°13.0	14.0′	55.7′
7	284°15.0	19.5	15°56.3	15.2′	06°27.0	14.0′	55.8′
8	299°14.8	19.4	30°30.4	15.1′	06°41.0	13.9′	55.8′
9	314°14.7	·· 19.3	45°04.6	15.1′	06°54.9	14.0′	55.8′
10	329°14.6	19.2	59°38.7	15.0′	07°08.9	13.9′	55.9′
11	344°14.4	19.1	74°12.7	15.0′	07°22.8	13.9′	55.9′
12	359°14.3	N23°19.0	88°46.6	14.9′	N07°36.7	13.9′	55.9′
13	14°14.2	18.9	103°20.5	14.8′	07°50.6	13.9′	56.0′
14	29°14.0	18.8	117°54.3	14.8′	08°04.5	13.9′	56.0′
15	44°13.9	·· 18.7	132°28.1	14.7′	08°18.4	13.8′	56.0′
16	59°13.8	18.6	147°01.8	14.6′	08°32.2	13.8′	56.1′
17	74°13.7	18.5	161°35.4	14.6′	08°46.0	13.8′	56.1′
18	89°13.5	N23°18.4	176°09.0	14.5′	N08°59.8	13.8′	56.1′
19	104°13.4	18.3	190°42.4	14.4′	09°13.6	13.8′	56.2′
20	119°13.3	18.2	205°15.8	14.3′	09°27.4	13.7′	56.2′
21	134°13.1	·· 18.1	219°49.2	14.3′	09°41.1	13.8′	56.2′
22	149°13.0	18.0	234°22.4	14.2′	09°54.9	13.6′	56.3′
23	164°12.9	17.9	248°55.6	14.1′	10°08.5	13.7′	56.3′
	SD = 15.7′	d = 0.1′		SD = 15.2′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.8	N23°17.8	263°28.7	14.0′	N10°22.2	13.7′	56.3′
1	194°12.6	17.7	278°01.8	13.9′	10°35.9	13.6′	56.4′
2	209°12.5	17.6	292°34.7	13.9′	10°49.5	13.5′	56.4′
3	224°12.4	·· 17.4	307°07.6	13.8′	11°03.0	13.6′	56.4′
4	239°12.2	17.3	321°40.4	13.7′	11°16.6	13.5′	56.5′
5	254°12.1	17.2	336°13.1	13.6′	11°30.1	13.5′	56.5′
6	269°12.0	N23°17.1	350°45.7	13.5′	N11°43.6	13.4′	56.5′
7	284°11.9	17.0	5°18.2	13.4′	11°57.0	13.4′	56.6′
8	299°11.7	16.9	19°50.6	13.3′	12°10.4	13.4′	56.6′
9	314°11.6	·· 16.8	34°23.0	13.3′	12°23.8	13.3′	56.6′
10	329°11.5	16.6	48°55.2	13.2′	12°37.1	13.3′	56.7′
11	344°11.3	16.5	63°27.4	13.1′	12°50.4	13.3′	56.7′
12	359°11.2	N23°16.4	77°59.5	13.0′	N13°03.7	13.2′	56.7′
13	14°11.1	16.3	92°31.5	12.9′	13°16.9	13.2′	56.8′
14	29°11.0	16.2	107°03.4	12.8′	13°30.1	13.1′	56.8′
15	44°10.8	·· 16.0	121°35.1	12.7′	13°43.2	13.1′	56.8′
16	59°10.7	15.9	136°06.8	12.6′	13°56.3	13.0′	56.9′
17	74°10.6	15.8	150°38.4	12.5′	14°09.3	13.0′	56.9′
18	89°10.4	N23°15.7	165°09.9	12.4′	N14°22.3	12.9′	57.0′
19	104°10.3	15.6	179°41.3	12.3′	14°35.2	12.9′	57.0′
20	119°10.2	15.4	194°12.6	12.2′	14°48.1	12.9′	57.0′
21	134°10.1	·· 15.3	208°43.8	12.1′	15°01.0	12.7′	57.1′
22	149°09.9	15.2	223°14.8	12.0′	15°13.7	12.7′	57.1′
23	164°09.8	15.1	237°45.8	11.9′	15°26.4	12.7′	57.1′
	SD = 15.7′	d = 0.1′		SD = 15.4′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.7	N23°14.9	252°16.7	11.8′	N15°39.1	12.6′	57.2′
1	194°09.5	14.8	266°47.4	11.6′	15°51.7	12.6′	57.2′
2	209°09.4	14.7	281°18.0	11.5′	16°04.3	12.4′	57.3′
3	224°09.3	·· 14.5	295°48.6	11.4′	16°16.7	12.5′	57.3′
4	239°09.2	14.4	310°19.0	11.3′	16°29.2	12.3′	57.3′
5	254°09.0	14.3	324°49.3	11.2′	16°41.5	12.3′	57.4′
6	269°08.9	N23°14.2	339°19.5	11.1′	N16°53.8	12.2′	57.4′
7	284°08.8	14.0	353°49.6	11.0′	17°06.0	12.2′	57.5′
8	299°08.7	13.9	8°19.5	10.8′	17°18.2	12.1′	57.5′
9	314°08.5	·· 13.8	22°49.4	10.7′	17°30.3	12.0′	57.5′
10	329°08.4	13.6	37°19.1	10.6′	17°42.3	11.9′	57.6′
11	344°08.3	13.5	51°48.7	10.5′	17°54.2	11.9′	57.6′
12	359°08.2	N23°13.4	66°18.2	10.4′	N18°06.1	11.8′	57.6′
13	14°08.0	13.2	80°47.5	10.2′	18°17.9	11.7′	57.7′
14	29°07.9	13.1	95°16.8	10.1′	18°29.6	11.6′	57.7′
15	44°07.8	·· 12.9	109°45.9	10.0′	18°41.2	11.5′	57.8′
16	59°07.6	12.8	124°14.9	9.9′	18°52.7	11.5′	57.8′
17	74°07.5	12.7	138°43.8	9.7′	19°04.2	11.4′	57.8′
18	89°07.4	N23°12.5	153°12.5	9.6′	N19°15.6	11.3′	57.9′
19	104°07.3	12.4	167°41.1	9.5′	19°26.9	11.2′	57.9′
20	119°07.1	12.3	182°09.6	9.4′	19°38.1	11.1′	58.0′
21	134°07.0	·· 12.1	196°38.0	9.2′	19°49.2	11.0′	58.0′
22	149°06.9	12.0	211°06.2	9.1′	20°00.2	10.9′	58.0′
23	164°06.8	11.8	225°34.3	9.0′	20°11.1	10.8′	58.1′
	SD = 15.7′	d = 0.1′		SD = 15.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	////	////	01:36	22:29	////	////
62°	////	////	02:13	21:53	////	////
60°	////	00:56	02:39	21:27	23:09	////
N 58°	////	01:45	02:59	21:07	22:21	////
56°	////	02:14	03:16	20:50	21:52	////
54°	00:52	02:36	03:30	20:36	21:30	23:13
52°	01:36	02:54	03:42	20:24	21:12	22:30
50°	02:04	03:09	03:53	20:13	20:58	22:02
45°	02:49	03:38	04:16	19:51	20:28	21:18
N 40°	03:19	04:01	04:33	19:33	20:06	20:47
35°	03:42	04:19	04:48	19:18	19:48	20:24
30°	04:01	04:34	05:01	19:05	19:33	20:06
20°	04:30	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:14
0°	05:11	05:37	06:00	18:07	18:29	18:56
S 10°	05:28	05:54	06:17	17:50	18:12	18:39
20°	05:44	06:11	06:35	17:31	17:55	18:23
30°	06:00	06:30	06:56	17:10	17:36	18:06
35°	06:09	06:41	07:09	16:58	17:26	17:58
40°	06:18	06:52	07:23	16:44	17:14	17:48
45°	06:29	07:06	07:40	16:27	17:01	17:38
S 50°	06:40	07:22	08:00	16:06	16:45	17:26
52°	06:45	07:29	08:10	15:57	16:38	17:21
54°	06:51	07:37	08:21	15:46	16:29	17:16
56°	06:57	07:46	08:33	15:33	16:20	17:09
58°	07:04	07:56	08:48	15:19	16:10	17:03
S 60°	07:11	08:08	09:05	15:01	15:59	16:55

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	22:14	21:24	▭	13:49	16:14	▭
N 70°	22:29	21:56	20:39	13:37	15:44	18:44
68°	22:41	22:19	21:43	13:27	15:22	17:42
66°	22:51	22:37	22:18	13:19	15:06	17:07
64°	22:59	22:52	22:44	13:12	14:52	16:42
62°	23:07	23:05	23:04	13:06	14:41	16:23
60°	23:13	23:16	23:21	13:01	14:31	16:07
N 58°	23:19	23:25	23:35	12:57	14:22	15:54
56°	23:24	23:34	23:47	12:53	14:15	15:43
54°	23:28	23:41	23:58	12:49	14:09	15:33
52°	23:32	23:48	·· ··	12:46	14:03	15:24
50°	23:36	23:54	·· ··	12:43	13:57	15:16
45°	23:44	·· ··	00:07	12:37	13:46	14:59
N 40°	23:51	·· ··	00:18	12:31	13:37	14:45
35°	23:57	·· ··	00:27	12:27	13:29	14:34
30°	·· ··	00:02	00:35	12:23	13:22	14:24
20°	·· ··	00:12	00:49	12:16	13:09	14:07
N 10°	·· ··	00:20	01:02	12:10	12:59	13:52
0°	·· ··	00:27	01:14	12:05	12:49	13:38
S 10°	·· ··	00:35	01:26	11:59	12:39	13:24
20°	·· ··	00:43	01:39	11:53	12:29	13:09
30°	·· ··	00:53	01:53	11:46	12:17	12:52
35°	·· ··	00:59	02:02	11:43	12:10	12:42
40°	00:01	01:05	02:12	11:38	12:03	12:31
45°	00:04	01:12	02:24	11:33	11:54	12:18
S 50°	00:08	01:21	02:38	11:27	11:43	12:02
52°	00:10	01:25	02:45	11:24	11:38	11:55
54°	00:12	01:30	02:52	11:21	11:32	11:47
56°	00:15	01:35	03:00	11:18	11:26	11:38
58°	00:17	01:41	03:10	11:14	11:20	11:27
S 60°	00:20	01:47	03:21	11:10	11:12	11:15

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 52-32%
27	02:57	03:03	12:03	05:54	18:16	
28	03:09	03:15	12:03	06:38	19:01	
29	03:21	03:27	12:03	07:26	19:51	

June 30, 01, 02 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	277°50.5	191°57.0	N23°11.7	105°20.2	N03°58.1	130°17.6	N14°04.2	252°23.6	N07°58.1
1	292°53.0	206°56.1	11.9	120°21.4	57.5	145°19.6	04.1	267°25.9	58.2
2	307°55.4	221°55.3	12.1	135°22.7	57.0	160°21.6	03.9	282°28.2	58.2
3	322°57.9	236°54.4	·· 12.3	150°23.9	·· 56.4	175°23.6	·· 03.8	297°30.5	·· 58.3
4	338°00.4	251°53.6	12.4	165°25.2	55.8	190°25.7	03.6	312°32.8	58.3
5	353°02.8	266°52.7	12.6	180°26.4	55.2	205°27.7	03.5	327°35.1	58.4
6	8°05.3	281°51.8	N23°12.8	195°27.7	N03°54.7	220°29.7	N14°03.3	342°37.4	N07°58.4
7	23°07.8	296°51.0	13.0	210°28.9	54.1	235°31.8	03.1	357°39.7	58.5
8	38°10.2	311°50.1	13.2	225°30.2	53.5	250°33.8	03.0	12°42.0	58.5
9	53°12.7	326°49.3	·· 13.4	240°31.4	·· 52.9	265°35.8	·· 02.8	27°44.3	·· 58.6
10	68°15.1	341°48.4	13.5	255°32.6	52.4	280°37.9	02.7	42°46.6	58.6
11	83°17.6	356°47.5	13.7	270°33.9	51.8	295°39.9	02.5	57°48.9	58.6
12	98°20.1	11°46.7	N23°13.9	285°35.1	N03°51.2	310°41.9	N14°02.4	72°51.2	N07°58.7
13	113°22.5	26°45.8	14.1	300°36.4	50.7	325°44.0	02.2	87°53.5	58.7
14	128°25.0	41°45.0	14.2	315°37.6	50.1	340°46.0	02.1	102°55.8	58.8
15	143°27.5	56°44.1	·· 14.4	330°38.9	·· 49.5	355°48.0	·· 01.9	117°58.1	·· 58.8
16	158°29.9	71°43.2	14.6	345°40.1	48.9	10°50.0	01.8	133°00.5	58.9
17	173°32.4	86°42.4	14.7	0°41.3	48.4	25°52.1	01.6	148°02.8	58.9
18	188°34.9	101°41.5	N23°14.9	15°42.6	N03°47.8	40°54.1	N14°01.5	163°05.1	N07°59.0
19	203°37.3	116°40.6	15.1	30°43.8	47.2	55°56.1	01.3	178°07.4	59.0
20	218°39.8	131°39.8	15.2	45°45.1	46.6	70°58.2	01.2	193°09.7	59.1
21	233°42.3	146°38.9	·· 15.4	60°46.3	·· 46.1	86°00.2	·· 01.0	208°12.0	·· 59.1
22	248°44.7	161°38.0	15.6	75°47.6	45.5	101°02.2	00.9	223°14.3	59.2
23	263°47.2	176°37.2	15.7	90°48.8	44.9	116°04.2	00.7	238°16.6	59.2
Mer.pass. 05:28		ν -0.9′	d 0.2′	m -3.90	ν 1.2′	d 0.6′	m 1.06	ν 2.0′	d 0.2′ m -1.80	ν 2.3′	d 0.1′ m 0.61

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°49.6	191°36.3	N23°15.9	105°50.0	N03°44.4	131°06.3	N14°00.6	253°18.9	N07°59.3
1	293°52.1	206°35.5	16.1	120°51.3	43.8	146°08.3	00.4	268°21.2	59.3
2	308°54.6	221°34.6	16.2	135°52.5	43.2	161°10.3	00.2	283°23.5	59.4
3	323°57.0	236°33.7	·· 16.4	150°53.8	·· 42.6	176°12.4	14°00.1	298°25.8	·· 59.4
4	338°59.5	251°32.9	16.5	165°55.0	42.1	191°14.4	13°59.9	313°28.2	59.5
5	354°02.0	266°32.0	16.7	180°56.2	41.5	206°16.4	59.8	328°30.5	59.5
6	9°04.4	281°31.1	N23°16.8	195°57.5	N03°40.9	221°18.4	N13°59.6	343°32.8	N07°59.6
7	24°06.9	296°30.3	17.0	210°58.7	40.3	236°20.5	59.5	358°35.1	59.6
8	39°09.4	311°29.4	17.1	226°00.0	39.8	251°22.5	59.3	13°37.4	59.7
9	54°11.8	326°28.5	·· 17.3	241°01.2	·· 39.2	266°24.5	·· 59.2	28°39.7	·· 59.7
10	69°14.3	341°27.7	17.4	256°02.4	38.6	281°26.6	59.0	43°42.0	59.8
11	84°16.8	356°26.8	17.6	271°03.7	38.0	296°28.6	58.9	58°44.3	59.8
12	99°19.2	11°25.9	N23°17.7	286°04.9	N03°37.5	311°30.6	N13°58.7	73°46.6	N07°59.9
13	114°21.7	26°25.1	17.9	301°06.2	36.9	326°32.6	58.6	88°48.9	07°59.9
14	129°24.1	41°24.2	18.0	316°07.4	36.3	341°34.7	58.4	103°51.2	08°00.0
15	144°26.6	56°23.3	·· 18.2	331°08.6	·· 35.7	356°36.7	·· 58.3	118°53.6	·· 00.0
16	159°29.1	71°22.5	18.3	346°09.9	35.2	11°38.7	58.1	133°55.9	00.1
17	174°31.5	86°21.6	18.5	1°11.1	34.6	26°40.7	57.9	148°58.2	00.1
18	189°34.0	101°20.7	N23°18.6	16°12.3	N03°34.0	41°42.8	N13°57.8	164°00.5	N08°00.2
19	204°36.5	116°19.9	18.7	31°13.6	33.4	56°44.8	57.6	179°02.8	00.2
20	219°38.9	131°19.0	18.9	46°14.8	32.9	71°46.8	57.5	194°05.1	00.2
21	234°41.4	146°18.1	·· 19.0	61°16.0	·· 32.3	86°48.8	·· 57.3	209°07.4	·· 00.3
22	249°43.9	161°17.3	19.2	76°17.3	31.7	101°50.9	57.2	224°09.7	00.3
23	264°46.3	176°16.4	19.3	91°18.5	31.1	116°52.9	57.0	239°12.0	00.4
Mer.pass. 05:24		ν -0.9′	d 0.2′	m -3.90	ν 1.2′	d 0.6′	m 1.07	ν 2.0′	d 0.2′ m -1.80	ν 2.3′	d 0.0′ m 0.61

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°48.8	191°15.5	N23°19.4	106°19.8	N03°30.5	131°54.9	N13°56.9	254°14.4	N08°00.4
1	294°51.3	206°14.7	19.6	121°21.0	30.0	146°57.0	56.7	269°16.7	00.5
2	309°53.7	221°13.8	19.7	136°22.2	29.4	161°59.0	56.6	284°19.0	00.5
3	324°56.2	236°12.9	·· 19.8	151°23.5	·· 28.8	177°01.0	·· 56.4	299°21.3	·· 00.6
4	339°58.6	251°12.1	19.9	166°24.7	28.2	192°03.0	56.3	314°23.6	00.6
5	355°01.1	266°11.2	20.1	181°25.9	27.7	207°05.1	56.1	329°25.9	00.7
6	10°03.6	281°10.3	N23°20.2	196°27.2	N03°27.1	222°07.1	N13°55.9	344°28.2	N08°00.7
7	25°06.0	296°09.5	20.3	211°28.4	26.5	237°09.1	55.8	359°30.5	00.8
8	40°08.5	311°08.6	20.4	226°29.6	25.9	252°11.1	55.6	14°32.9	00.8
9	55°11.0	326°07.7	·· 20.6	241°30.9	·· 25.4	267°13.2	·· 55.5	29°35.2	·· 00.9
10	70°13.4	341°06.9	20.7	256°32.1	24.8	282°15.2	55.3	44°37.5	00.9
11	85°15.9	356°06.0	20.8	271°33.3	24.2	297°17.2	55.2	59°39.8	01.0
12	100°18.4	11°05.1	N23°20.9	286°34.6	N03°23.6	312°19.2	N13°55.0	74°42.1	N08°01.0
13	115°20.8	26°04.3	21.0	301°35.8	23.0	327°21.2	54.9	89°44.4	01.0
14	130°23.3	41°03.4	21.2	316°37.0	22.5	342°23.3	54.7	104°46.7	01.1
15	145°25.8	56°02.5	·· 21.3	331°38.3	·· 21.9	357°25.3	·· 54.5	119°49.1	·· 01.1
16	160°28.2	71°01.6	21.4	346°39.5	21.3	12°27.3	54.4	134°51.4	01.2
17	175°30.7	86°00.8	21.5	1°40.7	20.7	27°29.3	54.2	149°53.7	01.2
18	190°33.1	100°59.9	N23°21.6	16°42.0	N03°20.1	42°31.4	N13°54.1	164°56.0	N08°01.3
19	205°35.6	115°59.0	21.7	31°43.2	19.6	57°33.4	53.9	179°58.3	01.3
20	220°38.1	130°58.2	21.8	46°44.4	19.0	72°35.4	53.8	195°00.6	01.4
21	235°40.5	145°57.3	·· 21.9	61°45.7	·· 18.4	87°37.4	·· 53.6	210°02.9	·· 01.4
22	250°43.0	160°56.4	22.1	76°46.9	17.8	102°39.5	53.5	225°05.3	01.5
23	265°45.5	175°55.6	22.2	91°48.1	17.3	117°41.5	53.3	240°07.6	01.5
Mer.pass. 05:20		ν -0.9′	d 0.1′	m -3.90	ν 1.2′	d 0.6′	m 1.07	ν 2.0′	d 0.2′ m -1.80	ν 2.3′	d 0.0′ m 0.60

Stars

	SHA	Dec
Alpheratz	357°32.6	29°14.5
Ankaa	353°05.2	-42°09.1
Schedar	349°28.7	56°41.1
Diphda	348°45.3	-17°49.9
Achernar	335°18.9	-57°05.5
Hamal	327°49.0	23°35.5
Polaris	313°15.6	89°22.5
Acamar	315°10.5	-40°11.4
Menkar	314°04.2	4°11.9
Mirfak	308°25.6	49°57.3
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.2
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.6
Sirius	258°24.8	-16°45.3
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.5	-59°36.0
Suhail	222°45.2	-43°32.8
Miaplacidus	221°38.5	-69°50.0
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.4
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.8	-63°15.5
Gacrux	171°49.3	-57°16.4
Alioth	166°11.2	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.3	49°10.7
Hadar	148°32.8	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.1	-60°57.2
Kochab	137°19.3	74°02.7
Zuben'ubi	136°53.5	-16°09.4
Alphecca	126°01.8	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.6
Nunki	75°44.9	-26°15.6
Altair	61°57.6	8°56.5
Peacock	53°02.0	-56°38.5
Deneb	49°24.0	45°22.6
Enif	33°36.6	10°00.1
Al Na'ir	27°30.1	-46°49.4
Fomalhaut	15°12.1	-29°28.3
Scheat	13°43.1	28°13.9
Markab	13°27.7	15°21.2

Jun 30 Wed	SHA	Mer.pass
Venus	274°06.5	11:13
Mars	187°29.7	16:57
Jupiter	212°27.0	15:17
Saturn	334°33.0	07:09

Jul 01 Thu	SHA	Mer.pass
Venus	272°46.7	11:14
Mars	187°00.4	16:55
Jupiter	212°16.6	15:14
Saturn	334°29.3	07:06

Jul 02 Fri	SHA	Mer.pass
Venus	271°26.8	11:16
Mars	186°31.0	16:53
Jupiter	212°06.1	15:10
Saturn	334°25.6	07:02

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°06.6	N23°11.7	240°02.3	8.8′	N20°21.9	10.7′	58.1′
1	194°06.5	11.5	254°30.1	8.7′	20°32.6	10.7′	58.2′
2	209°06.4	11.4	268°57.9	8.6′	20°43.3	10.5′	58.2′
3	224°06.3	·· 11.2	283°25.4	8.5′	20°53.8	10.4′	58.2′
4	239°06.1	11.1	297°52.9	8.3′	21°04.2	10.3′	58.3′
5	254°06.0	11.0	312°20.2	8.2′	21°14.5	10.2′	58.3′
6	269°05.9	N23°10.8	326°47.4	8.1′	N21°24.7	10.1′	58.4′
7	284°05.8	10.7	341°14.5	7.9′	21°34.8	10.0′	58.4′
8	299°05.6	10.5	355°41.4	7.8′	21°44.8	9.9′	58.4′
9	314°05.5	·· 10.4	10°08.2	7.7′	21°54.7	9.8′	58.5′
10	329°05.4	10.2	24°34.9	7.5′	22°04.5	9.6′	58.5′
11	344°05.3	10.1	39°01.4	7.4′	22°14.1	9.5′	58.6′
12	359°05.1	N23°09.9	53°27.8	7.3′	N22°23.6	9.4′	58.6′
13	14°05.0	09.7	67°54.1	7.1′	22°33.0	9.3′	58.6′
14	29°04.9	09.6	82°20.2	7.0′	22°42.3	9.2′	58.7′
15	44°04.8	·· 09.4	96°46.2	6.9′	22°51.5	9.0′	58.7′
16	59°04.7	09.3	111°12.0	6.7′	23°00.5	8.9′	58.7′
17	74°04.5	09.1	125°37.8	6.6′	23°09.4	8.8′	58.8′
18	89°04.4	N23°09.0	140°03.4	6.5′	N23°18.2	8.6′	58.8′
19	104°04.3	08.8	154°28.9	6.3′	23°26.8	8.5′	58.9′
20	119°04.2	08.7	168°54.2	6.2′	23°35.3	8.4′	58.9′
21	134°04.0	·· 08.5	183°19.4	6.1′	23°43.7	8.2′	58.9′
22	149°03.9	08.3	197°44.5	5.9′	23°51.9	8.1′	59.0′
23	164°03.8	08.2	212°09.4	5.8′	24°00.0	7.9′	59.0′
	SD = 15.7′	d = 0.1′	SD = 15.9′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°03.7	N23°08.0	226°34.2	5.7′	N24°07.9	7.8′	59.1′
1	194°03.5	07.9	240°58.9	5.6′	24°15.7	7.7′	59.1′
2	209°03.4	07.7	255°23.5	5.4′	24°23.4	7.5′	59.1′
3	224°03.3	·· 07.5	269°47.9	5.3′	24°30.9	7.4′	59.2′
4	239°03.2	07.4	284°12.2	5.2′	24°38.3	7.2′	59.2′
5	254°03.1	07.2	298°36.4	5.1′	24°45.5	7.0′	59.2′
6	269°02.9	N23°07.0	313°00.5	4.9′	N24°52.5	6.9′	59.3′
7	284°02.8	06.9	327°24.4	4.8′	24°59.4	6.8′	59.3′
8	299°02.7	06.7	341°48.2	4.7′	25°06.2	6.6′	59.3′
9	314°02.6	·· 06.5	356°11.9	4.6′	25°12.8	6.4′	59.4′
10	329°02.4	06.4	10°35.5	4.5′	25°19.2	6.3′	59.4′
11	344°02.3	06.2	24°59.0	4.3′	25°25.5	6.0′	59.5′
12	359°02.2	N23°06.0	39°22.3	4.2′	N25°31.5	6.0′	59.5′
13	14°02.1	05.9	53°45.5	4.1′	25°37.5	5.7′	59.5′
14	29°02.0	05.7	68°08.6	4.0′	25°43.2	5.6′	59.6′
15	44°01.8	·· 05.5	82°31.6	3.9′	25°48.8	5.5′	59.6′
16	59°01.7	05.4	96°54.5	3.8′	25°54.3	5.2′	59.6′
17	74°01.6	05.2	111°17.3	3.7′	25°59.5	5.1′	59.7′
18	89°01.5	N23°05.0	125°40.0	3.6′	N26°04.6	4.9′	59.7′
19	104°01.3	04.8	140°02.6	3.5′	26°09.5	4.7′	59.7′
20	119°01.2	04.7	154°25.0	3.4′	26°14.2	4.5′	59.8′
21	134°01.1	·· 04.5	168°47.4	3.3′	26°18.7	4.4′	59.8′
22	149°01.0	04.3	183°09.7	3.2′	26°23.1	4.2′	59.8′
23	164°00.9	04.1	197°31.8	3.1′	26°27.3	4.0′	59.9′
	SD = 15.7′	d = 0.2′	SD = 16.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°00.7	N23°04.0	211°53.9	3.0′	N26°31.3	3.8′	59.9′
1	194°00.6	03.8	226°15.9	2.9′	26°35.1	3.6′	59.9′
2	209°00.5	03.6	240°37.8	2.8′	26°38.7	3.4′	60.0′
3	224°00.4	·· 03.4	254°59.6	2.7′	26°42.1	3.3′	60.0′
4	239°00.3	03.2	269°21.3	2.6′	26°45.4	3.0′	60.0′
5	254°00.1	03.1	283°43.0	2.6′	26°48.4	2.9′	60.1′
6	269°00.0	N23°02.9	298°04.5	2.5′	N26°51.3	2.6′	60.1′
7	283°59.9	02.7	312°26.0	2.4′	26°53.9	2.5′	60.1′
8	298°59.8	02.5	326°47.4	2.3′	26°56.4	2.3′	60.2′
9	313°59.7	·· 02.3	341°08.7	2.3′	26°58.7	2.0′	60.2′
10	328°59.5	02.1	355°30.0	2.2′	27°00.7	1.9′	60.2′
11	343°59.4	02.0	9°51.2	2.1′	27°02.6	1.7′	60.2′
12	358°59.3	N23°01.8	24°12.4	2.1′	N27°04.3	1.5′	60.3′
13	13°59.2	01.6	38°33.4	2.0′	27°05.8	1.2′	60.3′
14	28°59.1	01.4	52°54.4	2.0′	27°07.0	1.1′	60.3′
15	43°59.0	·· 01.2	67°15.4	1.9′	27°08.1	0.9′	60.4′
16	58°58.8	01.0	81°36.3	1.9′	27°09.0	0.6′	60.4′
17	73°58.7	00.8	95°57.2	1.8′	27°09.6	0.5′	60.4′
18	88°58.6	N23°00.6	110°18.0	1.8′	N27°10.1	0.3′	60.4′
19	103°58.5	00.5	124°38.8	1.7′	27°10.4	0.0′	60.5′
20	118°58.4	00.3	138°59.5	1.7′	27°10.4	0.1′	60.5′
21	133°58.2	23°00.1	153°20.2	1.7′	27°10.3	0.4′	60.5′
22	148°58.1	22°59.9	167°40.9	1.6′	27°09.9	0.6′	60.5′
23	163°58.0	59.7	182°01.5	1.6′	27°09.3	0.8′	60.6′
	SD = 15.7′	d = 0.2′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:17	23:42	////	////
64°	////	////	01:41	22:26	////	////
62°	////	////	02:17	21:50	////	////
60°	////	01:03	02:42	21:25	23:03	////
N 58°	////	01:48	03:02	21:05	22:18	////
56°	////	02:17	03:18	20:49	21:50	////
54°	00:58	02:38	03:32	20:35	21:29	23:08
52°	01:40	02:56	03:44	20:23	21:11	22:27
50°	02:06	03:11	03:55	20:13	20:57	22:01
45°	02:51	03:40	04:17	19:50	20:28	21:17
N 40°	03:21	04:02	04:35	19:33	20:05	20:47
35°	03:43	04:20	04:50	19:18	19:48	20:24
30°	04:02	04:35	05:02	19:05	19:33	20:06
20°	04:30	05:00	05:24	18:43	19:08	19:37
N 10°	04:53	05:20	05:43	18:25	18:48	19:15
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	05:28	05:55	06:17	17:50	18:13	18:39
20°	05:44	06:12	06:36	17:32	17:56	18:23
30°	06:00	06:30	06:57	17:11	17:38	18:07
35°	06:09	06:41	07:09	16:59	17:27	17:59
40°	06:18	06:52	07:23	16:45	17:16	17:50
45°	06:28	07:06	07:39	16:29	17:02	17:39
S 50°	06:40	07:21	08:00	16:08	16:47	17:28
52°	06:45	07:29	08:09	15:59	16:39	17:23
54°	06:51	07:37	08:20	15:48	16:31	17:17
56°	06:57	07:46	08:33	15:35	16:22	17:11
58°	07:03	07:56	08:47	15:21	16:12	17:05
S 60°	07:11	08:07	09:04	15:04	16:01	16:57

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°	21:30			19:50		
64°	22:32			18:49		
62°	23:06	23:17	·· ··	18:15	20:11	21:42
60°	23:32	23:56	·· ··	17:50	19:32	20:54
N 58°	23:52	·· ··	00:23	17:31	19:05	20:24
56°	·· ··	00:09	00:45	17:14	18:44	20:00
54°	·· ··	00:23	01:03	17:00	18:27	19:41
52°	00:08	00:36	01:18	16:48	18:12	19:25
50°	00:16	00:47	01:31	16:38	17:59	19:11
45°	00:34	01:10	01:58	16:16	17:32	18:43
N 40°	00:49	01:29	02:20	15:58	17:11	18:21
35°	01:02	01:45	02:38	15:43	16:53	18:02
30°	01:13	01:58	02:53	15:30	16:38	17:46
20°	01:32	02:22	03:19	15:08	16:13	17:19
N 10°	01:49	02:42	03:42	14:49	15:51	16:56
0°	02:05	03:02	04:03	14:31	15:30	16:34
S 10°	02:21	03:21	04:25	14:14	15:10	16:13
20°	02:38	03:42	04:48	13:55	14:48	15:49
30°	02:58	04:06	05:15	13:33	14:23	15:22
35°	03:10	04:20	05:30	13:21	14:08	15:06
40°	03:23	04:36	05:49	13:06	13:51	14:47
45°	03:39	04:56	06:11	12:49	13:30	14:25
S 50°	03:59	05:21	06:39	12:28	13:04	13:56
52°	04:08	05:33	06:53	12:18	12:52	13:42
54°	04:19	05:47	07:10	12:07	12:38	13:26
56°	04:31	06:04	07:29	11:54	12:21	13:07
58°	04:45	06:23	07:52	11:39	12:01	12:43
S 60°	05:02	06:47	08:24	11:22	11:37	12:11

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 22-7%
30	03:33	03:39	12:04	08:18	20:46	
01	03:45	03:51	12:04	09:16	21:47	
02	03:57	04:03	12:04	10:19	22:52	

July 03, 04, 05 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°47.9	190°54.7	N23°22.3	106°49.3	N03°16.7	132°43.5	N13°53.2	255°09.9	N08°01.6
1	295°50.4	205°53.8	22.4	121°50.6	16.1	147°45.5	53.0	270°12.2	01.6
2	310°52.9	220°52.9	22.5	136°51.8	15.5	162°47.6	52.8	285°14.5	01.7
3	325°55.3	235°52.1	·· 22.6	151°53.0	·· 14.9	177°49.6	·· 52.7	300°16.8	·· 01.7
4	340°57.8	250°51.2	22.7	166°54.3	14.4	192°51.6	52.5	315°19.1	01.7
5	356°00.3	265°50.3	22.8	181°55.5	13.8	207°53.6	52.4	330°21.5	01.8
6	11°02.7	280°49.5	N23°22.9	196°56.7	N03°13.2	222°55.6	N13°52.2	345°23.8	N08°01.8
7	26°05.2	295°48.6	23.0	211°58.0	12.6	237°57.7	52.1	0°26.1	01.9
8	41°07.6	310°47.7	23.1	226°59.2	12.0	252°59.7	51.9	15°28.4	01.9
9	56°10.1	325°46.8	·· 23.2	242°00.4	·· 11.5	268°01.7	·· 51.7	30°30.7	·· 02.0
10	71°12.6	340°46.0	23.2	257°01.6	10.9	283°03.7	51.6	45°33.0	02.0
11	86°15.0	355°45.1	23.3	272°02.9	10.3	298°05.8	51.4	60°35.4	02.1
12	101°17.5	10°44.2	N23°23.4	287°04.1	N03°09.7	313°07.8	N13°51.3	75°37.7	N08°02.1
13	116°20.0	25°43.4	23.5	302°05.3	09.1	328°09.8	51.1	90°40.0	02.2
14	131°22.4	40°42.5	23.6	317°06.6	08.6	343°11.8	51.0	105°42.3	02.2
15	146°24.9	55°41.6	·· 23.7	332°07.8	·· 08.0	358°13.8	·· 50.8	120°44.6	·· 02.2
16	161°27.4	70°40.7	23.8	347°09.0	07.4	13°15.9	50.7	135°46.9	02.3
17	176°29.8	85°39.9	23.9	2°10.2	06.8	28°17.9	50.5	150°49.3	02.3
18	191°32.3	100°39.0	N23°23.9	17°11.5	N03°06.2	43°19.9	N13°50.3	165°51.6	N08°02.4
19	206°34.8	115°38.1	24.0	32°12.7	05.7	58°21.9	50.2	180°53.9	02.4
20	221°37.2	130°37.2	24.1	47°13.9	05.1	73°23.9	50.0	195°56.2	02.5
21	236°39.7	145°36.4	·· 24.2	62°15.1	·· 04.5	88°26.0	·· 49.9	210°58.5	·· 02.5
22	251°42.1	160°35.5	24.3	77°16.4	03.9	103°28.0	49.7	226°00.8	02.6
23	266°44.6	175°34.6	24.3	92°17.6	03.3	118°30.0	49.6	241°03.2	02.6
Mer.pass. 05:16		ν -0.9′	d 0.1′	ν 1.2′	d 0.6′	ν 2.0′	d 0.2′	ν 2.3′	d 0.0′
		m -3.90		m 1.08		m -1.79		m 0.60	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281°47.1	190°33.8	N23°24.4	107°18.8	N03°02.7	133°32.0	N13°49.4	256°05.5	N08°02.6
1	296°49.5	205°32.9	24.5	122°20.0	02.2	148°34.0	49.2	271°07.8	02.7
2	311°52.0	220°32.0	24.6	137°21.3	01.6	163°36.1	49.1	286°10.1	02.7
3	326°54.5	235°31.1	·· 24.6	152°22.5	·· 01.0	178°38.1	·· 48.9	301°12.4	·· 02.8
4	341°56.9	250°30.3	24.7	167°23.7	03°00.4	193°40.1	48.8	316°14.8	02.8
5	356°59.4	265°29.4	24.8	182°24.9	02°59.8	208°42.1	48.6	331°17.1	02.9
6	12°01.9	280°28.5	N23°24.9	197°26.2	N02°59.3	223°44.1	N13°48.5	346°19.4	N08°02.9
7	27°04.3	295°27.6	24.9	212°27.4	58.7	238°46.2	48.3	1°21.7	03.0
8	42°06.8	310°26.8	25.0	227°28.6	58.1	253°48.2	48.1	16°24.0	03.0
9	57°09.3	325°25.9	·· 25.1	242°29.8	·· 57.5	268°50.2	·· 48.0	31°26.4	·· 03.0
10	72°11.7	340°25.0	25.1	257°31.1	56.9	283°52.2	47.8	46°28.7	03.1
11	87°14.2	355°24.1	25.2	272°32.3	56.3	298°54.2	47.7	61°31.0	03.1
12	102°16.6	10°23.3	N23°25.2	287°33.5	N02°55.8	313°56.3	N13°47.5	76°33.3	N08°03.2
13	117°19.1	25°22.4	25.3	302°34.7	55.2	328°58.3	47.4	91°35.6	03.2
14	132°21.6	40°21.5	25.4	317°36.0	54.6	344°00.3	47.2	106°38.0	03.3
15	147°24.0	55°20.7	·· 25.4	332°37.2	·· 54.0	359°02.3	·· 47.0	121°40.3	·· 03.3
16	162°26.5	70°19.8	25.5	347°38.4	53.4	14°04.3	46.9	136°42.6	03.3
17	177°29.0	85°18.9	25.5	2°39.6	52.8	29°06.3	46.7	151°44.9	03.4
18	192°31.4	100°18.0	N23°25.6	17°40.8	N02°52.3	44°08.4	N13°46.6	166°47.2	N08°03.4
19	207°33.9	115°17.2	25.6	32°42.1	51.7	59°10.4	46.4	181°49.6	03.5
20	222°36.4	130°16.3	25.7	47°43.3	51.1	74°12.4	46.3	196°51.9	03.5
21	237°38.8	145°15.4	·· 25.7	62°44.5	·· 50.5	89°14.4	·· 46.1	211°54.2	·· 03.6
22	252°41.3	160°14.5	25.8	77°45.7	49.9	104°16.4	45.9	226°56.5	03.6
23	267°43.8	175°13.7	25.8	92°46.9	49.3	119°18.5	45.8	241°58.8	03.7
Mer.pass. 05:12		ν -0.9′	d 0.1′	ν 1.2′	d 0.6′	ν 2.0′	d 0.2′	ν 2.3′	d 0.0′
		m -3.90		m 1.09		m -1.79		m 0.59	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°46.2	190°12.8	N23°25.9	107°48.2	N02°48.8	134°20.5	N13°45.6	257°01.2	N08°03.7
1	297°48.7	205°11.9	25.9	122°49.4	48.2	149°22.5	45.5	272°03.5	03.7
2	312°51.1	220°11.0	26.0	137°50.6	47.6	164°24.5	45.3	287°05.8	03.8
3	327°53.6	235°10.2	·· 26.0	152°51.8	·· 47.0	179°26.5	·· 45.1	302°08.1	·· 03.8
4	342°56.1	250°09.3	26.1	167°53.0	46.4	194°28.5	45.0	317°10.5	03.9
5	357°58.5	265°08.4	26.1	182°54.3	45.8	209°30.6	44.8	332°12.8	03.9
6	13°01.0	280°07.5	N23°26.2	197°55.5	N02°45.2	224°32.6	N13°44.7	347°15.1	N08°04.0
7	28°03.5	295°06.7	26.2	212°56.7	44.7	239°34.6	44.5	2°17.4	04.0
8	43°05.9	310°05.8	26.2	227°57.9	44.1	254°36.6	44.4	17°19.7	04.0
9	58°08.4	325°04.9	·· 26.3	242°59.1	·· 43.5	269°38.6	·· 44.2	32°22.1	·· 04.1
10	73°10.9	340°04.0	26.3	258°00.4	42.9	284°40.6	44.0	47°24.4	04.1
11	88°13.3	355°03.1	26.3	273°01.6	42.3	299°42.7	43.9	62°26.7	04.2
12	103°15.8	10°02.3	N23°26.4	288°02.8	N02°41.7	314°44.7	N13°43.7	77°29.0	N08°04.2
13	118°18.2	25°01.4	26.4	303°04.0	41.2	329°46.7	43.6	92°31.4	04.3
14	133°20.7	40°00.5	26.4	318°05.2	40.6	344°48.7	43.4	107°33.7	04.3
15	148°23.2	54°59.6	·· 26.5	333°06.4	·· 40.0	359°50.7	·· 43.2	122°36.0	·· 04.3
16	163°25.6	69°58.8	26.5	348°07.7	39.4	14°52.7	43.1	137°38.3	04.4
17	178°28.1	84°57.9	26.5	3°08.9	38.8	29°54.8	42.9	152°40.7	04.4
18	193°30.6	99°57.0	N23°26.6	18°10.1	N02°38.2	44°56.8	N13°42.8	167°43.0	N08°04.5
19	208°33.0	114°56.1	26.6	33°11.3	37.6	59°58.8	42.6	182°45.3	04.5
20	223°35.5	129°55.3	26.6	48°12.5	37.1	75°00.8	42.5	197°47.6	04.5
21	238°38.0	144°54.4	·· 26.6	63°13.7	·· 36.5	90°02.8	·· 42.3	212°50.0	·· 04.6
22	253°40.4	159°53.5	26.6	78°15.0	35.9	105°04.8	42.1	227°52.3	04.6
23	268°42.9	174°52.6	26.7	93°16.2	35.3	120°06.8	42.0	242°54.6	04.7
Mer.pass. 05:08		ν -0.9′	d 0.0′	ν 1.2′	d 0.6′	ν 2.0′	d 0.2′	ν 2.3′	d 0.0′
		m -3.90		m 1.10		m -1.79		m 0.59	

Stars

	SHA	Dec
Alpheratz	357°32.6	29°14.5
Ankaa	353°05.1	-42°09.1
Schedar	349°28.6	56°41.1
Diphda	348°45.3	-17°49.9
Achernar	335°18.9	-57°05.5
Hamal	327°49.0	23°35.5
Polaris	313°14.0	89°22.5
Acamar	315°10.5	-40°11.4
Menkar	314°04.2	4°11.9
Mirfak	308°25.6	49°57.3
Aldebaran	290°37.6	16°33.8
Rigel	281°02.2	-8°10.2
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.6
Sirius	258°24.8	-16°45.2
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.5	-59°36.0
Suhail	222°45.2	-43°32.8
Miaplacidus	221°38.6	-69°50.0
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.3
Denebola	182°22.9	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.8	-63°15.5
Gacrux	171°49.3	-57°16.4
Alioth	166°11.2	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.3	49°10.7
Hadar	148°32.8	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.1	-60°57.2
Kochab	137°19.3	74°02.7
Zuben'ubi	136°53.5	-16°09.4
Alphecca	126°01.8	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.6
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.5
Peacock	53°02.0	-56°38.5
Deneb	49°24.0	45°22.7
Enif	33°36.5	10°00.1
Al Na'ir	27°30.1	-46°49.4
Fomalhaut	15°12.1	-29°28.3
Scheat	13°43.0	28°13.9
Markab	13°27.7	15°21.2

Jul 03 Sat	SHA	Mer.pass
Venus	270°06.8	11:17
Mars	186°01.4	16:51
Jupiter	211°55.6	15:07
Saturn	334°22.0	06:58

Jul 04 Sun	SHA	Mer.pass
Venus	268°46.7	11:18
Mars	185°31.7	16:49
Jupiter	211°44.9	15:04
Saturn	334°18.4	06:55

Jul 05 Mon	SHA	Mer.pass
Venus	267°26.6	11:20
Mars	185°01.9	16:47
Jupiter	211°34.3	15:01
Saturn	334°15.0	06:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°57.9	N22°59.5	196°22.2	1.6′	N27°08.5	0.9′	60.6′
1	193°57.8	59.3	210°42.8	1.6′	27°07.6	1.2′	60.6′
2	208°57.7	59.1	225°03.3	1.6′	27°06.4	1.4′	60.6′
3	223°57.5	·· 58.9	239°23.9	1.5′	27°05.0	1.6′	60.6′
4	238°57.4	58.7	253°44.4	1.5′	27°03.4	1.9′	60.7′
5	253°57.3	58.5	268°05.0	1.5′	27°01.5	2.0′	60.7′
6	268°57.2	N22°58.3	282°25.5	1.5′	N26°59.5	2.2′	60.7′
7	283°57.1	58.1	296°46.0	1.5′	26°57.3	2.5′	60.7′
8	298°57.0	57.9	311°06.5	1.5′	26°54.8	2.6′	60.8′
9	313°56.8	·· 57.7	325°27.1	1.5′	26°52.2	2.9′	60.8′
10	328°56.7	57.5	339°47.6	1.5′	26°49.3	3.0′	60.8′
11	343°56.6	57.3	354°08.1	1.6′	26°46.3	3.3′	60.8′
12	358°56.5	N22°57.1	8°28.7	1.6′	N26°43.0	3.5′	60.8′
13	13°56.4	56.9	22°49.3	1.6′	26°39.5	3.7′	60.8′
14	28°56.3	56.7	37°09.9	1.6′	26°35.8	3.9′	60.9′
15	43°56.1	·· 56.5	51°30.5	1.6′	26°31.9	4.1′	60.9′
16	58°56.0	56.3	65°51.1	1.7′	26°27.8	4.3′	60.9′
17	73°55.9	56.1	80°11.8	1.7′	26°23.5	4.5′	60.9′
18	88°55.8	N22°55.9	94°32.5	1.7′	N26°19.0	4.7′	60.9′
19	103°55.7	55.7	108°53.2	1.8′	26°14.3	5.0′	60.9′
20	118°55.6	55.5	123°14.0	1.8′	26°09.3	5.1′	61.0′
21	133°55.4	·· 55.2	137°34.8	1.9′	26°04.2	5.3′	61.0′
22	148°55.3	55.0	151°55.6	1.9′	25°58.9	5.5′	61.0′
23	163°55.2	54.8	166°16.5	2.0′	25°53.4	5.8′	61.0′
	SD = 15.7′	d = 0.2′	SD = 16.5′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°55.1	N22°54.6	180°37.5	2.0′	N25°47.6	5.9′	61.0′
1	193°55.0	54.4	194°58.5	2.1′	25°41.7	6.1′	61.0′
2	208°54.9	54.2	209°19.6	2.1′	25°35.6	6.3′	61.0′
3	223°54.8	·· 54.0	223°40.7	2.2′	25°29.3	6.5′	61.0′
4	238°54.6	53.8	238°01.9	2.2′	25°22.8	6.7′	61.0′
5	253°54.5	53.6	252°23.1	2.3′	25°16.1	6.9′	61.1′
6	268°54.4	N22°53.3	266°44.4	2.4′	N25°09.2	7.1′	61.1′
7	283°54.3	53.1	281°05.8	2.4′	25°02.1	7.3′	61.1′
8	298°54.2	52.9	295°27.2	2.5′	24°54.8	7.5′	61.1′
9	313°54.1	·· 52.7	309°48.7	2.6′	24°47.3	7.6′	61.1′
10	328°54.0	52.5	324°10.3	2.7′	24°39.7	7.9′	61.1′
11	343°53.9	52.3	338°32.0	2.7′	24°31.8	8.0′	61.1′
12	358°53.7	N22°52.0	352°53.7	2.8′	N24°23.8	8.2′	61.1′
13	13°53.6	51.8	7°15.6	2.9′	24°15.6	8.4′	61.1′
14	28°53.5	51.6	21°37.5	3.0′	24°07.2	8.6′	61.1′
15	43°53.4	·· 51.4	35°59.5	3.1′	23°58.6	8.7′	61.1′
16	58°53.3	51.1	50°21.5	3.2′	23°49.9	8.9′	61.1′
17	73°53.2	50.9	64°43.7	3.3′	23°41.0	9.1′	61.1′
18	88°53.1	N22°50.7	79°06.0	3.4′	N23°31.9	9.3′	61.1′
19	103°53.0	50.5	93°28.3	3.4′	23°22.6	9.4′	61.1′
20	118°52.8	50.3	107°50.8	3.5′	23°13.2	9.6′	61.1′
21	133°52.7	·· 50.0	122°13.3	3.6′	23°03.6	9.8′	61.1′
22	148°52.6	49.8	136°36.0	3.7′	22°53.8	9.9′	61.1′
23	163°52.5	49.6	150°58.7	3.8′	22°43.9	10.1′	61.1′
	SD = 15.7′	d = 0.2′	SD = 16.6′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°52.4	N22°49.3	165°21.5	3.9′	N22°33.8	10.3′	61.1′
1	193°52.3	49.1	179°44.5	4.0′	22°23.5	10.4′	61.1′
2	208°52.2	48.9	194°07.5	4.1′	22°13.1	10.6′	61.1′
3	223°52.1	·· 48.7	208°30.6	4.2′	22°02.5	10.7′	61.1′
4	238°52.0	48.4	222°53.9	4.4′	21°51.8	10.9′	61.1′
5	253°51.8	48.2	237°17.2	4.5′	21°40.9	11.1′	61.1′
6	268°51.7	N22°48.0	251°40.7	4.6′	N21°29.8	11.1′	61.1′
7	283°51.6	47.7	266°04.3	4.7′	21°18.7	11.4′	61.1′
8	298°51.5	47.5	280°27.9	4.8′	21°07.3	11.5′	61.1′
9	313°51.4	·· 47.3	294°51.7	4.9′	20°55.8	11.6′	61.1′
10	328°51.3	47.0	309°15.6	5.0′	20°44.2	11.7′	61.1′
11	343°51.2	46.8	323°39.6	5.1′	20°32.5	11.9′	61.1′
12	358°51.1	N22°46.6	338°03.7	5.2′	N20°20.6	12.0′	61.1′
13	13°51.0	46.3	352°27.9	5.3′	20°08.6	12.2′	61.1′
14	28°50.9	46.1	6°52.3	5.4′	19°56.4	12.3′	61.0′
15	43°50.7	·· 45.9	21°16.7	5.6′	19°44.1	12.4′	61.0′
16	58°50.6	45.6	35°41.3	5.7′	19°31.7	12.6′	61.0′
17	73°50.5	45.4	50°05.9	5.8′	19°19.1	12.7′	61.0′
18	88°50.4	N22°45.1	64°30.7	5.9′	N19°06.4	12.8′	61.0′
19	103°50.3	44.9	78°55.6	6.0′	18°53.6	12.9′	61.0′
20	118°50.2	44.7	93°20.6	6.1′	18°40.7	13.0′	61.0′
21	133°50.1	·· 44.4	107°45.7	6.2′	18°27.7	13.2′	61.0′
22	148°50.0	44.2	122°10.9	6.3′	18°14.5	13.2′	61.0′
23	163°49.9	43.9	136°36.3	6.5′	18°01.3	13.4′	60.9′
	SD = 15.7′	d = 0.2′	SD = 16.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:40	23:23	////	////
64°	////	////	01:47	22:21	////	////
62°	////	////	02:21	21:47	////	////
60°	////	01:10	02:45	21:23	22:56	////
N 58°	////	01:53	03:05	21:03	22:15	////
56°	////	02:20	03:21	20:47	21:48	////
54°	01:05	02:41	03:35	20:34	21:27	23:02
52°	01:44	02:59	03:46	20:22	21:10	22:24
50°	02:10	03:13	03:57	20:12	20:55	21:58
45°	02:53	03:42	04:19	19:50	20:27	21:15
N 40°	03:22	04:04	04:36	19:32	20:05	20:46
35°	03:45	04:21	04:51	19:18	19:47	20:24
30°	04:03	04:36	05:04	19:05	19:32	20:05
20°	04:32	05:01	05:25	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:31	18:57
S 10°	05:29	05:55	06:18	17:51	18:14	18:40
20°	05:45	06:12	06:36	17:33	17:57	18:24
30°	06:01	06:30	06:57	17:12	17:39	18:08
35°	06:09	06:41	07:09	17:00	17:28	18:00
40°	06:18	06:52	07:22	16:47	17:17	17:51
45°	06:28	07:05	07:39	16:30	17:04	17:41
S 50°	06:39	07:21	07:59	16:10	16:48	17:30
52°	06:44	07:28	08:08	16:01	16:41	17:25
54°	06:50	07:36	08:19	15:50	16:33	17:19
56°	06:56	07:44	08:31	15:38	16:25	17:13
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:09	08:05	09:02	15:07	16:04	17:00

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°						
N 70°						23:59
68°						23:24
66°			02:47		23:30	22:59
64°		00:45	03:27	23:18	22:50	22:39
62°	00:02	01:48	03:54	22:14	22:21	22:23
60°	00:50	02:23	04:16	21:39	21:59	22:09
N 58°	01:20	02:48	04:33	21:14	21:42	21:57
56°	01:44	03:08	04:47	20:54	21:26	21:47
54°	02:03	03:24	05:00	20:37	21:13	21:38
52°	02:19	03:39	05:11	20:22	21:02	21:29
50°	02:32	03:51	05:20	20:09	20:51	21:22
45°	03:01	04:17	05:41	19:43	20:30	21:06
N 40°	03:23	04:37	05:57	19:22	20:12	20:53
35°	03:41	04:54	06:11	19:04	19:57	20:42
30°	03:57	05:09	06:23	18:49	19:45	20:32
20°	04:24	05:33	06:43	18:23	19:22	20:15
N 10°	04:47	05:55	07:01	18:01	19:03	20:00
0°	05:09	06:14	07:17	17:40	18:45	19:45
S 10°	05:30	06:34	07:34	17:19	18:26	19:31
20°	05:54	06:55	07:51	16:57	18:07	19:16
30°	06:20	07:20	08:11	16:30	17:44	18:58
35°	06:36	07:34	08:23	16:15	17:30	18:47
40°	06:55	07:51	08:36	15:57	17:14	18:35
45°	07:17	08:10	08:51	15:35	16:56	18:21
S 50°	07:45	08:35	09:11	15:07	16:32	18:03
52°	07:59	08:47	09:20	14:53	16:21	17:55
54°	08:15	09:00	09:30	14:37	16:08	17:46
56°	08:34	09:16	09:41	14:19	15:53	17:35
58°	08:57	09:34	09:54	13:56	15:35	17:23
S 60°	09:28	09:57	10:09	13:26	15:13	17:09

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 29-1 2-1%
03	04:08	04:14	12:04	11:25	23:57	
04	04:20	04:25	12:04	12:30	–:–	
05	04:30	04:36	12:05	13:31	01:01	



July 06, 07, 08 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°45.4	189°51.8	N23°26.7	108°17.4	N02°34.7	135°08.9	N13°41.8	257°56.9	N08°04.7
1	298°47.8	204°50.9	26.7	123°18.6	34.1	150°10.9	41.7	272°59.3	04.8
2	313°50.3	219°50.0	26.7	138°19.8	33.5	165°12.9	41.5	288°01.6	04.8
3	328°52.7	234°49.1	·· 26.7	153°21.0	·· 32.9	180°14.9	·· 41.3	303°03.9	·· 04.8
4	343°55.2	249°48.3	26.7	168°22.2	32.4	195°16.9	41.2	318°06.2	04.9
5	358°57.7	264°47.4	26.8	183°23.5	31.8	210°18.9	41.0	333°08.6	04.9
6	14°00.1	279°46.5	N23°26.8	198°24.7	N02°31.2	225°20.9	N13°40.9	348°10.9	N08°05.0
7	29°02.6	294°45.6	26.8	213°25.9	30.6	240°23.0	40.7	3°13.2	05.0
8	44°05.1	309°44.7	26.8	228°27.1	30.0	255°25.0	40.5	18°15.5	05.0
9	59°07.5	324°43.9	·· 26.8	243°28.3	·· 29.4	270°27.0	·· 40.4	33°17.9	·· 05.1
10	74°10.0	339°43.0	26.8	258°29.5	28.8	285°29.0	40.2	48°20.2	05.1
11	89°12.5	354°42.1	26.8	273°30.7	28.2	300°31.0	40.1	63°22.5	05.2
12	104°14.9	9°41.2	N23°26.8	288°32.0	N02°27.7	315°33.0	N13°39.9	78°24.9	N08°05.2
13	119°17.4	24°40.4	26.8	303°33.2	27.1	330°35.0	39.7	93°27.2	05.3
14	134°19.9	39°39.5	26.8	318°34.4	26.5	345°37.1	39.6	108°29.5	05.3
15	149°22.3	54°38.6	·· 26.8	333°35.6	·· 25.9	0°39.1	·· 39.4	123°31.8	·· 05.3
16	164°24.8	69°37.7	26.8	348°36.8	25.3	15°41.1	39.3	138°34.2	05.4
17	179°27.2	84°36.9	26.8	3°38.0	24.7	30°43.1	39.1	153°36.5	05.4
18	194°29.7	99°36.0	N23°26.8	18°39.2	N02°24.1	45°45.1	N13°38.9	168°38.8	N08°05.5
19	209°32.2	114°35.1	26.8	33°40.4	23.5	60°47.1	38.8	183°41.1	05.5
20	224°34.6	129°34.2	26.8	48°41.7	23.0	75°49.1	38.6	198°43.5	05.5
21	239°37.1	144°33.3	·· 26.8	63°42.9	·· 22.4	90°51.1	·· 38.5	213°45.8	·· 05.6
22	254°39.6	159°32.5	26.8	78°44.1	21.8	105°53.2	38.3	228°48.1	05.6
23	269°42.0	174°31.6	26.8	93°45.3	21.2	120°55.2	38.1	243°50.5	05.7
Mer.pass. 05:04		ν -0.9′	d 0.0′	m -3.90	ν 1.2′	d 0.6′	m 1.10	ν 2.0′	d 0.2′ m -1.78	ν 2.3′	d 0.0′ m 0.59

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	284°44.5	189°30.7	N23°26.8	108°46.5	N02°20.6	135°57.2	N13°38.0	258°52.8	N08°05.7
1	299°47.0	204°29.8	26.8	123°47.7	20.0	150°59.2	37.8	273°55.1	05.7
2	314°49.4	219°29.0	26.8	138°48.9	19.4	166°01.2	37.7	288°57.4	05.8
3	329°51.9	234°28.1	·· 26.7	153°50.1	·· 18.8	181°03.2	·· 37.5	303°59.8	·· 05.8
4	344°54.4	249°27.2	26.7	168°51.3	18.2	196°05.2	37.3	319°02.1	05.9
5	359°56.8	264°26.3	26.7	183°52.5	17.7	211°07.2	37.2	334°04.4	05.9
6	14°59.3	279°25.5	N23°26.7	198°53.8	N02°17.1	226°09.3	N13°37.0	349°06.8	N08°05.9
7	30°01.7	294°24.6	26.7	213°55.0	16.5	241°11.3	36.9	4°09.1	06.0
8	45°04.2	309°23.7	26.7	228°56.2	15.9	256°13.3	36.7	19°11.4	06.0
9	60°06.7	324°22.8	·· 26.6	243°57.4	·· 15.3	271°15.3	·· 36.5	34°13.8	·· 06.1
10	75°09.1	339°21.9	26.6	258°58.6	14.7	286°17.3	36.4	49°16.1	06.1
11	90°11.6	354°21.1	26.6	273°59.8	14.1	301°19.3	36.2	64°18.4	06.1
12	105°14.1	9°20.2	N23°26.6	289°01.0	N02°13.5	316°21.3	N13°36.1	79°20.7	N08°06.2
13	120°16.5	24°19.3	26.5	304°02.2	12.9	331°23.3	35.9	94°23.1	06.2
14	135°19.0	39°18.4	26.5	319°03.4	12.4	346°25.3	35.7	109°25.4	06.3
15	150°21.5	54°17.6	·· 26.5	334°04.6	·· 11.8	1°27.4	·· 35.6	124°27.7	·· 06.3
16	165°23.9	69°16.7	26.5	349°05.8	11.2	16°29.4	35.4	139°30.1	06.3
17	180°26.4	84°15.8	26.4	4°07.0	10.6	31°31.4	35.2	154°32.4	06.4
18	195°28.8	99°14.9	N23°26.4	19°08.2	N02°10.0	46°33.4	N13°35.1	169°34.7	N08°06.4
19	210°31.3	114°14.1	26.4	34°09.5	09.4	61°35.4	34.9	184°37.1	06.5
20	225°33.8	129°13.2	26.3	49°10.7	08.8	76°37.4	34.8	199°39.4	06.5
21	240°36.2	144°12.3	·· 26.3	64°11.9	·· 08.2	91°39.4	·· 34.6	214°41.7	·· 06.5
22	255°38.7	159°11.4	26.3	79°13.1	07.6	106°41.4	34.4	229°44.1	06.6
23	270°41.2	174°10.5	26.2	94°14.3	07.0	121°43.4	34.3	244°46.4	06.6
Mer.pass. 05:00		ν -0.9′	d 0.0′	m -3.90	ν 1.2′	d 0.6′	m 1.11	ν 2.0′	d 0.2′ m -1.78	ν 2.3′	d 0.0′ m 0.58

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	285°43.6	189°09.7	N23°26.2	109°15.5	N02°06.4	136°45.5	N13°34.1	259°48.7	N08°06.6
1	300°46.1	204°08.8	26.1	124°16.7	05.9	151°47.5	34.0	274°51.1	06.7
2	315°48.6	219°07.9	26.1	139°17.9	05.3	166°49.5	33.8	289°53.4	06.7
3	330°51.0	234°07.0	·· 26.1	154°19.1	·· 04.7	181°51.5	·· 33.6	304°55.7	·· 06.8
4	345°53.5	249°06.2	26.0	169°20.3	04.1	196°53.5	33.5	319°58.1	06.8
5	0°56.0	264°05.3	26.0	184°21.5	03.5	211°55.5	33.3	335°00.4	06.8
6	15°58.4	279°04.4	N23°25.9	199°22.7	N02°02.9	226°57.5	N13°33.1	350°02.7	N08°06.9
7	31°00.9	294°03.5	25.9	214°23.9	02.3	241°59.5	33.0	5°05.1	06.9
8	46°03.3	309°02.6	25.8	229°25.1	01.7	257°01.5	32.8	20°07.4	07.0
9	61°05.8	324°01.8	·· 25.8	244°26.3	·· 01.1	272°03.5	·· 32.7	35°09.7	·· 07.0
10	76°08.3	339°00.9	25.7	259°27.5	02°00.5	287°05.5	32.5	50°12.1	07.0
11	91°10.7	354°00.0	25.7	274°28.7	01°59.9	302°07.6	32.3	65°14.4	07.1
12	106°13.2	8°59.1	N23°25.6	289°29.9	N01°59.3	317°09.6	N13°32.2	80°16.7	N08°07.1
13	121°15.7	23°58.3	25.6	304°31.1	58.8	332°11.6	32.0	95°19.1	07.1
14	136°18.1	38°57.4	25.5	319°32.3	58.2	347°13.6	31.8	110°21.4	07.2
15	151°20.6	53°56.5	·· 25.5	334°33.5	·· 57.6	2°15.6	·· 31.7	125°23.7	·· 07.2
16	166°23.1	68°55.6	25.4	349°34.7	57.0	17°17.6	31.5	140°26.1	07.3
17	181°25.5	83°54.8	25.3	4°35.9	56.4	32°19.6	31.4	155°28.4	07.3
18	196°28.0	98°53.9	N23°25.3	19°37.1	N01°55.8	47°21.6	N13°31.2	170°30.7	N08°07.3
19	211°30.5	113°53.0	25.2	34°38.3	55.2	62°23.6	31.0	185°33.1	07.4
20	226°32.9	128°52.1	25.2	49°39.5	54.6	77°25.6	30.9	200°35.4	07.4
21	241°35.4	143°51.2	·· 25.1	64°40.8	·· 54.0	92°27.6	·· 30.7	215°37.7	·· 07.4
22	256°37.8	158°50.4	25.0	79°42.0	53.4	107°29.6	30.5	230°40.1	07.5
23	271°40.3	173°49.5	25.0	94°43.2	52.8	122°31.7	30.4	245°42.4	07.5
Mer.pass. 04:56		ν -0.9′	d 0.0′	m -3.91	ν 1.2′	d 0.6′	m 1.12	ν 2.0′	d 0.2′ m -1.78	ν 2.3′	d 0.0′ m 0.58

Stars

	SHA	Dec
Alpheratz	357°32.5	29°14.5
Ankaa	353°05.1	-42°09.0
Schedar	349°28.6	56°41.1
Diphda	348°45.2	-17°49.9
Achernar	335°18.8	-57°05.5
Hamal	327°49.0	23°35.5
Polaris	313°12.6	89°22.5
Acamar	315°10.5	-40°11.4
Menkar	314°04.2	4°11.9
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.5	16°33.8
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°36.0	-1°11.1
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.6
Sirius	258°24.8	-16°45.2
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.5	-59°36.0
Suhail	222°45.2	-43°32.8
Miaplacidus	221°38.6	-69°50.0
Alphard	217°46.0	-8°46.8
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.8	-63°15.5
Gacrux	171°49.3	-57°16.4
Alioth	166°11.2	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.3	49°10.7
Hadar	148°32.8	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.1	-60°57.2
Kochab	137°19.4	74°02.7
Zuben'ubi	136°53.5	-16°09.4
Alphecca	126°01.8	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.6
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.5
Peacock	53°02.0	-56°38.6
Deneb	49°23.9	45°22.7
Enif	33°36.5	10°00.2
Al Na'ir	27°30.0	-46°49.4
Fomalhaut	15°12.1	-29°28.3
Scheat	13°43.0	28°13.9
Markab	13°27.7	15°21.2

Jul 06 Tue	SHA	Mer.pass
Venus	266°06.4	11:21
Mars	184°32.0	16:45
Jupiter	211°23.5	14:57
Saturn	334°11.6	06:47

Jul 07 Wed	SHA	Mer.pass
Venus	264°46.2	11:23
Mars	184°02.0	16:44
Jupiter	211°12.7	14:54
Saturn	334°08.3	06:43

Jul 08 Thu	SHA	Mer.pass
Venus	263°26.0	11:24
Mars	183°31.8	16:42
Jupiter	211°01.8	14:51
Saturn	334°05.1	06:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°49.8	N22°43.7	151°01.7	6.6′	N17°47.9	13.5′	60.9′
1	193°49.7	43.4	165°27.3	6.7′	17°34.4	13.6′	60.9′
2	208°49.6	43.2	179°53.0	6.8′	17°20.8	13.7′	60.9′
3	223°49.5	·· 42.9	194°18.8	6.9′	17°07.1	13.8′	60.9′
4	238°49.3	42.7	208°44.7	7.0′	16°53.3	13.9′	60.9′
5	253°49.2	42.4	223°10.7	7.1′	16°39.4	13.9′	60.8′
6	268°49.1	N22°42.2	237°36.8	7.2′	N16°25.5	14.1′	60.8′
7	283°49.0	42.0	252°03.0	7.3′	16°11.4	14.2′	60.8′
8	298°48.9	41.7	266°29.4	7.5′	15°57.2	14.3′	60.8′
9	313°48.8	·· 41.5	280°55.8	7.6′	15°42.9	14.3′	60.8′
10	328°48.7	41.2	295°22.4	7.7′	15°28.6	14.5′	60.8′
11	343°48.6	41.0	309°49.1	7.8′	15°14.1	14.5′	60.7′
12	358°48.5	N22°40.7	324°15.8	7.9′	N14°59.6	14.6′	60.7′
13	13°48.4	40.4	338°42.7	8.0′	14°45.0	14.7′	60.7′
14	28°48.3	40.2	353°09.7	8.1′	14°30.3	14.8′	60.7′
15	43°48.2	·· 39.9	7°36.8	8.2′	14°15.5	14.9′	60.7′
16	58°48.1	39.7	22°04.0	8.3′	14°00.6	14.9′	60.6′
17	73°48.0	39.4	36°31.3	8.4′	13°45.7	15.0′	60.6′
18	88°47.9	N22°39.2	50°58.7	8.5′	N13°30.7	15.0′	60.6′
19	103°47.8	38.9	65°26.2	8.6′	13°15.7	15.2′	60.6′
20	118°47.7	38.7	79°53.8	8.7′	13°00.5	15.2′	60.5′
21	133°47.6	·· 38.4	94°21.5	8.8′	12°45.3	15.2′	60.5′
22	148°47.4	38.1	108°49.3	8.9′	12°30.1	15.3′	60.5′
23	163°47.3	37.9	123°17.2	9.0′	12°14.8	15.4′	60.5′
	SD = 15.7′	*d* = 0.2′	SD = 16.6′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°47.2	N22°37.6	137°45.2	9.1′	N11°59.4	15.4′	60.4′
1	193°47.1	37.4	152°13.3	9.2′	11°44.0	15.5′	60.4′
2	208°47.0	37.1	166°41.5	9.3′	11°28.5	15.6′	60.4′
3	223°46.9	·· 36.8	181°09.8	9.4′	11°12.9	15.5′	60.4′
4	238°46.8	36.6	195°38.1	9.5′	10°57.4	15.7′	60.3′
5	253°46.7	36.3	210°06.6	9.6′	10°41.7	15.7′	60.3′
6	268°46.6	N22°36.0	224°35.2	9.6′	N10°26.0	15.7′	60.3′
7	283°46.5	35.8	239°03.8	9.7′	10°10.3	15.8′	60.3′
8	298°46.4	35.5	253°32.5	9.8′	09°54.5	15.8′	60.2′
9	313°46.3	·· 35.2	268°01.4	9.9′	09°38.7	15.8′	60.2′
10	328°46.2	35.0	282°30.3	10.0′	09°22.9	15.9′	60.2′
11	343°46.1	34.7	296°59.3	10.1′	09°07.0	15.9′	60.2′
12	358°46.0	N22°34.4	311°28.3	10.2′	N08°51.1	16.0′	60.1′
13	13°45.9	34.2	325°57.5	10.2′	08°35.1	16.0′	60.1′
14	28°45.8	33.9	340°26.7	10.3′	08°19.1	16.0′	60.1′
15	43°45.7	·· 33.6	354°56.0	10.4′	08°03.1	16.0′	60.0′
16	58°45.6	33.4	9°25.4	10.5′	07°47.1	16.1′	60.0′
17	73°45.5	33.1	23°54.9	10.5′	07°31.0	16.1′	60.0′
18	88°45.4	N22°32.8	38°24.5	10.6′	N07°14.9	16.1′	60.0′
19	103°45.3	32.5	52°54.1	10.7′	06°58.8	16.2′	59.9′
20	118°45.2	32.3	67°23.8	10.8′	06°42.6	16.1′	59.9′
21	133°45.1	·· 32.0	81°53.5	10.8′	06°26.5	16.2′	59.9′
22	148°45.0	31.7	96°23.4	10.9′	06°10.3	16.2′	59.8′
23	163°44.9	31.4	110°53.3	11.0′	05°54.1	16.2′	59.8′
	SD = 15.7′	*d* = 0.3′	SD = 16.5′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°44.8	N22°31.2	125°23.3	11.0′	N05°37.9	16.2′	59.8′
1	193°44.7	30.9	139°53.3	11.1′	05°21.7	16.2′	59.7′
2	208°44.6	30.6	154°23.4	11.2′	05°05.5	16.2′	59.7′
3	223°44.5	·· 30.3	168°53.6	11.2′	04°49.3	16.3′	59.7′
4	238°44.4	30.1	183°23.8	11.3′	04°33.0	16.2′	59.6′
5	253°44.3	29.8	197°54.1	11.4′	04°16.8	16.3′	59.6′
6	268°44.2	N22°29.5	212°24.5	11.4′	N04°00.5	16.2′	59.6′
7	283°44.1	29.2	226°54.9	11.5′	03°44.3	16.3′	59.5′
8	298°44.0	28.9	241°25.4	11.5′	03°28.0	16.2′	59.5′
9	313°43.9	·· 28.6	255°55.9	11.6′	03°11.8	16.3′	59.5′
10	328°43.8	28.4	270°26.5	11.6′	02°55.5	16.2′	59.4′
11	343°43.7	28.1	284°57.1	11.7′	02°39.3	16.2′	59.4′
12	358°43.6	N22°27.8	299°27.8	11.7′	N02°23.1	16.3′	59.4′
13	13°43.5	27.5	313°58.5	11.8′	02°06.8	16.2′	59.3′
14	28°43.4	27.2	328°29.3	11.8′	01°50.6	16.2′	59.3′
15	43°43.3	·· 26.9	343°00.2	11.9′	01°34.4	16.2′	59.3′
16	58°43.2	26.6	357°31.1	11.9′	01°18.2	16.2′	59.2′
17	73°43.1	26.4	12°02.0	12.0′	01°02.0	16.2′	59.2′
18	88°43.0	N22°26.1	26°32.9	12.0′	N00°45.8	16.1′	59.2′
19	103°43.0	25.8	41°04.0	12.1′	00°29.7	16.2′	59.1′
20	118°42.9	25.5	55°35.0	12.1′	N00°13.5	16.1′	59.1′
21	133°42.8	·· 25.2	70°06.1	12.1′	S00°02.6	16.1′	59.1′
22	148°42.7	24.9	84°37.2	12.2′	00°18.7	16.0′	59.0′
23	163°42.6	24.6	99°08.4	12.2′	00°34.7	16.1′	59.0′
	SD = 15.7′	*d* = 0.3′	SD = 16.3′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:57	23:09	////	////
64°	////	////	01:53	22:15	////	////
62°	////	////	02:26	21:43	////	////
60°	////	01:19	02:49	21:19	22:48	////
N 58°	////	01:58	03:08	21:01	22:10	////
56°	////	02:25	03:24	20:45	21:44	////
54°	01:13	02:45	03:37	20:32	21:24	22:55
52°	01:49	03:02	03:49	20:20	21:07	22:20
50°	02:13	03:16	03:59	20:10	20:53	21:55
45°	02:56	03:44	04:21	19:49	20:25	21:14
N 40°	03:25	04:06	04:38	19:32	20:04	20:45
35°	03:47	04:23	04:52	19:17	19:47	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:55	05:21	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:15	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:10
35°	06:09	06:40	07:08	17:02	17:30	18:01
40°	06:18	06:51	07:22	16:48	17:19	17:52
45°	06:27	07:04	07:38	16:32	17:06	17:43
S 50°	06:38	07:20	07:57	16:13	16:51	17:32
52°	06:43	07:27	08:07	16:03	16:44	17:27
54°	06:49	07:34	08:17	15:53	16:36	17:21
56°	06:54	07:43	08:29	15:41	16:27	17:16
58°	07:01	07:52	08:43	15:27	16:18	17:09
S 60°	07:08	08:03	08:59	15:11	16:07	17:03

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	03:29	06:51	09:21	00:57 23:30	22:49	22:15
N 70°	04:26	07:09	09:25	23:11	22:41	22:16
68°	04:59	07:22	09:28	22:55	22:34	22:17
66°	05:23	07:33	09:31	22:42	22:29	22:17
64°	05:41	07:42	09:34	22:31	22:24	22:18
62°	05:56	07:50	09:36	22:22	22:20	22:18
60°	06:09	07:57	09:38	22:14	22:16	22:18
N 58°	06:20	08:02	09:39	22:07	22:13	22:18
56°	06:29	08:07	09:41	22:00	22:10	22:19
54°	06:37	08:12	09:42	21:55	22:08	22:19
52°	06:45	08:16	09:43	21:49	22:05	22:19
50°	06:51	08:20	09:44	21:45	22:03	22:19
45°	07:06	08:28	09:47	21:35	21:58	22:20
N 40°	07:17	08:35	09:49	21:26	21:54	22:20
35°	07:27	08:40	09:50	21:19	21:51	22:20
30°	07:36	08:46	09:52	21:12	21:48	22:21
20°	07:51	08:54	09:54	21:01	21:42	22:21
N 10°	08:03	09:02	09:57	20:51	21:37	22:21
0°	08:15	09:09	09:59	20:41	21:33	22:22
S 10°	08:27	09:16	10:01	20:32	21:28	22:22
20°	08:40	09:23	10:03	20:21	21:23	22:22
30°	08:54	09:32	10:06	20:09	21:18	22:23
35°	09:03	09:37	10:07	20:02	21:14	22:23
40°	09:12	09:42	10:09	19:55	21:10	22:23
45°	09:23	09:49	10:11	19:45	21:06	22:23
S 50°	09:36	09:56	10:13	19:34	21:01	22:23
52°	09:43	10:00	10:14	19:29	20:58	22:23
54°	09:49	10:04	10:16	19:23	20:55	22:24
56°	09:57	10:08	10:17	19:16	20:52	22:24
58°	10:05	10:13	10:18	19:09	20:49	22:24
S 60°	10:15	10:18	10:20	19:00	20:45	22:24

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Mer.Pass. Lower hh:mm	Age 2-4 5-21%
06	04:41	04:46	12:05	14:28	02:00	
07	04:51	04:56	12:05	15:21	02:55	
08	05:01	05:05	12:05	16:10	03:46	

July 09, 10, 11 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°42.8	188°48.6	N23°24.9	109°44.4	N01°52.2	137°33.7	N13°30.2	260°44.7	N08°07.6
1	301°45.2	203°47.7	24.8	124°45.6	51.6	152°35.7	30.1	275°47.1	07.6
2	316°47.7	218°46.9	24.8	139°46.8	51.0	167°37.7	29.9	290°49.4	07.6
3	331°50.2	233°46.0	·· 24.7	154°48.0	·· 50.5	182°39.7	·· 29.7	305°51.8	·· 07.7
4	346°52.6	248°45.1	24.6	169°49.2	49.9	197°41.7	29.6	320°54.1	07.7
5	1°55.1	263°44.2	24.5	184°50.4	49.3	212°43.7	29.4	335°56.4	07.7
6	16°57.6	278°43.4	N23°24.5	199°51.6	N01°48.7	227°45.7	N13°29.2	350°58.8	N08°07.8
7	32°00.0	293°42.5	24.4	214°52.8	48.1	242°47.7	29.1	6°01.1	07.8
8	47°02.5	308°41.6	24.3	229°54.0	47.5	257°49.7	28.9	21°03.4	07.9
9	62°04.9	323°40.7	·· 24.2	244°55.1	·· 46.9	272°51.7	·· 28.8	36°05.8	·· 07.9
10	77°07.4	338°39.9	24.2	259°56.3	46.3	287°53.7	28.6	51°08.1	07.9
11	92°09.9	353°39.0	24.1	274°57.5	45.7	302°55.7	28.4	66°10.4	08.0
12	107°12.3	8°38.1	N23°24.0	289°58.7	N01°45.1	317°57.7	N13°28.3	81°12.8	N08°08.0
13	122°14.8	23°37.2	23.9	304°59.9	44.5	332°59.7	28.1	96°15.1	08.0
14	137°17.3	38°36.3	23.8	320°01.1	43.9	348°01.8	27.9	111°17.5	08.1
15	152°19.7	53°35.5	·· 23.7	335°02.3	·· 43.3	3°03.8	·· 27.8	126°19.8	·· 08.1
16	167°22.2	68°34.6	23.7	350°03.5	42.7	18°05.8	27.6	141°22.1	08.1
17	182°24.7	83°33.7	23.6	5°04.7	42.1	33°07.8	27.4	156°24.5	08.2
18	197°27.1	98°32.8	N23°23.5	20°05.9	N01°41.5	48°09.8	N13°27.3	171°26.8	N08°08.2
19	212°29.6	113°32.0	23.4	35°07.1	40.9	63°11.8	27.1	186°29.2	08.3
20	227°32.1	128°31.1	23.3	50°08.3	40.4	78°13.8	27.0	201°31.5	08.3
21	242°34.5	143°30.2	·· 23.2	65°09.5	·· 39.8	93°15.8	·· 26.8	216°33.8	·· 08.3
22	257°37.0	158°29.3	23.1	80°10.7	39.2	108°17.8	26.6	231°36.2	08.4
23	272°39.4	173°28.5	23.0	95°11.9	38.6	123°19.8	26.5	246°38.5	08.4
Mer.pass. 04:52		ν -0.9′ d 0.1′		m -3.91	ν 1.2′ d 0.6′		m 1.12	ν 2.0′ d 0.2′	m -1.78	ν 2.3′ d 0.0′	m 0.58

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°41.9	188°27.6	N23°22.9	110°13.1	N01°38.0	138°21.8	N13°26.3	261°40.8	N08°08.4
1	302°44.4	203°26.7	22.8	125°14.3	37.4	153°23.8	26.1	276°43.2	08.5
2	317°46.8	218°25.8	22.7	140°15.5	36.8	168°25.8	26.0	291°45.5	08.5
3	332°49.3	233°25.0	·· 22.6	155°16.7	·· 36.2	183°27.8	·· 25.8	306°47.9	·· 08.5
4	347°51.8	248°24.1	22.5	170°17.9	35.6	198°29.8	25.6	321°50.2	08.6
5	2°54.2	263°23.2	22.4	185°19.1	35.0	213°31.8	25.5	336°52.5	08.6
6	17°56.7	278°22.3	N23°22.3	200°20.3	N01°34.4	228°33.8	N13°25.3	351°54.9	N08°08.7
7	32°59.2	293°21.5	22.2	215°21.5	33.8	243°35.8	25.2	6°57.2	08.7
8	48°01.6	308°20.6	22.1	230°22.7	33.2	258°37.8	25.0	21°59.6	08.7
9	63°04.1	323°19.7	·· 22.0	245°23.9	·· 32.6	273°39.9	·· 24.8	37°01.9	·· 08.8
10	78°06.5	338°18.8	21.9	260°25.1	32.0	288°41.9	24.7	52°04.2	08.8
11	93°09.0	353°18.0	21.8	275°26.2	31.4	303°43.9	24.5	67°06.6	08.8
12	108°11.5	8°17.1	N23°21.7	290°27.4	N01°30.8	318°45.9	N13°24.3	82°08.9	N08°08.9
13	123°13.9	23°16.2	21.6	305°28.6	30.2	333°47.9	24.2	97°11.3	08.9
14	138°16.4	38°15.3	21.5	320°29.8	29.6	348°49.9	24.0	112°13.6	08.9
15	153°18.9	53°14.5	·· 21.3	335°31.0	·· 29.0	3°51.9	·· 23.8	127°16.0	·· 09.0
16	168°21.3	68°13.6	21.2	350°32.2	28.4	18°53.9	23.7	142°18.3	09.0
17	183°23.8	83°12.7	21.1	5°33.4	27.8	33°55.9	23.5	157°20.6	09.0
18	198°26.3	98°11.8	N23°21.0	20°34.6	N01°27.2	48°57.9	N13°23.3	172°23.0	N08°09.1
19	213°28.7	113°11.0	20.9	35°35.8	26.6	63°59.9	23.2	187°25.3	09.1
20	228°31.2	128°10.1	20.7	50°37.0	26.0	79°01.9	23.0	202°27.7	09.1
21	243°33.7	143°09.2	·· 20.6	65°38.2	·· 25.5	94°03.9	·· 22.8	217°30.0	·· 09.2
22	258°36.1	158°08.3	20.5	80°39.4	24.9	109°05.9	22.7	232°32.4	09.2
23	273°38.6	173°07.5	20.4	95°40.6	24.3	124°07.9	22.5	247°34.7	09.2
Mer.pass. 04:48		ν -0.9′ d 0.1′		m -3.91	ν 1.2′ d 0.6′		m 1.13	ν 2.0′ d 0.2′	m -1.77	ν 2.3′ d 0.0′	m 0.57

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°41.0	188°06.6	N23°20.3	110°41.7	N01°23.7	139°09.9	N13°22.4	262°37.0	N08°09.3
1	303°43.5	203°05.7	20.1	125°42.9	23.1	154°11.9	22.2	277°39.4	09.3
2	318°46.0	218°04.8	20.0	140°44.1	22.5	169°13.9	22.0	292°41.7	09.3
3	333°48.4	233°04.0	·· 19.9	155°45.3	·· 21.9	184°15.9	·· 21.9	307°44.1	·· 09.4
4	348°50.9	248°03.1	19.7	170°46.5	21.3	199°17.9	21.7	322°46.4	09.4
5	3°53.4	263°02.2	19.6	185°47.7	20.7	214°19.9	21.5	337°48.8	09.5
6	18°55.8	278°01.4	N23°19.5	200°48.9	N01°20.1	229°21.9	N13°21.4	352°51.1	N08°09.5
7	33°58.3	293°00.5	19.3	215°50.1	19.5	244°23.9	21.2	7°53.4	09.5
8	49°00.8	307°59.6	19.2	230°51.3	18.9	259°25.9	21.0	22°55.8	09.6
9	64°03.2	322°58.7	·· 19.1	245°52.5	·· 18.3	274°27.9	·· 20.9	37°58.1	·· 09.6
10	79°05.7	337°57.9	18.9	260°53.6	17.7	289°29.9	20.7	53°00.5	09.6
11	94°08.2	352°57.0	18.8	275°54.8	17.1	304°31.9	20.5	68°02.8	09.7
12	109°10.6	7°56.1	N23°18.7	290°56.0	N01°16.5	319°33.9	N13°20.4	83°05.2	N08°09.7
13	124°13.1	22°55.2	18.5	305°57.2	15.9	334°35.9	20.2	98°07.5	09.7
14	139°15.5	37°54.4	18.4	320°58.4	15.3	349°37.9	20.0	113°09.9	09.8
15	154°18.0	52°53.5	·· 18.2	335°59.6	·· 14.7	4°39.9	·· 19.9	128°12.2	·· 09.8
16	169°20.5	67°52.6	18.1	351°00.8	14.1	19°41.9	19.7	143°14.5	09.8
17	184°22.9	82°51.8	18.0	6°02.0	13.5	34°43.9	19.5	158°16.9	09.9
18	199°25.4	97°50.9	N23°17.8	21°03.2	N01°12.9	49°45.9	N13°19.4	173°19.2	N08°09.9
19	214°27.9	112°50.0	17.7	36°04.3	12.3	64°47.9	19.2	188°21.6	09.9
20	229°30.3	127°49.1	17.5	51°05.5	11.7	79°49.9	19.0	203°23.9	10.0
21	244°32.8	142°48.3	·· 17.4	66°06.7	·· 11.1	94°51.9	·· 18.9	218°26.3	·· 10.0
22	259°35.3	157°47.4	17.2	81°07.9	10.5	109°53.9	18.7	233°28.6	10.0
23	274°37.7	172°46.5	17.1	96°09.1	09.9	124°55.9	18.5	248°31.0	10.1
Mer.pass. 04:44		ν -0.9′ d 0.1′		m -3.91	ν 1.2′ d 0.6′		m 1.14	ν 2.0′ d 0.2′	m -1.77	ν 2.3′ d 0.0′	m 0.57

Stars

	SHA	Dec
Alpheratz	357°32.5	29°14.5
Ankaa	353°05.1	-42°09.0
Schedar	349°28.6	56°41.1
Diphda	348°45.2	-17°49.9
Achernar	335°18.8	-57°05.4
Hamal	327°48.9	23°35.5
Polaris	313°11.2	89°22.5
Acamar	315°10.4	-40°11.4
Menkar	314°04.1	4°11.9
Mirfak	308°25.5	49°57.4
Aldebaran	290°37.5	16°33.8
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.5
Sirius	258°24.8	-16°45.2
Adhara	255°04.6	-29°00.6
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.5	-59°36.0
Suhail	222°45.2	-43°32.8
Miaplacidus	221°38.6	-69°50.0
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.8	-63°15.5
Gacrux	171°49.4	-57°16.4
Alioth	166°11.2	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.3	49°10.8
Hadar	148°32.8	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.1	-60°57.2
Kochab	137°19.4	74°02.7
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.6
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.7
Enif	33°36.5	10°00.2
Al Na'ir	27°30.0	-46°49.4
Fomalhaut	15°12.1	-29°28.3
Scheat	13°43.0	28°13.9
Markab	13°27.7	15°21.3

Jul 09 Fri	SHA	Mer.pass
Venus	262°05.8	11:25
Mars	183°01.6	16:40
Jupiter	210°50.9	14:48
Saturn	334°02.0	06:36

Jul 10 Sat	SHA	Mer.pass
Venus	260°45.7	11:27
Mars	182°31.2	16:38
Jupiter	210°39.9	14:45
Saturn	333°58.9	06:32

Jul 11 Sun	SHA	Mer.pass
Venus	259°25.5	11:28
Mars	182°00.7	16:36
Jupiter	210°28.9	14:41
Saturn	333°56.0	06:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°42.5	N22°24.3	113°39.6	12.2′	S00°50.8	16.0′	59.0′
1	193°42.4	24.0	128°10.9	12.3′	01°06.8	16.0′	58.9′
2	208°42.3	23.7	142°42.1	12.3′	01°22.8	16.0′	58.9′
3	223°42.2	·· 23.4	157°13.4	12.3′	01°38.8	16.0′	58.9′
4	238°42.1	23.1	171°44.8	12.4′	01°54.8	15.9′	58.8′
5	253°42.0	22.8	186°16.1	12.4′	02°10.7	15.9′	58.8′
6	268°41.9	N22°22.6	200°47.5	12.4′	S02°26.6	15.8′	58.7′
7	283°41.8	22.3	215°18.9	12.4′	02°42.4	15.9′	58.7′
8	298°41.7	22.0	229°50.4	12.5′	02°58.3	15.8′	58.7′
9	313°41.6	·· 21.7	244°21.9	12.5′	03°14.1	15.7′	58.6′
10	328°41.5	21.4	258°53.4	12.5′	03°29.8	15.7′	58.6′
11	343°41.4	21.1	273°24.9	12.5′	03°45.5	15.7′	58.6′
12	358°41.3	N22°20.8	287°56.4	12.6′	S04°01.2	15.7′	58.5′
13	13°41.3	20.5	302°28.0	12.6′	04°16.9	15.6′	58.5′
14	28°41.2	20.2	316°59.5	12.6′	04°32.5	15.5′	58.5′
15	43°41.1	·· 19.9	331°31.1	12.6′	04°48.0	15.6′	58.4′
16	58°41.0	19.5	346°02.7	12.6′	05°03.6	15.4′	58.4′
17	73°40.9	19.2	0°34.3	12.6′	05°19.0	15.5′	58.4′
18	88°40.8	N22°18.9	15°06.0	12.6′	S05°34.5	15.4′	58.3′
19	103°40.7	18.6	29°37.6	12.7′	05°49.9	15.3′	58.3′
20	118°40.6	18.3	44°09.2	12.7′	06°05.2	15.3′	58.3′
21	133°40.5	·· 18.0	58°40.9	12.7′	06°20.5	15.2′	58.2′
22	148°40.4	17.7	73°12.6	12.7′	06°35.7	15.2′	58.2′
23	163°40.3	17.4	87°44.2	12.7′	06°50.9	15.2′	58.1′
	SD = 15.7′	d = 0.3′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°40.2	N22°17.1	102°15.9	12.7′	S07°06.1	15.0′	58.1′
1	193°40.2	16.8	116°47.6	12.7′	07°21.1	15.1′	58.1′
2	208°40.1	16.5	131°19.3	12.7′	07°36.2	14.9′	58.0′
3	223°40.0	·· 16.2	145°51.0	12.7′	07°51.1	15.0′	58.0′
4	238°39.9	15.9	160°22.7	12.7′	08°06.1	14.8′	58.0′
5	253°39.8	15.5	174°54.4	12.7′	08°20.9	14.8′	57.9′
6	268°39.7	N22°15.2	189°26.1	12.7′	S08°35.7	14.8′	57.9′
7	283°39.6	14.9	203°57.8	12.7′	08°50.5	14.7′	57.9′
8	298°39.5	14.6	218°29.4	12.7′	09°05.2	14.6′	57.8′
9	313°39.4	·· 14.3	233°01.1	12.7′	09°19.8	14.6′	57.8′
10	328°39.4	14.0	247°32.8	12.7′	09°34.4	14.5′	57.8′
11	343°39.3	13.7	262°04.5	12.7′	09°48.9	14.4′	57.7′
12	358°39.2	N22°13.3	276°36.1	12.7′	S10°03.3	14.4′	57.7′
13	13°39.1	13.0	291°07.8	12.6′	10°17.7	14.3′	57.7′
14	28°39.0	12.7	305°39.4	12.6′	10°32.0	14.2′	57.6′
15	43°38.9	·· 12.4	320°11.1	12.6′	10°46.2	14.2′	57.6′
16	58°38.8	12.1	334°42.7	12.6′	11°00.4	14.1′	57.5′
17	73°38.7	11.7	349°14.3	12.6′	11°14.5	14.1′	57.5′
18	88°38.7	N22°11.4	3°45.9	12.6′	S11°28.6	13.9′	57.5′
19	103°38.6	11.1	18°17.5	12.6′	11°42.5	13.9′	57.4′
20	118°38.5	10.8	32°49.0	12.6′	11°56.4	13.8′	57.4′
21	133°38.4	·· 10.5	47°20.6	12.5′	12°10.2	13.8′	57.4′
22	148°38.3	10.1	61°52.1	12.5′	12°24.0	13.6′	57.3′
23	163°38.2	09.8	76°23.7	12.5′	12°37.6	13.6′	57.3′
	SD = 15.7′	d = 0.3′	SD = 15.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°38.1	N22°09.5	90°55.1	12.5′	S12°51.2	13.6′	57.3′
1	193°38.0	09.2	105°26.6	12.5′	13°04.8	13.4′	57.2′
2	208°38.0	08.8	119°58.1	12.4′	13°18.2	13.4′	57.2′
3	223°37.9	·· 08.5	134°29.5	12.4′	13°31.6	13.3′	57.2′
4	238°37.8	08.2	149°00.9	12.4′	13°44.9	13.2′	57.1′
5	253°37.7	07.8	163°32.3	12.4′	13°58.1	13.1′	57.1′
6	268°37.6	N22°07.5	178°03.7	12.3′	S14°11.2	13.0′	57.1′
7	283°37.5	07.2	192°35.0	12.3′	14°24.2	13.0′	57.0′
8	298°37.5	06.9	207°06.3	12.3′	14°37.2	12.9′	57.0′
9	313°37.4	·· 06.5	221°37.6	12.3′	14°50.1	12.8′	57.0′
10	328°37.3	06.2	236°08.9	12.2′	15°02.9	12.7′	56.9′
11	343°37.2	05.9	250°40.1	12.2′	15°15.6	12.6′	56.9′
12	358°37.1	N22°05.5	265°11.3	12.2′	S15°28.2	12.5′	56.9′
13	13°37.0	05.2	279°42.5	12.1′	15°40.7	12.5′	56.9′
14	28°37.0	04.9	294°13.7	12.1′	15°53.2	12.3′	56.8′
15	43°36.9	·· 04.5	308°44.8	12.1′	16°05.5	12.3′	56.8′
16	58°36.8	04.2	323°15.9	12.1′	16°17.8	12.2′	56.8′
17	73°36.7	03.9	337°46.9	12.0′	16°30.0	12.1′	56.7′
18	88°36.6	N22°03.5	352°18.0	12.0′	S16°42.1	12.0′	56.7′
19	103°36.5	03.2	6°49.0	12.0′	16°54.1	11.9′	56.7′
20	118°36.5	02.8	21°19.9	11.9′	17°06.0	11.8′	56.6′
21	133°36.4	·· 02.5	35°50.8	11.9′	17°17.8	11.7′	56.6′
22	148°36.3	02.2	50°21.7	11.9′	17°29.5	11.6′	56.6′
23	163°36.2	01.8	64°52.6	11.8′	17°41.1	11.5′	56.5′
	SD = 15.7′	d = 0.3′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:11	22:55	////	////
64°	////	////	02:01	22:08	////	////
62°	////	////	02:31	21:38	////	////
60°	////	01:28	02:54	21:15	22:40	////
N 58°	////	02:04	03:12	20:57	22:05	////
56°	////	02:29	03:28	20:42	21:40	////
54°	01:21	02:49	03:41	20:29	21:21	22:47
52°	01:54	03:05	03:52	20:18	21:05	22:15
50°	02:18	03:19	04:02	20:08	20:51	21:52
45°	02:59	03:47	04:23	19:47	20:24	21:11
N 40°	03:27	04:08	04:40	19:30	20:03	20:43
35°	03:49	04:25	04:54	19:16	19:46	20:22
30°	04:06	04:39	05:06	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:37
N 10°	04:55	05:22	05:45	18:26	18:48	19:15
0°	05:13	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:40	07:07	17:04	17:31	18:03
40°	06:17	06:51	07:21	16:50	17:20	17:54
45°	06:26	07:03	07:36	16:35	17:08	17:45
S 50°	06:37	07:18	07:56	16:15	16:53	17:34
52°	06:42	07:25	08:05	16:06	16:46	17:29
54°	06:47	07:32	08:15	15:56	16:39	17:24
56°	06:53	07:41	08:27	15:44	16:30	17:18
58°	06:59	07:50	08:40	15:31	16:21	17:12
S 60°	07:05	08:01	08:56	15:15	16:10	17:06

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	11:38	13:59	16:55	21:42	21:02	19:46
N 70°	11:32	13:40	16:04	21:52	21:23	20:39
68°	11:27	13:26	15:32	21:59	21:39	21:13
66°	11:23	13:14	15:09	22:06	21:53	21:37
64°	11:20	13:05	14:51	22:11	22:04	21:56
62°	11:17	12:56	14:36	22:16	22:14	22:12
60°	11:15	12:49	14:24	22:20	22:22	22:25
N 58°	11:12	12:43	14:13	22:24	22:29	22:37
56°	11:10	12:38	14:04	22:27	22:36	22:47
54°	11:09	12:33	13:56	22:30	22:42	22:55
52°	11:07	12:28	13:49	22:33	22:47	23:03
50°	11:05	12:25	13:42	22:35	22:52	23:10
45°	11:02	12:16	13:28	22:40	23:02	23:26
N 40°	11:00	12:09	13:17	22:45	23:11	23:39
35°	10:57	12:03	13:07	22:49	23:18	23:49
30°	10:56	11:58	12:59	22:52	23:25	23:59
20°	10:52	11:49	12:45	22:58	23:36	·· ··
N 10°	10:49	11:41	12:32	23:04	23:46	·· ··
0°	10:46	11:33	12:20	23:09	23:56	·· ··
S 10°	10:44	11:26	12:09	23:14	·· ··	00:05
20°	10:41	11:18	11:57	23:19	·· ··	00:15
30°	10:38	11:10	11:43	23:25	·· ··	00:27
35°	10:36	11:05	11:35	23:29	·· ··	00:34
40°	10:34	10:59	11:26	23:33	·· ··	00:42
45°	10:32	10:53	11:15	23:38	·· ··	00:51
S 50°	10:29	10:45	11:02	23:43	·· ··	01:02
52°	10:28	10:41	10:56	23:46	·· ··	01:07
54°	10:26	10:37	10:50	23:49	·· ··	01:13
56°	10:25	10:33	10:43	23:52	·· ··	01:19
58°	10:23	10:28	10:35	23:56	·· ··	01:26
S 60°	10:21	10:23	10:26	·· ··	00:00	01:34

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 5-7 31-53%
09	05:10	05:15	12:05	16:58	04:34	
10	05:19	05:23	12:05	17:44	05:21	
11	05:27	05:32	12:06	18:32	06:08	

July 12, 13, 14 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	289°40.2	187°45.6	N23°16.9	111°10.3	N01°09.3	139°57.9	N13°18.4	263°33.3	N08°10.1
1	304°42.6	202°44.8	16.7	126°11.5	08.7	154°59.9	18.2	278°35.7	10.1
2	319°45.1	217°43.9	16.6	141°12.6	08.1	170°01.9	18.0	293°38.0	10.2
3	334°47.6	232°43.0	·· 16.4	156°13.8	·· 07.5	185°03.9	·· 17.9	308°40.4	·· 10.2
4	349°50.0	247°42.2	16.3	171°15.0	06.9	200°05.9	17.7	323°42.7	10.2
5	4°52.5	262°41.3	16.1	186°16.2	06.3	215°07.9	17.5	338°45.1	10.3
6	19°55.0	277°40.4	N23°16.0	201°17.4	N01°05.7	230°09.9	N13°17.4	353°47.4	N08°10.3
7	34°57.4	292°39.5	15.8	216°18.6	05.1	245°11.9	17.2	8°49.7	10.3
8	49°59.9	307°38.7	15.6	231°19.8	04.5	260°13.9	17.0	23°52.1	10.4
9	65°02.4	322°37.8	·· 15.5	246°20.9	·· 03.9	275°15.9	·· 16.9	38°54.4	·· 10.4
10	80°04.8	337°36.9	15.3	261°22.1	03.3	290°17.9	16.7	53°56.8	10.4
11	95°07.3	352°36.1	15.1	276°23.3	02.7	305°19.9	16.5	68°59.1	10.4
12	110°09.8	7°35.2	N23°15.0	291°24.5	N01°02.1	320°21.9	N13°16.4	84°01.5	N08°10.5
13	125°12.2	22°34.3	14.8	306°25.7	01.5	335°23.9	16.2	99°03.8	10.5
14	140°14.7	37°33.5	14.6	321°26.9	00.9	350°25.9	16.0	114°06.2	10.5
15	155°17.1	52°32.6	·· 14.5	336°28.0	01°00.3	5°27.9	·· 15.9	129°08.5	·· 10.6
16	170°19.6	67°31.7	14.3	351°29.2	00°59.7	20°29.9	15.7	144°10.9	10.6
17	185°22.1	82°30.8	14.1	6°30.4	59.1	35°31.9	15.5	159°13.2	10.6
18	200°24.5	97°30.0	N23°13.9	21°31.6	N00°58.5	50°33.9	N13°15.4	174°15.6	N08°10.7
19	215°27.0	112°29.1	13.8	36°32.8	57.9	65°35.9	15.2	189°17.9	10.7
20	230°29.5	127°28.2	13.6	51°34.0	57.3	80°37.9	15.0	204°20.3	10.7
21	245°31.9	142°27.4	·· 13.4	66°35.1	·· 56.7	95°39.9	·· 14.9	219°22.6	·· 10.8
22	260°34.4	157°26.5	13.2	81°36.3	56.1	110°41.9	14.7	234°25.0	10.8
23	275°36.9	172°25.6	13.0	96°37.5	55.5	125°43.9	14.5	249°27.3	10.8
Mer.pass. 04:41		ν -0.9′	d 0.2′	m -3.91	ν 1.2′	d 0.6′	m 1.14	ν 2.0′	d 0.2′ m -1.77	ν 2.3′	d 0.0′ m 0.56

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	290°39.3	187°24.8	N23°12.9	111°38.7	N00°54.9	140°45.9	N13°14.4	264°29.7	N08°10.9
1	305°41.8	202°23.9	12.7	126°39.9	54.3	155°47.9	14.2	279°32.0	10.9
2	320°44.3	217°23.0	12.5	141°41.0	53.7	170°49.9	14.0	294°34.4	10.9
3	335°46.7	232°22.2	·· 12.3	156°42.2	·· 53.1	185°51.9	·· 13.9	309°36.7	·· 11.0
4	350°49.2	247°21.3	12.1	171°43.4	52.5	200°53.9	13.7	324°39.1	11.0
5	5°51.6	262°20.4	11.9	186°44.6	51.9	215°55.9	13.5	339°41.4	11.0
6	20°54.1	277°19.5	N23°11.7	201°45.8	N00°51.3	230°57.9	N13°13.4	354°43.8	N08°11.1
7	35°56.6	292°18.7	11.6	216°47.0	50.7	245°59.9	13.2	9°46.1	11.1
8	50°59.0	307°17.8	11.4	231°48.1	50.1	261°01.9	13.0	24°48.5	11.1
9	66°01.5	322°16.9	·· 11.2	246°49.3	·· 49.5	276°03.9	·· 12.9	39°50.8	·· 11.1
10	81°04.0	337°16.1	11.0	261°50.5	48.9	291°05.9	12.7	54°53.2	11.2
11	96°06.4	352°15.2	10.8	276°51.7	48.3	306°07.9	12.5	69°55.5	11.2
12	111°08.9	7°14.3	N23°10.6	291°52.8	N00°47.7	321°09.9	N13°12.4	84°57.9	N08°11.2
13	126°11.4	22°13.5	10.4	306°54.0	47.1	336°11.9	12.2	100°00.2	11.3
14	141°13.8	37°12.6	10.2	321°55.2	46.5	351°13.9	12.0	115°02.6	11.3
15	156°16.3	52°11.7	·· 10.0	336°56.4	·· 45.9	6°15.9	·· 11.9	130°05.0	·· 11.3
16	171°18.8	67°10.9	09.8	351°57.6	45.3	21°17.9	11.7	145°07.3	11.4
17	186°21.2	82°10.0	09.6	6°58.7	44.7	36°19.9	11.5	160°09.7	11.4
18	201°23.7	97°09.1	N23°09.4	21°59.9	N00°44.1	51°21.9	N13°11.4	175°12.0	N08°11.4
19	216°26.1	112°08.3	09.2	37°01.1	43.5	66°23.9	11.2	190°14.4	11.5
20	231°28.6	127°07.4	09.0	52°02.3	42.9	81°25.9	11.0	205°16.7	11.5
21	246°31.1	142°06.5	·· 08.8	67°03.5	·· 42.3	96°27.9	·· 10.8	220°19.1	·· 11.5
22	261°33.5	157°05.7	08.6	82°04.6	41.7	111°29.9	10.7	235°21.4	11.5
23	276°36.0	172°04.8	08.3	97°05.8	41.1	126°31.9	10.5	250°23.8	11.6
Mer.pass. 04:37		ν -0.9′	d 0.2′	m -3.91	ν 1.2′	d 0.6′	m 1.15	ν 2.0′	d 0.2′ m -1.76	ν 2.4′	d 0.0′ m 0.56

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	291°38.5	187°03.9	N23°08.1	112°07.0	N00°40.4	141°33.9	N13°10.3	265°26.1	N08°11.6
1	306°40.9	202°03.1	07.9	127°08.2	39.8	156°35.9	10.2	280°28.5	11.6
2	321°43.4	217°02.2	07.7	142°09.3	39.2	171°37.9	10.0	295°30.8	11.7
3	336°45.9	232°01.3	·· 07.5	157°10.5	·· 38.6	186°39.9	·· 09.8	310°33.2	·· 11.7
4	351°48.3	247°00.5	07.3	172°11.7	38.0	201°41.9	09.7	325°35.5	11.7
5	6°50.8	261°59.6	07.1	187°12.9	37.4	216°43.8	09.5	340°37.9	11.8
6	21°53.2	276°58.7	N23°06.8	202°14.0	N00°36.8	231°45.8	N13°09.3	355°40.3	N08°11.8
7	36°55.7	291°57.9	06.6	217°15.2	36.2	246°47.8	09.2	10°42.6	11.8
8	51°58.2	306°57.0	06.4	232°16.4	35.6	261°49.8	09.0	25°45.0	11.8
9	67°00.6	321°56.2	·· 06.2	247°17.6	·· 35.0	276°51.8	·· 08.8	40°47.3	·· 11.9
10	82°03.1	336°55.3	06.0	262°18.7	34.4	291°53.8	08.7	55°49.7	11.9
11	97°05.6	351°54.4	05.7	277°19.9	33.8	306°55.8	08.5	70°52.0	11.9
12	112°08.0	6°53.6	N23°05.5	292°21.1	N00°33.2	321°57.8	N13°08.3	85°54.4	N08°12.0
13	127°10.5	21°52.7	05.3	307°22.3	32.6	336°59.8	08.1	100°56.7	12.0
14	142°13.0	36°51.8	05.1	322°23.4	32.0	352°01.8	08.0	115°59.1	12.0
15	157°15.4	51°51.0	·· 04.8	337°24.6	·· 31.4	7°03.8	·· 07.8	131°01.5	·· 12.0
16	172°17.9	66°50.1	04.6	352°25.8	30.8	22°05.8	07.6	146°03.8	12.1
17	187°20.4	81°49.2	04.4	7°27.0	30.2	37°07.8	07.5	161°06.2	12.1
18	202°22.8	96°48.4	N23°04.1	22°28.1	N00°29.6	52°09.8	N13°07.3	176°08.5	N08°12.1
19	217°25.3	111°47.5	03.9	37°29.3	29.0	67°11.8	07.1	191°10.9	12.2
20	232°27.7	126°46.7	03.7	52°30.5	28.4	82°13.8	07.0	206°13.2	12.2
21	247°30.2	141°45.8	·· 03.4	67°31.7	·· 27.8	97°15.8	·· 06.8	221°15.6	·· 12.2
22	262°32.7	156°44.9	03.2	82°32.8	27.2	112°17.8	06.6	236°18.0	12.3
23	277°35.1	171°44.1	03.0	97°34.0	26.6	127°19.8	06.5	251°20.3	12.3
Mer.pass. 04:33		ν -0.9′	d 0.2′	m -3.91	ν 1.2′	d 0.6′	m 1.16	ν 2.0′	d 0.2′ m -1.76	ν 2.4′	d 0.0′ m 0.56

Stars

	SHA	Dec
Alpheratz	357°32.5	29°14.5
Ankaa	353°05.0	-42°09.0
Schedar	349°28.5	56°41.1
Diphda	348°45.2	-17°49.9
Achernar	335°18.8	-57°05.4
Hamal	327°48.9	23°35.5
Polaris	313°09.6	89°22.5
Acamar	315°10.4	-40°11.4
Menkar	314°04.1	4°11.9
Mirfak	308°25.5	49°57.3
Aldebaran	290°37.5	16°33.8
Rigel	281°02.2	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.7
Canopus	263°52.0	-52°42.5
Sirius	258°24.8	-16°45.2
Adhara	255°04.6	-29°00.5
Procyon	244°49.0	5°09.2
Pollux	243°15.2	27°57.6
Avior	234°14.5	-59°36.0
Suhail	222°45.2	-43°32.8
Miaplacidus	221°38.6	-69°50.0
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.9	-63°15.4
Gacrux	171°49.4	-57°16.4
Alioth	166°11.3	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.3	49°10.8
Hadar	148°32.8	-60°30.6
Menkent	147°55.0	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.1	-60°57.2
Kochab	137°19.5	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.4
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.6
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.7
Enif	33°36.5	10°00.2
Al Na'ir	27°30.0	-46°49.4
Fomalhaut	15°12.0	-29°28.3
Scheat	13°43.0	28°13.9
Markab	13°27.6	15°21.3

Jul 12 Mon	SHA	Mer.pass
Venus	258°05.5	11:30
Mars	181°30.1	16:34
Jupiter	210°17.8	14:38
Saturn	333°53.1	06:25

Jul 13 Tue	SHA	Mer.pass
Venus	256°45.4	11:31
Mars	180°59.4	16:32
Jupiter	210°06.6	14:35
Saturn	333°50.4	06:21

Jul 14 Wed	SHA	Mer.pass
Venus	255°25.5	11:32
Mars	180°28.5	16:30
Jupiter	209°55.4	14:32
Saturn	333°47.7	06:17

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°36.1	N22°01.5	79°23.4	11.8′	S17°52.6	11.4′	56.5′
1	193°36.1	01.2	93°54.2	11.7′	18°04.0	11.4′	56.5′
2	208°36.0	00.8	108°24.9	11.7′	18°15.4	11.2′	56.5′
3	223°35.9	·· 00.5	122°55.7	11.7′	18°26.6	11.1′	56.4′
4	238°35.8	22°00.1	137°26.3	11.6′	18°37.7	11.1′	56.4′
5	253°35.7	21°59.8	151°57.0	11.6′	18°48.8	10.9′	56.4′
6	268°35.7	N21°59.4	166°27.6	11.6′	S18°59.7	10.8′	56.3′
7	283°35.6	59.1	180°58.1	11.5′	19°10.5	10.7′	56.3′
8	298°35.5	58.7	195°28.7	11.5′	19°21.2	10.7′	56.3′
9	313°35.4	·· 58.4	209°59.1	11.4′	19°31.9	10.5′	56.2′
10	328°35.3	58.0	224°29.6	11.4′	19°42.4	10.4′	56.2′
11	343°35.3	57.7	239°00.0	11.4′	19°52.8	10.3′	56.2′
12	358°35.2	N21°57.4	253°30.4	11.3′	S20°03.1	10.2′	56.2′
13	13°35.1	57.0	268°00.7	11.3′	20°13.3	10.1′	56.1′
14	28°35.0	56.7	282°31.0	11.2′	20°23.4	10.0′	56.1′
15	43°34.9	·· 56.3	297°01.2	11.2′	20°33.4	9.8′	56.1′
16	58°34.9	56.0	311°31.4	11.2′	20°43.2	9.8′	56.1′
17	73°34.8	55.6	326°01.6	11.1′	20°53.0	9.7′	56.0′
18	88°34.7	N21°55.2	340°31.7	11.1′	S21°02.7	9.5′	56.0′
19	103°34.6	54.9	355°01.8	11.0′	21°12.2	9.4′	56.0′
20	118°34.6	54.5	9°31.9	11.0′	21°21.6	9.4′	55.9′
21	133°34.5	·· 54.2	24°01.9	11.0′	21°31.0	9.2′	55.9′
22	148°34.4	53.8	38°31.9	10.9′	21°40.2	9.1′	55.9′
23	163°34.3	53.5	53°01.8	10.9′	21°49.3	8.9′	55.9′
	SD = 15.7′	d = 0.3′	SD = 15.4′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°34.3	N21°53.1	67°31.7	10.8′	S21°58.2	8.9′	55.8′
1	193°34.2	52.8	82°01.5	10.8′	22°07.1	8.8′	55.8′
2	208°34.1	52.4	96°31.3	10.8′	22°15.9	8.6′	55.8′
3	223°34.0	·· 52.1	111°01.1	10.7′	22°24.5	8.5′	55.8′
4	238°33.9	51.7	125°30.8	10.7′	22°33.0	8.4′	55.7′
5	253°33.9	51.3	140°00.5	10.6′	22°41.4	8.3′	55.7′
6	268°33.8	N21°51.0	154°30.2	10.6′	S22°49.7	8.1′	55.7′
7	283°33.7	50.6	168°59.8	10.6′	22°57.8	8.1′	55.7′
8	298°33.7	50.2	183°29.3	10.5′	23°05.9	7.9′	55.6′
9	313°33.6	·· 49.9	197°58.9	10.5′	23°13.8	7.8′	55.6′
10	328°33.5	49.5	212°28.4	10.5′	23°21.6	7.7′	55.6′
11	343°33.4	49.2	226°57.8	10.4′	23°29.3	7.5′	55.6′
12	358°33.4	N21°48.8	241°27.2	10.4′	S23°36.8	7.5′	55.5′
13	13°33.3	48.4	255°56.6	10.3′	23°44.3	7.3′	55.5′
14	28°33.2	48.1	270°26.0	10.3′	23°51.6	7.2′	55.5′
15	43°33.1	·· 47.7	284°55.3	10.3′	23°58.8	7.0′	55.5′
16	58°33.1	47.3	299°24.6	10.2′	24°05.8	7.0′	55.4′
17	73°33.0	47.0	313°53.8	10.2′	24°12.8	6.8′	55.4′
18	88°32.9	N21°46.6	328°23.0	10.2′	S24°19.6	6.7′	55.4′
19	103°32.8	46.2	342°52.2	10.1′	24°26.3	6.5′	55.4′
20	118°32.8	45.9	357°21.3	10.1′	24°32.8	6.5′	55.4′
21	133°32.7	·· 45.5	11°50.4	10.1′	24°39.3	6.3′	55.3′
22	148°32.6	45.1	26°19.5	10.0′	24°45.6	6.1′	55.3′
23	163°32.6	44.8	40°48.5	10.0′	24°51.7	6.1′	55.3′
	SD = 15.7′	d = 0.4′	SD = 15.2′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°32.5	N21°44.4	55°17.5	10.0′	S24°57.8	5.9′	55.3′
1	193°32.4	44.0	69°46.5	9.9′	25°03.7	5.8′	55.3′
2	208°32.4	43.6	84°15.4	9.9′	25°09.5	5.7′	55.2′
3	223°32.3	·· 43.3	98°44.3	9.9′	25°15.2	5.5′	55.2′
4	238°32.2	42.9	113°13.2	9.9′	25°20.7	5.4′	55.2′
5	253°32.1	42.5	127°42.1	9.8′	25°26.1	5.3′	55.2′
6	268°32.1	N21°42.1	142°10.9	9.8′	S25°31.4	5.1′	55.1′
7	283°32.0	41.8	156°39.7	9.8′	25°36.5	5.0′	55.1′
8	298°31.9	41.4	171°08.5	9.8′	25°41.5	4.9′	55.1′
9	313°31.9	·· 41.0	185°37.2	9.7′	25°46.4	4.7′	55.1′
10	328°31.8	40.6	200°06.0	9.7′	25°51.1	4.6′	55.1′
11	343°31.7	40.2	214°34.7	9.7′	25°55.7	4.5′	55.0′
12	358°31.7	N21°39.9	229°03.3	9.7′	S26°00.2	4.3′	55.0′
13	13°31.6	39.5	243°32.0	9.6′	26°04.5	4.2′	55.0′
14	28°31.5	39.1	258°00.6	9.6′	26°08.7	4.1′	55.0′
15	43°31.5	·· 38.7	272°29.3	9.6′	26°12.8	3.9′	55.0′
16	58°31.4	38.3	286°57.9	9.6′	26°16.7	3.8′	55.0′
17	73°31.3	38.0	301°26.4	9.6′	26°20.5	3.7′	54.9′
18	88°31.3	N21°37.6	315°55.0	9.6′	S26°24.2	3.5′	54.9′
19	103°31.2	37.2	330°23.6	9.5′	26°27.7	3.4′	54.9′
20	118°31.1	36.8	344°52.1	9.5′	26°31.1	3.3′	54.9′
21	133°31.1	·· 36.4	359°20.6	9.5′	26°34.4	3.1′	54.9′
22	148°31.0	36.0	13°49.1	9.5′	26°37.5	3.0′	54.8′
23	163°30.9	35.7	28°17.6	9.5′	26°40.5	2.9′	54.8′
	SD = 15.7′	d = 0.4′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:25	22:42	////	////
64°	////	////	02:09	22:00	////	////
62°	////	00:28	02:38	21:32	23:33	////
60°	////	01:38	02:59	21:11	22:31	////
N 58°	////	02:11	03:17	20:54	21:59	////
56°	00:26	02:35	03:32	20:39	21:36	23:36
54°	01:30	02:53	03:44	20:26	21:17	22:39
52°	02:00	03:09	03:55	20:16	21:01	22:10
50°	02:23	03:23	04:05	20:06	20:48	21:48
45°	03:02	03:49	04:26	19:45	20:22	21:09
N 40°	03:30	04:10	04:42	19:29	20:01	20:41
35°	03:51	04:27	04:56	19:15	19:44	20:20
30°	04:08	04:41	05:08	19:03	19:30	20:03
20°	04:35	05:04	05:28	18:43	19:07	19:36
N 10°	04:56	05:23	05:46	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:09	18:32	18:58
S 10°	05:30	05:56	06:18	17:53	18:16	18:42
20°	05:45	06:12	06:35	17:36	18:00	18:27
30°	06:00	06:29	06:55	17:17	17:43	18:12
35°	06:07	06:39	07:06	17:05	17:33	18:04
40°	06:16	06:49	07:19	16:52	17:22	17:56
45°	06:25	07:02	07:35	16:37	17:10	17:47
S 50°	06:35	07:16	07:54	16:18	16:56	17:36
52°	06:40	07:23	08:02	16:09	16:49	17:32
54°	06:45	07:30	08:12	15:59	16:42	17:27
56°	06:50	07:38	08:24	15:48	16:34	17:22
58°	06:56	07:47	08:37	15:35	16:25	17:16
S 60°	07:03	07:58	08:52	15:20	16:14	17:09

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°						
N 70°						
68°	18:13			20:13		
66°	17:15			21:12		
64°	16:42	18:45		21:46	21:28	
62°	16:18	18:01	19:41	22:11	22:12	22:20
60°	15:59	17:32	18:58	22:31	22:42	23:03
N 58°	15:43	17:10	18:30	22:47	23:04	23:32
56°	15:30	16:52	18:07	23:01	23:22	23:55
54°	15:18	16:37	17:49	23:13	23:38	·· ··
52°	15:08	16:24	17:34	23:24	23:51	·· ··
50°	14:59	16:13	17:21	23:34	·· ··	00:03
45°	14:40	15:49	16:53	23:54	·· ··	00:28
N 40°	14:24	15:30	16:32	·· ··	00:10	00:47
35°	14:11	15:14	16:14	·· ··	00:24	01:04
30°	14:00	15:00	15:59	·· ··	00:36	01:18
20°	13:41	14:37	15:33	00:15	00:57	01:43
N 10°	13:24	14:17	15:11	00:30	01:15	02:04
0°	13:09	13:59	14:50	00:43	01:33	02:23
S 10°	12:53	13:40	14:30	00:57	01:50	02:43
20°	12:37	13:21	14:08	01:12	02:08	03:04
30°	12:18	12:58	13:42	01:28	02:29	03:29
35°	12:08	12:45	13:27	01:38	02:42	03:43
40°	11:55	12:29	13:10	01:49	02:56	04:00
45°	11:41	12:11	12:49	02:03	03:13	04:20
S 50°	11:23	11:49	12:23	02:19	03:34	04:46
52°	11:15	11:39	12:10	02:27	03:45	04:58
54°	11:06	11:27	11:56	02:35	03:56	05:12
56°	10:55	11:13	11:39	02:45	04:09	05:29
58°	10:44	10:57	11:19	02:56	04:25	05:49
S 60°	10:30	10:38	10:54	03:09	04:43	06:14

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 8-10 63-81%
12	05:35	05:39	12:06	19:21	06:56	
13	05:43	05:47	12:06	20:11	07:46	
14	05:50	05:53	12:06	21:03	08:37	

July 15, 16, 17 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°37.6	186°43.2	N23°02.7	112°35.2	N00°26.0	142°21.8	N13°06.3	266°22.7	N08°12.3
1	307°40.1	201°42.3	02.5	127°36.3	25.4	157°23.8	06.1	281°25.0	12.3
2	322°42.5	216°41.5	02.2	142°37.5	24.7	172°25.7	05.9	296°27.4	12.4
3	337°45.0	231°40.6	·· 02.0	157°38.7	·· 24.1	187°27.7	·· 05.8	311°29.7	·· 12.4
4	352°47.5	246°39.8	01.8	172°39.9	23.5	202°29.7	05.6	326°32.1	12.4
5	7°49.9	261°38.9	01.5	187°41.0	22.9	217°31.7	05.4	341°34.5	12.5
6	22°52.4	276°38.0	N23°01.3	202°42.2	N00°22.3	232°33.7	N13°05.3	356°36.8	N08°12.5
7	37°54.9	291°37.2	01.0	217°43.4	21.7	247°35.7	05.1	11°39.2	12.5
8	52°57.3	306°36.3	00.8	232°44.5	21.1	262°37.7	04.9	26°41.5	12.5
9	67°59.8	321°35.5	·· 00.5	247°45.7	·· 20.5	277°39.7	·· 04.8	41°43.9	·· 12.6
10	83°02.2	336°34.6	00.3	262°46.9	19.9	292°41.7	04.6	56°46.3	12.6
11	98°04.7	351°33.7	23°00.0	277°48.1	19.3	307°43.7	04.4	71°48.6	12.6
12	113°07.2	6°32.9	N22°59.8	292°49.2	N00°18.7	322°45.7	N13°04.2	86°51.0	N08°12.6
13	128°09.6	21°32.0	59.5	307°50.4	18.1	337°47.7	04.1	101°53.3	12.7
14	143°12.1	36°31.2	59.2	322°51.6	17.5	352°49.7	03.9	116°55.7	12.7
15	158°14.6	51°30.3	·· 59.0	337°52.7	·· 16.9	7°51.7	·· 03.7	131°58.1	·· 12.7
16	173°17.0	66°29.4	58.7	352°53.9	16.3	22°53.7	03.6	147°00.4	12.8
17	188°19.5	81°28.6	58.5	7°55.1	15.7	37°55.6	03.4	162°02.8	12.8
18	203°22.0	96°27.7	N22°58.2	22°56.2	N00°15.1	52°57.6	N13°03.2	177°05.1	N08°12.8
19	218°24.4	111°26.9	58.0	37°57.4	14.5	67°59.6	03.1	192°07.5	12.8
20	233°26.9	126°26.0	57.7	52°58.6	13.8	83°01.6	02.9	207°09.9	12.9
21	248°29.4	141°25.2	·· 57.4	67°59.7	·· 13.2	98°03.6	·· 02.7	222°12.2	·· 12.9
22	263°31.8	156°24.3	57.2	83°00.9	12.6	113°05.6	02.5	237°14.6	12.9
23	278°34.3	171°23.4	56.9	98°02.1	12.0	128°07.6	02.4	252°16.9	13.0
Mer.pass.	04:29	ν -0.9′	d 0.2′	m -3.91	ν 1.2′	d 0.6′	m 1.16	ν 2.0′	d 0.2′ m -1.76	ν 2.4′	d 0.0′ m 0.55

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	293°36.7	186°22.6	N22°56.6	113°03.3	N00°11.4	143°09.6	N13°02.2	267°19.3	N08°13.0
1	308°39.2	201°21.7	56.4	128°04.4	10.8	158°11.6	02.0	282°21.7	13.0
2	323°41.7	216°20.9	56.1	143°05.6	10.2	173°13.6	01.9	297°24.0	13.0
3	338°44.1	231°20.0	·· 55.8	158°06.8	·· 09.6	188°15.6	·· 01.7	312°26.4	·· 13.1
4	353°46.6	246°19.2	55.5	173°07.9	09.0	203°17.6	01.5	327°28.7	13.1
5	8°49.1	261°18.3	55.3	188°09.1	08.4	218°19.6	01.4	342°31.1	13.1
6	23°51.5	276°17.4	N22°55.0	203°10.3	N00°07.8	233°21.5	N13°01.2	357°33.5	N08°13.1
7	38°54.0	291°16.6	54.7	218°11.4	07.2	248°23.5	01.0	12°35.8	13.2
8	53°56.5	306°15.7	54.4	233°12.6	06.6	263°25.5	00.8	27°38.2	13.2
9	68°58.9	321°14.9	·· 54.2	248°13.8	·· 06.0	278°27.5	·· 00.7	42°40.6	·· 13.2
10	84°01.4	336°14.0	53.9	263°14.9	05.4	293°29.5	00.5	57°42.9	13.2
11	99°03.9	351°13.2	53.6	278°16.1	04.8	308°31.5	00.3	72°45.3	13.3
12	114°06.3	6°12.3	N22°53.3	293°17.2	N00°04.1	323°33.5	N13°00.2	87°47.7	N08°13.3
13	129°08.8	21°11.4	53.0	308°18.4	03.5	338°35.5	13°00.0	102°50.0	13.3
14	144°11.2	36°10.6	52.8	323°19.6	02.9	353°37.5	12°59.8	117°52.4	13.4
15	159°13.7	51°09.7	·· 52.5	338°20.7	·· 02.3	8°39.5	·· 59.6	132°54.7	·· 13.4
16	174°16.2	66°08.9	52.2	353°21.9	01.7	23°41.5	59.5	147°57.1	13.4
17	189°18.6	81°08.0	51.9	8°23.1	01.1	38°43.5	59.3	162°59.5	13.4
18	204°21.1	96°07.2	N22°51.6	23°24.2	N00°00.5	53°45.4	N12°59.1	178°01.8	N08°13.5
19	219°23.6	111°06.3	51.3	38°25.4	S00°00.1	68°47.4	59.0	193°04.2	13.5
20	234°26.0	126°05.5	51.0	53°26.6	00.7	83°49.4	58.8	208°06.6	13.5
21	249°28.5	141°04.6	·· 50.7	68°27.7	·· 01.3	98°51.4	·· 58.6	223°08.9	·· 13.5
22	264°31.0	156°03.8	50.4	83°28.9	01.9	113°53.4	58.4	238°11.3	13.6
23	279°33.4	171°02.9	50.2	98°30.1	02.5	128°55.4	58.3	253°13.7	13.6
Mer.pass.	04:25	ν -0.9′	d 0.3′	m -3.91	ν 1.2′	d 0.6′	m 1.17	ν 2.0′	d 0.2′ m -1.76	ν 2.4′	d 0.0′ m 0.55

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	294°35.9	186°02.1	N22°49.9	113°31.2	S00°03.1	143°57.4	N12°58.1	268°16.0	N08°13.6
1	309°38.4	201°01.2	49.6	128°32.4	03.8	158°59.4	57.9	283°18.4	13.6
2	324°40.8	216°00.4	49.3	143°33.5	04.4	174°01.4	57.8	298°20.8	13.7
3	339°43.3	230°59.5	·· 49.0	158°34.7	·· 05.0	189°03.4	·· 57.6	313°23.1	·· 13.7
4	354°45.7	245°58.6	48.7	173°35.9	05.6	204°05.3	57.4	328°25.5	13.7
5	9°48.2	260°57.8	48.4	188°37.0	06.2	219°07.3	57.2	343°27.8	13.7
6	24°50.7	275°56.9	N22°48.1	203°38.2	S00°06.8	234°09.3	N12°57.1	358°30.2	N08°13.8
7	39°53.1	290°56.1	47.8	218°39.4	07.4	249°11.3	56.9	13°32.6	13.8
8	54°55.6	305°55.2	47.5	233°40.5	08.0	264°13.3	56.7	28°34.9	13.8
9	69°58.1	320°54.4	·· 47.1	248°41.7	·· 08.6	279°15.3	·· 56.6	43°37.3	·· 13.8
10	85°00.5	335°53.5	46.8	263°42.8	09.2	294°17.3	56.4	58°39.7	13.9
11	100°03.0	350°52.7	46.5	278°44.0	09.8	309°19.3	56.2	73°42.0	13.9
12	115°05.5	5°51.8	N22°46.2	293°45.2	S00°10.4	324°21.3	N12°56.0	88°44.4	N08°13.9
13	130°07.9	20°51.0	45.9	308°46.3	11.1	339°23.3	55.9	103°46.8	13.9
14	145°10.4	35°50.1	45.6	323°47.5	11.7	354°25.2	55.7	118°49.2	14.0
15	160°12.8	50°49.3	·· 45.3	338°48.6	·· 12.3	9°27.2	·· 55.5	133°51.5	·· 14.0
16	175°15.3	65°48.4	45.0	353°49.8	12.9	24°29.2	55.3	148°53.9	14.0
17	190°17.8	80°47.6	44.7	8°51.0	13.5	39°31.2	55.2	163°56.3	14.0
18	205°20.2	95°46.7	N22°44.3	23°52.1	S00°14.1	54°33.2	N12°55.0	178°58.6	N08°14.1
19	220°22.7	110°45.9	44.0	38°53.3	14.7	69°35.2	54.8	194°01.0	14.1
20	235°25.2	125°45.0	43.7	53°54.4	15.3	84°37.2	54.7	209°03.4	14.1
21	250°27.6	140°44.2	·· 43.4	68°55.6	·· 15.9	99°39.2	·· 54.5	224°05.7	·· 14.1
22	265°30.1	155°43.4	43.1	83°56.8	16.5	114°41.2	54.3	239°08.1	14.2
23	280°32.6	170°42.5	42.7	98°57.9	17.1	129°43.1	54.1	254°10.5	14.2
Mer.pass.	04:21	ν -0.9′	d 0.3′	m -3.91	ν 1.2′	d 0.6′	m 1.18	ν 2.0′	d 0.2′ m -1.76	ν 2.4′	d 0.0′ m 0.54

Stars

	SHA	Dec
Alpheratz	357°32.5	29°14.5
Ankaa	353°05.0	-42°09.0
Schedar	349°28.5	56°41.1
Diphda	348°45.2	-17°49.9
Achernar	335°18.7	-57°05.4
Hamal	327°48.9	23°35.5
Polaris	313°07.9	89°22.5
Acamar	315°10.4	-40°11.4
Menkar	314°04.1	4°11.9
Mirfak	308°25.5	49°57.3
Aldebaran	290°37.5	16°33.8
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°52.0	-52°42.5
Sirius	258°24.7	-16°45.2
Adhara	255°04.6	-29°00.5
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.6	-69°50.0
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.9	-63°15.4
Gacrux	171°49.4	-57°16.4
Alioth	166°11.3	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.4	49°10.8
Hadar	148°32.9	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.2	-60°57.2
Kochab	137°19.5	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°04.8	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.7
Enif	33°36.5	10°00.2
Al Na'ir	27°30.0	-46°49.4
Fomalhaut	15°12.0	-29°28.3
Scheat	13°42.9	28°13.9
Markab	13°27.6	15°21.3

Jul 15 Thu	SHA	Mer.pass
Venus	254°05.6	11:34
Mars	179°57.6	16:28
Jupiter	209°44.2	14:29
Saturn	333°45.1	06:14

Jul 16 Fri	SHA	Mer.pass
Venus	252°45.8	11:35
Mars	179°26.5	16:27
Jupiter	209°32.8	14:25
Saturn	333°42.6	06:10

Jul 17 Sat	SHA	Mer.pass
Venus	251°26.2	11:37
Mars	178°55.3	16:25
Jupiter	209°21.5	14:22
Saturn	333°40.1	06:06

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°30.9	N21°35.3	42°46.1	9.5′	S26°43.4	2.7′	54.8′
1	193°30.8	34.9	57°14.6	9.5′	26°46.1	2.6′	54.8′
2	208°30.7	34.5	71°43.1	9.5′	26°48.7	2.4′	54.8′
3	223°30.7	·· 34.1	86°11.6	9.5′	26°51.1	2.3′	54.8′
4	238°30.6	33.7	100°40.0	9.5′	26°53.4	2.2′	54.7′
5	253°30.5	33.3	115°08.5	9.5′	26°55.6	2.0′	54.7′
6	268°30.5	N21°32.9	129°36.9	9.4′	S26°57.6	1.9′	54.7′
7	283°30.4	32.5	144°05.4	9.4′	26°59.5	1.7′	54.7′
8	298°30.3	32.1	158°33.8	9.4′	27°01.2	1.7′	54.7′
9	313°30.3	·· 31.8	173°02.3	9.4′	27°02.9	1.4′	54.7′
10	328°30.2	31.4	187°30.7	9.5′	27°04.3	1.4′	54.6′
11	343°30.2	31.0	201°59.2	9.5′	27°05.7	1.2′	54.6′
12	358°30.1	N21°30.6	216°27.6	9.5′	S27°06.9	1.1′	54.6′
13	13°30.0	30.2	230°56.1	9.5′	27°08.0	0.9′	54.6′
14	28°30.0	29.8	245°24.5	9.5′	27°08.9	0.8′	54.6′
15	43°29.9	·· 29.4	259°53.0	9.5′	27°09.7	0.6′	54.6′
16	58°29.8	29.0	274°21.5	9.5′	27°10.3	0.6′	54.6′
17	73°29.8	28.6	288°50.0	9.5′	27°10.9	0.4′	54.5′
18	88°29.7	N21°28.2	303°18.5	9.5′	S27°11.3	0.2′	54.5′
19	103°29.7	27.8	317°47.0	9.5′	27°11.5	0.1′	54.5′
20	118°29.6	27.4	332°15.5	9.5′	27°11.6	0.0′	54.5′
21	133°29.5	·· 27.0	346°44.1	9.6′	27°11.6	0.2′	54.5′
22	148°29.5	26.6	1°12.6	9.6′	27°11.4	0.3′	54.5′
23	163°29.4	26.2	15°41.2	9.6′	27°11.1	0.4′	54.5′
	SD = 15.7′	d = 0.4′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°29.4	N21°25.8	30°09.8	9.6′	S27°10.7	0.6′	54.4′
1	193°29.3	25.4	44°38.4	9.6′	27°10.1	0.7′	54.4′
2	208°29.2	25.0	59°07.0	9.6′	27°09.4	0.8′	54.4′
3	223°29.2	·· 24.6	73°35.6	9.7′	27°08.6	1.0′	54.4′
4	238°29.1	24.2	88°04.3	9.7′	27°07.6	1.1′	54.4′
5	253°29.1	23.8	102°33.0	9.7′	27°06.5	1.2′	54.4′
6	268°29.0	N21°23.4	117°01.7	9.7′	S27°05.3	1.4′	54.4′
7	283°28.9	23.0	131°30.5	9.8′	27°03.9	1.5′	54.4′
8	298°28.9	22.5	145°59.2	9.8′	27°02.4	1.6′	54.4′
9	313°28.8	·· 22.1	160°28.0	9.8′	27°00.8	1.8′	54.3′
10	328°28.8	21.7	174°56.9	9.9′	26°59.0	1.9′	54.3′
11	343°28.7	21.3	189°25.7	9.9′	26°57.1	2.1′	54.3′
12	358°28.6	N21°20.9	203°54.6	9.9′	S26°55.0	2.1′	54.3′
13	13°28.6	20.5	218°23.5	10.0′	26°52.9	2.3′	54.3′
14	28°28.5	20.1	232°52.5	10.0′	26°50.6	2.5′	54.3′
15	43°28.5	·· 19.7	247°21.5	10.0′	26°48.1	2.5′	54.3′
16	58°28.4	19.3	261°50.5	10.1′	26°45.6	2.7′	54.3′
17	73°28.4	18.9	276°19.6	10.1′	26°42.9	2.8′	54.3′
18	88°28.3	N21°18.4	290°48.7	10.1′	S26°40.1	3.0′	54.2′
19	103°28.2	18.0	305°17.8	10.2′	26°37.1	3.1′	54.2′
20	118°28.2	17.6	319°47.0	10.2′	26°34.0	3.2′	54.2′
21	133°28.1	·· 17.2	334°16.2	10.3′	26°30.8	3.3′	54.2′
22	148°28.1	16.8	348°45.5	10.3′	26°27.5	3.5′	54.2′
23	163°28.0	16.4	3°14.8	10.3′	26°24.0	3.6′	54.2′
	SD = 15.7′	d = 0.4′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°28.0	N21°15.9	17°44.1	10.4′	S26°20.4	3.7′	54.2′
1	193°27.9	15.5	32°13.5	10.4′	26°16.7	3.8′	54.2′
2	208°27.9	15.1	46°42.9	10.5′	26°12.9	4.0′	54.2′
3	223°27.8	·· 14.7	61°12.4	10.5′	26°08.9	4.1′	54.2′
4	238°27.8	14.3	75°41.9	10.6′	26°04.8	4.2′	54.1′
5	253°27.7	13.9	90°11.5	10.6′	26°00.6	4.3′	54.1′
6	268°27.6	N21°13.4	104°41.1	10.7′	S25°56.3	4.5′	54.1′
7	283°27.6	13.0	119°10.8	10.7′	25°51.8	4.6′	54.1′
8	298°27.5	12.6	133°40.5	10.8′	25°47.2	4.7′	54.1′
9	313°27.5	·· 12.2	148°10.3	10.8′	25°42.5	4.8′	54.1′
10	328°27.4	11.7	162°40.1	10.9′	25°37.7	4.9′	54.1′
11	343°27.4	11.3	177°10.0	10.9′	25°32.8	5.1′	54.1′
12	358°27.3	N21°10.9	191°40.0	11.0′	S25°27.7	5.1′	54.1′
13	13°27.3	10.5	206°09.9	11.0′	25°22.6	5.3′	54.1′
14	28°27.2	10.0	220°40.0	11.1′	25°17.3	5.4′	54.1′
15	43°27.2	·· 09.6	235°10.1	11.2′	25°11.9	5.6′	54.1′
16	58°27.1	09.2	249°40.2	11.2′	25°06.3	5.6′	54.1′
17	73°27.1	08.8	264°10.4	11.3′	25°00.7	5.8′	54.1′
18	88°27.0	N21°08.3	278°40.7	11.3′	S24°54.9	5.8′	54.0′
19	103°27.0	07.9	293°11.0	11.4′	24°49.1	6.0′	54.0′
20	118°26.9	07.5	307°41.4	11.4′	24°43.1	6.1′	54.0′
21	133°26.9	·· 07.0	322°11.8	11.5′	24°37.0	6.2′	54.0′
22	148°26.8	06.6	336°42.3	11.6′	24°30.8	6.3′	54.0′
23	163°26.8	06.2	351°12.9	11.6′	24°24.5	6.5′	54.0′
	SD = 15.7′	d = 0.4′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:39	22:30	////	////
64°	////	////	02:18	21:52	////	////
62°	////	00:55	02:44	21:26	23:11	////
60°	////	01:47	03:05	21:06	22:22	////
N 58°	////	02:18	03:22	20:49	21:53	////
56°	00:51	02:40	03:36	20:35	21:30	23:16
54°	01:38	02:58	03:48	20:23	21:13	22:31
52°	02:07	03:13	03:59	20:13	20:58	22:04
50°	02:28	03:26	04:08	20:03	20:45	21:43
45°	03:06	03:52	04:28	19:43	20:19	21:05
N 40°	03:33	04:13	04:44	19:27	19:59	20:39
35°	03:53	04:29	04:58	19:14	19:43	20:18
30°	04:10	04:43	05:10	19:02	19:29	20:02
20°	04:37	05:05	05:29	18:43	19:07	19:35
N 10°	04:57	05:24	05:47	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:16	18:42
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:18	17:44	18:14
35°	06:06	06:38	07:05	17:07	17:35	18:06
40°	06:15	06:48	07:18	16:55	17:24	17:58
45°	06:23	07:00	07:33	16:40	17:13	17:49
S 50°	06:33	07:14	07:51	16:21	16:59	17:39
52°	06:38	07:20	08:00	16:13	16:52	17:35
54°	06:43	07:28	08:09	16:03	16:45	17:30
56°	06:48	07:35	08:20	15:52	16:37	17:25
58°	06:53	07:44	08:33	15:40	16:29	17:19
S 60°	07:00	07:54	08:47	15:25	16:19	17:13

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	22:12	▬	▬	▬
62°	20:57	21:25	21:31	22:53	·· ··	00:13
60°	20:04	20:43	21:03	23:46	·· ··	00:54
N 58°	19:33	20:15	20:41	·· ··	00:18	01:22
56°	19:09	19:53	20:23	·· ··	00:41	01:44
54°	18:50	19:35	20:07	00:13	01:01	02:02
52°	18:33	19:20	19:54	00:28	01:17	02:17
50°	18:19	19:06	19:43	00:42	01:31	02:30
45°	17:51	18:39	19:19	01:09	01:59	02:57
N 40°	17:28	18:18	18:59	01:31	02:22	03:18
35°	17:10	18:00	18:43	01:49	02:40	03:36
30°	16:54	17:44	18:29	02:05	02:56	03:51
20°	16:27	17:18	18:05	02:31	03:23	04:16
N 10°	16:04	16:55	17:44	02:54	03:46	04:38
0°	15:42	16:34	17:25	03:15	04:08	04:59
S 10°	15:21	16:13	17:05	03:37	04:29	05:19
20°	14:58	15:50	16:44	03:59	04:52	05:41
30°	14:31	15:24	16:20	04:26	05:19	06:06
35°	14:15	15:09	16:05	04:42	05:34	06:21
40°	13:57	14:50	15:49	05:00	05:53	06:38
45°	13:35	14:29	15:29	05:22	06:15	06:59
S 50°	13:07	14:01	15:04	05:50	06:43	07:24
52°	12:53	13:47	14:52	06:03	06:56	07:37
54°	12:37	13:32	14:38	06:19	07:12	07:51
56°	12:18	13:13	14:22	06:38	07:31	08:07
58°	11:55	12:50	14:02	07:01	07:54	08:27
S 60°	11:25	12:21	13:38	07:31	08:23	08:52

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 88-97%
15	05:57	06:00	12:06	21:55	09:29	
16	06:03	06:05	12:06	22:47	10:21	
17	06:08	06:11	12:06	23:36	11:12	

July 18, 19, 20 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	295°35.0	185°41.7	N22°42.4	113°59.1	S00°17.8	144°45.1	N12°54.0	269°12.8	N08°14.2
1	310°37.5	200°40.8	42.1	129°00.2	18.4	159°47.1	53.8	284°15.2	14.2
2	325°40.0	215°40.0	41.8	144°01.4	19.0	174°49.1	53.6	299°17.6	14.3
3	340°42.4	230°39.1	·· 41.4	159°02.5	·· 19.6	189°51.1	·· 53.5	314°19.9	·· 14.3
4	355°44.9	245°38.3	41.1	174°03.7	20.2	204°53.1	53.3	329°22.3	14.3
5	10°47.3	260°37.4	40.8	189°04.9	20.8	219°55.1	53.1	344°24.7	14.3
6	25°49.8	275°36.6	N22°40.5	204°06.0	S00°21.4	234°57.1	N12°52.9	359°27.0	N08°14.4
7	40°52.3	290°35.7	40.1	219°07.2	22.0	249°59.0	52.8	14°29.4	14.4
8	55°54.7	305°34.9	39.8	234°08.3	22.6	265°01.0	52.6	29°31.8	14.4
9	70°57.2	320°34.0	·· 39.5	249°09.5	·· 23.2	280°03.0	·· 52.4	44°34.2	·· 14.4
10	85°59.7	335°33.2	39.1	264°10.6	23.9	295°05.0	52.2	59°36.5	14.4
11	101°02.1	350°32.4	38.8	279°11.8	24.5	310°07.0	52.1	74°38.9	14.5
12	116°04.6	5°31.5	N22°38.4	294°13.0	S00°25.1	325°09.0	N12°51.9	89°41.3	N08°14.5
13	131°07.1	20°30.7	38.1	309°14.1	25.7	340°11.0	51.7	104°43.6	14.5
14	146°09.5	35°29.8	37.8	324°15.3	26.3	355°13.0	51.5	119°46.0	14.5
15	161°12.0	50°29.0	·· 37.4	339°16.4	·· 26.9	10°14.9	·· 51.4	134°48.4	·· 14.6
16	176°14.5	65°28.1	37.1	354°17.6	27.5	25°16.9	51.2	149°50.8	14.6
17	191°16.9	80°27.3	36.7	9°18.7	28.1	40°18.9	51.0	164°53.1	14.6
18	206°19.4	95°26.4	N22°36.4	24°19.9	S00°28.7	55°20.9	N12°50.9	179°55.5	N08°14.6
19	221°21.8	110°25.6	36.1	39°21.0	29.4	70°22.9	50.7	194°57.9	14.7
20	236°24.3	125°24.8	35.7	54°22.2	30.0	85°24.9	50.5	210°00.2	14.7
21	251°26.8	140°23.9	·· 35.4	69°23.4	·· 30.6	100°26.9	·· 50.3	225°02.6	·· 14.7
22	266°29.2	155°23.1	35.0	84°24.5	31.2	115°28.9	50.2	240°05.0	14.7
23	281°31.7	170°22.2	34.7	99°25.7	31.8	130°30.8	50.0	255°07.4	14.8
Mer.pass. 04:17		ν -0.8′	d 0.3′	m -3.91	ν 1.2′	d 0.6′	m 1.18	ν 2.0′	d 0.2′ m -1.75	ν 2.4′	d 0.0′ m 0.54

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	296°34.2	185°21.4	N22°34.3	114°26.8	S00°32.4	145°32.8	N12°49.8	270°09.7	N08°14.8
1	311°36.6	200°20.6	34.0	129°28.0	33.0	160°34.8	49.6	285°12.1	14.8
2	326°39.1	215°19.7	33.6	144°29.1	33.6	175°36.8	49.5	300°14.5	14.8
3	341°41.6	230°18.9	·· 33.2	159°30.3	·· 34.2	190°38.8	·· 49.3	315°16.9	·· 14.8
4	356°44.0	245°18.0	32.9	174°31.4	34.8	205°40.8	49.1	330°19.2	14.9
5	11°46.5	260°17.2	32.5	189°32.6	35.5	220°42.8	48.9	345°21.6	14.9
6	26°49.0	275°16.4	N22°32.2	204°33.7	S00°36.1	235°44.7	N12°48.8	0°24.0	N08°14.9
7	41°51.4	290°15.5	31.8	219°34.9	36.7	250°46.7	48.6	15°26.3	14.9
8	56°53.9	305°14.7	31.5	234°36.0	37.3	265°48.7	48.4	30°28.7	15.0
9	71°56.3	320°13.8	·· 31.1	249°37.2	·· 37.9	280°50.7	·· 48.2	45°31.1	·· 15.0
10	86°58.8	335°13.0	30.7	264°38.3	38.5	295°52.7	48.1	60°33.5	15.0
11	102°01.3	350°12.2	30.4	279°39.5	39.1	310°54.7	47.9	75°35.8	15.0
12	117°03.7	5°11.3	N22°30.0	294°40.6	S00°39.7	325°56.7	N12°47.7	90°38.2	N08°15.0
13	132°06.2	20°10.5	29.6	309°41.8	40.4	340°58.6	47.6	105°40.6	15.1
14	147°08.7	35°09.6	29.3	324°42.9	41.0	356°00.6	47.4	120°43.0	15.1
15	162°11.1	50°08.8	·· 28.9	339°44.1	·· 41.6	11°02.6	·· 47.2	135°45.3	·· 15.1
16	177°13.6	65°08.0	28.5	354°45.2	42.2	26°04.6	47.0	150°47.7	15.1
17	192°16.1	80°07.1	28.2	9°46.4	42.8	41°06.6	46.9	165°50.1	15.2
18	207°18.5	95°06.3	N22°27.8	24°47.5	S00°43.4	56°08.6	N12°46.7	180°52.5	N08°15.2
19	222°21.0	110°05.5	27.4	39°48.7	44.0	71°10.6	46.5	195°54.8	15.2
20	237°23.5	125°04.6	27.0	54°49.8	44.6	86°12.5	46.3	210°57.2	15.2
21	252°25.9	140°03.8	·· 26.7	69°51.0	·· 45.2	101°14.5	·· 46.2	225°59.6	·· 15.2
22	267°28.4	155°02.9	26.3	84°52.1	45.9	116°16.5	46.0	241°02.0	15.3
23	282°30.8	170°02.1	25.9	99°53.3	46.5	131°18.5	45.8	256°04.3	15.3
Mer.pass. 04:13		ν -0.8′	d 0.4′	m -3.92	ν 1.2′	d 0.6′	m 1.19	ν 2.0′	d 0.2′ m -1.75	ν 2.4′	d 0.0′ m 0.54

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	297°33.3	185°01.3	N22°25.5	114°54.4	S00°47.1	146°20.5	N12°45.6	271°06.7	N08°15.3
1	312°35.8	200°00.4	25.2	129°55.6	47.7	161°22.5	45.5	286°09.1	15.3
2	327°38.2	214°59.6	24.8	144°56.7	48.3	176°24.5	45.3	301°11.5	15.3
3	342°40.7	229°58.8	·· 24.4	159°57.9	·· 48.9	191°26.4	·· 45.1	316°13.9	·· 15.4
4	357°43.2	244°57.9	24.0	174°59.0	49.5	206°28.4	44.9	331°16.2	15.4
5	12°45.6	259°57.1	23.6	190°00.2	50.1	221°30.4	44.8	346°18.6	15.4
6	27°48.1	274°56.3	N22°23.2	205°01.3	S00°50.8	236°32.4	N12°44.6	1°21.0	N08°15.4
7	42°50.6	289°55.4	22.9	220°02.5	51.4	251°34.4	44.4	16°23.4	15.4
8	57°53.0	304°54.6	22.5	235°03.6	52.0	266°36.4	44.2	31°25.7	15.5
9	72°55.5	319°53.8	·· 22.1	250°04.8	·· 52.6	281°38.3	·· 44.1	46°28.1	·· 15.5
10	87°57.9	334°52.9	21.7	265°05.9	53.2	296°40.3	43.9	61°30.5	15.5
11	103°00.4	349°52.1	21.3	280°07.1	53.8	311°42.3	43.7	76°32.9	15.5
12	118°02.9	4°51.3	N22°20.9	295°08.2	S00°54.4	326°44.3	N12°43.5	91°35.3	N08°15.6
13	133°05.3	19°50.4	20.5	310°09.4	55.1	341°46.3	43.4	106°37.6	15.6
14	148°07.8	34°49.6	20.1	325°10.5	55.7	356°48.3	43.2	121°40.0	15.6
15	163°10.3	49°48.8	·· 19.7	340°11.7	·· 56.3	11°50.2	·· 43.0	136°42.4	·· 15.6
16	178°12.7	64°48.0	19.3	355°12.8	56.9	26°52.2	42.8	151°44.8	15.6
17	193°15.2	79°47.1	18.9	10°13.9	57.5	41°54.2	42.7	166°47.1	15.7
18	208°17.7	94°46.3	N22°18.5	25°15.1	S00°58.1	56°56.2	N12°42.5	181°49.5	N08°15.7
19	223°20.1	109°45.5	18.1	40°16.2	58.7	71°58.2	42.3	196°51.9	15.7
20	238°22.6	124°44.6	17.7	55°17.4	00°59.3	87°00.2	42.1	211°54.3	15.7
21	253°25.1	139°43.8	·· 17.3	70°18.5	01°00.0	102°02.2	·· 42.0	226°56.7	·· 15.7
22	268°27.5	154°43.0	16.9	85°19.7	00.6	117°04.1	41.8	241°59.0	15.8
23	283°30.0	169°42.1	16.5	100°20.8	01.2	132°06.1	41.6	257°01.4	15.8
Mer.pass. 04:09		ν -0.8′	d 0.4′	m -3.92	ν 1.1′	d 0.6′	m 1.19	ν 2.0′	d 0.2′ m -1.75	ν 2.4′	d 0.0′ m 0.53

Stars

	SHA	Dec
Alpheratz	357°32.4	29°14.5
Ankaa	353°05.0	-42°09.0
Schedar	349°28.4	56°41.1
Diphda	348°45.1	-17°49.9
Achernar	335°18.7	-57°05.4
Hamal	327°48.9	23°35.5
Polaris	313°06.3	89°22.5
Acamar	315°10.4	-40°11.4
Menkar	314°04.1	4°11.9
Mirfak	308°25.4	49°57.4
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°52.0	-52°42.5
Sirius	258°24.7	-16°45.2
Adhara	255°04.6	-29°00.5
Procyon	244°49.0	5°09.2
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°50.0
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.9	-63°15.4
Gacrux	171°49.4	-57°16.4
Alioth	166°11.3	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.4	49°10.8
Hadar	148°32.9	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°45.9	19°02.4
Rigil Kent.	139°37.2	-60°57.2
Kochab	137°19.6	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.7
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.2
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.8
Enif	33°36.4	10°00.2
Al Na'ir	27°29.9	-46°49.4
Fomalhaut	15°12.0	-29°28.3
Scheat	13°42.9	28°14.0
Markab	13°27.6	15°21.3

Jul 18 Sun	SHA	Mer.pass
Venus	250°06.6	11:38
Mars	178°24.0	16:23
Jupiter	209°10.1	14:19
Saturn	333°37.8	06:02

Jul 19 Mon	SHA	Mer.pass
Venus	248°47.2	11:39
Mars	177°52.6	16:21
Jupiter	208°58.7	14:16
Saturn	333°35.6	05:58

Jul 20 Tue	SHA	Mer.pass
Venus	247°28.0	11:41
Mars	177°21.1	16:19
Jupiter	208°47.2	14:13
Saturn	333°33.4	05:55

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°26.7	N21°05.7	5°43.5	11.7′	S24°18.0	6.5′	54.0′
1	193°26.7	05.3	20°14.2	11.7′	24°11.5	6.7′	54.0′
2	208°26.6	04.9	34°44.9	11.8′	24°04.8	6.7′	54.0′
3	223°26.6	·· 04.4	49°15.7	11.9′	23°58.1	6.9′	54.0′
4	238°26.5	04.0	63°46.6	11.9′	23°51.2	6.9′	54.0′
5	253°26.5	03.6	78°17.5	12.0′	23°44.3	7.1′	54.0′
6	268°26.4	N21°03.1	92°48.5	12.0′	S23°37.2	7.2′	54.0′
7	283°26.4	02.7	107°19.5	12.1′	23°30.0	7.3′	54.0′
8	298°26.3	02.3	121°50.6	12.2′	23°22.7	7.4′	54.0′
9	313°26.3	·· 01.8	136°21.8	12.2′	23°15.3	7.4′	54.0′
10	328°26.2	01.4	150°53.0	12.3′	23°07.9	7.6′	54.0′
11	343°26.2	01.0	165°24.3	12.4′	23°00.3	7.7′	54.0′
12	358°26.2	N21°00.5	179°55.7	12.4′	S22°52.6	7.8′	54.0′
13	13°26.1	21°00.1	194°27.1	12.5′	22°44.8	7.9′	54.0′
14	28°26.1	20°59.6	208°58.6	12.5′	22°36.9	8.0′	53.9′
15	43°26.0	·· 59.2	223°30.1	12.6′	22°28.9	8.1′	53.9′
16	58°26.0	58.7	238°01.7	12.7′	22°20.8	8.1′	53.9′
17	73°25.9	58.3	252°33.4	12.7′	22°12.7	8.3′	53.9′
18	88°25.9	N20°57.9	267°05.1	12.8′	S22°04.4	8.4′	53.9′
19	103°25.8	57.4	281°36.9	12.9′	21°56.0	8.5′	53.9′
20	118°25.8	57.0	296°08.8	12.9′	21°47.5	8.5′	53.9′
21	133°25.7	·· 56.5	310°40.7	13.0′	21°39.0	8.7′	53.9′
22	148°25.7	56.1	325°12.7	13.1′	21°30.3	8.7′	53.9′
23	163°25.7	55.6	339°44.7	13.1′	21°21.6	8.8′	53.9′
	SD = 15.7′	d = 0.4′	SD = 14.7′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°25.6	N20°55.2	354°16.9	13.2′	S21°12.8	9.0′	53.9′
1	193°25.6	54.7	8°49.0	13.2′	21°03.8	9.0′	53.9′
2	208°25.5	54.3	23°21.3	13.3′	20°54.8	9.1′	53.9′
3	223°25.5	·· 53.8	37°53.6	13.4′	20°45.7	9.1′	53.9′
4	238°25.4	53.4	52°25.9	13.4′	20°36.6	9.3′	53.9′
5	253°25.4	52.9	66°58.4	13.5′	20°27.3	9.4′	53.9′
6	268°25.4	N20°52.5	81°30.9	13.6′	S20°17.9	9.4′	53.9′
7	283°25.3	52.0	96°03.4	13.6′	20°08.5	9.5′	53.9′
8	298°25.3	51.6	110°36.0	13.7′	19°59.0	9.6′	53.9′
9	313°25.2	·· 51.1	125°08.7	13.7′	19°49.4	9.7′	53.9′
10	328°25.2	50.7	139°41.5	13.8′	19°39.7	9.8′	53.9′
11	343°25.2	50.2	154°14.3	13.9′	19°29.9	9.8′	53.9′
12	358°25.1	N20°49.8	168°47.1	13.9′	S19°20.1	10.0′	53.9′
13	13°25.1	49.3	183°20.0	14.0′	19°10.1	10.0′	53.9′
14	28°25.0	48.9	197°53.0	14.0′	19°00.1	10.1′	53.9′
15	43°25.0	·· 48.4	212°26.1	14.1′	18°50.0	10.1′	53.9′
16	58°25.0	48.0	226°59.2	14.2′	18°39.9	10.3′	53.9′
17	73°24.9	47.5	241°32.3	14.2′	18°29.6	10.3′	53.9′
18	88°24.9	N20°47.0	256°05.6	14.3′	S18°19.3	10.4′	53.9′
19	103°24.8	46.6	270°38.8	14.3′	18°08.9	10.4′	53.9′
20	118°24.8	46.1	285°12.2	14.4′	17°58.5	10.5′	53.9′
21	133°24.8	·· 45.7	299°45.6	14.4′	17°48.0	10.7′	53.9′
22	148°24.7	45.2	314°19.0	14.5′	17°37.3	10.6′	53.9′
23	163°24.7	44.7	328°52.5	14.6′	17°26.7	10.8′	53.9′
	SD = 15.7′	d = 0.4′	SD = 14.7′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°24.6	N20°44.3	343°26.1	14.6′	S17°15.9	10.8′	53.9′
1	193°24.6	43.8	357°59.7	14.7′	17°05.1	10.9′	53.9′
2	208°24.6	43.4	12°33.4	14.7′	16°54.2	10.9′	53.9′
3	223°24.5	·· 42.9	27°07.1	14.8′	16°43.3	11.0′	53.9′
4	238°24.5	42.4	41°40.9	14.8′	16°32.3	11.1′	53.9′
5	253°24.5	42.0	56°14.7	14.9′	16°21.2	11.2′	53.9′
6	268°24.4	N20°41.5	70°48.6	14.9′	S16°10.0	11.2′	53.9′
7	283°24.4	41.0	85°22.5	15.0′	15°58.8	11.2′	53.9′
8	298°24.3	40.6	99°56.5	15.0′	15°47.6	11.4′	53.9′
9	313°24.3	·· 40.1	114°30.6	15.1′	15°36.2	11.4′	54.0′
10	328°24.3	39.6	129°04.7	15.1′	15°24.8	11.4′	54.0′
11	343°24.2	39.2	143°38.8	15.2′	15°13.4	11.6′	54.0′
12	358°24.2	N20°38.7	158°13.0	15.2′	S15°01.8	11.5′	54.0′
13	13°24.2	38.2	172°47.2	15.3′	14°50.3	11.7′	54.0′
14	28°24.1	37.8	187°21.5	15.3′	14°38.6	11.7′	54.0′
15	43°24.1	·· 37.3	201°55.8	15.4′	14°26.9	11.7′	54.0′
16	58°24.1	36.8	216°30.2	15.4′	14°15.2	11.8′	54.0′
17	73°24.0	36.3	231°04.7	15.5′	14°03.4	11.9′	54.0′
18	88°24.0	N20°35.9	245°39.1	15.5′	S13°51.5	11.9′	54.0′
19	103°24.0	35.4	260°13.6	15.6′	13°39.6	12.0′	54.0′
20	118°23.9	34.9	274°48.2	15.6′	13°27.6	12.0′	54.0′
21	133°23.9	·· 34.4	289°22.8	15.6′	13°15.6	12.1′	54.0′
22	148°23.9	34.0	303°57.4	15.7′	13°03.5	12.1′	54.0′
23	163°23.8	33.5	318°32.1	15.7′	12°51.4	12.2′	54.0′
	SD = 15.7′	d = 0.5′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°	////	////	00:43	23:19	////	////
66°	////	////	01:52	22:17	////	////
64°	////	////	02:27	21:44	////	////
62°	////	01:14	02:52	21:19	22:54	////
60°	////	01:57	03:11	21:00	22:13	////
N 58°	////	02:25	03:27	20:44	21:46	////
56°	01:08	02:46	03:41	20:31	21:25	23:01
54°	01:47	03:03	03:52	20:19	21:08	22:23
52°	02:13	03:18	04:03	20:09	20:54	21:58
50°	02:33	03:30	04:12	20:00	20:41	21:38
45°	03:10	03:56	04:31	19:41	20:16	21:02
N 40°	03:36	04:15	04:47	19:25	19:57	20:36
35°	03:56	04:31	05:00	19:12	19:41	20:16
30°	04:12	04:44	05:11	19:01	19:28	20:00
20°	04:38	05:07	05:31	18:42	19:06	19:34
N 10°	04:58	05:25	05:47	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:44	06:11	06:34	17:38	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:04	17:09	17:37	18:08
40°	06:13	06:46	07:16	16:57	17:27	18:00
45°	06:22	06:58	07:31	16:42	17:15	17:51
S 50°	06:31	07:11	07:48	16:25	17:02	17:42
52°	06:35	07:18	07:57	16:17	16:55	17:38
54°	06:40	07:24	08:06	16:07	16:49	17:33
56°	06:45	07:32	08:16	15:57	16:41	17:28
58°	06:50	07:40	08:28	15:45	16:33	17:23
S 60°	06:56	07:50	08:42	15:31	16:23	17:17

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	00:02 22:46	▬	▬	02:34
N 70°	▬	23:05	22:23	▬	▬	03:30
68°	23:25	22:31	22:05	▬	01:36	04:03
66°	22:29	22:06	21:51	▬	02:31	04:27
64°	21:56	21:46	21:39	01:09	03:03	04:45
62°	21:32	21:30	21:29	01:50	03:27	05:00
60°	21:12	21:17	21:20	02:18	03:46	05:13
N 58°	20:56	21:05	21:12	02:39	04:01	05:23
56°	20:42	20:55	21:05	02:57	04:15	05:33
54°	20:30	20:46	20:59	03:12	04:26	05:41
52°	20:20	20:38	20:53	03:25	04:36	05:48
50°	20:10	20:31	20:48	03:36	04:45	05:55
45°	19:50	20:16	20:37	03:59	05:04	06:09
N 40°	19:34	20:03	20:28	04:18	05:19	06:21
35°	19:20	19:52	20:20	04:34	05:32	06:31
30°	19:08	19:42	20:13	04:47	05:44	06:39
20°	18:47	19:26	20:01	05:10	06:03	06:54
N 10°	18:29	19:11	19:51	05:30	06:19	07:07
0°	18:12	18:58	19:41	05:48	06:35	07:19
S 10°	17:55	18:44	19:31	06:06	06:50	07:31
20°	17:37	18:29	19:20	06:26	07:06	07:43
30°	17:16	18:12	19:08	06:48	07:25	07:57
35°	17:04	18:03	19:00	07:01	07:36	08:06
40°	16:50	17:51	18:52	07:16	07:48	08:15
45°	16:33	17:38	18:43	07:34	08:02	08:26
S 50°	16:12	17:21	18:31	07:56	08:20	08:39
52°	16:02	17:14	18:26	08:06	08:28	08:45
54°	15:50	17:05	18:20	08:18	08:37	08:52
56°	15:37	16:55	18:13	08:32	08:48	08:59
58°	15:22	16:44	18:05	08:47	08:59	09:07
S 60°	15:04	16:31	17:57	09:06	09:13	09:17

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 100-98%
18	06:13	06:15	12:06	–:–	12:00	
19	06:18	06:20	12:06	00:24	12:46	
20	06:21	06:23	12:06	01:08	13:30	

July 21, 22, 23 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	298°32.4	184°41.3	N22°16.1	115°22.0	S01°01.8	147°08.1	N12°41.4	272°03.8	N08°15.8
1	313°34.9	199°40.5	15.7	130°23.1	02.4	162°10.1	41.3	287°06.2	15.8
2	328°37.4	214°39.7	15.3	145°24.3	03.0	177°12.1	41.1	302°08.6	15.8
3	343°39.8	229°38.8	·· 14.9	160°25.4	·· 03.6	192°14.0	·· 40.9	317°10.9	·· 15.9
4	358°42.3	244°38.0	14.5	175°26.5	04.3	207°16.0	40.7	332°13.3	15.9
5	13°44.8	259°37.2	14.1	190°27.7	04.9	222°18.0	40.6	347°15.7	15.9
6	28°47.2	274°36.4	N22°13.6	205°28.8	S01°05.5	237°20.0	N12°40.4	2°18.1	N08°15.9
7	43°49.7	289°35.5	13.2	220°30.0	06.1	252°22.0	40.2	17°20.5	15.9
8	58°52.2	304°34.7	12.8	235°31.1	06.7	267°24.0	40.0	32°22.9	15.9
9	73°54.6	319°33.9	·· 12.4	250°32.3	·· 07.3	282°25.9	·· 39.9	47°25.2	·· 16.0
10	88°57.1	334°33.0	12.0	265°33.4	07.9	297°27.9	39.7	62°27.6	16.0
11	103°59.6	349°32.2	11.6	280°34.5	08.6	312°29.9	39.5	77°30.0	16.0
12	119°02.0	4°31.4	N22°11.1	295°35.7	S01°09.2	327°31.9	N12°39.3	92°32.4	N08°16.0
13	134°04.5	19°30.6	10.7	310°36.8	09.8	342°33.9	39.1	107°34.8	16.0
14	149°06.9	34°29.7	10.3	325°38.0	10.4	357°35.9	39.0	122°37.1	16.1
15	164°09.4	49°28.9	·· 09.9	340°39.1	·· 11.0	12°37.8	·· 38.8	137°39.5	·· 16.1
16	179°11.9	64°28.1	09.4	355°40.2	11.6	27°39.8	38.6	152°41.9	16.1
17	194°14.3	79°27.3	09.0	10°41.4	12.2	42°41.8	38.4	167°44.3	16.1
18	209°16.8	94°26.5	N22°08.6	25°42.5	S01°12.9	57°43.8	N12°38.3	182°46.7	N08°16.1
19	224°19.3	109°25.6	08.2	40°43.7	13.5	72°45.8	38.1	197°49.1	16.2
20	239°21.7	124°24.8	07.7	55°44.8	14.1	87°47.7	37.9	212°51.4	16.2
21	254°24.2	139°24.0	·· 07.3	70°45.9	·· 14.7	102°49.7	·· 37.7	227°53.8	·· 16.2
22	269°26.7	154°23.2	06.9	85°47.1	15.3	117°51.7	37.6	242°56.2	16.2
23	284°29.1	169°22.3	06.4	100°48.2	15.9	132°53.7	37.4	257°58.6	16.2
Mer.pass. 04:05		ν -0.8′	d 0.4′	m -3.92	ν 1.1′	d 0.6′	m 1.20	ν 2.0′	d 0.2′ m -1.75	ν 2.4′	d 0.0′ m 0.53

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	299°31.6	184°21.5	N22°06.0	115°49.4	S01°16.5	147°55.7	N12°37.2	273°01.0	N08°16.2
1	314°34.0	199°20.7	05.6	130°50.5	17.2	162°57.7	37.0	288°03.4	16.3
2	329°36.5	214°19.9	05.1	145°51.6	17.8	177°59.6	36.9	303°05.8	16.3
3	344°39.0	229°19.1	·· 04.7	160°52.8	·· 18.4	193°01.6	·· 36.7	318°08.1	·· 16.3
4	359°41.4	244°18.2	04.3	175°53.9	19.0	208°03.6	36.5	333°10.5	16.3
5	14°43.9	259°17.4	03.8	190°55.1	19.6	223°05.6	36.3	348°12.9	16.3
6	29°46.4	274°16.6	N22°03.4	205°56.2	S01°20.2	238°07.6	N12°36.1	3°15.3	N08°16.4
7	44°48.8	289°15.8	03.0	220°57.3	20.9	253°09.5	36.0	18°17.7	16.4
8	59°51.3	304°15.0	02.5	235°58.5	21.5	268°11.5	35.8	33°20.1	16.4
9	74°53.8	319°14.1	·· 02.1	250°59.6	·· 22.1	283°13.5	·· 35.6	48°22.4	·· 16.4
10	89°56.2	334°13.3	01.6	266°00.8	22.7	298°15.5	35.4	63°24.8	16.4
11	104°58.7	349°12.5	01.2	281°01.9	23.3	313°17.5	35.3	78°27.2	16.4
12	120°01.2	4°11.7	N22°00.7	296°03.0	S01°23.9	328°19.4	N12°35.1	93°29.6	N08°16.5
13	135°03.6	19°10.9	22°00.3	311°04.2	24.6	343°21.4	34.9	108°32.0	16.5
14	150°06.1	34°10.1	21°59.8	326°05.3	25.2	358°23.4	34.7	123°34.4	16.5
15	165°08.5	49°09.2	·· 59.4	341°06.4	·· 25.8	13°25.4	·· 34.6	138°36.8	·· 16.5
16	180°11.0	64°08.4	58.9	356°07.6	26.4	28°27.4	34.4	153°39.2	16.5
17	195°13.5	79°07.6	58.5	11°08.7	27.0	43°29.3	34.2	168°41.5	16.5
18	210°15.9	94°06.8	N21°58.0	26°09.8	S01°27.6	58°31.3	N12°34.0	183°43.9	N08°16.6
19	225°18.4	109°06.0	57.6	41°11.0	28.2	73°33.3	33.8	198°46.3	16.6
20	240°20.9	124°05.2	57.1	56°12.1	28.9	88°35.3	33.7	213°48.7	16.6
21	255°23.3	139°04.3	·· 56.7	71°13.3	·· 29.5	103°37.3	·· 33.5	228°51.1	·· 16.6
22	270°25.8	154°03.5	56.2	86°14.4	30.1	118°39.2	33.3	243°53.5	16.6
23	285°28.3	169°02.7	55.7	101°15.5	30.7	133°41.2	33.1	258°55.9	16.6
Mer.pass. 04:01		ν -0.8′	d 0.4′	m -3.92	ν 1.1′	d 0.6′	m 1.20	ν 2.0′	d 0.2′ m -1.74	ν 2.4′	d 0.0′ m 0.52

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°30.7	184°01.9	N21°55.3	116°16.7	S01°31.3	148°43.2	N12°33.0	273°58.3	N08°16.7
1	315°33.2	199°01.1	54.8	131°17.8	31.9	163°45.2	32.8	289°00.6	16.7
2	330°35.6	214°00.3	54.4	146°18.9	32.6	178°47.2	32.6	304°03.0	16.7
3	345°38.1	228°59.5	·· 53.9	161°20.1	·· 33.2	193°49.1	·· 32.4	319°05.4	·· 16.7
4	0°40.6	243°58.7	53.4	176°21.2	33.8	208°51.1	32.2	334°07.8	16.7
5	15°43.0	258°57.8	53.0	191°22.3	34.4	223°53.1	32.1	349°10.2	16.7
6	30°45.5	273°57.0	N21°52.5	206°23.5	S01°35.0	238°55.1	N12°31.9	4°12.6	N08°16.8
7	45°48.0	288°56.2	52.0	221°24.6	35.6	253°57.1	31.7	19°15.0	16.8
8	60°50.4	303°55.4	51.6	236°25.7	36.3	268°59.0	31.5	34°17.4	16.8
9	75°52.9	318°54.6	·· 51.1	251°26.9	·· 36.9	284°01.0	·· 31.4	49°19.8	·· 16.8
10	90°55.4	333°53.8	50.6	266°28.0	37.5	299°03.0	31.2	64°22.1	16.8
11	105°57.8	348°53.0	50.1	281°29.1	38.1	314°05.0	31.0	79°24.5	16.8
12	121°00.3	3°52.2	N21°49.7	296°30.3	S01°38.7	329°07.0	N12°30.8	94°26.9	N08°16.9
13	136°02.8	18°51.4	49.2	311°31.4	39.3	344°08.9	30.6	109°29.3	16.9
14	151°05.2	33°50.5	48.7	326°32.5	40.0	359°10.9	30.5	124°31.7	16.9
15	166°07.7	48°49.7	·· 48.2	341°33.7	·· 40.6	14°12.9	·· 30.3	139°34.1	·· 16.9
16	181°10.1	63°48.9	47.8	356°34.8	41.2	29°14.9	30.1	154°36.5	16.9
17	196°12.6	78°48.1	47.3	11°35.9	41.8	44°16.8	29.9	169°38.9	16.9
18	211°15.1	93°47.3	N21°46.8	26°37.1	S01°42.4	59°18.8	N12°29.8	184°41.3	N08°17.0
19	226°17.5	108°46.5	46.3	41°38.2	43.0	74°20.8	29.6	199°43.7	17.0
20	241°20.0	123°45.7	45.8	56°39.3	43.7	89°22.8	29.4	214°46.0	17.0
21	256°22.5	138°44.9	·· 45.4	71°40.4	·· 44.3	104°24.8	·· 29.2	229°48.4	·· 17.0
22	271°24.9	153°44.1	44.9	86°41.6	44.9	119°26.7	29.0	244°50.8	17.0
23	286°27.4	168°43.3	44.4	101°42.7	45.5	134°28.7	28.9	259°53.2	17.0
Mer.pass. 03:57		ν -0.8′	d 0.5′	m -3.92	ν 1.1′	d 0.6′	m 1.21	ν 2.0′	d 0.2′ m -1.74	ν 2.4′	d 0.0′ m 0.52

Stars

	SHA	Dec
Alpheratz	357°32.4	29°14.6
Ankaa	353°04.9	-42°09.0
Schedar	349°28.4	56°41.2
Diphda	348°45.1	-17°49.9
Achernar	335°18.6	-57°05.4
Hamal	327°48.8	23°35.5
Polaris	313°04.9	89°22.5
Acamar	315°10.3	-40°11.3
Menkar	314°04.1	4°11.9
Mirfak	308°25.4	49°57.4
Aldebaran	290°37.4	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°52.0	-52°42.5
Sirius	258°24.7	-16°45.2
Adhara	255°04.6	-29°00.5
Procyon	244°49.0	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.5	-17°41.8
Acrux	172°57.9	-63°15.4
Gacrux	171°49.4	-57°16.4
Alioth	166°11.3	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.4	49°10.8
Hadar	148°32.9	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.2	-60°57.2
Kochab	137°19.6	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.8
Enif	33°36.4	10°00.2
Al Na'ir	27°29.9	-46°49.4
Fomalhaut	15°12.0	-29°28.3
Scheat	13°42.9	28°14.0
Markab	13°27.6	15°21.3

Jul 21 Wed	SHA	Mer.pass
Venus	246°08.9	11:42
Mars	176°49.5	16:17
Jupiter	208°35.7	14:10
Saturn	333°31.4	05:51

Jul 22 Thu	SHA	Mer.pass
Venus	244°49.9	11:43
Mars	176°17.8	16:15
Jupiter	208°24.1	14:06
Saturn	333°29.4	05:47

Jul 23 Fri	SHA	Mer.pass
Venus	243°31.2	11:45
Mars	175°45.9	16:14
Jupiter	208°12.5	14:03
Saturn	333°27.5	05:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°23.8	N20°33.0	333°06.9	15.8′	S12°39.2	12.2′	54.0′
1	193°23.8	32.5	347°41.6	15.8′	12°27.0	12.3′	54.0′
2	208°23.7	32.1	2°16.4	15.8′	12°14.7	12.3′	54.0′
3	223°23.7	·· 31.6	16°51.3	15.9′	12°02.4	12.4′	54.0′
4	238°23.7	31.1	31°26.2	15.9′	11°50.0	12.4′	54.0′
5	253°23.6	30.6	46°01.1	16.0′	11°37.6	12.5′	54.1′
6	268°23.6	N20°30.2	60°36.0	16.0′	S11°25.1	12.5′	54.1′
7	283°23.6	29.7	75°11.0	16.0′	11°12.6	12.6′	54.1′
8	298°23.6	29.2	89°46.0	16.1′	11°00.0	12.6′	54.1′
9	313°23.5	·· 28.7	104°21.1	16.1′	10°47.4	12.6′	54.1′
10	328°23.5	28.2	118°56.2	16.1′	10°34.8	12.7′	54.1′
11	343°23.5	27.7	133°31.3	16.2′	10°22.1	12.7′	54.1′
12	358°23.4	N20°27.3	148°06.4	16.2′	S10°09.4	12.8′	54.1′
13	13°23.4	26.8	162°41.6	16.2′	09°56.6	12.8′	54.1′
14	28°23.4	26.3	177°16.8	16.2′	09°43.8	12.8′	54.1′
15	43°23.3	·· 25.8	191°52.1	16.3′	09°31.0	12.9′	54.1′
16	58°23.3	25.3	206°27.3	16.3′	09°18.1	12.9′	54.1′
17	73°23.3	24.8	221°02.6	16.3′	09°05.2	13.0′	54.2′
18	88°23.3	N20°24.4	235°38.0	16.3′	S08°52.2	13.0′	54.2′
19	103°23.2	23.9	250°13.3	16.4′	08°39.2	13.0′	54.2′
20	118°23.2	23.4	264°48.7	16.4′	08°26.2	13.1′	54.2′
21	133°23.2	·· 22.9	279°24.1	16.4′	08°13.1	13.1′	54.2′
22	148°23.2	22.4	293°59.5	16.4′	08°00.0	13.1′	54.2′
23	163°23.1	21.9	308°34.9	16.5′	07°46.9	13.2′	54.2′
	SD = 15.7′	d = 0.5′	SD = 14.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°23.1	N20°21.4	323°10.4	16.5′	S07°33.7	13.2′	54.2′
1	193°23.1	20.9	337°45.8	16.5′	07°20.5	13.2′	54.2′
2	208°23.1	20.4	352°21.3	16.5′	07°07.3	13.3′	54.2′
3	223°23.0	·· 19.9	6°56.8	16.5′	06°54.0	13.3′	54.3′
4	238°23.0	19.5	21°32.3	16.5′	06°40.7	13.3′	54.3′
5	253°23.0	19.0	36°07.9	16.6′	06°27.4	13.3′	54.3′
6	268°23.0	N20°18.5	50°43.4	16.6′	S06°14.1	13.4′	54.3′
7	283°22.9	18.0	65°19.0	16.6′	06°00.7	13.4′	54.3′
8	298°22.9	17.5	79°54.6	16.6′	05°47.3	13.4′	54.3′
9	313°22.9	·· 17.0	94°30.2	16.6′	05°33.9	13.5′	54.3′
10	328°22.9	16.5	109°05.8	16.6′	05°20.4	13.4′	54.3′
11	343°22.8	16.0	123°41.4	16.6′	05°07.0	13.5′	54.3′
12	358°22.8	N20°15.5	138°17.0	16.6′	S04°53.5	13.6′	54.4′
13	13°22.8	15.0	152°52.6	16.6′	04°39.9	13.5′	54.4′
14	28°22.8	14.5	167°28.3	16.6′	04°26.4	13.6′	54.4′
15	43°22.7	·· 14.0	182°03.9	16.6′	04°12.8	13.5′	54.4′
16	58°22.7	13.5	196°39.6	16.6′	03°59.3	13.7′	54.4′
17	73°22.7	13.0	211°15.2	16.6′	03°45.6	13.6′	54.4′
18	88°22.7	N20°12.5	225°50.9	16.7′	S03°32.0	13.6′	54.4′
19	103°22.6	12.0	240°26.5	16.7′	03°18.4	13.7′	54.5′
20	118°22.6	11.5	255°02.2	16.7′	03°04.7	13.7′	54.5′
21	133°22.6	·· 11.0	269°37.8	16.6′	02°51.0	13.7′	54.5′
22	148°22.6	10.5	284°13.5	16.6′	02°37.3	13.7′	54.5′
23	163°22.6	10.0	298°49.1	16.6′	02°23.6	13.7′	54.5′
	SD = 15.7′	d = 0.5′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°22.5	N20°09.5	313°24.7	16.6′	S02°09.9	13.8′	54.5′
1	193°22.5	09.0	328°00.4	16.6′	01°56.1	13.7′	54.5′
2	208°22.5	08.5	342°36.0	16.6′	01°42.4	13.8′	54.6′
3	223°22.5	·· 08.0	357°11.6	16.6′	01°28.6	13.8′	54.6′
4	238°22.5	07.4	11°47.3	16.6′	01°14.8	13.8′	54.6′
5	253°22.4	06.9	26°22.9	16.6′	01°01.0	13.8′	54.6′
6	268°22.4	N20°06.4	40°58.5	16.6′	S00°47.2	13.8′	54.6′
7	283°22.4	05.9	55°34.0	16.6′	00°33.4	13.8′	54.6′
8	298°22.4	05.4	70°09.6	16.6′	00°19.6	13.9′	54.7′
9	313°22.4	·· 04.9	84°45.2	16.5′	S00°05.7	13.8′	54.7′
10	328°22.4	04.4	99°20.7	16.5′	N00°08.1	13.8′	54.7′
11	343°22.3	03.9	113°56.3	16.5′	00°21.9	13.9′	54.7′
12	358°22.3	N20°03.4	128°31.8	16.5′	N00°35.8	13.9′	54.7′
13	13°22.3	02.9	143°07.3	16.5′	00°49.7	13.8′	54.8′
14	28°22.3	02.3	157°42.7	16.5′	01°03.5	13.9′	54.8′
15	43°22.3	·· 01.8	172°18.2	16.4′	01°17.4	13.9′	54.8′
16	58°22.3	01.3	186°53.6	16.4′	01°31.3	13.9′	54.8′
17	73°22.2	00.8	201°29.0	16.4′	01°45.2	13.8′	54.8′
18	88°22.2	N20°00.3	216°04.4	16.4′	N01°59.0	13.9′	54.8′
19	103°22.2	19°59.8	230°39.8	16.3′	02°12.9	13.9′	54.9′
20	118°22.2	59.3	245°15.1	16.3′	02°26.8	13.9′	54.9′
21	133°22.2	·· 58.7	259°50.5	16.3′	02°40.7	13.9′	54.9′
22	148°22.2	58.2	274°25.7	16.3′	02°54.6	13.9′	54.9′
23	163°22.1	57.7	289°01.0	16.2′	03°08.5	13.8′	54.9′
	SD = 15.7′	d = 0.5′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	01:12	22:54	////	////
66°	////	////	02:04	22:05	////	////
64°	////	////	02:36	21:35	////	////
62°	////	01:30	02:59	21:12	22:39	////
60°	////	02:07	03:17	20:54	22:03	////
N 58°	////	02:33	03:33	20:39	21:38	////
56°	01:22	02:53	03:46	20:26	21:19	22:47
54°	01:56	03:09	03:57	20:15	21:03	22:14
52°	02:20	03:23	04:07	20:05	20:49	21:51
50°	02:39	03:35	04:16	19:57	20:37	21:32
45°	03:14	03:59	04:34	19:38	20:13	20:58
N 40°	03:39	04:18	04:49	19:23	19:54	20:33
35°	03:58	04:33	05:02	19:11	19:39	20:14
30°	04:14	04:46	05:13	19:00	19:26	19:58
20°	04:39	05:08	05:32	18:41	19:05	19:33
N 10°	04:59	05:25	05:48	18:25	18:47	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:55	06:18	17:55	18:18	18:43
20°	05:43	06:10	06:34	17:39	18:03	18:30
30°	05:57	06:26	06:52	17:22	17:47	18:16
35°	06:04	06:35	07:02	17:11	17:38	18:09
40°	06:11	06:44	07:14	16:59	17:29	18:02
45°	06:19	06:56	07:28	16:45	17:18	17:54
S 50°	06:29	07:09	07:45	16:28	17:05	17:45
52°	06:33	07:14	07:53	16:20	16:59	17:41
54°	06:37	07:21	08:02	16:12	16:52	17:37
56°	06:41	07:28	08:12	16:02	16:45	17:32
58°	06:47	07:36	08:23	15:50	16:37	17:27
S 60°	06:52	07:45	08:37	15:37	16:28	17:22

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	22:08	21:37	21:09	05:19	07:24	09:20
N 70°	21:56	21:34	21:12	05:40	07:33	09:20
68°	21:47	21:30	21:15	05:56	07:40	09:20
66°	21:39	21:28	21:17	06:09	07:46	09:20
64°	21:32	21:26	21:19	06:20	07:51	09:21
62°	21:26	21:24	21:21	06:29	07:55	09:21
60°	21:21	21:22	21:23	06:37	07:59	09:21
N 58°	21:17	21:21	21:24	06:44	08:02	09:21
56°	21:13	21:19	21:26	06:50	08:05	09:21
54°	21:09	21:18	21:27	06:55	08:08	09:21
52°	21:06	21:17	21:28	07:00	08:10	09:21
50°	21:03	21:16	21:29	07:04	08:13	09:21
45°	20:56	21:14	21:31	07:14	08:17	09:21
N 40°	20:51	21:12	21:33	07:21	08:21	09:21
35°	20:46	21:10	21:34	07:28	08:25	09:21
30°	20:42	21:09	21:36	07:34	08:27	09:21
20°	20:34	21:06	21:38	07:44	08:33	09:21
N 10°	20:28	21:04	21:40	07:52	08:37	09:21
0°	20:22	21:02	21:42	08:01	08:41	09:21
S 10°	20:16	21:00	21:44	08:09	08:45	09:21
20°	20:09	20:58	21:47	08:17	08:49	09:21
30°	20:02	20:55	21:49	08:27	08:54	09:21
35°	19:57	20:54	21:51	08:32	08:57	09:21
40°	19:52	20:52	21:52	08:39	09:00	09:21
45°	19:47	20:50	21:54	08:46	09:04	09:21
S 50°	19:40	20:48	21:57	08:54	09:08	09:21
52°	19:36	20:47	21:58	08:58	09:10	09:21
54°	19:33	20:46	21:59	09:03	09:12	09:21
56°	19:29	20:44	22:00	09:08	09:15	09:21
58°	19:25	20:43	22:02	09:13	09:17	09:21
S 60°	19:20	20:41	22:03	09:19	09:20	09:21

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 17-19 95-84%
21	06:25	06:26	12:06	01:51	14:11	
22	06:28	06:29	12:06	02:31	14:52	
23	06:30	06:31	12:07	03:12	15:32	

July 24, 25, 26 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	301°29.9	183°42.5	N21°43.9	116°43.8	S01°46.1	149°30.7	N12°28.7	274°55.6	N08°17.0
1	316°32.3	198°41.7	43.4	131°45.0	46.8	164°32.7	28.5	289°58.0	17.1
2	331°34.8	213°40.9	42.9	146°46.1	47.4	179°34.7	28.3	305°00.4	17.1
3	346°37.3	228°40.1	·· 42.4	161°47.2	·· 48.0	194°36.6	·· 28.2	320°02.8	·· 17.1
4	1°39.7	243°39.3	41.9	176°48.4	48.6	209°38.6	28.0	335°05.2	17.1
5	16°42.2	258°38.5	41.5	191°49.5	49.2	224°40.6	27.8	350°07.6	17.1
6	31°44.6	273°37.6	N21°41.0	206°50.6	S01°49.8	239°42.6	N12°27.6	5°10.0	N08°17.1
7	46°47.1	288°36.8	40.5	221°51.7	50.5	254°44.5	27.4	20°12.4	17.1
8	61°49.6	303°36.0	40.0	236°52.9	51.1	269°46.5	27.3	35°14.8	17.2
9	76°52.0	318°35.2	·· 39.5	251°54.0	·· 51.7	284°48.5	·· 27.1	50°17.1	·· 17.2
10	91°54.5	333°34.4	39.0	266°55.1	52.3	299°50.5	26.9	65°19.5	17.2
11	106°57.0	348°33.6	38.5	281°56.3	52.9	314°52.4	26.7	80°21.9	17.2
12	121°59.4	3°32.8	N21°38.0	296°57.4	S01°53.6	329°54.4	N12°26.5	95°24.3	N08°17.2
13	137°01.9	18°32.0	37.5	311°58.5	54.2	344°56.4	26.4	110°26.7	17.2
14	152°04.4	33°31.2	37.0	326°59.6	54.8	359°58.4	26.2	125°29.1	17.3
15	167°06.8	48°30.4	·· 36.5	342°00.8	·· 55.4	15°00.4	·· 26.0	140°31.5	·· 17.3
16	182°09.3	63°29.6	36.0	357°01.9	56.0	30°02.3	25.8	155°33.9	17.3
17	197°11.7	78°28.8	35.5	12°03.0	56.6	45°04.3	25.6	170°36.3	17.3
18	212°14.2	93°28.0	N21°35.0	27°04.1	S01°57.3	60°06.3	N12°25.5	185°38.7	N08°17.3
19	227°16.7	108°27.2	34.4	42°05.3	57.9	75°08.3	25.3	200°41.1	17.3
20	242°19.1	123°26.4	33.9	57°06.4	58.5	90°10.2	25.1	215°43.5	17.3
21	257°21.6	138°25.6	·· 33.4	72°07.5	·· 59.1	105°12.2	·· 24.9	230°45.9	·· 17.3
22	272°24.1	153°24.8	32.9	87°08.7	01°59.7	120°14.2	24.8	245°48.3	17.4
23	287°26.5	168°24.0	32.4	102°09.8	02°00.4	135°16.2	24.6	260°50.7	17.4
Mer.pass. 03:53		ν -0.8′	d 0.5′	m -3.92	ν 1.1′	d 0.6′	m 1.22	ν 2.0′	d 0.2′ m -1.74	ν 2.4′	d 0.0′ m 0.51

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	302°29.0	183°23.2	N21°31.9	117°10.9	S02°01.0	150°18.1	N12°24.4	275°53.1	N08°17.4
1	317°31.5	198°22.4	31.4	132°12.0	01.6	165°20.1	24.2	290°55.5	17.4
2	332°33.9	213°21.6	30.9	147°13.2	02.2	180°22.1	24.0	305°57.9	17.4
3	347°36.4	228°20.9	·· 30.3	162°14.3	·· 02.8	195°24.1	·· 23.9	321°00.3	·· 17.4
4	2°38.9	243°20.1	29.8	177°15.4	03.4	210°26.1	23.7	336°02.7	17.4
5	17°41.3	258°19.3	29.3	192°16.5	04.1	225°28.0	23.5	351°05.1	17.5
6	32°43.8	273°18.5	N21°28.8	207°17.7	S02°04.7	240°30.0	N12°23.3	6°07.4	N08°17.5
7	47°46.2	288°17.7	28.3	222°18.8	05.3	255°32.0	23.1	21°09.8	17.5
8	62°48.7	303°16.9	27.7	237°19.9	05.9	270°34.0	23.0	36°12.2	17.5
9	77°51.2	318°16.1	·· 27.2	252°21.0	·· 06.5	285°35.9	·· 22.8	51°14.6	·· 17.5
10	92°53.6	333°15.3	26.7	267°22.1	07.2	300°37.9	22.6	66°17.0	17.5
11	107°56.1	348°14.5	26.2	282°23.3	07.8	315°39.9	22.4	81°19.4	17.5
12	122°58.6	3°13.7	N21°25.6	297°24.4	S02°08.4	330°41.9	N12°22.2	96°21.8	N08°17.5
13	138°01.0	18°12.9	25.1	312°25.5	09.0	345°43.8	22.1	111°24.2	17.6
14	153°03.5	33°12.1	24.6	327°26.6	09.6	0°45.8	21.9	126°26.6	17.6
15	168°06.0	48°11.3	·· 24.1	342°27.8	·· 10.3	15°47.8	·· 21.7	141°29.0	·· 17.6
16	183°08.4	63°10.5	23.5	357°28.9	10.9	30°49.8	21.5	156°31.4	17.6
17	198°10.9	78°09.7	23.0	12°30.0	11.5	45°51.7	21.3	171°33.8	17.6
18	213°13.3	93°09.0	N21°22.5	27°31.1	S02°12.1	60°53.7	N12°21.2	186°36.2	N08°17.6
19	228°15.8	108°08.2	21.9	42°32.2	12.7	75°55.7	21.0	201°38.6	17.6
20	243°18.3	123°07.4	21.4	57°33.4	13.4	90°57.7	20.8	216°41.0	17.6
21	258°20.7	138°06.6	·· 20.9	72°34.5	·· 14.0	105°59.6	·· 20.6	231°43.4	·· 17.7
22	273°23.2	153°05.8	20.3	87°35.6	14.6	121°01.6	20.4	246°45.8	17.7
23	288°25.7	168°05.0	19.8	102°36.7	15.2	136°03.6	20.3	261°48.2	17.7
Mer.pass. 03:49		ν -0.8′	d 0.5′	m -3.92	ν 1.1′	d 0.6′	m 1.22	ν 2.0′	d 0.2′ m -1.74	ν 2.4′	d 0.0′ m 0.51

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	303°28.1	183°04.2	N21°19.3	117°37.9	S02°15.8	151°05.6	N12°20.1	276°50.6	N08°17.7
1	318°30.6	198°03.4	18.7	132°39.0	16.5	166°07.5	19.9	291°53.0	17.7
2	333°33.1	213°02.6	18.2	147°40.1	17.1	181°09.5	19.7	306°55.4	17.7
3	348°35.5	228°01.9	·· 17.6	162°41.2	·· 17.7	196°11.5	·· 19.5	321°57.8	·· 17.7
4	3°38.0	243°01.1	17.1	177°42.3	18.3	211°13.5	19.4	337°00.2	17.7
5	18°40.5	258°00.3	16.5	192°43.5	18.9	226°15.4	19.2	352°02.6	17.8
6	33°42.9	272°59.5	N21°16.0	207°44.6	S02°19.6	241°17.4	N12°19.0	7°05.0	N08°17.8
7	48°45.4	287°58.7	15.4	222°45.7	20.2	256°19.4	18.8	22°07.4	17.8
8	63°47.8	302°57.9	14.9	237°46.8	20.8	271°21.4	18.6	37°09.8	17.8
9	78°50.3	317°57.1	·· 14.3	252°47.9	·· 21.4	286°23.3	·· 18.5	52°12.2	·· 17.8
10	93°52.8	332°56.3	13.8	267°49.0	22.0	301°25.3	18.3	67°14.6	17.8
11	108°55.2	347°55.6	13.2	282°50.2	22.7	316°27.3	18.1	82°17.0	17.8
12	123°57.7	2°54.8	N21°12.7	297°51.3	S02°23.3	331°29.3	N12°17.9	97°19.4	N08°17.8
13	139°00.2	17°54.0	12.1	312°52.4	23.9	346°31.2	17.7	112°21.8	17.8
14	154°02.6	32°53.2	11.6	327°53.5	24.5	1°33.2	17.5	127°24.2	17.9
15	169°05.1	47°52.4	·· 11.0	342°54.6	·· 25.1	16°35.2	·· 17.4	142°26.6	·· 17.9
16	184°07.6	62°51.6	10.5	357°55.8	25.8	31°37.2	17.2	157°29.0	17.9
17	199°10.0	77°50.9	09.9	12°56.9	26.4	46°39.1	17.0	172°31.4	17.9
18	214°12.5	92°50.1	N21°09.4	27°58.0	S02°27.0	61°41.1	N12°16.8	187°33.8	N08°17.9
19	229°15.0	107°49.3	08.8	42°59.1	27.6	76°43.1	16.6	202°36.2	17.9
20	244°17.4	122°48.5	08.2	58°00.2	28.2	91°45.1	16.5	217°38.7	17.9
21	259°19.9	137°47.7	·· 07.7	73°01.3	·· 28.9	106°47.0	·· 16.3	232°41.1	·· 17.9
22	274°22.3	152°47.0	07.1	88°02.5	29.5	121°49.0	16.1	247°43.5	17.9
23	289°24.8	167°46.2	06.6	103°03.6	30.1	136°51.0	15.9	262°45.9	18.0
Mer.pass. 03:46		ν -0.8′	d 0.5′	m -3.92	ν 1.1′	d 0.6′	m 1.23	ν 2.4′	d 0.0′ m 0.51	ν 2.0′	d 0.2′ m -1.74

Stars

	SHA	Dec
Alpheratz	357°32.4	29°14.6
Ankaa	353°04.9	-42°09.0
Schedar	349°28.4	56°41.2
Diphda	348°45.1	-17°49.9
Achernar	335°18.6	-57°05.4
Hamal	327°48.8	23°35.5
Polaris	313°03.5	89°22.5
Acamar	315°10.3	-40°11.3
Menkar	314°04.0	4°12.0
Mirfak	308°25.4	49°57.4
Aldebaran	290°37.4	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.1	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°52.0	-52°42.5
Sirius	258°24.7	-16°45.2
Adhara	255°04.6	-29°00.5
Procyon	244°49.0	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.0	-63°15.4
Gacrux	171°49.5	-57°16.4
Alioth	166°11.3	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.4	49°10.8
Hadar	148°32.9	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.2	-60°57.2
Kochab	137°19.7	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.7	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.8
Enif	33°36.4	10°00.2
Al Na'ir	27°29.9	-46°49.4
Fomalhaut	15°11.9	-29°28.3
Scheat	13°42.9	28°14.0
Markab	13°27.6	15°21.3

Jul 24 Sat	SHA	Mer.pass
Venus	242°12.6	11:46
Mars	175°14.0	16:12
Jupiter	208°00.8	14:00
Saturn	333°25.8	05:39

Jul 25 Sun	SHA	Mer.pass
Venus	240°54.2	11:47
Mars	174°41.9	16:10
Jupiter	207°49.2	13:57
Saturn	333°24.1	05:36

Jul 26 Mon	SHA	Mer.pass
Venus	239°36.1	11:48
Mars	174°09.7	16:08
Jupiter	207°37.4	13:54
Saturn	333°22.5	05:32

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°22.1	N19°57.2	303°36.2	16.2′	N03°22.3	13.9′	55.0′
1	193°22.1	56.7	318°11.4	16.2′	03°36.2	13.9′	55.0′
2	208°22.1	56.2	332°46.6	16.1′	03°50.1	13.9′	55.0′
3	223°22.1	·· 55.6	347°21.7	16.1′	04°04.0	13.8′	55.0′
4	238°22.1	55.1	1°56.8	16.1′	04°17.8	13.9′	55.1′
5	253°22.1	54.6	16°31.8	16.0′	04°31.7	13.8′	55.1′
6	268°22.0	N19°54.1	31°06.9	16.0′	N04°45.5	13.9′	55.1′
7	283°22.0	53.5	45°41.8	15.9′	04°59.4	13.8′	55.1′
8	298°22.0	53.0	60°16.8	15.9′	05°13.2	13.8′	55.1′
9	313°22.0	·· 52.5	74°51.7	15.9′	05°27.0	13.8′	55.2′
10	328°22.0	52.0	89°26.5	15.8′	05°40.8	13.8′	55.2′
11	343°22.0	51.4	104°01.3	15.8′	05°54.6	13.8′	55.2′
12	358°22.0	N19°50.9	118°36.1	15.7′	N06°08.4	13.8′	55.2′
13	13°22.0	50.4	133°10.8	15.7′	06°22.2	13.7′	55.3′
14	28°21.9	49.9	147°45.5	15.6′	06°35.9	13.8′	55.3′
15	43°21.9	·· 49.3	162°20.1	15.6′	06°49.7	13.7′	55.3′
16	58°21.9	48.8	176°54.7	15.5′	07°03.4	13.7′	55.3′
17	73°21.9	48.3	191°29.2	15.5′	07°17.1	13.7′	55.4′
18	88°21.9	N19°47.8	206°03.7	15.4′	N07°30.8	13.7′	55.4′
19	103°21.9	47.2	220°38.1	15.4′	07°44.5	13.7′	55.4′
20	118°21.9	46.7	235°12.5	15.3′	07°58.2	13.6′	55.4′
21	133°21.9	·· 46.2	249°46.8	15.3′	08°11.8	13.6′	55.5′
22	148°21.9	45.6	264°21.1	15.2′	08°25.4	13.6′	55.5′
23	163°21.9	45.1	278°55.3	15.1′	08°39.0	13.6′	55.5′
	SD = 15.7′	d = 0.5′		SD = 15.0′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.9	N19°44.6	293°29.4	15.1′	N08°52.6	13.6′	55.5′
1	193°21.8	44.0	308°03.5	15.0′	09°06.2	13.5′	55.6′
2	208°21.8	43.5	322°37.5	15.0′	09°19.7	13.5′	55.6′
3	223°21.8	·· 43.0	337°11.5	14.9′	09°33.2	13.5′	55.6′
4	238°21.8	42.4	351°45.4	14.8′	09°46.7	13.4′	55.6′
5	253°21.8	41.9	6°19.2	14.8′	10°00.1	13.4′	55.7′
6	268°21.8	N19°41.4	20°52.9	14.7′	N10°13.5	13.4′	55.7′
7	283°21.8	40.8	35°26.6	14.6′	10°26.9	13.4′	55.7′
8	298°21.8	40.3	50°00.3	14.6′	10°40.3	13.3′	55.7′
9	313°21.8	·· 39.8	64°33.8	14.5′	10°53.6	13.3′	55.8′
10	328°21.8	39.2	79°07.3	14.4′	11°06.9	13.3′	55.8′
11	343°21.8	38.7	93°40.7	14.3′	11°20.2	13.2′	55.8′
12	358°21.8	N19°38.1	108°14.0	14.3′	N11°33.4	13.2′	55.9′
13	13°21.8	37.6	122°47.3	14.2′	11°46.6	13.2′	55.9′
14	28°21.8	37.1	137°20.5	14.1′	11°59.8	13.1′	55.9′
15	43°21.8	·· 36.5	151°53.6	14.0′	12°12.9	13.1′	55.9′
16	58°21.7	36.0	166°26.6	14.0′	12°26.0	13.0′	56.0′
17	73°21.7	35.4	180°59.6	13.9′	12°39.0	13.0′	56.0′
18	88°21.7	N19°34.9	195°32.5	13.8′	N12°52.0	13.0′	56.0′
19	103°21.7	34.4	210°05.2	13.7′	13°05.0	12.9′	56.1′
20	118°21.7	33.8	224°37.9	13.6′	13°17.9	12.8′	56.1′
21	133°21.7	·· 33.3	239°10.6	13.5′	13°30.7	12.9′	56.1′
22	148°21.7	32.7	253°43.1	13.4′	13°43.6	12.8′	56.2′
23	163°21.7	32.2	268°15.6	13.4′	13°56.4	12.7′	56.2′
	SD = 15.7′	d = 0.5′		SD = 15.1′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.7	N19°31.6	282°47.9	13.3′	N14°09.1	12.7′	56.2′
1	193°21.7	31.1	297°20.2	13.2′	14°21.8	12.6′	56.3′
2	208°21.7	30.5	311°52.4	13.1′	14°34.4	12.6′	56.3′
3	223°21.7	·· 30.0	326°24.5	13.0′	14°47.0	12.5′	56.3′
4	238°21.7	29.4	340°56.4	12.9′	14°59.5	12.5′	56.4′
5	253°21.7	28.9	355°28.4	12.8′	15°12.0	12.4′	56.4′
6	268°21.7	N19°28.3	10°00.2	12.7′	N15°24.4	12.4′	56.4′
7	283°21.7	27.8	24°31.9	12.6′	15°36.8	12.3′	56.4′
8	298°21.7	27.2	39°03.5	12.5′	15°49.1	12.2′	56.5′
9	313°21.7	·· 26.7	53°35.0	12.4′	16°01.3	12.2′	56.5′
10	328°21.7	26.1	68°06.4	12.3′	16°13.5	12.2′	56.5′
11	343°21.7	25.6	82°37.7	12.2′	16°25.7	12.0′	56.6′
12	358°21.7	N19°25.0	97°09.0	12.1′	N16°37.7	12.0′	56.6′
13	13°21.7	24.5	111°40.1	12.0′	16°49.7	12.0′	56.6′
14	28°21.7	23.9	126°11.1	11.9′	17°01.7	11.8′	56.7′
15	43°21.7	·· 23.4	140°42.0	11.8′	17°13.5	11.8′	56.7′
16	58°21.7	22.8	155°12.8	11.7′	17°25.3	11.8′	56.7′
17	73°21.7	22.3	169°43.5	11.6′	17°37.1	11.6′	56.8′
18	88°21.7	N19°21.7	184°14.1	11.5′	N17°48.7	11.6′	56.8′
19	103°21.7	21.1	198°44.5	11.4′	18°00.3	11.5′	56.9′
20	118°21.7	20.6	213°14.9	11.3′	18°11.8	11.5′	56.9′
21	133°21.7	·· 20.0	227°45.2	11.1′	18°23.3	11.3′	56.9′
22	148°21.7	19.5	242°15.3	11.0′	18°34.6	11.3′	57.0′
23	163°21.7	18.9	256°45.4	10.9′	18°45.9	11.2′	57.0′
	SD = 15.7′	d = 0.5′		SD = 15.3′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	01:34	22:34	////	////
66°	////	////	02:17	21:53	////	////
64°	////	00:41	02:45	21:26	23:21	////
62°	////	01:44	03:07	21:05	22:25	////
60°	////	02:17	03:24	20:48	21:54	////
N 58°	00:37	02:40	03:38	20:33	21:31	23:25
56°	01:35	02:59	03:51	20:21	21:12	22:35
54°	02:05	03:15	04:01	20:11	20:57	22:06
52°	02:27	03:28	04:11	20:01	20:44	21:44
50°	02:45	03:39	04:19	19:53	20:33	21:27
45°	03:18	04:03	04:37	19:35	20:10	20:54
N 40°	03:42	04:21	04:52	19:21	19:52	20:30
35°	04:01	04:36	05:04	19:09	19:37	20:11
30°	04:17	04:48	05:15	18:58	19:24	19:56
20°	04:41	05:09	05:33	18:40	19:04	19:32
N 10°	05:00	05:26	05:48	18:25	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:43	06:09	06:33	17:41	18:04	18:31
30°	05:55	06:25	06:50	17:23	17:49	18:18
35°	06:02	06:33	07:00	17:13	17:40	18:11
40°	06:09	06:42	07:12	17:02	17:31	18:04
45°	06:17	06:53	07:25	16:48	17:21	17:57
S 50°	06:26	07:05	07:41	16:32	17:08	17:48
52°	06:29	07:11	07:49	16:25	17:03	17:44
54°	06:33	07:17	07:58	16:16	16:56	17:40
56°	06:38	07:24	08:07	16:06	16:50	17:36
58°	06:42	07:32	08:18	15:56	16:42	17:31
S 60°	06:48	07:40	08:31	15:43	16:34	17:26

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	20:38	19:57	18:22	11:18	13:29	16:41
N 70°	20:49	20:21	19:34	11:09	13:08	15:31
68°	20:59	20:39	20:11	11:02	12:51	14:55
66°	21:06	20:54	20:38	10:56	12:38	14:30
64°	21:13	21:06	20:59	10:51	12:27	14:10
62°	21:19	21:17	21:16	10:47	12:18	13:54
60°	21:24	21:26	21:30	10:43	12:10	13:41
N 58°	21:28	21:34	21:42	10:40	12:03	13:30
56°	21:33	21:41	21:52	10:37	11:57	13:20
54°	21:36	21:47	22:02	10:35	11:51	13:11
52°	21:39	21:53	22:10	10:32	11:46	13:04
50°	21:42	21:58	22:18	10:30	11:42	12:57
45°	21:49	22:09	22:34	10:26	11:32	12:42
N 40°	21:55	22:19	22:47	10:22	11:24	12:30
35°	21:59	22:27	22:59	10:18	11:18	12:20
30°	22:04	22:34	23:09	10:15	11:12	12:11
20°	22:11	22:46	23:26	10:10	11:02	11:56
N 10°	22:18	22:57	23:41	10:06	10:53	11:42
0°	22:24	23:08	23:55	10:02	10:44	11:30
S 10°	22:30	23:18	·· ··	09:58	10:36	11:18
20°	22:37	23:29	·· ··	09:53	10:27	11:04
30°	22:44	23:42	·· ··	09:48	10:17	10:49
35°	22:49	23:50	·· ··	09:46	10:12	10:41
40°	22:54	23:58	·· ··	09:42	10:05	10:31
45°	23:00	·· ··	00:08	09:39	09:58	10:19
S 50°	23:07	·· ··	00:21	09:34	09:49	10:06
52°	23:10	·· ··	00:26	09:32	09:44	09:59
54°	23:14	·· ··	00:33	09:30	09:40	09:52
56°	23:18	·· ··	00:40	09:27	09:35	09:44
58°	23:23	·· ··	00:48	09:25	09:29	09:35
S 60°	23:28	·· ··	00:57	09:22	09:23	09:25

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-22 76-57%
24	06:31	06:32	12:07	03:52	16:13	
25	06:33	06:33	12:07	04:34	16:56	
26	06:33	06:33	12:07	05:19	17:42	

July 27, 28, 29 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	304°27.3	182°45.4	N21°06.0	118°04.7	S02°30.7	151°52.9	N12°15.7	277°48.3	N08°18.0
1	319°29.7	197°44.6	05.4	133°05.8	31.3	166°54.9	15.6	292°50.7	18.0
2	334°32.2	212°43.8	04.9	148°06.9	32.0	181°56.9	15.4	307°53.1	18.0
3	349°34.7	227°43.1	·· 04.3	163°08.0	·· 32.6	196°58.9	·· 15.2	322°55.5	·· 18.0
4	4°37.1	242°42.3	03.7	178°09.1	33.2	212°00.8	15.0	337°57.9	18.0
5	19°39.6	257°41.5	03.1	193°10.3	33.8	227°02.8	14.8	353°00.3	18.0
6	34°42.1	272°40.7	N21°02.6	208°11.4	S02°34.5	242°04.8	N12°14.6	8°02.7	N08°18.0
7	49°44.5	287°40.0	02.0	223°12.5	35.1	257°06.8	14.5	23°05.1	18.0
8	64°47.0	302°39.2	01.4	238°13.6	35.7	272°08.7	14.3	38°07.5	18.1
9	79°49.5	317°38.4	·· 00.9	253°14.7	·· 36.3	287°10.7	·· 14.1	53°09.9	·· 18.1
10	94°51.9	332°37.6	21°00.3	268°15.8	36.9	302°12.7	13.9	68°12.3	18.1
11	109°54.4	347°36.8	20°59.7	283°16.9	37.6	317°14.7	13.7	83°14.7	18.1
12	124°56.8	2°36.1	N20°59.1	298°18.1	S02°38.2	332°16.6	N12°13.6	98°17.1	N08°18.1
13	139°59.3	17°35.3	58.5	313°19.2	38.8	347°18.6	13.4	113°19.5	18.1
14	155°01.8	32°34.5	58.0	328°20.3	39.4	2°20.6	13.2	128°21.9	18.1
15	170°04.2	47°33.8	·· 57.4	343°21.4	·· 40.0	17°22.5	·· 13.0	143°24.3	·· 18.1
16	185°06.7	62°33.0	56.8	358°22.5	40.7	32°24.5	12.8	158°26.7	18.1
17	200°09.2	77°32.2	56.2	13°23.6	41.3	47°26.5	12.7	173°29.2	18.1
18	215°11.6	92°31.4	N20°55.6	28°24.7	S02°41.9	62°28.5	N12°12.5	188°31.6	N08°18.1
19	230°14.1	107°30.7	55.1	43°25.8	42.5	77°30.4	12.3	203°34.0	18.2
20	245°16.6	122°29.9	54.5	58°27.0	43.2	92°32.4	12.1	218°36.4	18.2
21	260°19.0	137°29.1	·· 53.9	73°28.1	·· 43.8	107°34.4	·· 11.9	233°38.8	·· 18.2
22	275°21.5	152°28.3	53.3	88°29.2	44.4	122°36.3	11.7	248°41.2	18.2
23	290°23.9	167°27.6	52.7	103°30.3	45.0	137°38.3	11.6	263°43.6	18.2
Mer.pass. 03:42		ν -0.8′	d 0.6′	m -3.92	ν 1.1′	d 0.6′	m 1.23	ν 2.0′	d 0.2′ m -1.73	ν 2.4′	d 0.0′ m 0.50

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	305°26.4	182°26.8	N20°52.1	118°31.4	S02°45.6	152°40.3	N12°11.4	278°46.0	N08°18.2
1	320°28.9	197°26.0	51.5	133°32.5	46.3	167°42.3	11.2	293°48.4	18.2
2	335°31.3	212°25.3	50.9	148°33.6	46.9	182°44.2	11.0	308°50.8	18.2
3	350°33.8	227°24.5	·· 50.3	163°34.7	·· 47.5	197°46.2	·· 10.8	323°53.2	·· 18.2
4	5°36.3	242°23.7	49.7	178°35.8	48.1	212°48.2	10.6	338°55.6	18.2
5	20°38.7	257°23.0	49.1	193°37.0	48.7	227°50.2	10.5	353°58.0	18.2
6	35°41.2	272°22.2	N20°48.6	208°38.1	S02°49.4	242°52.1	N12°10.3	9°00.5	N08°18.3
7	50°43.7	287°21.4	48.0	223°39.2	50.0	257°54.1	10.1	24°02.9	18.3
8	65°46.1	302°20.7	47.4	238°40.3	50.6	272°56.1	09.9	39°05.3	18.3
9	80°48.6	317°19.9	·· 46.8	253°41.4	·· 51.2	287°58.0	·· 09.7	54°07.7	·· 18.3
10	95°51.1	332°19.1	46.2	268°42.5	51.9	303°00.0	09.6	69°10.1	18.3
11	110°53.5	347°18.4	45.6	283°43.6	52.5	318°02.0	09.4	84°12.5	18.3
12	125°56.0	2°17.6	N20°45.0	298°44.7	S02°53.1	333°04.0	N12°09.2	99°14.9	N08°18.3
13	140°58.4	17°16.8	44.3	313°45.8	53.7	348°05.9	09.0	114°17.3	18.3
14	156°00.9	32°16.1	43.7	328°46.9	54.3	3°07.9	08.8	129°19.7	18.3
15	171°03.4	47°15.3	·· 43.1	343°48.0	·· 55.0	18°09.9	·· 08.6	144°22.1	·· 18.3
16	186°05.8	62°14.5	42.5	358°49.1	55.6	33°11.8	08.5	159°24.6	18.3
17	201°08.3	77°13.8	41.9	13°50.3	56.2	48°13.8	08.3	174°27.0	18.3
18	216°10.8	92°13.0	N20°41.3	28°51.4	S02°56.8	63°15.8	N12°08.1	189°29.4	N08°18.4
19	231°13.2	107°12.2	40.7	43°52.5	57.5	78°17.8	07.9	204°31.8	18.4
20	246°15.7	122°11.5	40.1	58°53.6	58.1	93°19.7	07.7	219°34.2	18.4
21	261°18.2	137°10.7	·· 39.5	73°54.7	·· 58.7	108°21.7	·· 07.5	234°36.6	·· 18.4
22	276°20.6	152°10.0	38.9	88°55.8	02°59.3	123°23.7	07.4	249°39.0	18.4
23	291°23.1	167°09.2	38.3	103°56.9	03°00.0	138°25.6	07.2	264°41.4	18.4
Mer.pass. 03:38		ν -0.8′	d 0.6′	m -3.92	ν 1.1′	d 0.6′	m 1.23	ν 2.0′	d 0.2′ m -1.73	ν 2.4′	d 0.0′ m 0.50

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	306°25.6	182°08.4	N20°37.6	118°58.0	S03°00.6	153°27.6	N12°07.0	279°43.8	N08°18.4
1	321°28.0	197°07.7	37.0	133°59.1	01.2	168°29.6	06.8	294°46.3	18.4
2	336°30.5	212°06.9	36.4	149°00.2	01.8	183°31.5	06.6	309°48.7	18.4
3	351°32.9	227°06.2	·· 35.8	164°01.3	·· 02.4	198°33.5	·· 06.4	324°51.1	·· 18.4
4	6°35.4	242°05.4	35.2	179°02.4	03.1	213°35.5	06.3	339°53.5	18.4
5	21°37.9	257°04.6	34.5	194°03.5	03.7	228°37.5	06.1	354°55.9	18.4
6	36°40.3	272°03.9	N20°33.9	209°04.6	S03°04.3	243°39.4	N12°05.9	9°58.3	N08°18.4
7	51°42.8	287°03.1	33.3	224°05.7	04.9	258°41.4	05.7	25°00.7	18.5
8	66°45.3	302°02.4	32.7	239°06.8	05.6	273°43.4	05.5	40°03.1	18.5
9	81°47.7	317°01.6	·· 32.1	254°07.9	·· 06.2	288°45.3	·· 05.3	55°05.6	·· 18.5
10	96°50.2	332°00.9	31.4	269°09.0	06.8	303°47.3	05.2	70°08.0	18.5
11	111°52.7	347°00.1	30.8	284°10.2	07.4	318°49.3	05.0	85°10.4	18.5
12	126°55.1	1°59.3	N20°30.2	299°11.3	S03°08.1	333°51.2	N12°04.8	100°12.8	N08°18.5
13	141°57.6	16°58.6	29.5	314°12.4	08.7	348°53.2	04.6	115°15.2	18.5
14	157°00.1	31°57.8	28.9	329°13.5	09.3	3°55.2	04.4	130°17.6	18.5
15	172°02.5	46°57.1	·· 28.3	344°14.6	·· 09.9	18°57.2	·· 04.2	145°20.0	·· 18.5
16	187°05.0	61°56.3	27.7	359°15.7	10.5	33°59.1	04.1	160°22.5	18.5
17	202°07.4	76°55.6	27.0	14°16.8	11.2	49°01.1	03.9	175°24.9	18.5
18	217°09.9	91°54.8	N20°26.4	29°17.9	S03°11.8	64°03.1	N12°03.7	190°27.3	N08°18.5
19	232°12.4	106°54.1	25.8	44°19.0	12.4	79°05.0	03.5	205°29.7	18.5
20	247°14.8	121°53.3	25.1	59°20.1	13.0	94°07.0	03.3	220°32.1	18.5
21	262°17.3	136°52.6	·· 24.5	74°21.2	·· 13.7	109°09.0	·· 03.1	235°34.5	·· 18.5
22	277°19.8	151°51.8	23.8	89°22.3	14.3	124°10.9	03.0	250°36.9	18.6
23	292°22.2	166°51.1	23.2	104°23.4	14.9	139°12.9	02.8	265°39.4	18.6
Mer.pass. 03:34		ν -0.8′	d 0.6′	m -3.92	ν 1.1′	d 0.6′	m 1.24	ν 2.4′	d 0.0′ m 0.49

Stars

	SHA	Dec
Alpheratz	357°32.4	29°14.6
Ankaa	353°04.9	-42°09.0
Schedar	349°28.3	56°41.2
Diphda	348°45.1	-17°49.9
Achernar	335°18.6	-57°05.4
Hamal	327°48.8	23°35.6
Polaris	313°01.7	89°22.5
Acamar	315°10.3	-40°11.3
Menkar	314°04.0	4°12.0
Mirfak	308°25.4	49°57.4
Aldebaran	290°37.4	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.1	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°51.9	-52°42.4
Sirius	258°24.7	-16°45.2
Adhara	255°04.6	-29°00.5
Procyon	244°49.0	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.0	-63°15.4
Gacrux	171°49.5	-57°16.3
Alioth	166°11.4	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.4	49°10.8
Hadar	148°33.0	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.3	-60°57.2
Kochab	137°19.7	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.8	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.9	-56°38.6
Deneb	49°23.9	45°22.8
Enif	33°36.4	10°00.2
Al Na'ir	27°29.9	-46°49.4
Fomalhaut	15°11.9	-29°28.3
Scheat	13°42.9	28°14.0
Markab	13°27.5	15°21.3

Jul 27 Tue	SHA	Mer.pass
Venus	238°18.1	11:50
Mars	173°37.4	16:06
Jupiter	207°25.7	13:51
Saturn	333°21.0	05:28

Jul 28 Wed	SHA	Mer.pass
Venus	237°00.4	11:51
Mars	173°05.0	16:05
Jupiter	207°13.9	13:48
Saturn	333°19.6	05:24

Jul 29 Thu	SHA	Mer.pass
Venus	235°42.9	11:52
Mars	172°32.4	16:03
Jupiter	207°02.1	13:44
Saturn	333°18.3	05:20

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°21.7	N19°18.4	271°15.3	10.8′	N18°57.1	11.1′	57.0′
1	193°21.7	17.8	285°45.1	10.7′	19°08.2	11.1′	57.1′
2	208°21.7	17.2	300°14.8	10.6′	19°19.3	10.9′	57.1′
3	223°21.7	·· 16.7	314°44.4	10.5′	19°30.2	10.9′	57.1′
4	238°21.8	16.1	329°13.8	10.3′	19°41.1	10.8′	57.2′
5	253°21.8	15.5	343°43.2	10.2′	19°51.9	10.7′	57.2′
6	268°21.8	N19°15.0	358°12.4	10.1′	N20°02.6	10.6′	57.2′
7	283°21.8	14.4	12°41.5	10.0′	20°13.2	10.5′	57.3′
8	298°21.8	13.9	27°10.5	9.9′	20°23.7	10.5′	57.3′
9	313°21.8	·· 13.3	41°39.4	9.8′	20°34.2	10.3′	57.4′
10	328°21.8	12.7	56°08.1	9.6′	20°44.5	10.2′	57.4′
11	343°21.8	12.2	70°36.8	9.5′	20°54.7	10.2′	57.4′
12	358°21.8	N19°11.6	85°05.3	9.4′	N21°04.9	10.0′	57.5′
13	13°21.8	11.0	99°33.7	9.3′	21°14.9	9.9′	57.5′
14	28°21.8	10.5	114°01.9	9.1′	21°24.8	9.8′	57.5′
15	43°21.8	·· 09.9	128°30.1	9.0′	21°34.6	9.8′	57.6′
16	58°21.8	09.3	142°58.1	8.9′	21°44.4	9.6′	57.6′
17	73°21.8	08.8	157°26.0	8.8′	21°54.0	9.5′	57.7′
18	88°21.8	N19°08.2	171°53.8	8.6′	N22°03.5	9.4′	57.7′
19	103°21.8	07.6	186°21.4	8.5′	22°12.9	9.3′	57.7′
20	118°21.9	07.0	200°48.9	8.4′	22°22.2	9.2′	57.8′
21	133°21.9	·· 06.5	215°16.3	8.3′	22°31.4	9.0′	57.8′
22	148°21.9	05.9	229°43.6	8.2′	22°40.4	9.0′	57.8′
23	163°21.9	05.3	244°10.8	8.0′	22°49.4	8.8′	57.9′
	SD = 15.7′	*d* = 0.6′	SD = 15.6′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°21.9	N19°04.8	258°37.8	7.9′	N22°58.2	8.7′	57.9′
1	193°21.9	04.2	273°04.7	7.8′	23°06.9	8.6′	58.0′
2	208°21.9	03.6	287°31.5	7.7′	23°15.5	8.5′	58.0′
3	223°21.9	·· 03.0	301°58.1	7.5′	23°24.0	8.3′	58.0′
4	238°21.9	02.5	316°24.6	7.4′	23°32.3	8.2′	58.1′
5	253°21.9	01.9	330°51.0	7.3′	23°40.5	8.1′	58.1′
6	268°22.0	N19°01.3	345°17.3	7.2′	N23°48.6	8.0′	58.1′
7	283°22.0	00.7	359°43.5	7.0′	23°56.6	7.8′	58.2′
8	298°22.0	19°00.2	14°09.5	6.9′	24°04.4	7.7′	58.2′
9	313°22.0	18°59.6	28°35.4	6.8′	24°12.1	7.5′	58.3′
10	328°22.0	59.0	43°01.2	6.7′	24°19.6	7.4′	58.3′
11	343°22.0	58.4	57°26.8	6.5′	24°27.0	7.3′	58.3′
12	358°22.0	N18°57.8	71°52.4	6.4′	N24°34.3	7.1′	58.4′
13	13°22.0	57.3	86°17.8	6.3′	24°41.4	7.0′	58.4′
14	28°22.1	56.7	100°43.1	6.2′	24°48.4	6.9′	58.5′
15	43°22.1	·· 56.1	115°08.3	6.1′	24°55.3	6.7′	58.5′
16	58°22.1	55.5	129°33.3	5.9′	25°02.0	6.5′	58.5′
17	73°22.1	54.9	143°58.3	5.8′	25°08.5	6.4′	58.6′
18	88°22.1	N18°54.4	158°23.1	5.7′	N25°14.9	6.3′	58.6′
19	103°22.1	53.8	172°47.8	5.6′	25°21.2	6.1′	58.6′
20	118°22.1	53.2	187°12.4	5.5′	25°27.3	6.0′	58.7′
21	133°22.1	·· 52.6	201°36.8	5.4′	25°33.3	5.7′	58.7′
22	148°22.2	52.0	216°01.2	5.2′	25°39.0	5.7′	58.8′
23	163°22.2	51.4	230°25.4	5.1′	25°44.7	5.5′	58.8′
	SD = 15.7′	*d* = 0.6′	SD = 15.8′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°22.2	N18°50.9	244°49.6	5.0′	N25°50.2	5.3′	58.8′
1	193°22.2	50.3	259°13.6	4.9′	25°55.5	5.1′	58.9′
2	208°22.2	49.7	273°37.5	4.8′	26°00.6	5.0′	58.9′
3	223°22.2	·· 49.1	288°01.3	4.7′	26°05.6	4.8′	59.0′
4	238°22.3	48.5	302°25.0	4.6′	26°10.4	4.7′	59.0′
5	253°22.3	47.9	316°48.6	4.5′	26°15.1	4.5′	59.0′
6	268°22.3	N18°47.3	331°12.1	4.4′	N26°19.6	4.3′	59.1′
7	283°22.3	46.7	345°35.4	4.3′	26°23.9	4.1′	59.1′
8	298°22.3	46.1	359°58.7	4.2′	26°28.0	4.0′	59.1′
9	313°22.3	·· 45.6	14°21.9	4.1′	26°32.0	3.8′	59.2′
10	328°22.4	45.0	28°45.0	4.0′	26°35.8	3.6′	59.2′
11	343°22.4	44.4	43°08.0	3.9′	26°39.4	3.5′	59.3′
12	358°22.4	N18°43.8	57°30.9	3.8′	N26°42.9	3.2′	59.3′
13	13°22.4	43.2	71°53.7	3.7′	26°46.1	3.1′	59.3′
14	28°22.4	42.6	86°16.4	3.6′	26°49.2	2.9′	59.4′
15	43°22.5	·· 42.0	100°39.1	3.6′	26°52.1	2.7′	59.4′
16	58°22.5	41.4	115°01.6	3.5′	26°54.8	2.6′	59.4′
17	73°22.5	40.8	129°24.1	3.4′	26°57.4	2.3′	59.5′
18	88°22.5	N18°40.2	143°46.5	3.3′	N26°59.7	2.2′	59.5′
19	103°22.5	39.6	158°08.8	3.2′	27°01.9	2.0′	59.5′
20	118°22.6	39.0	172°31.0	3.2′	27°03.9	1.8′	59.6′
21	133°22.6	·· 38.4	186°53.2	3.1′	27°05.7	1.6′	59.6′
22	148°22.6	37.8	201°15.3	3.0′	27°07.3	1.4′	59.7′
23	163°22.6	37.2	215°37.3	3.0′	27°08.7	1.2′	59.7′
	SD = 15.7′	*d* = 0.6′	SD = 16.0′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	00:30	23:24	////	////
68°	////	////	01:52	22:16	////	////
66°	////	////	02:29	21:41	////	////
64°	////	01:11	02:55	21:16	22:55	////
62°	////	01:57	03:15	20:57	22:12	////
60°	////	02:26	03:31	20:41	21:44	////
N 58°	01:04	02:48	03:44	20:27	21:23	23:02
56°	01:47	03:06	03:56	20:16	21:06	22:23
54°	02:14	03:20	04:06	20:06	20:51	21:57
52°	02:34	03:33	04:15	19:57	20:39	21:37
50°	02:51	03:44	04:23	19:49	20:28	21:21
45°	03:22	04:06	04:40	19:32	20:06	20:49
N 40°	03:46	04:24	04:54	19:18	19:49	20:27
35°	04:04	04:38	05:06	19:06	19:34	20:09
30°	04:19	04:50	05:16	18:56	19:22	19:54
20°	04:42	05:10	05:34	18:39	19:03	19:31
N 10°	05:01	05:27	05:49	18:24	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:08	06:32	17:42	18:05	18:32
30°	05:54	06:23	06:48	17:25	17:50	18:19
35°	06:00	06:31	06:58	17:15	17:42	18:13
40°	06:07	06:40	07:09	17:04	17:34	18:06
45°	06:14	06:50	07:22	16:52	17:24	17:59
S 50°	06:22	07:02	07:38	16:36	17:12	17:51
52°	06:26	07:07	07:45	16:29	17:06	17:48
54°	06:30	07:13	07:53	16:21	17:01	17:44
56°	06:34	07:20	08:02	16:12	16:54	17:40
58°	06:38	07:27	08:12	16:01	16:47	17:36
S 60°	06:43	07:35	08:24	15:49	16:39	17:31

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	20:10	▭	▭	16:44	▭	▭
64°	20:49	20:27	▭	16:06	18:24	▭
62°	21:16	21:21	21:42	15:39	17:31	19:18
60°	21:37	21:53	22:29	15:19	16:59	18:31
N 58°	21:55	22:17	22:59	15:02	16:36	18:01
56°	22:09	22:37	23:22	14:48	16:16	17:38
54°	22:22	22:53	23:41	14:35	16:00	17:19
52°	22:34	23:07	23:57	14:25	15:47	17:04
50°	22:44	23:20	·· ··	14:15	15:35	16:50
45°	23:05	23:45	·· ··	13:55	15:10	16:22
N 40°	23:22	·· ··	00:06	13:39	14:50	16:00
35°	23:37	·· ··	00:23	13:25	14:33	15:41
30°	23:49	·· ··	00:38	13:14	14:19	15:26
20°	·· ··	00:11	01:03	12:53	13:55	14:59
N 10°	·· ··	00:30	01:25	12:36	13:34	14:36
0°	·· ··	00:48	01:46	12:20	13:15	14:15
S 10°	00:10	01:06	02:06	12:04	12:55	13:53
20°	00:25	01:25	02:28	11:46	12:35	13:31
30°	00:43	01:48	02:54	11:27	12:11	13:04
35°	00:54	02:01	03:09	11:15	11:57	12:48
40°	01:06	02:16	03:27	11:02	11:41	12:30
45°	01:20	02:34	03:49	10:47	11:22	12:08
S 50°	01:38	02:57	04:16	10:28	10:58	11:41
52°	01:46	03:08	04:29	10:19	10:46	11:27
54°	01:55	03:21	04:44	10:09	10:33	11:11
56°	02:06	03:35	05:03	09:58	10:18	10:53
58°	02:18	03:52	05:25	09:45	10:01	10:31
S 60°	02:32	04:13	05:53	09:30	09:40	10:02

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 23-25 47-26%
27	06:33	06:33	12:07	06:07	18:34	
28	06:32	06:32	12:07	07:01	19:30	
29	06:31	06:30	12:07	08:00	20:31	

July 30, 31, 01 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	307°24.7	181°50.3	N20°22.6	119°24.5	S03°15.5	154°14.9	N12°02.6	280°41.8	N08°18.6
1	322°27.2	196°49.6	21.9	134°25.6	16.2	169°16.9	02.4	295°44.2	18.6
2	337°29.6	211°48.8	21.3	149°26.7	16.8	184°18.8	02.2	310°46.6	18.6
3	352°32.1	226°48.1	·· 20.6	164°27.8	·· 17.4	199°20.8	·· 02.0	325°49.0	·· 18.6
4	7°34.6	241°47.3	20.0	179°28.9	18.0	214°22.8	01.9	340°51.4	18.6
5	22°37.0	256°46.6	19.3	194°30.0	18.7	229°24.7	01.7	355°53.9	18.6
6	37°39.5	271°45.8	N20°18.7	209°31.1	S03°19.3	244°26.7	N12°01.5	10°56.3	N08°18.6
7	52°41.9	286°45.1	18.1	224°32.2	19.9	259°28.7	01.3	25°58.7	18.6
8	67°44.4	301°44.3	17.4	239°33.3	20.5	274°30.6	01.1	41°01.1	18.6
9	82°46.9	316°43.6	·· 16.8	254°34.4	·· 21.1	289°32.6	·· 00.9	56°03.5	·· 18.6
10	97°49.3	331°42.8	16.1	269°35.5	21.8	304°34.6	00.8	71°05.9	18.6
11	112°51.8	346°42.1	15.5	284°36.6	22.4	319°36.5	00.6	86°08.4	18.6
12	127°54.3	1°41.3	N20°14.8	299°37.7	S03°23.0	334°38.5	N12°00.4	101°10.8	N08°18.6
13	142°56.7	16°40.6	14.2	314°38.8	23.6	349°40.5	00.2	116°13.2	18.6
14	157°59.2	31°39.8	13.5	329°39.9	24.3	4°42.4	12°00.0	131°15.6	18.6
15	173°01.7	46°39.1	·· 12.8	344°41.0	·· 24.9	19°44.4	11°59.8	146°18.0	·· 18.6
16	188°04.1	61°38.4	12.2	359°42.1	25.5	34°46.4	59.6	161°20.5	18.7
17	203°06.6	76°37.6	11.5	14°43.2	26.1	49°48.4	59.5	176°22.9	18.7
18	218°09.0	91°36.9	N20°10.9	29°44.3	S03°26.8	64°50.3	N11°59.3	191°25.3	N08°18.7
19	233°11.5	106°36.1	10.2	44°45.4	27.4	79°52.3	59.1	206°27.7	18.7
20	248°14.0	121°35.4	09.6	59°46.5	28.0	94°54.3	58.9	221°30.1	18.7
21	263°16.4	136°34.6	·· 08.9	74°47.5	·· 28.6	109°56.2	·· 58.7	236°32.6	·· 18.7
22	278°18.9	151°33.9	08.2	89°48.6	29.3	124°58.2	58.5	251°35.0	18.7
23	293°21.4	166°33.2	07.6	104°49.7	29.9	140°00.2	58.4	266°37.4	18.7
Mer.pass.	03:30	ν -0.8′	d 0.6′	m -3.92	ν 1.1′	d 0.6′	m 1.24	ν 2.0′	d 0.2′ m -1.73	ν 2.4′	d 0.0′ m 0.49

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	308°23.8	181°32.4	N20°06.9	119°50.8	S03°30.5	155°02.1	N11°58.2	281°39.8	N08°18.7
1	323°26.3	196°31.7	06.2	134°51.9	31.1	170°04.1	58.0	296°42.2	18.7
2	338°28.8	211°30.9	05.6	149°53.0	31.8	185°06.1	57.8	311°44.7	18.7
3	353°31.2	226°30.2	·· 04.9	164°54.1	·· 32.4	200°08.0	·· 57.6	326°47.1	·· 18.7
4	8°33.7	241°29.5	04.2	179°55.2	33.0	215°10.0	57.4	341°49.5	18.7
5	23°36.2	256°28.7	03.6	194°56.3	33.6	230°12.0	57.2	356°51.9	18.7
6	38°38.6	271°28.0	N20°02.9	209°57.4	S03°34.3	245°13.9	N11°57.1	11°54.3	N08°18.7
7	53°41.1	286°27.2	02.2	224°58.5	34.9	260°15.9	56.9	26°56.8	18.7
8	68°43.5	301°26.5	01.6	239°59.6	35.5	275°17.9	56.7	41°59.2	18.7
9	83°46.0	316°25.8	·· 00.9	255°00.7	·· 36.1	290°19.8	·· 56.5	57°01.6	·· 18.7
10	98°48.5	331°25.0	20°00.2	270°01.8	36.8	305°21.8	56.3	72°04.0	18.7
11	113°50.9	346°24.3	19°59.5	285°02.9	37.4	320°23.8	56.1	87°06.4	18.7
12	128°53.4	1°23.6	N19°58.9	300°04.0	S03°38.0	335°25.7	N11°56.0	102°08.9	N08°18.7
13	143°55.9	16°22.8	58.2	315°05.1	38.6	350°27.7	55.8	117°11.3	18.7
14	158°58.3	31°22.1	57.5	330°06.2	39.3	5°29.7	55.6	132°13.7	18.7
15	174°00.8	46°21.4	·· 56.8	345°07.2	·· 39.9	20°31.6	·· 55.4	147°16.1	·· 18.8
16	189°03.3	61°20.6	56.1	0°08.3	40.5	35°33.6	55.2	162°18.6	18.8
17	204°05.7	76°19.9	55.5	15°09.4	41.1	50°35.6	55.0	177°21.0	18.8
18	219°08.2	91°19.2	N19°54.8	30°10.5	S03°41.8	65°37.5	N11°54.8	192°23.4	N08°18.8
19	234°10.7	106°18.4	54.1	45°11.6	42.4	80°39.5	54.7	207°25.8	18.8
20	249°13.1	121°17.7	53.4	60°12.7	43.0	95°41.5	54.5	222°28.2	18.8
21	264°15.6	136°17.0	·· 52.7	75°13.8	·· 43.6	110°43.4	·· 54.3	237°30.7	·· 18.8
22	279°18.0	151°16.2	52.0	90°14.9	44.3	125°45.4	54.1	252°33.1	18.8
23	294°20.5	166°15.5	51.4	105°16.0	44.9	140°47.4	53.9	267°35.5	18.8
Mer.pass.	03:26	ν -0.7′	d 0.7′	m -3.92	ν 1.1′	d 0.6′	m 1.25	ν 2.0′	d 0.2′ m -1.73	ν 2.4′	d 0.0′ m 0.48

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	309°23.0	181°14.8	N19°50.7	120°17.1	S03°45.5	155°49.3	N11°53.7	282°37.9	N08°18.8
1	324°25.4	196°14.0	50.0	135°18.2	46.1	170°51.3	53.5	297°40.4	18.8
2	339°27.9	211°13.3	49.3	150°19.3	46.8	185°53.3	53.4	312°42.8	18.8
3	354°30.4	226°12.6	·· 48.6	165°20.3	·· 47.4	200°55.2	·· 53.2	327°45.2	·· 18.8
4	9°32.8	241°11.9	47.9	180°21.4	48.0	215°57.2	53.0	342°47.6	18.8
5	24°35.3	256°11.1	47.2	195°22.5	48.6	230°59.2	52.8	357°50.1	18.8
6	39°37.8	271°10.4	N19°46.5	210°23.6	S03°49.3	246°01.1	N11°52.6	12°52.5	N08°18.8
7	54°40.2	286°09.7	45.8	225°24.7	49.9	261°03.1	52.4	27°54.9	18.8
8	69°42.7	301°09.0	45.1	240°25.8	50.5	276°05.1	52.2	42°57.3	18.8
9	84°45.2	316°08.2	·· 44.4	255°26.9	·· 51.1	291°07.0	·· 52.1	57°59.8	·· 18.8
10	99°47.6	331°07.5	43.7	270°28.0	51.8	306°09.0	51.9	73°02.2	18.8
11	114°50.1	346°06.8	43.0	285°29.1	52.4	321°11.0	51.7	88°04.6	18.8
12	129°52.5	1°06.1	N19°42.3	300°30.1	S03°53.0	336°12.9	N11°51.5	103°07.0	N08°18.8
13	144°55.0	16°05.3	41.6	315°31.2	53.6	351°14.9	51.3	118°09.5	18.8
14	159°57.5	31°04.6	40.9	330°32.3	54.3	6°16.9	51.1	133°11.9	18.8
15	174°59.9	46°03.9	·· 40.2	345°33.4	·· 54.9	21°18.8	·· 50.9	148°14.3	·· 18.8
16	190°02.4	61°03.2	39.5	0°34.5	55.5	36°20.8	50.8	163°16.7	18.8
17	205°04.9	76°02.4	38.8	15°35.6	56.1	51°22.8	50.6	178°19.2	18.8
18	220°07.3	91°01.7	N19°38.1	30°36.7	S03°56.8	66°24.7	N11°50.4	193°21.6	N08°18.8
19	235°09.8	106°01.0	37.4	45°37.8	57.4	81°26.7	50.2	208°24.0	18.8
20	250°12.3	121°00.3	36.7	60°38.8	58.0	96°28.7	50.0	223°26.5	18.8
21	265°14.7	135°59.5	·· 36.0	75°39.9	·· 58.6	111°30.6	·· 49.8	238°28.9	·· 18.8
22	280°17.2	150°58.8	35.3	90°41.0	59.3	126°32.6	49.6	253°31.3	18.8
23	295°19.7	165°58.1	34.6	105°42.1	59.9	141°34.6	49.5	268°33.7	18.8
Mer.pass.	03:22	ν -0.7′	d 0.7′	m -3.92	ν 1.1′	d 0.6′	m 1.25	ν 2.0′	d 0.2′ m -1.73	ν 2.4′	d 0.0′ m 0.48

Stars

	SHA	Dec
Alpheratz	357°32.3	29°14.6
Ankaa	353°04.9	-42°09.0
Schedar	349°28.3	56°41.2
Diphda	348°45.0	-17°49.9
Achernar	335°18.5	-57°05.4
Hamal	327°48.8	23°35.6
Polaris	312°59.8	89°22.5
Acamar	315°10.3	-40°11.3
Menkar	314°04.0	4°12.0
Mirfak	308°25.3	49°57.4
Aldebaran	290°37.4	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.1	46°01.4
Bellatrix	278°20.8	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°51.9	-52°42.4
Sirius	258°24.7	-16°45.2
Adhara	255°04.5	-29°00.5
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.0	-63°15.4
Gacrux	171°49.5	-57°16.3
Alioth	166°11.4	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.4	49°10.8
Hadar	148°33.0	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.3	-60°57.2
Kochab	137°19.8	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°04.9	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.8	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.8	-56°38.6
Deneb	49°23.9	45°22.8
Enif	33°36.4	10°00.2
Al Na'ir	27°29.9	-46°49.4
Fomalhaut	15°11.9	-29°28.3
Scheat	13°42.8	28°14.0
Markab	13°27.5	15°21.3

Jul 30 Fri	SHA	Mer.pass
Venus	234°25.6	11:53
Mars	171°59.8	16:01
Jupiter	206°50.2	13:41
Saturn	333°17.1	05:16

Jul 31 Sat	SHA	Mer.pass
Venus	233°08.6	11:54
Mars	171°27.0	15:59
Jupiter	206°38.3	13:38
Saturn	333°16.0	05:13

Aug 01 Sun	SHA	Mer.pass
Venus	231°51.8	11:56
Mars	170°54.1	15:58
Jupiter	206°26.4	13:35
Saturn	333°15.0	05:09

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°22.6	N18°36.6	229°59.3	2.9′	N27°09.9	1.0′	59.7′
1	193°22.7	36.0	244°21.2	2.8′	27°10.9	0.8′	59.8′
2	208°22.7	35.4	258°43.0	2.8′	27°11.7	0.7′	59.8′
3	223°22.7	·· 34.8	273°04.8	2.7′	27°12.4	0.4′	59.8′
4	238°22.7	34.2	287°26.5	2.7′	27°12.8	0.3′	59.9′
5	253°22.8	33.6	301°48.1	2.6′	27°13.1	0.0′	59.9′
6	268°22.8	N18°33.0	316°09.7	2.6′	N27°13.1	0.2′	59.9′
7	283°22.8	32.4	330°31.3	2.5′	27°12.9	0.3′	60.0′
8	298°22.8	31.8	344°52.8	2.5′	27°12.6	0.6′	60.0′
9	313°22.9	·· 31.2	359°14.3	2.4′	27°12.0	0.7′	60.0′
10	328°22.9	30.6	13°35.7	2.4′	27°11.3	1.0′	60.1′
11	343°22.9	30.0	27°57.1	2.4′	27°10.3	1.1′	60.1′
12	358°22.9	N18°29.4	42°18.5	2.3′	N27°09.2	1.4′	60.1′
13	13°23.0	28.8	56°39.8	2.3′	27°07.8	1.5′	60.2′
14	28°23.0	28.2	71°01.2	2.3′	27°06.3	1.8′	60.2′
15	43°23.0	·· 27.6	85°22.4	2.3′	27°04.5	1.9′	60.2′
16	58°23.0	27.0	99°43.7	2.2′	27°02.6	2.2′	60.2′
17	73°23.1	26.4	114°04.9	2.2′	27°00.4	2.3′	60.3′
18	88°23.1	N18°25.8	128°26.2	2.2′	N26°58.1	2.6′	60.3′
19	103°23.1	25.2	142°47.4	2.2′	26°55.5	2.8′	60.3′
20	118°23.1	24.5	157°08.6	2.2′	26°52.7	2.9′	60.4′
21	133°23.2	·· 23.9	171°29.8	2.2′	26°49.8	3.2′	60.4′
22	148°23.2	23.3	185°51.0	2.2′	26°46.6	3.4′	60.4′
23	163°23.2	22.7	200°12.1	2.2′	26°43.2	3.6′	60.5′
	SD = 15.7′	d = 0.6′	SD = 16.3′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°23.2	N18°22.1	214°33.3	2.2′	N26°39.6	3.7′	60.5′
1	193°23.3	21.5	228°54.5	2.2′	26°35.9	4.0′	60.5′
2	208°23.3	20.9	243°15.7	2.2′	26°31.9	4.2′	60.5′
3	223°23.3	·· 20.3	257°36.9	2.2′	26°27.7	4.4′	60.6′
4	238°23.4	19.7	271°58.1	2.2′	26°23.3	4.6′	60.6′
5	253°23.4	19.0	286°19.4	2.3′	26°18.7	4.8′	60.6′
6	268°23.4	N18°18.4	300°40.6	2.3′	N26°13.9	5.0′	60.6′
7	283°23.4	17.8	315°01.9	2.3′	26°08.9	5.1′	60.7′
8	298°23.5	17.2	329°23.2	2.3′	26°03.8	5.4′	60.7′
9	313°23.5	·· 16.6	343°44.5	2.4′	25°58.4	5.6′	60.7′
10	328°23.5	16.0	358°05.9	2.4′	25°52.8	5.8′	60.7′
11	343°23.6	15.3	12°27.3	2.4′	25°47.0	6.0′	60.8′
12	358°23.6	N18°14.7	26°48.7	2.5′	N25°41.0	6.2′	60.8′
13	13°23.6	14.1	41°10.1	2.5′	25°34.8	6.3′	60.8′
14	28°23.7	13.5	55°31.6	2.5′	25°28.5	6.6′	60.8′
15	43°23.7	·· 12.9	69°53.2	2.6′	25°21.9	6.7′	60.8′
16	58°23.7	12.3	84°14.8	2.6′	25°15.2	7.0′	60.9′
17	73°23.8	11.6	98°36.4	2.7′	25°08.2	7.1′	60.9′
18	88°23.8	N18°11.0	112°58.1	2.7′	N25°01.1	7.4′	60.9′
19	103°23.8	10.4	127°19.8	2.8′	24°53.7	7.5′	60.9′
20	118°23.9	09.8	141°41.6	2.8′	24°46.2	7.7′	60.9′
21	133°23.9	·· 09.1	156°03.4	2.9′	24°38.5	7.9′	61.0′
22	148°23.9	08.5	170°25.3	3.0′	24°30.6	8.1′	61.0′
23	163°24.0	07.9	184°47.3	3.0′	24°22.5	8.2′	61.0′
	SD = 15.7′	d = 0.6′	SD = 16.5′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°24.0	N18°07.3	199°09.3	3.1′	N24°14.3	8.5′	61.0′
1	193°24.0	06.6	213°31.4	3.1′	24°05.8	8.6′	61.0′
2	208°24.1	06.0	227°53.5	3.2′	23°57.2	8.8′	61.1′
3	223°24.1	·· 05.4	242°15.7	3.3′	23°48.4	9.0′	61.1′
4	238°24.1	04.8	256°38.0	3.4′	23°39.4	9.2′	61.1′
5	253°24.2	04.1	271°00.4	3.4′	23°30.2	9.3′	61.1′
6	268°24.2	N18°03.5	285°22.8	3.5′	N23°20.9	9.6′	61.1′
7	283°24.2	02.9	299°45.3	3.6′	23°11.3	9.6′	61.1′
8	298°24.3	02.3	314°07.9	3.7′	23°01.7	9.9′	61.1′
9	313°24.3	·· 01.6	328°30.6	3.7′	22°51.8	10.0′	61.2′
10	328°24.3	01.0	342°53.3	3.8′	22°41.8	10.2′	61.2′
11	343°24.4	18°00.4	357°16.1	3.9′	22°31.6	10.4′	61.2′
12	358°24.4	N17°59.7	11°39.0	4.0′	N22°21.2	10.5′	61.2′
13	13°24.5	59.1	26°02.0	4.1′	22°10.7	10.7′	61.2′
14	28°24.5	58.5	40°25.1	4.2′	22°00.0	10.8′	61.2′
15	43°24.5	·· 57.9	54°48.3	4.2′	21°49.2	11.0′	61.2′
16	58°24.6	57.2	69°11.5	4.3′	21°38.2	11.2′	61.2′
17	73°24.6	56.6	83°34.8	4.4′	21°27.0	11.3′	61.2′
18	88°24.7	N17°56.0	97°58.3	4.5′	N21°15.7	11.5′	61.2′
19	103°24.7	55.3	112°21.8	4.6′	21°04.2	11.6′	61.2′
20	118°24.7	54.7	126°45.4	4.7′	20°52.6	11.8′	61.3′
21	133°24.8	·· 54.1	141°09.1	4.8′	20°40.8	11.9′	61.3′
22	148°24.8	53.4	155°32.9	4.9′	20°28.9	12.0′	61.3′
23	163°24.8	52.8	169°56.8	5.0′	20°16.9	12.2′	61.3′
	SD = 15.7′	d = 0.6′	SD = 16.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°	////	////	01:14	22:50	////	////
68°	////	////	02:08	22:00	////	////
66°	////	////	02:41	21:29	////	////
64°	////	01:32	03:04	21:06	22:36	////
62°	////	02:10	03:23	20:48	21:59	////
60°	////	02:36	03:38	20:33	21:34	////
N 58°	01:23	02:56	03:50	20:21	21:15	22:45
56°	01:58	03:12	04:02	20:10	20:59	22:11
54°	02:22	03:26	04:11	20:00	20:45	21:48
52°	02:41	03:38	04:20	19:52	20:33	21:30
50°	02:57	03:49	04:28	19:44	20:23	21:14
45°	03:27	04:10	04:44	19:28	20:02	20:45
N 40°	03:49	04:27	04:57	19:15	19:45	20:23
35°	04:07	04:41	05:08	19:04	19:32	20:06
30°	04:21	04:52	05:18	18:54	19:20	19:51
20°	04:44	05:11	05:35	18:38	19:01	19:29
N 10°	05:01	05:27	05:49	18:23	18:45	19:11
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:54	06:16	17:57	18:19	18:44
20°	05:41	06:07	06:30	17:43	18:06	18:32
30°	05:52	06:21	06:46	17:27	17:52	18:21
35°	05:58	06:29	06:56	17:18	17:44	18:15
40°	06:05	06:37	07:06	17:07	17:36	18:09
45°	06:11	06:47	07:18	16:55	17:27	18:02
S 50°	06:19	06:58	07:33	16:40	17:15	17:55
52°	06:22	07:03	07:40	16:33	17:10	17:51
54°	06:25	07:09	07:48	16:25	17:05	17:48
56°	06:29	07:15	07:57	16:17	16:59	17:44
58°	06:33	07:21	08:06	16:07	16:52	17:40
S 60°	06:37	07:29	08:18	15:56	16:45	17:36

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°						
N 70°						23:34
68°						22:03
66°						21:23
64°			00:20		21:11	20:56
62°	22:59	·· ··	01:00	20:16	20:31	20:34
60°	23:42	·· ··	01:27	19:33	20:03	20:16
N 58°	·· ··	00:11	01:48	19:04	19:41	20:02
56°	·· ··	00:33	02:06	18:42	19:23	19:49
54°	·· ··	00:51	02:21	18:23	19:08	19:38
52°	·· ··	01:07	02:33	18:08	18:55	19:28
50°	00:11	01:20	02:45	17:54	18:43	19:19
45°	00:39	01:48	03:08	17:26	18:19	19:00
N 40°	01:02	02:09	03:26	17:04	17:59	18:45
35°	01:20	02:27	03:42	16:46	17:43	18:31
30°	01:36	02:43	03:56	16:30	17:29	18:20
20°	02:03	03:09	04:18	16:03	17:04	18:00
N 10°	02:26	03:32	04:38	15:40	16:43	17:42
0°	02:48	03:53	04:57	15:19	16:23	17:26
S 10°	03:10	04:14	05:15	14:57	16:03	17:09
20°	03:33	04:36	05:35	14:34	15:42	16:52
30°	04:00	05:02	05:57	14:07	15:17	16:31
35°	04:16	05:17	06:10	13:51	15:02	16:19
40°	04:35	05:35	06:25	13:32	14:45	16:05
45°	04:58	05:56	06:43	13:09	14:24	15:48
S 50°	05:27	06:23	07:05	12:40	13:58	15:27
52°	05:41	06:36	07:16	12:26	13:45	15:17
54°	05:57	06:51	07:28	12:10	13:31	15:06
56°	06:17	07:09	07:41	11:50	13:13	14:53
58°	06:41	07:30	07:57	11:26	12:53	14:38
S 60°	07:14	07:57	08:15	10:54	12:26	14:20

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 17-3%
30	06:29	06:28	12:06	09:03	21:36	
31	06:27	06:26	12:06	10:08	22:40	
01	06:24	06:22	12:06	11:11	23:42	

August 02, 03, 04 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	310°22.1	180°57.4	N19°33.9	120°43.2	S04°00.5	156°36.5	N11°49.3	283°36.2	N08°18.8
1	325°24.6	195°56.7	33.1	135°44.3	01.1	171°38.5	49.1	298°38.6	18.8
2	340°27.0	210°56.0	32.4	150°45.4	01.8	186°40.5	48.9	313°41.0	18.8
3	355°29.5	225°55.2	·· 31.7	165°46.4	·· 02.4	201°42.4	·· 48.7	328°43.5	·· 18.8
4	10°32.0	240°54.5	31.0	180°47.5	03.0	216°44.4	48.5	343°45.9	18.8
5	25°34.4	255°53.8	30.3	195°48.6	03.6	231°46.4	48.3	358°48.3	18.8
6	40°36.9	270°53.1	N19°29.6	210°49.7	S04°04.3	246°48.3	N11°48.2	13°50.7	N08°18.8
7	55°39.4	285°52.4	28.8	225°50.8	04.9	261°50.3	48.0	28°53.2	18.8
8	70°41.8	300°51.6	28.1	240°51.9	05.5	276°52.3	47.8	43°55.6	18.8
9	85°44.3	315°50.9	·· 27.4	255°53.0	·· 06.2	291°54.2	·· 47.6	58°58.0	·· 18.8
10	100°46.8	330°50.2	26.7	270°54.0	06.8	306°56.2	47.4	74°00.5	18.8
11	115°49.2	345°49.5	26.0	285°55.1	07.4	321°58.2	47.2	89°02.9	18.8
12	130°51.7	0°48.8	N19°25.2	300°56.2	S04°08.0	337°00.1	N11°47.0	104°05.3	N08°18.8
13	145°54.2	15°48.1	24.5	315°57.3	08.7	352°02.1	46.8	119°07.8	18.8
14	160°56.6	30°47.4	23.8	330°58.4	09.3	7°04.0	46.7	134°10.2	18.8
15	175°59.1	45°46.7	·· 23.1	345°59.5	·· 09.9	22°06.0	·· 46.5	149°12.6	·· 18.8
16	191°01.5	60°45.9	22.3	1°00.5	10.5	37°08.0	46.3	164°15.0	18.8
17	206°04.0	75°45.2	21.6	16°01.6	11.2	52°09.9	46.1	179°17.5	18.8
18	221°06.5	90°44.5	N19°20.9	31°02.7	S04°11.8	67°11.9	N11°45.9	194°19.9	N08°18.8
19	236°08.9	105°43.8	20.2	46°03.8	12.4	82°13.9	45.7	209°22.3	18.8
20	251°11.4	120°43.1	19.4	61°04.9	13.0	97°15.8	45.5	224°24.8	18.8
21	266°13.9	135°42.4	·· 18.7	76°05.9	·· 13.7	112°17.8	·· 45.4	239°27.2	·· 18.8
22	281°16.3	150°41.7	18.0	91°07.0	14.3	127°19.8	45.2	254°29.6	18.8
23	296°18.8	165°41.0	17.2	106°08.1	14.9	142°21.7	45.0	269°32.1	18.8
Mer.pass. 03:18		ν -0.7′	d 0.7′	m -3.92	ν 1.1′	d 0.6′	m 1.26	ν 2.0′	d 0.2′ m -1.72	ν 2.4′	d 0.0′ m 0.47

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	311°21.3	180°40.3	N19°16.5	121°09.2	S04°15.5	157°23.7	N11°44.8	284°34.5	N08°18.8
1	326°23.7	195°39.6	15.8	136°10.3	16.2	172°25.7	44.6	299°36.9	18.8
2	341°26.2	210°38.8	15.0	151°11.3	16.8	187°27.6	44.4	314°39.4	18.8
3	356°28.6	225°38.1	·· 14.3	166°12.4	·· 17.4	202°29.6	·· 44.2	329°41.8	·· 18.8
4	11°31.1	240°37.4	13.5	181°13.5	18.0	217°31.6	44.0	344°44.2	18.8
5	26°33.6	255°36.7	12.8	196°14.6	18.7	232°33.5	43.9	359°46.7	18.8
6	41°36.0	270°36.0	N19°12.1	211°15.7	S04°19.3	247°35.5	N11°43.7	14°49.1	N08°18.8
7	56°38.5	285°35.3	11.3	226°16.7	19.9	262°37.4	43.5	29°51.5	18.8
8	71°41.0	300°34.6	10.6	241°17.8	20.6	277°39.4	43.3	44°54.0	18.8
9	86°43.4	315°33.9	·· 09.8	256°18.9	·· 21.2	292°41.4	·· 43.1	59°56.4	·· 18.8
10	101°45.9	330°33.2	09.1	271°20.0	21.8	307°43.3	42.9	74°58.8	18.8
11	116°48.4	345°32.5	08.4	286°21.1	22.4	322°45.3	42.7	90°01.3	18.8
12	131°50.8	0°31.8	N19°07.6	301°22.1	S04°23.1	337°47.3	N11°42.5	105°03.7	N08°18.8
13	146°53.3	15°31.1	06.9	316°23.2	23.7	352°49.2	42.4	120°06.1	18.8
14	161°55.8	30°30.4	06.1	331°24.3	24.3	7°51.2	42.2	135°08.6	18.8
15	176°58.2	45°29.7	·· 05.4	346°25.4	·· 24.9	22°53.2	·· 42.0	150°11.0	·· 18.8
16	192°00.7	60°29.0	04.6	1°26.4	25.6	37°55.1	41.8	165°13.4	18.8
17	207°03.1	75°28.3	03.9	16°27.5	26.2	52°57.1	41.6	180°15.9	18.8
18	222°05.6	90°27.6	N19°03.1	31°28.6	S04°26.8	67°59.0	N11°41.4	195°18.3	N08°18.8
19	237°08.1	105°26.9	02.4	46°29.7	27.4	83°01.0	41.2	210°20.7	18.8
20	252°10.5	120°26.2	01.6	61°30.8	28.1	98°03.0	41.0	225°23.2	18.8
21	267°13.0	135°25.5	·· 00.8	76°31.8	·· 28.7	113°04.9	·· 40.9	240°25.6	·· 18.8
22	282°15.5	150°24.8	19°00.1	91°32.9	29.3	128°06.9	40.7	255°28.0	18.8
23	297°17.9	165°24.1	18°59.3	106°34.0	30.0	143°08.9	40.5	270°30.5	18.8
Mer.pass. 03:14		ν -0.7′	d 0.7′	m -3.92	ν 1.1′	d 0.6′	m 1.26	ν 2.0′	d 0.2′ m -1.72	ν 2.4′	d 0.0′ m 0.47

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	312°20.4	180°23.4	N18°58.6	121°35.1	S04°30.6	158°10.8	N11°40.3	285°32.9	N08°18.8
1	327°22.9	195°22.7	57.8	136°36.1	31.2	173°12.8	40.1	300°35.4	18.8
2	342°25.3	210°22.0	57.1	151°37.2	31.8	188°14.8	39.9	315°37.8	18.8
3	357°27.8	225°21.3	·· 56.3	166°38.3	·· 32.5	203°16.7	·· 39.7	330°40.2	·· 18.8
4	12°30.3	240°20.6	55.5	181°39.4	33.1	218°18.7	39.5	345°42.7	18.8
5	27°32.7	255°19.9	54.8	196°40.4	33.7	233°20.6	39.4	0°45.1	18.8
6	42°35.2	270°19.2	N18°54.0	211°41.5	S04°34.3	248°22.6	N11°39.2	15°47.5	N08°18.8
7	57°37.6	285°18.5	53.3	226°42.6	35.0	263°24.6	39.0	30°50.0	18.8
8	72°40.1	300°17.8	52.5	241°43.7	35.6	278°26.5	38.8	45°52.4	18.8
9	87°42.6	315°17.1	·· 51.7	256°44.7	·· 36.2	293°28.5	·· 38.6	60°54.9	·· 18.8
10	102°45.0	330°16.4	51.0	271°45.8	36.8	308°30.5	38.4	75°57.3	18.8
11	117°47.5	345°15.8	50.2	286°46.9	37.5	323°32.4	38.2	90°59.7	18.8
12	132°50.0	0°15.1	N18°49.4	301°47.9	S04°38.1	338°34.4	N11°38.0	106°02.2	N08°18.8
13	147°52.4	15°14.4	48.7	316°49.0	38.7	353°36.4	37.9	121°04.6	18.8
14	162°54.9	30°13.7	47.9	331°50.1	39.4	8°38.3	37.7	136°07.0	18.8
15	177°57.4	45°13.0	·· 47.1	346°51.2	·· 40.0	23°40.3	·· 37.5	151°09.5	·· 18.8
16	192°59.8	60°12.3	46.3	1°52.2	40.6	38°42.2	37.3	166°11.9	18.8
17	208°02.3	75°11.6	45.6	16°53.3	41.2	53°44.2	37.1	181°14.4	18.8
18	223°04.7	90°10.9	N18°44.8	31°54.4	S04°41.9	68°46.2	N11°36.9	196°16.8	N08°18.8
19	238°07.2	105°10.2	44.0	46°55.5	42.5	83°48.1	36.7	211°19.2	18.8
20	253°09.7	120°09.5	43.2	61°56.5	43.1	98°50.1	36.5	226°21.7	18.8
21	268°12.1	135°08.9	·· 42.5	76°57.6	·· 43.7	113°52.1	·· 36.3	241°24.1	·· 18.8
22	283°14.6	150°08.2	41.7	91°58.7	44.4	128°54.0	36.2	256°26.6	18.8
23	298°17.1	165°07.5	40.9	106°59.7	45.0	143°56.0	36.0	271°29.0	18.8
Mer.pass. 03:10		ν -0.7′	d 0.8′	m -3.92	ν 1.1′	d 0.6′	m 1.27	ν 2.0′	d 0.2′ m -1.72	ν 2.4′	d 0.0′ m 0.46

Stars

	SHA	Dec
Alpheratz	357°32.3	29°14.6
Ankaa	353°04.8	-42°09.0
Schedar	349°28.3	56°41.2
Diphda	348°45.0	-17°49.9
Achernar	335°18.5	-57°05.4
Hamal	327°48.7	23°35.6
Polaris	312°58.2	89°22.5
Acamar	315°10.2	-40°11.3
Menkar	314°04.0	4°12.0
Mirfak	308°25.3	49°57.4
Aldebaran	290°37.3	16°33.9
Rigel	281°02.0	-8°10.1
Capella	280°19.0	46°01.4
Bellatrix	278°20.8	6°22.5
Elnath	277°59.4	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.0	7°24.8
Canopus	263°51.9	-52°42.4
Sirius	258°24.7	-16°45.1
Adhara	255°04.5	-29°00.5
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.9
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.3
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.0	-63°15.4
Gacrux	171°49.5	-57°16.3
Alioth	166°11.4	55°48.8
Spica	158°20.1	-11°18.4
Alkaid	152°50.5	49°10.8
Hadar	148°33.0	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.3	-60°57.2
Kochab	137°19.8	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.8	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°05.0	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.5
Eltanin	90°40.8	51°29.3
Kaus Aust.	83°29.3	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.6
Altair	61°57.6	8°56.6
Peacock	53°01.8	-56°38.6
Deneb	49°23.9	45°22.8
Enif	33°36.4	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.9	-29°28.3
Scheat	13°42.8	28°14.0
Markab	13°27.5	15°21.3

Aug 02 Mon	SHA	Mer.pass
Venus	230°35.3	11:57
Mars	170°21.1	15:56
Jupiter	206°14.4	13:32
Saturn	333°14.1	05:05

Aug 03 Tue	SHA	Mer.pass
Venus	229°19.0	11:58
Mars	169°47.9	15:54
Jupiter	206°02.4	13:29
Saturn	333°13.2	05:01

Aug 04 Wed	SHA	Mer.pass
Venus	228°03.0	11:59
Mars	169°14.7	15:53
Jupiter	205°50.4	13:26
Saturn	333°12.5	04:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0830 sec ΔT = TT-UT1 = +69.2670 sec

2027 August 02 to Aug. 04 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°24.9	N17°52.1	184°20.8	5.1′	N20°04.7	12.4′	61.3′
1	193°24.9	51.5	198°44.9	5.2′	19°52.3	12.5′	61.3′
2	208°25.0	50.9	213°09.0	5.3′	19°39.8	12.6′	61.3′
3	223°25.0	·· 50.2	227°33.3	5.4′	19°27.2	12.7′	61.3′
4	238°25.1	49.6	241°57.7	5.5′	19°14.5	12.9′	61.3′
5	253°25.1	49.0	256°22.1	5.6′	19°01.6	13.0′	61.3′
6	268°25.1	N17°48.3	270°46.7	5.7′	N18°48.6	13.1′	61.3′
7	283°25.2	47.7	285°11.3	5.8′	18°35.5	13.3′	61.3′
8	298°25.2	47.0	299°36.1	5.9′	18°22.2	13.4′	61.3′
9	313°25.3	·· 46.4	314°01.0	6.0′	18°08.8	13.5′	61.3′
10	328°25.3	45.8	328°25.9	6.1′	17°55.3	13.6′	61.3′
11	343°25.4	45.1	342°51.0	6.1′	17°41.7	13.8′	61.3′
12	358°25.4	N17°44.5	357°16.1	6.2′	N17°27.9	13.8′	61.3′
13	13°25.4	43.8	11°41.4	6.3′	17°14.1	14.0′	61.3′
14	28°25.5	43.2	26°06.7	6.4′	17°00.1	14.1′	61.3′
15	43°25.5	·· 42.5	40°32.1	6.5′	16°46.0	14.1′	61.3′
16	58°25.6	41.9	54°57.7	6.6′	16°31.9	14.3′	61.3′
17	73°25.6	41.3	69°23.3	6.7′	16°17.6	14.4′	61.2′
18	88°25.7	N17°40.6	83°49.1	6.8′	N16°03.2	14.5′	61.2′
19	103°25.7	40.0	98°14.9	6.9′	15°48.7	14.6′	61.2′
20	118°25.8	39.3	112°40.8	7.0′	15°34.1	14.7′	61.2′
21	133°25.8	·· 38.7	127°06.8	7.1′	15°19.4	14.8′	61.2′
22	148°25.8	38.0	141°33.0	7.2′	15°04.6	14.8′	61.2′
23	163°25.9	37.4	155°59.2	7.3′	14°49.8	15.0′	61.2′
	SD = 15.8′	d = 0.6′	SD = 16.7′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°25.9	N17°36.7	170°25.5	7.4′	N14°34.8	15.1′	61.2′
1	193°26.0	36.1	184°51.9	7.5′	14°19.7	15.1′	61.2′
2	208°26.0	35.4	199°18.4	7.6′	14°04.6	15.2′	61.2′
3	223°26.1	·· 34.8	213°45.0	7.7′	13°49.4	15.3′	61.2′
4	238°26.1	34.1	228°11.7	7.8′	13°34.1	15.4′	61.1′
5	253°26.2	33.5	242°38.5	7.9′	13°18.7	15.4′	61.1′
6	268°26.2	N17°32.8	257°05.3	8.0′	N13°03.3	15.5′	61.1′
7	283°26.3	32.2	271°32.3	8.1′	12°47.8	15.6′	61.1′
8	298°26.3	31.5	285°59.4	8.1′	12°32.2	15.7′	61.1′
9	313°26.4	·· 30.9	300°26.5	8.2′	12°16.5	15.7′	61.1′
10	328°26.4	30.2	314°53.7	8.3′	12°00.8	15.8′	61.1′
11	343°26.5	29.6	329°21.0	8.4′	11°45.0	15.9′	61.0′
12	358°26.5	N17°28.9	343°48.5	8.5′	N11°29.1	15.9′	61.0′
13	13°26.6	28.3	358°15.9	8.6′	11°13.2	16.0′	61.0′
14	28°26.6	27.6	12°43.5	8.7′	10°57.2	16.0′	61.0′
15	43°26.7	·· 27.0	27°11.2	8.7′	10°41.2	16.1′	61.0′
16	58°26.7	26.3	41°38.9	8.8′	10°25.1	16.2′	61.0′
17	73°26.8	25.6	56°06.8	8.9′	10°08.9	16.1′	60.9′
18	88°26.8	N17°25.0	70°34.7	9.0′	N09°52.8	16.3′	60.9′
19	103°26.9	24.3	85°02.6	9.1′	09°36.5	16.3′	60.9′
20	118°26.9	23.7	99°30.7	9.1′	09°20.2	16.3′	60.9′
21	133°27.0	·· 23.0	113°58.9	9.2′	09°03.9	16.4′	60.9′
22	148°27.0	22.3	128°27.1	9.3′	08°47.5	16.4′	60.8′
23	163°27.1	21.7	142°55.4	9.4′	08°31.1	16.4′	60.8′
	SD = 15.8′	d = 0.6′	SD = 16.7′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°27.1	N17°21.0	157°23.8	9.4′	N08°14.7	16.5′	60.8′
1	193°27.2	20.4	171°52.2	9.5′	07°58.2	16.5′	60.8′
2	208°27.2	19.7	186°20.7	9.6′	07°41.7	16.5′	60.7′
3	223°27.3	·· 19.0	200°49.3	9.7′	07°25.2	16.6′	60.7′
4	238°27.4	18.4	215°18.0	9.7′	07°08.6	16.6′	60.7′
5	253°27.4	17.7	229°46.7	9.8′	06°52.0	16.6′	60.7′
6	268°27.5	N17°17.1	244°15.5	9.9′	N06°35.4	16.7′	60.6′
7	283°27.5	16.4	258°44.4	9.9′	06°18.7	16.6′	60.6′
8	298°27.6	15.7	273°13.3	10.0′	06°02.1	16.7′	60.6′
9	313°27.6	·· 15.1	287°42.3	10.1′	05°45.4	16.7′	60.6′
10	328°27.7	14.4	302°11.4	10.1′	05°28.7	16.7′	60.5′
11	343°27.7	13.7	316°40.5	10.2′	05°12.0	16.7′	60.5′
12	358°27.8	N17°13.1	331°09.7	10.3′	N04°55.3	16.8′	60.5′
13	13°27.9	12.4	345°39.0	10.3′	04°38.5	16.7′	60.5′
14	28°27.9	11.7	0°08.3	10.4′	04°21.8	16.8′	60.4′
15	43°28.0	·· 11.1	14°37.7	10.4′	04°05.0	16.8′	60.4′
16	58°28.0	10.4	29°07.1	10.5′	03°48.2	16.7′	60.4′
17	73°28.1	09.7	43°36.6	10.5′	03°31.5	16.8′	60.3′
18	88°28.1	N17°09.1	58°06.1	10.6′	N03°14.7	16.8′	60.3′
19	103°28.2	08.4	72°35.7	10.6′	02°57.9	16.7′	60.3′
20	118°28.3	07.7	87°05.3	10.7′	02°41.2	16.8′	60.3′
21	133°28.3	·· 07.1	101°35.0	10.7′	02°24.4	16.7′	60.2′
22	148°28.4	06.4	116°04.8	10.8′	02°07.7	16.8′	60.2′
23	163°28.4	05.7	130°34.5	10.8′	01°50.9	16.7′	60.2′
	SD = 15.8′	d = 0.7′	SD = 16.6′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	01:41	22:25	////	////
68°	////	////	02:24	21:45	////	////
66°	////	00:50	02:52	21:17	23:11	////
64°	////	01:50	03:14	20:57	22:18	////
62°	////	02:22	03:31	20:40	21:47	////
60°	00:45	02:46	03:45	20:26	21:24	23:17
N 58°	01:39	03:04	03:57	20:14	21:06	22:29
56°	02:09	03:19	04:07	20:04	20:51	22:00
54°	02:31	03:32	04:16	19:55	20:39	21:39
52°	02:48	03:44	04:24	19:47	20:28	21:22
50°	03:03	03:53	04:32	19:40	20:18	21:08
45°	03:32	04:14	04:47	19:24	19:58	20:40
N 40°	03:53	04:30	05:00	19:12	19:42	20:19
35°	04:09	04:43	05:11	19:01	19:29	20:02
30°	04:23	04:54	05:20	18:52	19:18	19:49
20°	04:45	05:13	05:36	18:36	19:00	19:27
N 10°	05:02	05:28	05:50	18:22	18:45	19:10
0°	05:16	05:41	06:03	18:10	18:31	18:57
S 10°	05:28	05:54	06:15	17:57	18:19	18:44
20°	05:39	06:06	06:29	17:44	18:07	18:33
30°	05:50	06:19	06:44	17:29	17:54	18:22
35°	05:56	06:26	06:53	17:20	17:46	18:17
40°	06:02	06:34	07:03	17:10	17:39	18:11
45°	06:08	06:43	07:15	16:58	17:30	18:05
S 50°	06:15	06:54	07:29	16:44	17:19	17:58
52°	06:18	06:59	07:35	16:38	17:14	17:55
54°	06:21	07:04	07:43	16:30	17:09	17:52
56°	06:24	07:09	07:51	16:22	17:04	17:49
58°	06:28	07:16	08:00	16:13	16:57	17:45
S 60°	06:32	07:23	08:11	16:03	16:50	17:41

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▭	03:36	06:24	22:13	21:19	20:42
N 70°	00:11	04:04	06:34	21:42	21:06	20:39
68°	01:40	04:25	06:42	21:19	20:55	20:36
66°	02:19	04:42	06:48	21:01	20:46	20:34
64°	02:45	04:55	06:54	20:46	20:39	20:32
62°	03:06	05:06	06:58	20:34	20:32	20:30
60°	03:22	05:15	07:02	20:23	20:27	20:29
N 58°	03:36	05:23	07:06	20:14	20:22	20:28
56°	03:48	05:31	07:09	20:06	20:17	20:27
54°	03:59	05:37	07:12	19:58	20:13	20:26
52°	04:08	05:43	07:14	19:51	20:10	20:25
50°	04:16	05:48	07:17	19:45	20:06	20:24
45°	04:33	05:59	07:22	19:32	19:59	20:22
N 40°	04:48	06:08	07:26	19:22	19:53	20:20
35°	05:00	06:16	07:30	19:12	19:47	20:19
30°	05:10	06:23	07:33	19:04	19:43	20:18
20°	05:28	06:35	07:38	18:50	19:34	20:15
N 10°	05:43	06:45	07:43	18:37	19:27	20:13
0°	05:58	06:54	07:47	18:25	19:20	20:11
S 10°	06:12	07:04	07:52	18:13	19:13	20:09
20°	06:27	07:14	07:57	18:00	19:05	20:07
30°	06:44	07:25	08:02	17:45	18:56	20:05
35°	06:55	07:32	08:05	17:36	18:51	20:03
40°	07:06	07:40	08:09	17:26	18:45	20:02
45°	07:19	07:48	08:13	17:14	18:39	20:00
S 50°	07:36	07:59	08:17	17:00	18:30	19:58
52°	07:43	08:03	08:20	16:53	18:27	19:57
54°	07:52	08:09	08:22	16:45	18:22	19:55
56°	08:01	08:14	08:25	16:37	18:18	19:54
58°	08:12	08:21	08:27	16:27	18:12	19:53
S 60°	08:24	08:28	08:31	16:16	18:06	19:51

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 0-4%
02	06:20	06:18	12:06	12:11	–:–	
03	06:16	06:14	12:06	13:07	00:40	
04	06:11	06:09	12:06	13:59	01:34	

August 05, 06, 07 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	313°19.5	180°06.8	N18°40.1	122°00.8	S04°45.6	158°57.9	N11°35.8	286°31.4	N08°18.8
1	328°22.0	195°06.1	39.4	137°01.9	46.3	173°59.9	35.6	301°33.9	18.8
2	343°24.5	210°05.4	38.6	152°02.9	46.9	189°01.9	35.4	316°36.3	18.8
3	358°26.9	225°04.7	·· 37.8	167°04.0	·· 47.5	204°03.8	·· 35.2	331°38.8	·· 18.8
4	13°29.4	240°04.1	37.0	182°05.1	48.1	219°05.8	35.0	346°41.2	18.7
5	28°31.9	255°03.4	36.2	197°06.2	48.8	234°07.8	34.8	1°43.6	18.7
6	43°34.3	270°02.7	N18°35.4	212°07.2	S04°49.4	249°09.7	N11°34.6	16°46.1	N08°18.7
7	58°36.8	285°02.0	34.7	227°08.3	50.0	264°11.7	34.5	31°48.5	18.7
8	73°39.2	300°01.3	33.9	242°09.4	50.6	279°13.6	34.3	46°51.0	18.7
9	88°41.7	315°00.6	·· 33.1	257°10.4	·· 51.3	294°15.6	·· 34.1	61°53.4	·· 18.7
10	103°44.2	330°00.0	32.3	272°11.5	51.9	309°17.6	33.9	76°55.9	18.7
11	118°46.6	344°59.3	31.5	287°12.6	52.5	324°19.5	33.7	91°58.3	18.7
12	133°49.1	359°58.6	N18°30.7	302°13.6	S04°53.2	339°21.5	N11°33.5	107°00.7	N08°18.7
13	148°51.6	14°57.9	29.9	317°14.7	53.8	354°23.4	33.3	122°03.2	18.7
14	163°54.0	29°57.2	29.1	332°15.8	54.4	9°25.4	33.1	137°05.6	18.7
15	178°56.5	44°56.6	·· 28.3	347°16.8	·· 55.0	24°27.4	·· 32.9	152°08.1	·· 18.7
16	193°59.0	59°55.9	27.5	2°17.9	55.7	39°29.3	32.8	167°10.5	18.7
17	209°01.4	74°55.2	26.7	17°19.0	56.3	54°31.3	32.6	182°13.0	18.7
18	224°03.9	89°54.5	N18°25.9	32°20.0	S04°56.9	69°33.3	N11°32.4	197°15.4	N08°18.7
19	239°06.3	104°53.8	25.2	47°21.1	57.5	84°35.2	32.2	212°17.8	18.7
20	254°08.8	119°53.2	24.4	62°22.2	58.2	99°37.2	32.0	227°20.3	18.7
21	269°11.3	134°52.5	·· 23.6	77°23.2	·· 58.8	114°39.1	·· 31.8	242°22.7	·· 18.7
22	284°13.7	149°51.8	22.8	92°24.3	04°59.4	129°41.1	31.6	257°25.2	18.7
23	299°16.2	164°51.1	22.0	107°25.4	05°00.1	144°43.1	31.4	272°27.6	18.7
Mer.pass.	03:06	ν -0.7′	d 0.8′	m -3.92	ν 1.1′	d 0.6′	m 1.27	ν 2.0′	d 0.2′ m -1.72	ν 2.4′	d 0.0′ m 0.46

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	314°18.7	179°50.5	N18°21.2	122°26.4	S05°00.7	159°45.0	N11°31.2	287°30.1	N08°18.7
1	329°21.1	194°49.8	20.4	137°27.5	01.3	174°47.0	31.1	302°32.5	18.7
2	344°23.6	209°49.1	19.5	152°28.6	01.9	189°48.9	30.9	317°35.0	18.7
3	359°26.1	224°48.4	·· 18.7	167°29.6	·· 02.6	204°50.9	·· 30.7	332°37.4	·· 18.6
4	14°28.5	239°47.8	17.9	182°30.7	03.2	219°52.9	30.5	347°39.8	18.6
5	29°31.0	254°47.1	17.1	197°31.8	03.8	234°54.8	30.3	2°42.3	18.6
6	44°33.5	269°46.4	N18°16.3	212°32.8	S05°04.4	249°56.8	N11°30.1	17°44.7	N08°18.6
7	59°35.9	284°45.8	15.5	227°33.9	05.1	264°58.8	29.9	32°47.2	18.6
8	74°38.4	299°45.1	14.7	242°34.9	05.7	280°00.7	29.7	47°49.6	18.6
9	89°40.8	314°44.4	·· 13.9	257°36.0	·· 06.3	295°02.7	·· 29.5	62°52.1	·· 18.6
10	104°43.3	329°43.7	13.1	272°37.1	07.0	310°04.6	29.4	77°54.5	18.6
11	119°45.8	344°43.1	12.3	287°38.1	07.6	325°06.6	29.2	92°57.0	18.6
12	134°48.2	359°42.4	N18°11.5	302°39.2	S05°08.2	340°08.6	N11°29.0	107°59.4	N08°18.6
13	149°50.7	14°41.7	10.7	317°40.3	08.8	355°10.5	28.8	123°01.9	18.6
14	164°53.2	29°41.1	09.8	332°41.3	09.5	10°12.5	28.6	138°04.3	18.6
15	179°55.6	44°40.4	·· 09.0	347°42.4	·· 10.1	25°14.4	·· 28.4	153°06.8	·· 18.6
16	194°58.1	59°39.7	08.2	2°43.5	10.7	40°16.4	28.2	168°09.2	18.6
17	210°00.6	74°39.1	07.4	17°44.5	11.3	55°18.4	28.0	183°11.7	18.6
18	225°03.0	89°38.4	N18°06.6	32°45.6	S05°12.0	70°20.3	N11°27.8	198°14.1	N08°18.6
19	240°05.5	104°37.7	05.8	47°46.6	12.6	85°22.3	27.6	213°16.5	18.6
20	255°08.0	119°37.1	04.9	62°47.7	13.2	100°24.2	27.5	228°19.0	18.6
21	270°10.4	134°36.4	·· 04.1	77°48.8	·· 13.9	115°26.2	·· 27.3	243°21.4	·· 18.5
22	285°12.9	149°35.7	03.3	92°49.8	14.5	130°28.2	27.1	258°23.9	18.5
23	300°15.3	164°35.1	02.5	107°50.9	15.1	145°30.1	26.9	273°26.3	18.5
Mer.pass.	03:02	ν -0.7′	d 0.8′	m -3.92	ν 1.1′	d 0.6′	m 1.27	ν 2.0′	d 0.2′ m -1.72	ν 2.4′	d 0.0′ m 0.45

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	315°17.8	179°34.4	N18°01.7	122°51.9	S05°15.7	160°32.1	N11°26.7	288°28.8	N08°18.5
1	330°20.3	194°33.7	00.8	137°53.0	16.4	175°34.0	26.5	303°31.2	18.5
2	345°22.7	209°33.1	18°00.0	152°54.1	17.0	190°36.0	26.3	318°33.7	18.5
3	0°25.2	224°32.4	17°59.2	167°55.1	·· 17.6	205°38.0	·· 26.1	333°36.1	·· 18.5
4	15°27.7	239°31.8	58.4	182°56.2	18.2	220°39.9	25.9	348°38.6	18.5
5	30°30.1	254°31.1	57.5	197°57.2	18.9	235°41.9	25.8	3°41.0	18.5
6	45°32.6	269°30.4	N17°56.7	212°58.3	S05°19.5	250°43.9	N11°25.6	18°43.5	N08°18.5
7	60°35.1	284°29.8	55.9	227°59.4	20.1	265°45.8	25.4	33°45.9	18.5
8	75°37.5	299°29.1	55.1	243°00.4	20.8	280°47.8	25.2	48°48.4	18.5
9	90°40.0	314°28.5	·· 54.2	258°01.5	·· 21.4	295°49.7	·· 25.0	63°50.8	·· 18.5
10	105°42.4	329°27.8	53.4	273°02.5	22.0	310°51.7	24.8	78°53.3	18.5
11	120°44.9	344°27.1	52.6	288°03.6	22.6	325°53.7	24.6	93°55.7	18.5
12	135°47.4	359°26.5	N17°51.7	303°04.6	S05°23.3	340°55.6	N11°24.4	108°58.2	N08°18.4
13	150°49.8	14°25.8	50.9	318°05.7	23.9	355°57.6	24.2	124°00.6	18.4
14	165°52.3	29°25.2	50.1	333°06.8	24.5	10°59.5	24.0	139°03.1	18.4
15	180°54.8	44°24.5	·· 49.2	348°07.8	·· 25.2	26°01.5	·· 23.8	154°05.5	·· 18.4
16	195°57.2	59°23.9	48.4	3°08.9	25.8	41°03.5	23.7	169°08.0	18.4
17	210°59.7	74°23.2	47.5	18°09.9	26.4	56°05.4	23.5	184°10.4	18.4
18	226°02.2	89°22.5	N17°46.7	33°11.0	S05°27.0	71°07.4	N11°23.3	199°12.9	N08°18.4
19	241°04.6	104°21.9	45.9	48°12.0	27.7	86°09.3	23.1	214°15.3	18.4
20	256°07.1	119°21.2	45.0	63°13.1	28.3	101°11.3	22.9	229°17.8	18.4
21	271°09.6	134°20.6	·· 44.2	78°14.2	·· 28.9	116°13.3	·· 22.7	244°20.3	·· 18.4
22	286°12.0	149°19.9	43.3	93°15.2	29.5	131°15.2	22.5	259°22.7	18.4
23	301°14.5	164°19.3	42.5	108°16.3	30.2	146°17.2	22.3	274°25.2	18.4
Mer.pass.	02:58	ν -0.7′	d 0.8′	m -3.92	ν 1.1′	d 0.6′	m 1.28	ν 2.0′	d 0.2′ m -1.72	ν 2.4′	d 0.0′ m 0.45

Stars

	SHA	Dec
Alpheratz	357°32.3	29°14.6
Ankaa	353°04.8	-42°09.0
Schedar	349°28.2	56°41.2
Diphda	348°45.0	-17°49.9
Achernar	335°18.5	-57°05.4
Hamal	327°48.7	23°35.6
Polaris	312°56.7	89°22.5
Acamar	315°10.2	-40°11.3
Menkar	314°03.9	4°12.0
Mirfak	308°25.2	49°57.4
Aldebaran	290°37.3	16°33.9
Rigel	281°02.0	-8°10.1
Capella	280°19.0	46°01.4
Bellatrix	278°20.8	6°22.5
Elnath	277°59.4	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.0	7°24.8
Canopus	263°51.9	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.5	-29°00.5
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.8
Suhail	222°45.2	-43°32.7
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.0	-63°15.4
Gacrux	171°49.5	-57°16.3
Alioth	166°11.4	55°48.8
Spica	158°20.2	-11°18.4
Alkaid	152°50.5	49°10.7
Hadar	148°33.0	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.3	-60°57.2
Kochab	137°19.9	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.0	-26°29.6
Atria	107°05.0	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.6
Eltanin	90°40.8	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.7
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.6
Peacock	53°01.8	-56°38.6
Deneb	49°23.9	45°22.9
Enif	33°36.4	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.9	-29°28.3
Scheat	13°42.8	28°14.0
Markab	13°27.5	15°21.4

Aug 05 Thu	SHA	Mer.pass
Venus	226°47.3	12:00
Mars	168°41.3	15:51
Jupiter	205°38.4	13:22
Saturn	333°11.9	04:53

Aug 06 Fri	SHA	Mer.pass
Venus	225°31.8	12:01
Mars	168°07.8	15:49
Jupiter	205°26.4	13:19
Saturn	333°11.4	04:49

Aug 07 Sat	SHA	Mer.pass
Venus	224°16.6	12:02
Mars	167°34.1	15:47
Jupiter	205°14.3	13:16
Saturn	333°11.0	04:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.5	N17°05.0	145°04.4	10.9′	N01°34.2	16.8′	60.1′
1	193°28.6	04.4	159°34.3	10.9′	01°17.4	16.7′	60.1′
2	208°28.6	03.7	174°04.2	11.0′	01°00.7	16.7′	60.1′
3	223°28.7	·· 03.0	188°34.1	11.0′	00°44.0	16.7′	60.0′
4	238°28.7	02.4	203°04.2	11.0′	00°27.3	16.6′	60.0′
5	253°28.8	01.7	217°34.2	11.1′	N00°10.7	16.7′	60.0′
6	268°28.9	N17°01.0	232°04.3	11.1′	S00°06.0	16.6′	59.9′
7	283°28.9	17°00.3	246°34.4	11.2′	00°22.6	16.6′	59.9′
8	298°29.0	16°59.7	261°04.6	11.2′	00°39.2	16.6′	59.9′
9	313°29.0	·· 59.0	275°34.8	11.2′	00°55.8	16.6′	59.8′
10	328°29.1	58.3	290°05.0	11.3′	01°12.4	16.5′	59.8′
11	343°29.2	57.6	304°35.3	11.3′	01°28.9	16.5′	59.8′
12	358°29.2	N16°57.0	319°05.6	11.3′	S01°45.4	16.5′	59.7′
13	13°29.3	56.3	333°35.9	11.4′	02°01.9	16.4′	59.7′
14	28°29.4	55.6	348°06.3	11.4′	02°18.3	16.5′	59.7′
15	43°29.4	·· 54.9	2°36.7	11.4′	02°34.8	16.3′	59.6′
16	58°29.5	54.2	17°07.1	11.4′	02°51.1	16.4′	59.6′
17	73°29.5	53.6	31°37.5	11.5′	03°07.5	16.3′	59.5′
18	88°29.6	N16°52.9	46°08.0	11.5′	S03°23.8	16.2′	59.5′
19	103°29.7	52.2	60°38.5	11.5′	03°40.0	16.3′	59.5′
20	118°29.7	51.5	75°09.0	11.5′	03°56.3	16.2′	59.4′
21	133°29.8	·· 50.8	89°39.5	11.6′	04°12.5	16.1′	59.4′
22	148°29.9	50.2	104°10.1	11.6′	04°28.6	16.1′	59.4′
23	163°29.9	49.5	118°40.6	11.6′	04°44.7	16.0′	59.3′
	SD = 15.8′	d = 0.7′		SD = 16.4′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.0	N16°48.8	133°11.2	11.6′	S05°00.7	16.1′	59.3′
1	193°30.1	48.1	147°41.8	11.6′	05°16.8	15.9′	59.2′
2	208°30.1	47.4	162°12.4	11.6′	05°32.7	15.9′	59.2′
3	223°30.2	·· 46.7	176°43.1	11.6′	05°48.6	15.9′	59.2′
4	238°30.3	46.1	191°13.7	11.7′	06°04.5	15.8′	59.1′
5	253°30.3	45.4	205°44.4	11.7′	06°20.3	15.7′	59.1′
6	268°30.4	N16°44.7	220°15.1	11.7′	S06°36.0	15.7′	59.1′
7	283°30.5	44.0	234°45.7	11.7′	06°51.7	15.6′	59.0′
8	298°30.5	43.3	249°16.4	11.7′	07°07.3	15.6′	59.0′
9	313°30.6	·· 42.6	263°47.1	11.7′	07°22.9	15.5′	58.9′
10	328°30.7	41.9	278°17.8	11.7′	07°38.4	15.5′	58.9′
11	343°30.7	41.2	292°48.5	11.7′	07°53.9	15.4′	58.9′
12	358°30.8	N16°40.6	307°19.3	11.7′	S08°09.3	15.3′	58.8′
13	13°30.9	39.9	321°50.0	11.7′	08°24.6	15.3′	58.8′
14	28°31.0	39.2	336°20.7	11.7′	08°39.9	15.2′	58.7′
15	43°31.0	·· 38.5	350°51.4	11.7′	08°55.1	15.2′	58.7′
16	58°31.1	37.8	5°22.1	11.7′	09°10.3	15.0′	58.7′
17	73°31.2	37.1	19°52.9	11.7′	09°25.3	15.0′	58.6′
18	88°31.2	N16°36.4	34°23.6	11.7′	S09°40.3	15.0′	58.6′
19	103°31.3	35.7	48°54.3	11.7′	09°55.3	14.8′	58.6′
20	118°31.4	35.0	63°25.0	11.7′	10°10.1	14.8′	58.5′
21	133°31.5	·· 34.3	77°55.7	11.7′	10°24.9	14.7′	58.5′
22	148°31.5	33.6	92°26.4	11.7′	10°39.6	14.7′	58.4′
23	163°31.6	33.0	106°57.1	11.7′	10°54.3	14.6′	58.4′
	SD = 15.8′	d = 0.7′		SD = 16.2′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°31.7	N16°32.3	121°27.8	11.7′	S11°08.9	14.5′	58.4′
1	193°31.7	31.6	135°58.5	11.7′	11°23.4	14.4′	58.3′
2	208°31.8	30.9	150°29.2	11.7′	11°37.8	14.3′	58.3′
3	223°31.9	·· 30.2	164°59.8	11.7′	11°52.1	14.3′	58.2′
4	238°32.0	29.5	179°30.5	11.6′	12°06.4	14.2′	58.2′
5	253°32.0	28.8	194°01.1	11.6′	12°20.6	14.1′	58.2′
6	268°32.1	N16°28.1	208°31.8	11.6′	S12°34.7	14.0′	58.1′
7	283°32.2	27.4	223°02.4	11.6′	12°48.7	13.9′	58.1′
8	298°32.3	26.7	237°33.0	11.6′	13°02.6	13.9′	58.0′
9	313°32.3	·· 26.0	252°03.6	11.6′	13°16.5	13.7′	58.0′
10	328°32.4	25.3	266°34.1	11.6′	13°30.2	13.7′	58.0′
11	343°32.5	24.6	281°04.7	11.5′	13°43.9	13.6′	57.9′
12	358°32.6	N16°23.9	295°35.2	11.5′	S13°57.5	13.5′	57.9′
13	13°32.6	23.2	310°05.7	11.5′	14°11.0	13.4′	57.8′
14	28°32.7	22.5	324°36.2	11.5′	14°24.4	13.3′	57.8′
15	43°32.8	·· 21.8	339°06.7	11.5′	14°37.7	13.2′	57.8′
16	58°32.9	21.1	353°37.2	11.4′	14°50.9	13.2′	57.7′
17	73°32.9	20.4	8°07.6	11.4′	15°04.1	13.0′	57.7′
18	88°33.0	N16°19.7	22°38.1	11.4′	S15°17.1	13.0′	57.6′
19	103°33.1	19.0	37°08.4	11.4′	15°30.1	12.8′	57.6′
20	118°33.2	18.3	51°38.8	11.4′	15°42.9	12.8′	57.6′
21	133°33.2	·· 17.6	66°09.2	11.3′	15°55.7	12.6′	57.5′
22	148°33.3	16.9	80°39.5	11.3′	16°08.3	12.6′	57.5′
23	163°33.4	16.2	95°09.8	11.3′	16°20.9	12.5′	57.5′
	SD = 15.8′	d = 0.7′		SD = 15.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	00:54	23:04	////	////
N 70°	////	////	02:03	22:04	////	////
68°	////	////	02:38	21:30	////	////
66°	////	01:21	03:04	21:05	22:43	////
64°	////	02:05	03:23	20:46	22:02	////
62°	////	02:34	03:39	20:31	21:35	////
60°	01:13	02:55	03:52	20:18	21:15	22:52
N 58°	01:53	03:12	04:03	20:07	20:58	22:15
56°	02:19	03:26	04:13	19:58	20:44	21:50
54°	02:39	03:38	04:21	19:49	20:32	21:30
52°	02:56	03:49	04:29	19:42	20:22	21:14
50°	03:09	03:58	04:36	19:35	20:12	21:01
45°	03:36	04:18	04:51	19:20	19:53	20:35
N 40°	03:56	04:33	05:03	19:09	19:38	20:15
35°	04:12	04:45	05:13	18:58	19:26	19:59
30°	04:25	04:56	05:22	18:50	19:15	19:46
20°	04:46	05:14	05:37	18:35	18:58	19:25
N 10°	05:02	05:28	05:50	18:21	18:44	19:09
0°	05:16	05:41	06:03	18:09	18:31	18:56
S 10°	05:27	05:53	06:15	17:57	18:19	18:45
20°	05:38	06:04	06:27	17:45	18:08	18:34
30°	05:48	06:17	06:42	17:30	17:55	18:24
35°	05:54	06:24	06:50	17:22	17:49	18:19
40°	05:59	06:31	07:00	17:13	17:41	18:13
45°	06:05	06:40	07:11	17:02	17:33	18:08
S 50°	06:11	06:49	07:24	16:48	17:23	18:02
52°	06:13	06:54	07:30	16:42	17:19	17:59
54°	06:16	06:59	07:37	16:35	17:14	17:56
56°	06:19	07:04	07:45	16:28	17:09	17:53
58°	06:22	07:10	07:54	16:19	17:03	17:50
S 60°	06:26	07:16	08:03	16:09	16:56	17:47

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	08:50	11:13	13:53	20:08	19:31	18:35
N 70°	08:49	11:00	13:20	20:14	19:47	19:10
68°	08:48	10:50	12:56	20:18	19:59	19:35
66°	08:47	10:42	12:38	20:22	20:10	19:55
64°	08:46	10:34	12:23	20:25	20:19	20:11
62°	08:45	10:28	12:11	20:28	20:26	20:24
60°	08:44	10:23	12:01	20:31	20:33	20:36
N 58°	08:44	10:19	11:52	20:33	20:39	20:45
56°	08:43	10:15	11:44	20:35	20:44	20:54
54°	08:43	10:11	11:37	20:37	20:49	21:02
52°	08:42	10:08	11:31	20:39	20:53	21:09
50°	08:42	10:05	11:26	20:40	20:57	21:15
45°	08:41	09:58	11:14	20:43	21:05	21:29
N 40°	08:41	09:53	11:04	20:46	21:12	21:40
35°	08:40	09:49	10:56	20:49	21:18	21:50
30°	08:40	09:45	10:48	20:51	21:24	21:58
20°	08:39	09:38	10:36	20:54	21:33	22:13
N 10°	08:38	09:32	10:25	20:58	21:41	22:26
0°	08:38	09:26	10:15	21:01	21:49	22:38
S 10°	08:37	09:21	10:05	21:04	21:57	22:50
20°	08:36	09:15	09:54	21:07	22:06	23:03
30°	08:36	09:09	09:42	21:11	22:15	23:18
35°	08:35	09:05	09:35	21:13	22:21	23:27
40°	08:35	09:01	09:27	21:15	22:27	23:37
45°	08:34	08:56	09:18	21:18	22:35	23:49
S 50°	08:34	08:50	09:07	21:22	22:44	·· ··
52°	08:34	08:48	09:02	21:23	22:48	·· ··
54°	08:33	08:45	08:57	21:25	22:52	·· ··
56°	08:33	08:42	08:51	21:27	22:57	·· ··
58°	08:33	08:38	08:44	21:29	23:03	·· ··
S 60°	08:32	08:34	08:36	21:31	23:10	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 3-5 10-27%
05	06:06	06:03	12:06	14:49	02:25	
06	06:00	05:57	12:06	15:38	03:14	
07	05:53	05:50	12:06	16:26	04:02	

August 08, 09, 10 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	316°16.9	179°18.6	N17°41.7	123°17.3	S05°30.8	161°19.1	N11°22.1	289°27.6	N08°18.4
1	331°19.4	194°18.0	40.8	138°18.4	31.4	176°21.1	21.9	304°30.1	18.3
2	346°21.9	209°17.3	40.0	153°19.4	32.1	191°23.1	21.8	319°32.5	18.3
3	1°24.3	224°16.7	·· 39.1	168°20.5	·· 32.7	206°25.0	·· 21.6	334°35.0	·· 18.3
4	16°26.8	239°16.0	38.3	183°21.5	33.3	221°27.0	21.4	349°37.4	18.3
5	31°29.3	254°15.4	37.4	198°22.6	33.9	236°28.9	21.2	4°39.9	18.3
6	46°31.7	269°14.7	N17°36.6	213°23.6	S05°34.6	251°30.9	N11°21.0	19°42.3	N08°18.3
7	61°34.2	284°14.1	35.7	228°24.7	35.2	266°32.8	20.8	34°44.8	18.3
8	76°36.7	299°13.4	34.9	243°25.8	35.8	281°34.8	20.6	49°47.2	18.3
9	91°39.1	314°12.8	·· 34.0	258°26.8	·· 36.5	296°36.8	·· 20.4	64°49.7	·· 18.3
10	106°41.6	329°12.1	33.2	273°27.9	37.1	311°38.7	20.2	79°52.1	18.3
11	121°44.1	344°11.5	32.3	288°28.9	37.7	326°40.7	20.0	94°54.6	18.3
12	136°46.5	359°10.8	N17°31.5	303°30.0	S05°38.3	341°42.6	N11°19.8	109°57.1	N08°18.3
13	151°49.0	14°10.2	30.6	318°31.0	39.0	356°44.6	19.7	124°59.5	18.2
14	166°51.4	29°09.5	29.8	333°32.1	39.6	11°46.6	19.5	140°02.0	18.2
15	181°53.9	44°08.9	·· 28.9	348°33.1	·· 40.2	26°48.5	·· 19.3	155°04.4	·· 18.2
16	196°56.4	59°08.3	28.1	3°34.2	40.8	41°50.5	19.1	170°06.9	18.2
17	211°58.8	74°07.6	27.2	18°35.2	41.5	56°52.4	18.9	185°09.3	18.2
18	227°01.3	89°07.0	N17°26.3	33°36.3	S05°42.1	71°54.4	N11°18.7	200°11.8	N08°18.2
19	242°03.8	104°06.3	25.5	48°37.3	42.7	86°56.4	18.5	215°14.2	18.2
20	257°06.2	119°05.7	24.6	63°38.4	43.4	101°58.3	18.3	230°16.7	18.2
21	272°08.7	134°05.0	·· 23.8	78°39.4	·· 44.0	117°00.3	·· 18.1	245°19.2	·· 18.2
22	287°11.2	149°04.4	22.9	93°40.5	44.6	132°02.2	17.9	260°21.6	18.2
23	302°13.6	164°03.8	22.0	108°41.5	45.2	147°04.2	17.7	275°24.1	18.2
Mer.pass. 02:54		ν -0.7′	d 0.8′	m -3.92	ν 1.1′	d 0.6′	m 1.28	ν 2.0′	d 0.2′ m -1.72	ν 2.5′	d 0.0′ m 0.44

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	317°16.1	179°03.1	N17°21.2	123°42.6	S05°45.9	162°06.2	N11°17.6	290°26.5	N08°18.1
1	332°18.5	194°02.5	20.3	138°43.6	46.5	177°08.1	17.4	305°29.0	18.1
2	347°21.0	209°01.8	19.4	153°44.7	47.1	192°10.1	17.2	320°31.4	18.1
3	2°23.5	224°01.2	·· 18.6	168°45.7	·· 47.7	207°12.0	·· 17.0	335°33.9	·· 18.1
4	17°25.9	239°00.6	17.7	183°46.8	48.4	222°14.0	16.8	350°36.4	18.1
5	32°28.4	253°59.9	16.8	198°47.8	49.0	237°15.9	16.6	5°38.8	18.1
6	47°30.9	268°59.3	N17°16.0	213°48.9	S05°49.6	252°17.9	N11°16.4	20°41.3	N08°18.1
7	62°33.3	283°58.6	15.1	228°49.9	50.3	267°19.9	16.2	35°43.7	18.1
8	77°35.8	298°58.0	14.2	243°51.0	50.9	282°21.8	16.0	50°46.2	18.1
9	92°38.3	313°57.4	·· 13.4	258°52.0	·· 51.5	297°23.8	·· 15.8	65°48.6	·· 18.1
10	107°40.7	328°56.7	12.5	273°53.1	52.1	312°25.7	15.6	80°51.1	18.1
11	122°43.2	343°56.1	11.6	288°54.1	52.8	327°27.7	15.5	95°53.6	18.0
12	137°45.7	358°55.5	N17°10.7	303°55.2	S05°53.4	342°29.7	N11°15.3	110°56.0	N08°18.0
13	152°48.1	13°54.8	09.9	318°56.2	54.0	357°31.6	15.1	125°58.5	18.0
14	167°50.6	28°54.2	09.0	333°57.3	54.7	12°33.6	14.9	141°00.9	18.0
15	182°53.0	43°53.6	·· 08.1	348°58.3	·· 55.3	27°35.5	·· 14.7	156°03.4	·· 18.0
16	197°55.5	58°52.9	07.2	3°59.4	55.9	42°37.5	14.5	171°05.9	18.0
17	212°58.0	73°52.3	06.4	19°00.4	56.5	57°39.5	14.3	186°08.3	18.0
18	228°00.4	88°51.7	N17°05.5	34°01.4	S05°57.2	72°41.4	N11°14.1	201°10.8	N08°18.0
19	243°02.9	103°51.0	04.6	49°02.5	57.8	87°43.4	13.9	216°13.2	18.0
20	258°05.4	118°50.4	03.7	64°03.5	58.4	102°45.3	13.7	231°15.7	17.9
21	273°07.8	133°49.8	·· 02.8	79°04.6	·· 59.0	117°47.3	·· 13.5	246°18.2	·· 17.9
22	288°10.3	148°49.1	02.0	94°05.6	05°59.7	132°49.2	13.3	261°20.6	17.9
23	303°12.8	163°48.5	01.1	109°06.7	06°00.3	147°51.2	13.2	276°23.1	17.9
Mer.pass. 02:50		ν -0.6′	d 0.9′	m -3.92	ν 1.0′	d 0.6′	m 1.29	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.44

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	318°15.2	178°47.9	N17°00.2	124°07.7	S06°00.9	162°53.2	N11°13.0	291°25.5	N08°17.9
1	333°17.7	193°47.3	16°59.3	139°08.8	01.6	177°55.1	12.8	306°28.0	17.9
2	348°20.2	208°46.6	58.4	154°09.8	02.2	192°57.1	12.6	321°30.5	17.9
3	3°22.6	223°46.0	·· 57.5	169°10.9	·· 02.8	207°59.0	·· 12.4	336°32.9	·· 17.9
4	18°25.1	238°45.4	56.6	184°11.9	03.4	223°01.0	12.2	351°35.4	17.9
5	33°27.5	253°44.7	55.8	199°12.9	04.1	238°03.0	12.0	6°37.9	17.8
6	48°30.0	268°44.1	N16°54.9	214°14.0	S06°04.7	253°04.9	N11°11.8	21°40.3	N08°17.8
7	63°32.5	283°43.5	54.0	229°15.0	05.3	268°06.9	11.6	36°42.8	17.8
8	78°34.9	298°42.9	53.1	244°16.1	06.0	283°08.8	11.4	51°45.2	17.8
9	93°37.4	313°42.2	·· 52.2	259°17.1	·· 06.6	298°10.8	·· 11.2	66°47.7	·· 17.8
10	108°39.9	328°41.6	51.3	274°18.2	07.2	313°12.7	11.0	81°50.2	17.8
11	123°42.3	343°41.0	50.4	289°19.2	07.8	328°14.7	10.8	96°52.6	17.8
12	138°44.8	358°40.4	N16°49.5	304°20.2	S06°08.5	343°16.7	N11°10.7	111°55.1	N08°17.8
13	153°47.3	13°39.7	48.6	319°21.3	09.1	358°18.6	10.5	126°57.6	17.8
14	168°49.7	28°39.1	47.7	334°22.3	09.7	13°20.6	10.3	142°00.0	17.7
15	183°52.2	43°38.5	·· 46.8	349°23.4	·· 10.3	28°22.5	·· 10.1	157°02.5	·· 17.7
16	198°54.6	58°37.9	45.9	4°24.4	11.0	43°24.5	09.9	172°04.9	17.7
17	213°57.1	73°37.3	45.0	19°25.4	11.6	58°26.4	09.7	187°07.4	17.7
18	228°59.6	88°36.6	N16°44.1	34°26.5	S06°12.2	73°28.4	N11°09.5	202°09.9	N08°17.7
19	244°02.0	103°36.0	43.2	49°27.5	12.9	88°30.4	09.3	217°12.3	17.7
20	259°04.5	118°35.4	42.3	64°28.6	13.5	103°32.3	09.1	232°14.8	17.7
21	274°07.0	133°34.8	·· 41.4	79°29.6	·· 14.1	118°34.3	·· 08.9	247°17.3	·· 17.7
22	289°09.4	148°34.2	40.5	94°30.7	14.7	133°36.2	08.7	262°19.7	17.7
23	304°11.9	163°33.5	39.6	109°31.7	15.4	148°38.2	08.5	277°22.2	17.6
Mer.pass. 02:47		ν -0.6′	d 0.9′	m -3.92	ν 1.0′	d 0.6′	m 1.29	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.43

Stars

	SHA	**Dec**
Alpheratz	357°32.3	29°14.6
Ankaa	353°04.8	-42°09.0
Schedar	349°28.2	56°41.2
Diphda	348°45.0	-17°49.8
Achernar	335°18.4	-57°05.4
Hamal	327°48.7	23°35.6
Polaris	312°55.0	89°22.5
Acamar	315°10.2	-40°11.3
Menkar	314°03.9	4°12.0
Mirfak	308°25.2	49°57.4
Aldebaran	290°37.3	16°33.9
Rigel	281°02.0	-8°10.1
Capella	280°19.0	46°01.4
Bellatrix	278°20.8	6°22.5
Elnath	277°59.4	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.0	7°24.8
Canopus	263°51.9	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.5	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°14.5	-59°35.8
Suhail	222°45.2	-43°32.6
Miaplacidus	221°38.7	-69°49.9
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.1	-63°15.4
Gacrux	171°49.6	-57°16.3
Alioth	166°11.4	55°48.8
Spica	158°20.2	-11°18.4
Alkaid	152°50.5	49°10.7
Hadar	148°33.0	-60°30.6
Menkent	147°55.1	-36°30.5
Arcturus	145°46.0	19°02.5
Rigil Kent.	139°37.4	-60°57.2
Kochab	137°20.0	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.0	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.3	12°32.6
Eltanin	90°40.8	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.6
Deneb	49°23.9	45°22.9
Enif	33°36.4	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.9	-29°28.3
Scheat	13°42.8	28°14.1
Markab	13°27.5	15°21.4

Aug 08 Sun	**SHA**	**Mer.pass**
Venus	223°01.7	12:03
Mars	167°00.4	15:46
Jupiter	205°02.2	13:13
Saturn	333°10.7	04:41

Aug 09 Mon	**SHA**	**Mer.pass**
Venus	221°47.0	12:04
Mars	166°26.5	15:44
Jupiter	204°50.1	13:10
Saturn	333°10.4	04:37

Aug 10 Tue	**SHA**	**Mer.pass**
Venus	220°32.7	12:05
Mars	165°52.5	15:42
Jupiter	204°37.9	13:07
Saturn	333°10.3	04:34

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.5	N16°15.5	109°40.1	11.3′	S16°33.4	12.3′	57.4′
1	193°33.6	14.8	124°10.3	11.2′	16°45.7	12.3′	57.4′
2	208°33.6	14.1	138°40.6	11.2′	16°58.0	12.2′	57.3′
3	223°33.7	·· 13.3	153°10.8	11.2′	17°10.2	12.0′	57.3′
4	238°33.8	12.6	167°41.0	11.1′	17°22.2	12.0′	57.3′
5	253°33.9	11.9	182°11.1	11.1′	17°34.2	11.9′	57.2′
6	268°34.0	N16°11.2	196°41.2	11.1′	S17°46.1	11.7′	57.2′
7	283°34.0	10.5	211°11.3	11.1′	17°57.8	11.7′	57.2′
8	298°34.1	09.8	225°41.4	11.0′	18°09.5	11.5′	57.1′
9	313°34.2	·· 09.1	240°11.4	11.0′	18°21.0	11.4′	57.1′
10	328°34.3	08.4	254°41.4	11.0′	18°32.4	11.4′	57.0′
11	343°34.4	07.7	269°11.4	10.9′	18°43.8	11.2′	57.0′
12	358°34.4	N16°07.0	283°41.3	10.9′	S18°55.0	11.1′	57.0′
13	13°34.5	06.3	298°11.3	10.9′	19°06.1	11.0′	56.9′
14	28°34.6	05.5	312°41.1	10.9′	19°17.1	10.9′	56.9′
15	43°34.7	·· 04.8	327°11.0	10.8′	19°28.0	10.8′	56.9′
16	58°34.8	04.1	341°40.8	10.8′	19°38.8	10.6′	56.8′
17	73°34.9	03.4	356°10.6	10.8′	19°49.4	10.6′	56.8′
18	88°34.9	N16°02.7	10°40.4	10.7′	S20°00.0	10.4′	56.8′
19	103°35.0	02.0	25°10.1	10.7′	20°10.4	10.4′	56.7′
20	118°35.1	01.3	39°39.8	10.7′	20°20.8	10.2′	56.7′
21	133°35.2	16°00.6	54°09.5	10.6′	20°31.0	10.1′	56.7′
22	148°35.3	15°59.8	68°39.1	10.6′	20°41.1	10.0′	56.6′
23	163°35.4	59.1	83°08.7	10.6′	20°51.1	9.8′	56.6′
	SD = 15.8′	d = 0.7′		SD = 15.7′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.5	N15°58.4	97°38.3	10.5′	S21°00.9	9.8′	56.5′
1	193°35.5	57.7	112°07.8	10.5′	21°10.7	9.6′	56.5′
2	208°35.6	57.0	126°37.3	10.5′	21°20.3	9.5′	56.5′
3	223°35.7	·· 56.3	141°06.8	10.4′	21°29.8	9.4′	56.4′
4	238°35.8	55.5	155°36.3	10.4′	21°39.2	9.3′	56.4′
5	253°35.9	54.8	170°05.7	10.4′	21°48.5	9.1′	56.4′
6	268°36.0	N15°54.1	184°35.1	10.4′	S21°57.6	9.1′	56.3′
7	283°36.1	53.4	199°04.4	10.3′	22°06.7	8.9′	56.3′
8	298°36.1	52.7	213°33.7	10.3′	22°15.6	8.7′	56.3′
9	313°36.2	·· 52.0	228°03.0	10.3′	22°24.3	8.7′	56.2′
10	328°36.3	51.2	242°32.3	10.2′	22°33.0	8.5′	56.2′
11	343°36.4	50.5	257°01.5	10.2′	22°41.5	8.5′	56.2′
12	358°36.5	N15°49.8	271°30.7	10.2′	S22°50.0	8.3′	56.1′
13	13°36.6	49.1	285°59.9	10.1′	22°58.3	8.1′	56.1′
14	28°36.7	48.3	300°29.0	10.1′	23°06.4	8.1′	56.1′
15	43°36.8	·· 47.6	314°58.1	10.1′	23°14.5	7.9′	56.1′
16	58°36.8	46.9	329°27.2	10.0′	23°22.4	7.8′	56.0′
17	73°36.9	46.2	343°56.2	10.0′	23°30.2	7.6′	56.0′
18	88°37.0	N15°45.5	358°25.2	10.0′	S23°37.8	7.5′	56.0′
19	103°37.1	44.7	12°54.2	10.0′	23°45.3	7.4′	55.9′
20	118°37.2	44.0	27°23.2	9.9′	23°52.7	7.3′	55.9′
21	133°37.3	·· 43.3	41°52.1	9.9′	24°00.0	7.2′	55.9′
22	148°37.4	42.6	56°21.0	9.9′	24°07.2	7.0′	55.8′
23	163°37.5	41.8	70°49.9	9.9′	24°14.2	6.9′	55.8′
	SD = 15.8′	d = 0.7′		SD = 15.4′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.6	N15°41.1	85°18.8	9.8′	S24°21.1	6.7′	55.8′
1	193°37.7	40.4	99°47.6	9.8′	24°27.8	6.6′	55.8′
2	208°37.8	39.6	114°16.4	9.8′	24°34.4	6.5′	55.7′
3	223°37.8	·· 38.9	128°45.2	9.8′	24°40.9	6.4′	55.7′
4	238°37.9	38.2	143°13.9	9.7′	24°47.3	6.2′	55.7′
5	253°38.0	37.5	157°42.6	9.7′	24°53.5	6.1′	55.6′
6	268°38.1	N15°36.7	172°11.3	9.7′	S24°59.6	6.0′	55.6′
7	283°38.2	36.0	186°40.0	9.7′	25°05.6	5.8′	55.6′
8	298°38.3	35.3	201°08.7	9.6′	25°11.4	5.7′	55.6′
9	313°38.4	·· 34.5	215°37.3	9.6′	25°17.1	5.6′	55.5′
10	328°38.5	33.8	230°05.9	9.6′	25°22.7	5.4′	55.5′
11	343°38.6	33.1	244°34.5	9.6′	25°28.1	5.3′	55.5′
12	358°38.7	N15°32.4	259°03.1	9.6′	S25°33.4	5.1′	55.4′
13	13°38.8	31.6	273°31.7	9.5′	25°38.5	5.1′	55.4′
14	28°38.9	30.9	288°00.2	9.5′	25°43.6	4.9′	55.4′
15	43°39.0	·· 30.2	302°28.8	9.5′	25°48.5	4.7′	55.4′
16	58°39.1	29.4	316°57.3	9.5′	25°53.2	4.6′	55.3′
17	73°39.2	28.7	331°25.8	9.5′	25°57.8	4.5′	55.3′
18	88°39.3	N15°28.0	345°54.2	9.5′	S26°02.3	4.3′	55.3′
19	103°39.4	27.2	0°22.7	9.5′	26°06.6	4.3′	55.3′
20	118°39.4	26.5	14°51.2	9.4′	26°10.9	4.0′	55.2′
21	133°39.5	·· 25.8	29°19.6	9.4′	26°14.9	4.0′	55.2′
22	148°39.6	25.0	43°48.1	9.4′	26°18.9	3.8′	55.2′
23	163°39.7	24.3	58°16.5	9.4′	26°22.7	3.6′	55.2′
	SD = 15.8′	d = 0.7′		SD = 15.2′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	01:33	22:30	////	////
N 70°	////	////	02:22	21:45	////	////
68°	////	00:18	02:52	21:15	23:26	////
66°	////	01:44	03:15	20:54	22:21	////
64°	////	02:20	03:32	20:36	21:48	////
62°	00:17	02:45	03:47	20:22	21:24	23:30
60°	01:33	03:04	03:59	20:10	21:05	22:33
N 58°	02:06	03:20	04:10	20:00	20:49	22:02
56°	02:29	03:33	04:19	19:51	20:36	21:39
54°	02:47	03:44	04:27	19:43	20:25	21:22
52°	03:03	03:54	04:34	19:36	20:15	21:07
50°	03:15	04:03	04:40	19:30	20:07	20:54
45°	03:41	04:21	04:54	19:16	19:49	20:29
N 40°	04:00	04:36	05:06	19:05	19:34	20:10
35°	04:15	04:48	05:15	18:55	19:23	19:55
30°	04:28	04:58	05:24	18:47	19:13	19:43
20°	04:48	05:15	05:38	18:33	18:56	19:23
N 10°	05:03	05:29	05:51	18:20	18:42	19:08
0°	05:16	05:41	06:02	18:09	18:30	18:55
S 10°	05:27	05:52	06:14	17:58	18:19	18:45
20°	05:37	06:03	06:26	17:46	18:08	18:35
30°	05:46	06:15	06:39	17:32	17:57	18:25
35°	05:51	06:21	06:47	17:24	17:51	18:21
40°	05:56	06:28	06:56	17:15	17:44	18:16
45°	06:01	06:36	07:07	17:05	17:36	18:11
S 50°	06:06	06:45	07:19	16:53	17:27	18:05
52°	06:09	06:49	07:25	16:47	17:23	18:03
54°	06:11	06:53	07:31	16:40	17:18	18:01
56°	06:14	06:58	07:39	16:33	17:14	17:58
58°	06:17	07:04	07:47	16:25	17:08	17:55
S 60°	06:20	07:10	07:56	16:16	17:02	17:53

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	16:55	▬	▬	17:19	▬	▬
68°	15:20	▬	▬	18:55	▬	▬
66°	14:42	17:24	▬	19:34	18:38	▬
64°	14:15	16:15	▬	20:02	19:47	▬
62°	13:55	15:40	17:24	20:23	20:23	20:28
60°	13:38	15:15	16:45	20:40	20:49	21:06
N 58°	13:25	14:55	16:18	20:55	21:10	21:34
56°	13:13	14:38	15:57	21:08	21:27	21:55
54°	13:02	14:24	15:40	21:19	21:41	22:12
52°	12:53	14:12	15:25	21:28	21:54	22:27
50°	12:45	14:01	15:12	21:37	22:05	22:41
45°	12:28	13:39	14:46	21:56	22:28	23:07
N 40°	12:13	13:21	14:25	22:11	22:47	23:29
35°	12:02	13:06	14:08	22:24	23:03	23:46
30°	11:51	12:53	13:53	22:35	23:16	·· ··
20°	11:33	12:31	13:28	22:55	23:40	·· ··
N 10°	11:18	12:12	13:06	23:12	·· ··	00:00
0°	11:04	11:54	12:46	23:28	·· ··	00:19
S 10°	10:50	11:37	12:26	23:44	·· ··	00:38
20°	10:35	11:18	12:04	·· ··	00:01	00:58
30°	10:18	10:57	11:40	·· ··	00:21	01:22
35°	10:08	10:44	11:25	·· ··	00:33	01:36
40°	09:57	10:30	11:08	·· ··	00:46	01:52
45°	09:43	10:13	10:48	·· ··	01:02	02:12
S 50°	09:27	09:52	10:23	00:04	01:22	02:36
52°	09:20	09:42	10:11	00:10	01:31	02:48
54°	09:12	09:31	09:58	00:18	01:42	03:01
56°	09:03	09:18	09:42	00:26	01:54	03:16
58°	08:52	09:04	09:23	00:36	02:08	03:35
S 60°	08:40	08:47	09:00	00:47	02:24	03:58

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 6-8 38-58%
08	05:46	05:42	12:06	17:16	04:51	
09	05:38	05:34	12:06	18:07	05:41	
10	05:30	05:25	12:05	18:58	06:32	

August 11, 12, 13 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	319°14.4	178°32.9	N16°38.7	124°32.7	S06°16.0	163°40.1	N11°08.3	292°24.7	N08°17.6
1	334°16.8	193°32.3	37.8	139°33.8	16.6	178°42.1	08.2	307°27.1	17.6
2	349°19.3	208°31.7	36.9	154°34.8	17.2	193°44.1	08.0	322°29.6	17.6
3	4°21.8	223°31.1	·· 36.0	169°35.8	·· 17.9	208°46.0	·· 07.8	337°32.1	·· 17.6
4	19°24.2	238°30.5	35.1	184°36.9	18.5	223°48.0	07.6	352°34.5	17.6
5	34°26.7	253°29.8	34.2	199°37.9	19.1	238°49.9	07.4	7°37.0	17.6
6	49°29.1	268°29.2	N16°33.3	214°39.0	S06°19.8	253°51.9	N11°07.2	22°39.5	N08°17.5
7	64°31.6	283°28.6	32.4	229°40.0	20.4	268°53.8	07.0	37°41.9	17.5
8	79°34.1	298°28.0	31.5	244°41.0	21.0	283°55.8	06.8	52°44.4	17.5
9	94°36.5	313°27.4	·· 30.6	259°42.1	·· 21.6	298°57.8	·· 06.6	67°46.9	·· 17.5
10	109°39.0	328°26.8	29.7	274°43.1	22.3	313°59.7	06.4	82°49.3	17.5
11	124°41.5	343°26.2	28.8	289°44.2	22.9	329°01.7	06.2	97°51.8	17.5
12	139°43.9	358°25.5	N16°27.8	304°45.2	S06°23.5	344°03.6	N11°06.0	112°54.3	N08°17.5
13	154°46.4	13°24.9	26.9	319°46.2	24.1	359°05.6	05.8	127°56.7	17.5
14	169°48.9	28°24.3	26.0	334°47.3	24.8	14°07.5	05.7	142°59.2	17.4
15	184°51.3	43°23.7	·· 25.1	349°48.3	·· 25.4	29°09.5	·· 05.5	158°01.7	·· 17.4
16	199°53.8	58°23.1	24.2	4°49.3	26.0	44°11.5	05.3	173°04.1	17.4
17	214°56.3	73°22.5	23.3	19°50.4	26.7	59°13.4	05.1	188°06.6	17.4
18	229°58.7	88°21.9	N16°22.4	34°51.4	S06°27.3	74°15.4	N11°04.9	203°09.1	N08°17.4
19	245°01.2	103°21.3	21.4	49°52.4	27.9	89°17.3	04.7	218°11.5	17.4
20	260°03.6	118°20.7	20.5	64°53.5	28.5	104°19.3	04.5	233°14.0	17.4
21	275°06.1	133°20.1	·· 19.6	79°54.5	·· 29.2	119°21.2	·· 04.3	248°16.5	·· 17.4
22	290°08.6	148°19.5	18.7	94°55.6	29.8	134°23.2	04.1	263°18.9	17.3
23	305°11.0	163°18.8	17.8	109°56.6	30.4	149°25.2	03.9	278°21.4	17.3
Mer.pass. 02:43		ν -0.6′	d 0.9′	m -3.92	ν 1.0′	d 0.6′	m 1.29	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.43

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	320°13.5	178°18.2	N16°16.8	124°57.6	S06°31.0	164°27.1	N11°03.7	293°23.9	N08°17.3
1	335°16.0	193°17.6	15.9	139°58.7	31.7	179°29.1	03.5	308°26.3	17.3
2	350°18.4	208°17.0	15.0	154°59.7	32.3	194°31.0	03.3	323°28.8	17.3
3	5°20.9	223°16.4	·· 14.1	170°00.7	·· 32.9	209°33.0	·· 03.1	338°31.3	·· 17.3
4	20°23.4	238°15.8	13.1	185°01.8	33.6	224°34.9	03.0	353°33.8	17.3
5	35°25.8	253°15.2	12.2	200°02.8	34.2	239°36.9	02.8	8°36.2	17.2
6	50°28.3	268°14.6	N16°11.3	215°03.8	S06°34.8	254°38.9	N11°02.6	23°38.7	N08°17.2
7	65°30.8	283°14.0	10.4	230°04.9	35.4	269°40.8	02.4	38°41.2	17.2
8	80°33.2	298°13.4	09.4	245°05.9	36.1	284°42.8	02.2	53°43.6	17.2
9	95°35.7	313°12.8	·· 08.5	260°06.9	·· 36.7	299°44.7	·· 02.0	68°46.1	·· 17.2
10	110°38.1	328°12.2	07.6	275°08.0	37.3	314°46.7	01.8	83°48.6	17.2
11	125°40.6	343°11.6	06.6	290°09.0	37.9	329°48.6	01.6	98°51.0	17.2
12	140°43.1	358°11.0	N16°05.7	305°10.0	S06°38.6	344°50.6	N11°01.4	113°53.5	N08°17.1
13	155°45.5	13°10.4	04.8	320°11.0	39.2	359°52.6	01.2	128°56.0	17.1
14	170°48.0	28°09.8	03.8	335°12.1	39.8	14°54.5	01.0	143°58.5	17.1
15	185°50.5	43°09.2	·· 02.9	350°13.1	·· 40.5	29°56.5	·· 00.8	159°00.9	·· 17.1
16	200°52.9	58°08.6	02.0	5°14.1	41.1	44°58.4	00.6	174°03.4	17.1
17	215°55.4	73°08.0	01.0	20°15.2	41.7	60°00.4	00.4	189°05.9	17.1
18	230°57.9	88°07.4	N16°00.1	35°16.2	S06°42.3	75°02.3	N11°00.2	204°08.3	N08°17.0
19	246°00.3	103°06.8	15°59.2	50°17.2	43.0	90°04.3	11°00.1	219°10.8	17.0
20	261°02.8	118°06.2	58.2	65°18.3	43.6	105°06.2	10°59.9	234°13.3	17.0
21	276°05.3	133°05.6	·· 57.3	80°19.3	·· 44.2	120°08.2	·· 59.7	249°15.8	·· 17.0
22	291°07.7	148°05.0	56.3	95°20.3	44.8	135°10.2	59.5	264°18.2	17.0
23	306°10.2	163°04.4	55.4	110°21.4	45.5	150°12.1	59.3	279°20.7	17.0
Mer.pass. 02:39		ν -0.6′	d 0.9′	m -3.92	ν 1.0′	d 0.6′	m 1.30	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.42

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	321°12.6	178°03.8	N15°54.5	125°22.4	S06°46.1	165°14.1	N10°59.1	294°23.2	N08°17.0
1	336°15.1	193°03.2	53.5	140°23.4	46.7	180°16.0	58.9	309°25.7	16.9
2	351°17.6	208°02.6	52.6	155°24.4	47.3	195°18.0	58.7	324°28.1	16.9
3	6°20.0	223°02.0	·· 51.6	170°25.5	·· 48.0	210°19.9	·· 58.5	339°30.6	·· 16.9
4	21°22.5	238°01.5	50.7	185°26.5	48.6	225°21.9	58.3	354°33.1	16.9
5	36°25.0	253°00.9	49.8	200°27.5	49.2	240°23.9	58.1	9°35.6	16.9
6	51°27.4	268°00.3	N15°48.8	215°28.6	S06°49.9	255°25.8	N10°57.9	24°38.0	N08°16.9
7	66°29.9	282°59.7	47.9	230°29.6	50.5	270°27.8	57.7	39°40.5	16.8
8	81°32.4	297°59.1	46.9	245°30.6	51.1	285°29.7	57.5	54°43.0	16.8
9	96°34.8	312°58.5	·· 46.0	260°31.6	·· 51.7	300°31.7	·· 57.3	69°45.5	·· 16.8
10	111°37.3	327°57.9	45.0	275°32.7	52.4	315°33.6	57.1	84°47.9	16.8
11	126°39.7	342°57.3	44.1	290°33.7	53.0	330°35.6	57.0	99°50.4	16.8
12	141°42.2	357°56.7	N15°43.1	305°34.7	S06°53.6	345°37.5	N10°56.8	114°52.9	N08°16.8
13	156°44.7	12°56.1	42.2	320°35.7	54.2	0°39.5	56.6	129°55.4	16.8
14	171°47.1	27°55.5	41.2	335°36.8	54.9	15°41.5	56.4	144°57.8	16.7
15	186°49.6	42°55.0	·· 40.3	350°37.8	·· 55.5	30°43.4	·· 56.2	160°00.3	·· 16.7
16	201°52.1	57°54.4	39.3	5°38.8	56.1	45°45.4	56.0	175°02.8	16.7
17	216°54.5	72°53.8	38.4	20°39.8	56.8	60°47.3	55.8	190°05.3	16.7
18	231°57.0	87°53.2	N15°37.4	35°40.9	S06°57.4	75°49.3	N10°55.6	205°07.7	N08°16.7
19	246°59.5	102°52.6	36.5	50°41.9	58.0	90°51.2	55.4	220°10.2	16.7
20	262°01.9	117°52.0	35.5	65°42.9	58.6	105°53.2	55.2	235°12.7	16.6
21	277°04.4	132°51.4	·· 34.5	80°43.9	·· 59.3	120°55.1	·· 55.0	250°15.2	·· 16.6
22	292°06.9	147°50.9	33.6	95°45.0	06°59.9	135°57.1	54.8	265°17.6	16.6
23	307°09.3	162°50.3	32.6	110°46.0	07°00.5	150°59.1	54.6	280°20.1	16.6
Mer.pass. 02:35		ν -0.6′	d 0.9′	m -3.92	ν 1.0′	d 0.6′	m 1.30	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.42

Stars

	SHA	Dec
Alpheratz	357°32.3	29°14.6
Ankaa	353°04.8	-42°09.0
Schedar	349°28.2	56°41.2
Diphda	348°45.0	-17°49.8
Achernar	335°18.4	-57°05.4
Hamal	327°48.7	23°35.6
Polaris	312°53.2	89°22.5
Acamar	315°10.1	-40°11.3
Menkar	314°03.9	4°12.0
Mirfak	308°25.2	49°57.4
Aldebaran	290°37.3	16°33.9
Rigel	281°02.0	-8°10.1
Capella	280°19.0	46°01.4
Bellatrix	278°20.8	6°22.5
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.0
Betelgeuse	270°50.0	7°24.8
Canopus	263°51.8	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.5	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°14.5	-59°35.8
Suhail	222°45.2	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.1	-63°15.4
Gacrux	171°49.6	-57°16.3
Alioth	166°11.5	55°48.8
Spica	158°20.2	-11°18.4
Alkaid	152°50.5	49°10.7
Hadar	148°33.1	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.0	19°02.5
Rigil Kent.	139°37.4	-60°57.2
Kochab	137°20.0	74°02.8
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.0	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.4
Rasalhague	95°56.4	12°32.6
Eltanin	90°40.8	51°29.3
Kaus Aust.	83°29.4	-34°22.2
Vega	80°31.4	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°22.9
Enif	33°36.4	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.8	28°14.1
Markab	13°27.5	15°21.4

Aug 11 Wed	SHA	Mer.pass
Venus	219°18.6	12:06
Mars	165°18.4	15:41
Jupiter	204°25.8	13:04
Saturn	333°10.3	04:30

Aug 12 Thu	SHA	Mer.pass
Venus	218°04.7	12:07
Mars	164°44.1	15:39
Jupiter	204°13.6	13:00
Saturn	333°10.4	04:26

Aug 13 Fri	SHA	Mer.pass
Venus	216°51.2	12:08
Mars	164°09.7	15:37
Jupiter	204°01.4	12:57
Saturn	333°10.5	04:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°39.8	N15°23.5	72°44.9	9.4′	S26°26.3	3.5′	55.1′
1	193°39.9	22.8	87°13.3	9.4′	26°29.8	3.4′	55.1′
2	208°40.0	22.1	101°41.7	9.4′	26°33.2	3.3′	55.1′
3	223°40.1	·· 21.3	116°10.1	9.4′	26°36.5	3.1′	55.1′
4	238°40.2	20.6	130°38.5	9.4′	26°39.6	2.9′	55.1′
5	253°40.3	19.9	145°06.9	9.4′	26°42.5	2.9′	55.0′
6	268°40.4	N15°19.1	159°35.2	9.4′	S26°45.4	2.7′	55.0′
7	283°40.5	18.4	174°03.6	9.4′	26°48.1	2.5′	55.0′
8	298°40.6	17.6	188°32.0	9.4′	26°50.6	2.5′	55.0′
9	313°40.7	·· 16.9	203°00.4	9.4′	26°53.1	2.2′	54.9′
10	328°40.8	16.2	217°28.8	9.4′	26°55.3	2.2′	54.9′
11	343°40.9	15.4	231°57.1	9.4′	26°57.5	2.0′	54.9′
12	358°41.0	N15°14.7	246°25.5	9.4′	S26°59.5	1.9′	54.9′
13	13°41.1	13.9	260°53.9	9.4′	27°01.4	1.7′	54.9′
14	28°41.2	13.2	275°22.3	9.4′	27°03.1	1.6′	54.8′
15	43°41.3	·· 12.4	289°50.7	9.4′	27°04.7	1.4′	54.8′
16	58°41.4	11.7	304°19.1	9.4′	27°06.1	1.4′	54.8′
17	73°41.5	11.0	318°47.5	9.4′	27°07.5	1.1′	54.8′
18	88°41.6	N15°10.2	333°15.9	9.4′	S27°08.6	1.1′	54.8′
19	103°41.7	09.5	347°44.4	9.4′	27°09.7	0.9′	54.7′
20	118°41.8	08.7	2°12.8	9.5′	27°10.6	0.7′	54.7′
21	133°41.9	·· 08.0	16°41.3	9.5′	27°11.3	0.7′	54.7′
22	148°42.0	07.2	31°09.7	9.5′	27°12.0	0.5′	54.7′
23	163°42.1	06.5	45°38.2	9.5′	27°12.5	0.3′	54.7′
	SD = 15.8′	d = 0.7′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°42.2	N15°05.7	60°06.7	9.5′	S27°12.8	0.2′	54.6′
1	193°42.4	05.0	74°35.2	9.5′	27°13.0	0.1′	54.6′
2	208°42.5	04.3	89°03.8	9.6′	27°13.1	0.0′	54.6′
3	223°42.6	·· 03.5	103°32.3	9.6′	27°13.1	0.2′	54.6′
4	238°42.7	02.8	118°00.9	9.6′	27°12.9	0.3′	54.6′
5	253°42.8	02.0	132°29.5	9.6′	27°12.6	0.5′	54.6′
6	268°42.9	N15°01.3	146°58.1	9.6′	S27°12.1	0.6′	54.5′
7	283°43.0	15°00.5	161°26.8	9.7′	27°11.5	0.7′	54.5′
8	298°43.1	14°59.8	175°55.4	9.7′	27°10.8	0.9′	54.5′
9	313°43.2	·· 59.0	190°24.1	9.7′	27°09.9	1.0′	54.5′
10	328°43.3	58.3	204°52.8	9.7′	27°08.9	1.1′	54.5′
11	343°43.4	57.5	219°21.6	9.8′	27°07.8	1.3′	54.5′
12	358°43.5	N14°56.8	233°50.3	9.8′	S27°06.5	1.4′	54.5′
13	13°43.6	56.0	248°19.1	9.8′	27°05.1	1.5′	54.4′
14	28°43.7	55.3	262°48.0	9.9′	27°03.6	1.7′	54.4′
15	43°43.8	·· 54.5	277°16.8	9.9′	27°01.9	1.8′	54.4′
16	58°43.9	53.7	291°45.7	9.9′	27°00.1	1.9′	54.4′
17	73°44.0	53.0	306°14.6	10.0′	26°58.2	2.0′	54.4′
18	88°44.2	N14°52.2	320°43.6	10.0′	S26°56.2	2.2′	54.4′
19	103°44.3	51.5	335°12.6	10.0′	26°54.0	2.4′	54.4′
20	118°44.4	50.7	349°41.6	10.1′	26°51.6	2.4′	54.3′
21	133°44.5	·· 50.0	4°10.7	10.1′	26°49.2	2.6′	54.3′
22	148°44.6	49.2	18°39.8	10.1′	26°46.6	2.7′	54.3′
23	163°44.7	48.5	33°08.9	10.2′	26°43.9	2.8′	54.3′
	SD = 15.8′	d = 0.7′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°44.8	N14°47.7	47°38.1	10.2′	S26°41.1	3.0′	54.3′
1	193°44.9	46.9	62°07.3	10.3′	26°38.1	3.1′	54.3′
2	208°45.0	46.2	76°36.6	10.3′	26°35.0	3.2′	54.3′
3	223°45.1	·· 45.4	91°05.9	10.3′	26°31.8	3.4′	54.3′
4	238°45.2	44.7	105°35.2	10.4′	26°28.4	3.4′	54.2′
5	253°45.4	43.9	120°04.6	10.4′	26°25.0	3.6′	54.2′
6	268°45.5	N14°43.2	134°34.1	10.5′	S26°21.4	3.7′	54.2′
7	283°45.6	42.4	149°03.5	10.5′	26°17.7	3.9′	54.2′
8	298°45.7	41.6	163°33.1	10.6′	26°13.8	4.0′	54.2′
9	313°45.8	·· 40.9	178°02.6	10.6′	26°09.8	4.1′	54.2′
10	328°45.9	40.1	192°32.3	10.7′	26°05.7	4.2′	54.2′
11	343°46.0	39.4	207°01.9	10.7′	26°01.5	4.3′	54.2′
12	358°46.1	N14°38.6	221°31.7	10.8′	S25°57.2	4.5′	54.2′
13	13°46.2	37.8	236°01.4	10.8′	25°52.7	4.5′	54.1′
14	28°46.4	37.1	250°31.2	10.9′	25°48.2	4.7′	54.1′
15	43°46.5	·· 36.3	265°01.1	10.9′	25°43.5	4.9′	54.1′
16	58°46.6	35.5	279°31.0	11.0′	25°38.6	4.9′	54.1′
17	73°46.7	34.8	294°01.0	11.0′	25°33.7	5.1′	54.1′
18	88°46.8	N14°34.0	308°31.0	11.1′	S25°28.6	5.1′	54.1′
19	103°46.9	33.3	323°01.1	11.1′	25°23.5	5.3′	54.1′
20	118°47.0	32.5	337°31.2	11.2′	25°18.2	5.4′	54.1′
21	133°47.2	·· 31.7	352°01.4	11.2′	25°12.8	5.6′	54.1′
22	148°47.3	31.0	6°31.7	11.3′	25°07.2	5.6′	54.1′
23	163°47.4	30.2	21°02.0	11.4′	25°01.6	5.7′	54.1′
	SD = 15.8′	d = 0.8′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:00	22:04	////	////
N 70°	////	////	02:39	21:27	////	////
68°	////	01:14	03:06	21:01	22:47	////
66°	////	02:03	03:26	20:42	22:02	////
64°	////	02:33	03:42	20:26	21:33	////
62°	01:06	02:55	03:55	20:13	21:12	22:56
60°	01:50	03:13	04:06	20:02	20:55	22:16
N 58°	02:18	03:28	04:16	19:53	20:41	21:49
56°	02:39	03:40	04:24	19:44	20:29	21:29
54°	02:55	03:51	04:32	19:37	20:18	21:13
52°	03:09	04:00	04:39	19:30	20:09	20:59
50°	03:21	04:08	04:45	19:24	20:01	20:47
45°	03:45	04:25	04:58	19:12	19:44	20:24
N 40°	04:03	04:39	05:08	19:01	19:30	20:06
35°	04:18	04:50	05:18	18:52	19:19	19:52
30°	04:30	05:00	05:25	18:44	19:10	19:40
20°	04:49	05:16	05:39	18:31	18:54	19:21
N 10°	05:03	05:29	05:51	18:19	18:41	19:07
0°	05:15	05:40	06:02	18:08	18:30	18:55
S 10°	05:26	05:51	06:12	17:58	18:19	18:45
20°	05:35	06:01	06:24	17:47	18:09	18:35
30°	05:44	06:12	06:37	17:34	17:59	18:27
35°	05:48	06:18	06:44	17:26	17:53	18:23
40°	05:52	06:24	06:53	17:18	17:46	18:18
45°	05:57	06:32	07:02	17:08	17:39	18:14
S 50°	06:02	06:40	07:14	16:57	17:31	18:09
52°	06:04	06:44	07:19	16:51	17:27	18:07
54°	06:06	06:48	07:25	16:45	17:23	18:05
56°	06:08	06:52	07:32	16:39	17:19	18:03
58°	06:10	06:57	07:40	16:31	17:14	18:01
S 60°	06:13	07:03	07:48	16:23	17:09	17:58

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	20:36	▬	▬	22:38
62°	18:51	19:33	19:43	20:49	21:56	23:30
60°	17:59	18:47	19:11	21:41	22:42	·· ··
N 58°	17:28	18:16	18:47	22:13	23:12	·· ··
56°	17:04	17:54	18:27	22:37	23:35	·· ··
54°	16:45	17:35	18:11	22:56	23:53	·· ··
52°	16:28	17:19	17:57	23:12	·· ··	00:09
50°	16:14	17:05	17:45	23:26	·· ··	00:22
45°	15:46	16:37	17:19	23:55	·· ··	00:50
N 40°	15:24	16:15	16:59	·· ··	00:17	01:12
35°	15:05	15:57	16:42	·· ··	00:36	01:30
30°	14:49	15:41	16:28	00:02	00:52	01:45
20°	14:23	15:15	16:03	00:28	01:19	02:12
N 10°	14:00	14:52	15:41	00:50	01:42	02:34
0°	13:38	14:30	15:21	01:11	02:03	02:55
S 10°	13:17	14:09	15:01	01:32	02:25	03:16
20°	12:54	13:46	14:39	01:54	02:48	03:38
30°	12:27	13:19	14:14	02:21	03:15	04:04
35°	12:12	13:03	13:59	02:36	03:31	04:19
40°	11:54	12:45	13:42	02:54	03:49	04:37
45°	11:32	12:23	13:21	03:15	04:11	04:58
S 50°	11:04	11:55	12:55	03:43	04:40	05:25
52°	10:50	11:41	12:42	03:56	04:54	05:38
54°	10:35	11:25	12:28	04:12	05:10	05:53
56°	10:16	11:06	12:11	04:30	05:28	06:10
58°	09:54	10:43	11:50	04:52	05:52	06:31
S 60°	09:25	10:12	11:24	05:21	06:23	06:58

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 9-11 68-84%
11	05:21	05:16	12:05	19:51	07:25	
12	05:11	05:06	12:05	20:43	08:17	
13	05:01	04:55	12:05	21:33	09:08	

August 14, 15, 16 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	322°11.8	177°49.7	N15°31.7	125°47.0	S07°01.1	166°01.0	N10°54.4	295°22.6	N08°16.6
1	337°14.2	192°49.1	30.7	140°48.0	01.8	181°03.0	54.2	310°25.1	16.6
2	352°16.7	207°48.5	29.7	155°49.1	02.4	196°04.9	54.0	325°27.6	16.5
3	7°19.2	222°47.9	·· 28.8	170°50.1	·· 03.0	211°06.9	·· 53.9	340°30.0	·· 16.5
4	22°21.6	237°47.4	27.8	185°51.1	03.6	226°08.8	53.7	355°32.5	16.5
5	37°24.1	252°46.8	26.9	200°52.1	04.3	241°10.8	53.5	10°35.0	16.5
6	52°26.6	267°46.2	N15°25.9	215°53.2	S07°04.9	256°12.7	N10°53.3	25°37.5	N08°16.5
7	67°29.0	282°45.6	24.9	230°54.2	05.5	271°14.7	53.1	40°39.9	16.5
8	82°31.5	297°45.0	24.0	245°55.2	06.1	286°16.7	52.9	55°42.4	16.4
9	97°34.0	312°44.5	·· 23.0	260°56.2	·· 06.8	301°18.6	·· 52.7	70°44.9	·· 16.4
10	112°36.4	327°43.9	22.0	275°57.3	07.4	316°20.6	52.5	85°47.4	16.4
11	127°38.9	342°43.3	21.1	290°58.3	08.0	331°22.5	52.3	100°49.9	16.4
12	142°41.4	357°42.7	N15°20.1	305°59.3	S07°08.7	346°24.5	N10°52.1	115°52.3	N08°16.4
13	157°43.8	12°42.1	19.1	321°00.3	09.3	1°26.4	51.9	130°54.8	16.3
14	172°46.3	27°41.6	18.2	336°01.3	09.9	16°28.4	51.7	145°57.3	16.3
15	187°48.7	42°41.0	·· 17.2	351°02.4	·· 10.5	31°30.3	·· 51.5	160°59.8	·· 16.3
16	202°51.2	57°40.4	16.2	6°03.4	11.2	46°32.3	51.3	176°02.3	16.3
17	217°53.7	72°39.8	15.3	21°04.4	11.8	61°34.3	51.1	191°04.7	16.3
18	232°56.1	87°39.3	N15°14.3	36°05.4	S07°12.4	76°36.2	N10°50.9	206°07.2	N08°16.3
19	247°58.6	102°38.7	13.3	51°06.4	13.0	91°38.2	50.7	221°09.7	16.2
20	263°01.1	117°38.1	12.3	66°07.5	13.7	106°40.1	50.5	236°12.2	16.2
21	278°03.5	132°37.5	·· 11.4	81°08.5	·· 14.3	121°42.1	·· 50.4	251°14.7	·· 16.2
22	293°06.0	147°37.0	10.4	96°09.5	14.9	136°44.0	50.2	266°17.1	16.2
23	308°08.5	162°36.4	09.4	111°10.5	15.5	151°46.0	50.0	281°19.6	16.2
Mer.pass. 02:31		ν -0.6′	d 1.0′	m -3.92	ν 1.0′	d 0.6′	m 1.30	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.41

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	323°10.9	177°35.8	N15°08.4	126°11.5	S07°16.2	166°47.9	N10°49.8	296°22.1	N08°16.1
1	338°13.4	192°35.2	07.5	141°12.6	16.8	181°49.9	49.6	311°24.6	16.1
2	353°15.9	207°34.7	06.5	156°13.6	17.4	196°51.9	49.4	326°27.1	16.1
3	8°18.3	222°34.1	·· 05.5	171°14.6	·· 18.0	211°53.8	·· 49.2	341°29.6	·· 16.1
4	23°20.8	237°33.5	04.5	186°15.6	18.7	226°55.8	49.0	356°32.0	16.1
5	38°23.2	252°33.0	03.6	201°16.6	19.3	241°57.7	48.8	11°34.5	16.1
6	53°25.7	267°32.4	N15°02.6	216°17.6	S07°19.9	256°59.7	N10°48.6	26°37.0	N08°16.0
7	68°28.2	282°31.8	01.6	231°18.7	20.5	272°01.6	48.4	41°39.5	16.0
8	83°30.6	297°31.2	15°00.6	246°19.7	21.2	287°03.6	48.2	56°42.0	16.0
9	98°33.1	312°30.7	14°59.6	261°20.7	·· 21.8	302°05.5	·· 48.0	71°44.4	·· 16.0
10	113°35.6	327°30.1	58.6	276°21.7	22.4	317°07.5	47.8	86°46.9	16.0
11	128°38.0	342°29.5	57.7	291°22.7	23.1	332°09.4	47.6	101°49.4	15.9
12	143°40.5	357°29.0	N14°56.7	306°23.7	S07°23.7	347°11.4	N10°47.4	116°51.9	N08°15.9
13	158°43.0	12°28.4	55.7	321°24.8	24.3	2°13.4	47.2	131°54.4	15.9
14	173°45.4	27°27.8	54.7	336°25.8	24.9	17°15.3	47.0	146°56.9	15.9
15	188°47.9	42°27.3	·· 53.7	351°26.8	·· 25.6	32°17.3	·· 46.8	161°59.3	·· 15.9
16	203°50.3	57°26.7	52.7	6°27.8	26.2	47°19.2	46.7	177°01.8	15.8
17	218°52.8	72°26.1	51.7	21°28.8	26.8	62°21.2	46.5	192°04.3	15.8
18	233°55.3	87°25.6	N14°50.8	36°29.8	S07°27.4	77°23.1	N10°46.3	207°06.8	N08°15.8
19	248°57.7	102°25.0	49.8	51°30.8	28.1	92°25.1	46.1	222°09.3	15.8
20	264°00.2	117°24.5	48.8	66°31.9	28.7	107°27.0	45.9	237°11.8	15.8
21	279°02.7	132°23.9	·· 47.8	81°32.9	·· 29.3	122°29.0	·· 45.7	252°14.3	·· 15.7
22	294°05.1	147°23.3	46.8	96°33.9	29.9	137°30.9	45.5	267°16.7	15.7
23	309°07.6	162°22.8	45.8	111°34.9	30.6	152°32.9	45.3	282°19.2	15.7
Mer.pass. 02:27		ν -0.6′	d 1.0′	m -3.92	ν 1.0′	d 0.6′	m 1.30	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.41

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	324°10.1	177°22.2	N14°44.8	126°35.9	S07°31.2	167°34.9	N10°45.1	297°21.7	N08°15.7
1	339°12.5	192°21.6	43.8	141°36.9	31.8	182°36.8	44.9	312°24.2	15.7
2	354°15.0	207°21.1	42.8	156°37.9	32.4	197°38.8	44.7	327°26.7	15.6
3	9°17.5	222°20.5	·· 41.8	171°39.0	·· 33.1	212°40.7	·· 44.5	342°29.2	·· 15.6
4	24°19.9	237°20.0	40.8	186°40.0	33.7	227°42.7	44.3	357°31.7	15.6
5	39°22.4	252°19.4	39.8	201°41.0	34.3	242°44.6	44.1	12°34.1	15.6
6	54°24.8	267°18.8	N14°38.8	216°42.0	S07°34.9	257°46.6	N10°43.9	27°36.6	N08°15.6
7	69°27.3	282°18.3	37.8	231°43.0	35.6	272°48.5	43.7	42°39.1	15.5
8	84°29.8	297°17.7	36.8	246°44.0	36.2	287°50.5	43.5	57°41.6	15.5
9	99°32.2	312°17.2	·· 35.8	261°45.0	·· 36.8	302°52.4	·· 43.3	72°44.1	·· 15.5
10	114°34.7	327°16.6	34.8	276°46.0	37.4	317°54.4	43.1	87°46.6	15.5
11	129°37.2	342°16.0	33.8	291°47.1	38.1	332°56.4	42.9	102°49.1	15.5
12	144°39.6	357°15.5	N14°32.8	306°48.1	S07°38.7	347°58.3	N10°42.8	117°51.6	N08°15.4
13	159°42.1	12°14.9	31.8	321°49.1	39.3	3°00.3	42.6	132°54.0	15.4
14	174°44.6	27°14.4	30.8	336°50.1	39.9	18°02.2	42.4	147°56.5	15.4
15	189°47.0	42°13.8	·· 29.8	351°51.1	·· 40.6	33°04.2	·· 42.2	162°59.0	·· 15.4
16	204°49.5	57°13.3	28.8	6°52.1	41.2	48°06.1	42.0	178°01.5	15.4
17	219°52.0	72°12.7	27.8	21°53.1	41.8	63°08.1	41.8	193°04.0	15.3
18	234°54.4	87°12.2	N14°26.8	36°54.1	S07°42.4	78°10.0	N10°41.6	208°06.5	N08°15.3
19	249°56.9	102°11.6	25.8	51°55.1	43.1	93°12.0	41.4	223°09.0	15.3
20	264°59.3	117°11.1	24.8	66°56.1	43.7	108°13.9	41.2	238°11.5	15.3
21	280°01.8	132°10.5	·· 23.8	81°57.1	·· 44.3	123°15.9	·· 41.0	253°13.9	·· 15.3
22	295°04.3	147°10.0	22.8	96°58.2	44.9	138°17.9	40.8	268°16.4	15.2
23	310°06.7	162°09.4	21.8	111°59.2	45.6	153°19.8	40.6	283°18.9	15.2
Mer.pass. 02:23		ν -0.6′	d 1.0′	m -3.92	ν 1.0′	d 0.6′	m 1.31	ν 2.0′	d 0.2′ m -1.71	ν 2.5′	d 0.0′ m 0.40

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.7	-42°09.0
Schedar	349°28.1	56°41.3
Diphda	348°44.9	-17°49.8
Achernar	335°18.4	-57°05.4
Hamal	327°48.6	23°35.6
Polaris	312°51.5	89°22.5
Acamar	315°10.1	-40°11.3
Menkar	314°03.9	4°12.0
Mirfak	308°25.1	49°57.4
Aldebaran	290°37.2	16°33.9
Rigel	281°02.0	-8°10.0
Capella	280°18.9	46°01.4
Bellatrix	278°20.7	6°22.5
Elnath	277°59.3	28°37.8
Alnilam	275°35.7	-1°11.0
Betelgeuse	270°50.0	7°24.8
Canopus	263°51.8	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.5	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°14.5	-59°35.8
Suhail	222°45.2	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.1	-63°15.4
Gacrux	171°49.6	-57°16.3
Alioth	166°11.5	55°48.8
Spica	158°20.2	-11°18.4
Alkaid	152°50.5	49°10.7
Hadar	148°33.1	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.0	19°02.4
Rigil Kent.	139°37.4	-60°57.2
Kochab	137°20.1	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.1	-69°04.8
Sabik	102°00.1	-15°45.5
Shaula	96°07.2	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°40.8	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.4	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°22.9
Enif	33°36.3	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.8	28°14.1
Markab	13°27.4	15°21.4

Aug 14 Sat	SHA	Mer.pass
Venus	215°37.9	12:09
Mars	163°35.2	15:36
Jupiter	203°49.2	12:54
Saturn	333°10.8	04:18

Aug 15 Sun	SHA	Mer.pass
Venus	214°24.9	12:10
Mars	163°00.6	15:34
Jupiter	203°37.0	12:51
Saturn	333°11.2	04:14

Aug 16 Mon	SHA	Mer.pass
Venus	213°12.1	12:11
Mars	162°25.9	15:33
Jupiter	203°24.8	12:48
Saturn	333°11.7	04:10

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°47.5	N14°29.4	35°32.3	11.4′	S24°55.9	5.9′	54.1′
1	193°47.6	28.7	50°02.7	11.5′	24°50.0	6.0′	54.1′
2	208°47.7	27.9	64°33.2	11.5′	24°44.0	6.1′	54.0′
3	223°47.8	·· 27.1	79°03.7	11.6′	24°37.9	6.2′	54.0′
4	238°48.0	26.4	93°34.3	11.6′	24°31.7	6.3′	54.0′
5	253°48.1	25.6	108°04.9	11.7′	24°25.4	6.4′	54.0′
6	268°48.2	N14°24.8	122°35.6	11.8′	S24°19.0	6.5′	54.0′
7	283°48.3	24.1	137°06.4	11.8′	24°12.5	6.7′	54.0′
8	298°48.4	23.3	151°37.2	11.9′	24°05.8	6.7′	54.0′
9	313°48.6	·· 22.5	166°08.1	11.9′	23°59.1	6.9′	54.0′
10	328°48.7	21.7	180°39.0	12.0′	23°52.2	6.9′	54.0′
11	343°48.8	21.0	195°10.0	12.1′	23°45.3	7.1′	54.0′
12	358°48.9	N14°20.2	209°41.0	12.1′	S23°38.2	7.1′	54.0′
13	13°49.0	19.4	224°12.2	12.2′	23°31.1	7.3′	54.0′
14	28°49.1	18.7	238°43.3	12.2′	23°23.8	7.4′	54.0′
15	43°49.3	·· 17.9	253°14.6	12.3′	23°16.4	7.5′	54.0′
16	58°49.4	17.1	267°45.8	12.4′	23°08.9	7.5′	54.0′
17	73°49.5	16.3	282°17.2	12.4′	23°01.4	7.7′	54.0′
18	88°49.6	N14°15.6	296°48.6	12.5′	S22°53.7	7.8′	54.0′
19	103°49.7	14.8	311°20.1	12.5′	22°45.9	7.9′	54.0′
20	118°49.9	14.0	325°51.6	12.6′	22°38.0	7.9′	54.0′
21	133°50.0	·· 13.3	340°23.2	12.7′	22°30.1	8.1′	54.0′
22	148°50.1	12.5	354°54.9	12.7′	22°22.0	8.2′	54.0′
23	163°50.2	11.7	9°26.6	12.8′	22°13.8	8.3′	53.9′
	SD = 15.8′	d = 0.8′	SD = 14.7′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°50.3	N14°10.9	23°58.4	12.8′	S22°05.5	8.3′	53.9′
1	193°50.5	10.2	38°30.2	12.9′	21°57.2	8.5′	53.9′
2	208°50.6	09.4	53°02.1	13.0′	21°48.7	8.5′	53.9′
3	223°50.7	·· 08.6	67°34.1	13.0′	21°40.2	8.6′	53.9′
4	238°50.8	07.8	82°06.1	13.1′	21°31.6	8.8′	53.9′
5	253°50.9	07.0	96°38.2	13.1′	21°22.8	8.8′	53.9′
6	268°51.1	N14°06.3	111°10.3	13.2′	S21°14.0	8.9′	53.9′
7	283°51.2	05.5	125°42.5	13.3′	21°05.1	9.0′	53.9′
8	298°51.3	04.7	140°14.8	13.3′	20°56.1	9.1′	53.9′
9	313°51.4	·· 03.9	154°47.1	13.4′	20°47.0	9.2′	53.9′
10	328°51.6	03.2	169°19.5	13.4′	20°37.8	9.2′	53.9′
11	343°51.7	02.4	183°51.9	13.5′	20°28.6	9.4′	53.9′
12	358°51.8	N14°01.6	198°24.4	13.6′	S20°19.2	9.4′	53.9′
13	13°51.9	00.8	212°57.0	13.6′	20°09.8	9.6′	53.9′
14	28°52.1	14°00.0	227°29.6	13.7′	20°00.2	9.6′	53.9′
15	43°52.2	13°59.2	242°02.3	13.7′	19°50.6	9.6′	53.9′
16	58°52.3	58.5	256°35.0	13.8′	19°41.0	9.8′	53.9′
17	73°52.4	57.7	271°07.8	13.9′	19°31.2	9.9′	53.9′
18	88°52.6	N13°56.9	285°40.7	13.9′	S19°21.3	9.9′	53.9′
19	103°52.7	56.1	300°13.6	14.0′	19°11.4	10.0′	53.9′
20	118°52.8	55.3	314°46.6	14.0′	19°01.4	10.1′	53.9′
21	133°52.9	·· 54.6	329°19.6	14.1′	18°51.3	10.1′	53.9′
22	148°53.1	53.8	343°52.7	14.1′	18°41.2	10.3′	53.9′
23	163°53.2	53.0	358°25.8	14.2′	18°30.9	10.3′	53.9′
	SD = 15.8′	d = 0.8′	SD = 14.7′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°53.3	N13°52.2	12°59.0	14.3′	S18°20.6	10.4′	53.9′
1	193°53.4	51.4	27°32.3	14.3′	18°10.2	10.5′	53.9′
2	208°53.6	50.6	42°05.6	14.4′	17°59.7	10.5′	53.9′
3	223°53.7	·· 49.8	56°39.0	14.4′	17°49.2	10.6′	53.9′
4	238°53.8	49.1	71°12.4	14.5′	17°38.6	10.7′	53.9′
5	253°53.9	48.3	85°45.8	14.5′	17°27.9	10.8′	53.9′
6	268°54.1	N13°47.5	100°19.4	14.6′	S17°17.1	10.8′	53.9′
7	283°54.2	46.7	114°52.9	14.6′	17°06.3	10.9′	54.0′
8	298°54.3	45.9	129°26.6	14.7′	16°55.4	10.9′	54.0′
9	313°54.5	·· 45.1	144°00.2	14.7′	16°44.5	11.1′	54.0′
10	328°54.6	44.3	158°34.0	14.8′	16°33.4	11.1′	54.0′
11	343°54.7	43.5	173°07.8	14.8′	16°22.3	11.1′	54.0′
12	358°54.8	N13°42.8	187°41.6	14.9′	S16°11.2	11.3′	54.0′
13	13°55.0	42.0	202°15.5	14.9′	15°59.9	11.3′	54.0′
14	28°55.1	41.2	216°49.4	15.0′	15°48.6	11.3′	54.0′
15	43°55.2	·· 40.4	231°23.4	15.0′	15°37.3	11.5′	54.0′
16	58°55.4	39.6	245°57.4	15.1′	15°25.8	11.4′	54.0′
17	73°55.5	38.8	260°31.5	15.1′	15°14.4	11.6′	54.0′
18	88°55.6	N13°38.0	275°05.6	15.2′	S15°02.8	11.6′	54.0′
19	103°55.8	37.2	289°39.8	15.2′	14°51.2	11.7′	54.0′
20	118°55.9	36.4	304°14.0	15.3′	14°39.5	11.7′	54.0′
21	133°56.0	·· 35.6	318°48.2	15.3′	14°27.8	11.8′	54.0′
22	148°56.2	34.8	333°22.5	15.3′	14°16.0	11.8′	54.0′
23	163°56.3	34.0	347°56.9	15.4′	14°04.2	11.9′	54.0′
	SD = 15.8′	d = 0.8′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:23	21:41	////	////
N 70°	////	////	02:55	21:10	23:38	////
68°	////	01:41	03:18	20:48	22:21	////
66°	////	02:20	03:36	20:30	21:45	////
64°	////	02:46	03:51	20:16	21:20	23:41
62°	01:30	03:06	04:03	20:04	21:01	22:33
60°	02:05	03:22	04:14	19:54	20:45	22:00
N 58°	02:29	03:35	04:22	19:45	20:32	21:37
56°	02:48	03:47	04:30	19:37	20:21	21:19
54°	03:03	03:57	04:37	19:31	20:11	21:04
52°	03:16	04:05	04:44	19:24	20:02	20:51
50°	03:27	04:13	04:49	19:19	19:55	20:40
45°	03:50	04:29	05:01	19:07	19:39	20:18
N 40°	04:07	04:42	05:11	18:57	19:26	20:01
35°	04:21	04:53	05:20	18:49	19:16	19:48
30°	04:32	05:02	05:27	18:41	19:07	19:36
20°	04:50	05:17	05:40	18:29	18:52	19:19
N 10°	05:04	05:29	05:51	18:18	18:40	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:25	05:50	06:11	17:58	18:20	18:45
20°	05:33	05:59	06:22	17:47	18:10	18:36
30°	05:41	06:09	06:34	17:35	18:00	18:28
35°	05:45	06:15	06:41	17:29	17:55	18:25
40°	05:49	06:21	06:49	17:21	17:49	18:21
45°	05:53	06:27	06:58	17:12	17:42	18:17
S 50°	05:57	06:35	07:09	17:01	17:35	18:13
52°	05:59	06:38	07:14	16:56	17:32	18:11
54°	06:00	06:42	07:19	16:51	17:28	18:10
56°	06:02	06:46	07:25	16:45	17:24	18:08
58°	06:04	06:50	07:32	16:38	17:20	18:06
S 60°	06:06	06:55	07:40	16:30	17:15	18:04

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▬	▬	21:16	▬	▬	▬
N 70°	▬	21:42	20:47	▬	▬	00:49
68°	▬	20:55	20:25	▬	▬	01:34
66°	20:55	20:25	20:08	23:59	·· ··	02:03
64°	20:13	20:02	19:54	·· ··	00:40	02:25
62°	19:44	19:44	19:42	·· ··	01:08	02:43
60°	19:22	19:28	19:32	00:02	01:30	02:57
N 58°	19:04	19:15	19:23	00:26	01:47	03:09
56°	18:49	19:04	19:15	00:45	02:02	03:20
54°	18:36	18:54	19:08	01:01	02:14	03:29
52°	18:25	18:45	19:01	01:14	02:25	03:37
50°	18:15	18:37	18:56	01:26	02:35	03:45
45°	17:53	18:20	18:43	01:51	02:55	04:00
N 40°	17:36	18:06	18:33	02:11	03:12	04:13
35°	17:21	17:55	18:24	02:27	03:26	04:24
30°	17:08	17:44	18:16	02:41	03:38	04:34
20°	16:46	17:26	18:03	03:05	03:58	04:50
N 10°	16:27	17:10	17:51	03:26	04:16	05:04
0°	16:10	16:56	17:39	03:45	04:32	05:17
S 10°	15:52	16:41	17:28	04:04	04:49	05:30
20°	15:33	16:25	17:16	04:24	05:06	05:44
30°	15:10	16:07	17:02	04:48	05:26	06:00
35°	14:57	15:56	16:54	05:01	05:37	06:09
40°	14:42	15:44	16:45	05:17	05:51	06:19
45°	14:24	15:29	16:34	05:36	06:06	06:31
S 50°	14:02	15:11	16:21	05:59	06:25	06:46
52°	13:51	15:03	16:15	06:10	06:34	06:53
54°	13:39	14:53	16:08	06:23	06:44	07:00
56°	13:25	14:42	16:00	06:38	06:56	07:08
58°	13:08	14:30	15:52	06:55	07:09	07:18
S 60°	12:48	14:15	15:42	07:15	07:24	07:29

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 12-14 90-98%
14	04:50	04:44	12:05	22:21	09:57	
15	04:39	04:33	12:05	23:06	10:44	
16	04:27	04:21	12:04	23:50	11:28	

August 17, 18, 19 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	325°09.2	177°08.8	N14°20.8	127°00.2	S07°46.2	168°21.8	N10°40.4	298°21.4	N08°15.2
1	340°11.7	192°08.3	19.7	142°01.2	46.8	183°23.7	40.2	313°23.9	15.2
2	355°14.1	207°07.7	18.7	157°02.2	47.4	198°25.7	40.0	328°26.4	15.2
3	10°16.6	222°07.2	·· 17.7	172°03.2	·· 48.1	213°27.6	·· 39.8	343°28.9	·· 15.1
4	25°19.1	237°06.6	16.7	187°04.2	48.7	228°29.6	39.6	358°31.4	15.1
5	40°21.5	252°06.1	15.7	202°05.2	49.3	243°31.5	39.4	13°33.9	15.1
6	55°24.0	267°05.6	N14°14.7	217°06.2	S07°49.9	258°33.5	N10°39.2	28°36.4	N08°15.1
7	70°26.4	282°05.0	13.7	232°07.2	50.6	273°35.4	39.0	43°38.8	15.0
8	85°28.9	297°04.5	12.7	247°08.2	51.2	288°37.4	38.8	58°41.3	15.0
9	100°31.4	312°03.9	·· 11.6	262°09.2	·· 51.8	303°39.3	·· 38.6	73°43.8	·· 15.0
10	115°33.8	327°03.4	10.6	277°10.2	52.4	318°41.3	38.4	88°46.3	15.0
11	130°36.3	342°02.8	09.6	292°11.2	53.1	333°43.3	38.3	103°48.8	15.0
12	145°38.8	357°02.3	N14°08.6	307°12.3	S07°53.7	348°45.2	N10°38.1	118°51.3	N08°14.9
13	160°41.2	12°01.7	07.6	322°13.3	54.3	3°47.2	37.9	133°53.8	14.9
14	175°43.7	27°01.2	06.5	337°14.3	54.9	18°49.1	37.7	148°56.3	14.9
15	190°46.2	42°00.6	·· 05.5	352°15.3	·· 55.6	33°51.1	·· 37.5	163°58.8	·· 14.9
16	205°48.6	57°00.1	04.5	7°16.3	56.2	48°53.0	37.3	179°01.3	14.8
17	220°51.1	71°59.5	03.5	22°17.3	56.8	63°55.0	37.1	194°03.8	14.8
18	235°53.6	86°59.0	N14°02.5	37°18.3	S07°57.4	78°56.9	N10°36.9	209°06.3	N08°14.8
19	250°56.0	101°58.5	01.4	52°19.3	58.0	93°58.9	36.7	224°08.8	14.8
20	265°58.5	116°57.9	14°00.4	67°20.3	58.7	109°00.8	36.5	239°11.2	14.8
21	281°00.9	131°57.4	13°59.4	82°21.3	·· 59.3	124°02.8	·· 36.3	254°13.7	·· 14.7
22	296°03.4	146°56.8	58.4	97°22.3	07°59.9	139°04.7	36.1	269°16.2	14.7
23	311°05.9	161°56.3	57.3	112°23.3	08°00.5	154°06.7	35.9	284°18.7	14.7
Mer.pass. 02:19		ν -0.6′ d 1.0′		m -3.92	ν 1.0′ d 0.6′		m 1.31	ν 2.0′ d 0.2′	m -1.71	ν 2.5′ d 0.0′	m 0.40

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	326°08.3	176°55.8	N13°56.3	127°24.3	S08°01.2	169°08.7	N10°35.7	299°21.2	N08°14.7
1	341°10.8	191°55.2	55.3	142°25.3	01.8	184°10.6	35.5	314°23.7	14.6
2	356°13.3	206°54.7	54.3	157°26.3	02.4	199°12.6	35.3	329°26.2	14.6
3	11°15.7	221°54.1	·· 53.2	172°27.3	·· 03.0	214°14.5	·· 35.1	344°28.7	·· 14.6
4	26°18.2	236°53.6	52.2	187°28.3	03.7	229°16.5	34.9	359°31.2	14.6
5	41°20.7	251°53.1	51.2	202°29.3	04.3	244°18.4	34.7	14°33.7	14.6
6	56°23.1	266°52.5	N13°50.2	217°30.3	S08°04.9	259°20.4	N10°34.5	29°36.2	N08°14.5
7	71°25.6	281°52.0	49.1	232°31.3	05.5	274°22.3	34.3	44°38.7	14.5
8	86°28.1	296°51.4	48.1	247°32.3	06.2	289°24.3	34.1	59°41.2	14.5
9	101°30.5	311°50.9	·· 47.1	262°33.3	·· 06.8	304°26.2	·· 33.9	74°43.7	·· 14.5
10	116°33.0	326°50.4	46.0	277°34.3	07.4	319°28.2	33.7	89°46.2	14.4
11	131°35.4	341°49.8	45.0	292°35.3	08.0	334°30.1	33.5	104°48.7	14.4
12	146°37.9	356°49.3	N13°44.0	307°36.3	S08°08.7	349°32.1	N10°33.4	119°51.2	N08°14.4
13	161°40.4	11°48.8	42.9	322°37.3	09.3	4°34.1	33.2	134°53.7	14.4
14	176°42.8	26°48.2	41.9	337°38.3	09.9	19°36.0	33.0	149°56.1	14.3
15	191°45.3	41°47.7	·· 40.9	352°39.3	·· 10.5	34°38.0	·· 32.8	164°58.6	·· 14.3
16	206°47.8	56°47.2	39.8	7°40.3	11.1	49°39.9	32.6	180°01.1	14.3
17	221°50.2	71°46.6	38.8	22°41.3	11.8	64°41.9	32.4	195°03.6	14.3
18	236°52.7	86°46.1	N13°37.7	37°42.3	S08°12.4	79°43.8	N10°32.2	210°06.1	N08°14.2
19	251°55.2	101°45.6	36.7	52°43.3	13.0	94°45.8	32.0	225°08.6	14.2
20	266°57.6	116°45.0	35.7	67°44.3	13.6	109°47.7	31.8	240°11.1	14.2
21	282°00.1	131°44.5	·· 34.6	82°45.3	·· 14.3	124°49.7	·· 31.6	255°13.6	·· 14.2
22	297°02.5	146°44.0	33.6	97°46.3	14.9	139°51.6	31.4	270°16.1	14.1
23	312°05.0	161°43.4	32.5	112°47.3	15.5	154°53.6	31.2	285°18.6	14.1
Mer.pass. 02:15		ν -0.5′ d 1.0′		m -3.92	ν 1.0′ d 0.6′		m 1.31	ν 2.0′ d 0.2′	m -1.71	ν 2.5′ d 0.0′	m 0.39

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	327°07.5	176°42.9	N13°31.5	127°48.3	S08°16.1	169°55.5	N10°31.0	300°21.1	N08°14.1
1	342°09.9	191°42.4	30.5	142°49.3	16.8	184°57.5	30.8	315°23.6	14.1
2	357°12.4	206°41.9	29.4	157°50.3	17.4	199°59.4	30.6	330°26.1	14.1
3	12°14.9	221°41.3	·· 28.4	172°51.3	·· 18.0	215°01.4	·· 30.4	345°28.6	·· 14.0
4	27°17.3	236°40.8	27.3	187°52.3	18.6	230°03.4	30.2	0°31.1	14.0
5	42°19.8	251°40.3	26.3	202°53.3	19.3	245°05.3	30.0	15°33.6	14.0
6	57°22.3	266°39.7	N13°25.2	217°54.3	S08°19.9	260°07.3	N10°29.8	30°36.1	N08°14.0
7	72°24.7	281°39.2	24.2	232°55.3	20.5	275°09.2	29.6	45°38.6	13.9
8	87°27.2	296°38.7	23.1	247°56.3	21.1	290°11.2	29.4	60°41.1	13.9
9	102°29.7	311°38.2	·· 22.1	262°57.3	·· 21.7	305°13.1	·· 29.2	75°43.6	·· 13.9
10	117°32.1	326°37.6	21.1	277°58.3	22.4	320°15.1	29.0	90°46.1	13.9
11	132°34.6	341°37.1	20.0	292°59.2	23.0	335°17.0	28.8	105°48.6	13.8
12	147°37.0	356°36.6	N13°19.0	308°00.2	S08°23.6	350°19.0	N10°28.6	120°51.1	N08°13.8
13	162°39.5	11°36.1	17.9	323°01.2	24.2	5°20.9	28.4	135°53.6	13.8
14	177°42.0	26°35.5	16.9	338°02.2	24.9	20°22.9	28.2	150°56.1	13.8
15	192°44.4	41°35.0	·· 15.8	353°03.2	·· 25.5	35°24.8	·· 28.0	165°58.6	·· 13.7
16	207°46.9	56°34.5	14.8	8°04.2	26.1	50°26.8	27.8	181°01.1	13.7
17	222°49.4	71°34.0	13.7	23°05.2	26.7	65°28.7	27.6	196°03.6	13.7
18	237°51.8	86°33.4	N13°12.6	38°06.2	S08°27.3	80°30.7	N10°27.5	211°06.1	N08°13.7
19	252°54.3	101°32.9	11.6	53°07.2	28.0	95°32.7	27.3	226°08.6	13.6
20	267°56.8	116°32.4	10.5	68°08.2	28.6	110°34.6	27.1	241°11.1	13.6
21	282°59.2	131°31.9	·· 09.5	83°09.2	·· 29.2	125°36.6	·· 26.9	256°13.6	·· 13.6
22	298°01.7	146°31.4	08.4	98°10.2	29.8	140°38.5	26.7	271°16.1	13.6
23	313°04.1	161°30.8	07.4	113°11.2	30.5	155°40.5	26.5	286°18.6	13.5
Mer.pass. 02:11		ν -0.5′ d 1.0′		m -3.92	ν 1.0′ d 0.6′		m 1.32	ν 2.0′ d 0.2′	m -1.71	ν 2.5′ d 0.0′	m 0.39

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.7	-42°09.0
Schedar	349°28.1	56°41.3
Diphda	348°44.9	-17°49.8
Achernar	335°18.3	-57°05.4
Hamal	327°48.6	23°35.6
Polaris	312°50.0	89°22.5
Acamar	315°10.1	-40°11.3
Menkar	314°03.8	4°12.0
Mirfak	308°25.1	49°57.4
Aldebaran	290°37.2	16°33.9
Rigel	281°01.9	-8°10.0
Capella	280°18.9	46°01.4
Bellatrix	278°20.7	6°22.5
Elnath	277°59.3	28°37.8
Alnilam	275°35.7	-1°11.0
Betelgeuse	270°49.9	7°24.8
Canopus	263°51.8	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.5	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°14.4	-59°35.8
Suhail	222°45.1	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.0	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.1	-63°15.4
Gacrux	171°49.6	-57°16.3
Alioth	166°11.5	55°48.8
Spica	158°20.2	-11°18.4
Alkaid	152°50.5	49°10.7
Hadar	148°33.1	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.4	-60°57.2
Kochab	137°20.1	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.1	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.2	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°40.9	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°22.9
Enif	33°36.3	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.8	28°14.1
Markab	13°27.4	15°21.4

Aug 17 Tue	SHA	Mer.pass
Venus	211°59.6	12:12
Mars	161°51.0	15:31
Jupiter	203°12.6	12:45
Saturn	333°12.2	04:06

Aug 18 Wed	SHA	Mer.pass
Venus	210°47.4	12:13
Mars	161°16.0	15:29
Jupiter	203°00.3	12:42
Saturn	333°12.9	04:02

Aug 19 Thu	SHA	Mer.pass
Venus	209°35.4	12:14
Mars	160°40.8	15:28
Jupiter	202°48.1	12:39
Saturn	333°13.6	03:58

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°56.4	N13°33.3	2°31.3	15.4′	S13°52.3	12.0′	54.0′
1	193°56.5	32.5	17°05.7	15.5′	13°40.3	12.0′	54.0′
2	208°56.7	31.7	31°40.2	15.5′	13°28.3	12.0′	54.0′
3	223°56.8	·· 30.9	46°14.7	15.6′	13°16.3	12.1′	54.0′
4	238°56.9	30.1	60°49.2	15.6′	13°04.2	12.2′	54.0′
5	253°57.1	29.3	75°23.8	15.6′	12°52.0	12.2′	54.0′
6	268°57.2	N13°28.5	89°58.5	15.7′	S12°39.8	12.3′	54.1′
7	283°57.3	27.7	104°33.1	15.7′	12°27.5	12.3′	54.1′
8	298°57.5	26.9	119°07.9	15.7′	12°15.2	12.4′	54.1′
9	313°57.6	·· 26.1	133°42.6	15.8′	12°02.8	12.4′	54.1′
10	328°57.7	25.3	148°17.4	15.8′	11°50.4	12.5′	54.1′
11	343°57.9	24.5	162°52.2	15.8′	11°37.9	12.5′	54.1′
12	358°58.0	N13°23.7	177°27.0	15.9′	S11°25.4	12.5′	54.1′
13	13°58.2	22.9	192°01.9	15.9′	11°12.9	12.6′	54.1′
14	28°58.3	22.1	206°36.8	15.9′	11°00.3	12.7′	54.1′
15	43°58.4	·· 21.3	221°11.8	16.0′	10°47.6	12.7′	54.1′
16	58°58.6	20.5	235°46.8	16.0′	10°34.9	12.7′	54.1′
17	73°58.7	19.7	250°21.8	16.0′	10°22.2	12.8′	54.1′
18	88°58.8	N13°18.9	264°56.8	16.1′	S10°09.4	12.8′	54.1′
19	103°59.0	18.1	279°31.9	16.1′	09°56.6	12.9′	54.1′
20	118°59.1	17.3	294°07.0	16.1′	09°43.7	12.8′	54.2′
21	133°59.2	·· 16.5	308°42.1	16.2′	09°30.9	13.0′	54.2′
22	148°59.4	15.7	323°17.3	16.2′	09°17.9	13.0′	54.2′
23	163°59.5	14.9	337°52.4	16.2′	09°04.9	13.0′	54.2′
	SD = 15.8′	d = 0.8′	SD = 14.7′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°59.7	N13°14.1	352°27.6	16.2′	S08°51.9	13.0′	54.2′
1	193°59.8	13.3	7°02.9	16.2′	08°38.9	13.1′	54.2′
2	208°59.9	12.5	21°38.1	16.3′	08°25.8	13.1′	54.2′
3	224°00.1	·· 11.7	36°13.4	16.3′	08°12.7	13.2′	54.2′
4	239°00.2	10.9	50°48.7	16.3′	07°59.5	13.2′	54.2′
5	254°00.3	10.1	65°24.0	16.3′	07°46.3	13.2′	54.2′
6	269°00.5	N13°09.3	79°59.3	16.4′	S07°33.1	13.2′	54.2′
7	284°00.6	08.5	94°34.7	16.4′	07°19.9	13.3′	54.3′
8	299°00.8	07.7	109°10.0	16.4′	07°06.6	13.3′	54.3′
9	314°00.9	·· 06.9	123°45.4	16.4′	06°53.3	13.4′	54.3′
10	329°01.0	06.0	138°20.8	16.4′	06°39.9	13.4′	54.3′
11	344°01.2	05.2	152°56.3	16.4′	06°26.5	13.4′	54.3′
12	359°01.3	N13°04.4	167°31.7	16.4′	S06°13.1	13.4′	54.3′
13	14°01.5	03.6	182°07.1	16.5′	05°59.7	13.4′	54.3′
14	29°01.6	02.8	196°42.6	16.5′	05°46.3	13.5′	54.3′
15	44°01.7	·· 02.0	211°18.1	16.5′	05°32.8	13.5′	54.3′
16	59°01.9	01.2	225°53.5	16.5′	05°19.3	13.6′	54.3′
17	74°02.0	13°00.4	240°29.0	16.5′	05°05.7	13.5′	54.4′
18	89°02.2	N12°59.6	255°04.5	16.5′	S04°52.2	13.6′	54.4′
19	104°02.3	58.8	269°40.1	16.5′	04°38.6	13.6′	54.4′
20	119°02.4	58.0	284°15.6	16.5′	04°25.0	13.6′	54.4′
21	134°02.6	·· 57.2	298°51.1	16.5′	04°11.4	13.7′	54.4′
22	149°02.7	56.3	313°26.6	16.5′	03°57.7	13.6′	54.4′
23	164°02.9	55.5	328°02.2	16.5′	03°44.1	13.7′	54.4′
	SD = 15.8′	d = 0.8′	SD = 14.8′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°03.0	N12°54.7	342°37.7	16.5′	S03°30.4	13.7′	54.4′
1	194°03.2	53.9	357°13.2	16.5′	03°16.7	13.7′	54.5′
2	209°03.3	53.1	11°48.8	16.5′	03°03.0	13.7′	54.5′
3	224°03.4	·· 52.3	26°24.3	16.5′	02°49.3	13.8′	54.5′
4	239°03.6	51.5	40°59.9	16.5′	02°35.5	13.8′	54.5′
5	254°03.7	50.7	55°35.4	16.5′	02°21.7	13.7′	54.5′
6	269°03.9	N12°49.8	70°10.9	16.5′	S02°08.0	13.8′	54.5′
7	284°04.0	49.0	84°46.5	16.5′	01°54.2	13.8′	54.5′
8	299°04.2	48.2	99°22.0	16.5′	01°40.4	13.8′	54.5′
9	314°04.3	·· 47.4	113°57.5	16.5′	01°26.6	13.9′	54.6′
10	329°04.4	46.6	128°33.0	16.5′	01°12.7	13.8′	54.6′
11	344°04.6	45.8	143°08.5	16.5′	00°58.9	13.9′	54.6′
12	359°04.7	N12°45.0	157°44.0	16.5′	S00°45.0	13.8′	54.6′
13	14°04.9	44.1	172°19.5	16.5′	00°31.2	13.9′	54.6′
14	29°05.0	43.3	186°55.0	16.5′	00°17.3	13.8′	54.6′
15	44°05.2	·· 42.5	201°30.5	16.5′	S00°03.5	13.9′	54.6′
16	59°05.3	41.7	216°06.0	16.4′	N00°10.4	13.9′	54.7′
17	74°05.5	40.9	230°41.4	16.4′	00°24.3	13.9′	54.7′
18	89°05.6	N12°40.1	245°16.8	16.4′	N00°38.2	13.9′	54.7′
19	104°05.8	39.2	259°52.3	16.4′	00°52.1	13.9′	54.7′
20	119°05.9	38.4	274°27.7	16.4′	01°06.0	13.9′	54.7′
21	134°06.1	·· 37.6	289°03.0	16.4′	01°19.9	13.9′	54.7′
22	149°06.2	36.8	303°38.4	16.3′	01°33.8	13.9′	54.7′
23	164°06.3	36.0	318°13.8	16.3′	01°47.7	13.9′	54.8′
	SD = 15.8′	d = 0.8′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:43	21:20	////	////
N 70°	////	01:10	03:10	20:54	22:47	////
68°	////	02:03	03:31	20:34	21:59	////
66°	////	02:35	03:47	20:18	21:29	////
64°	01:01	02:58	04:00	20:05	21:07	22:56
62°	01:49	03:16	04:11	19:55	20:49	22:13
60°	02:18	03:31	04:21	19:45	20:35	21:46
N 58°	02:40	03:43	04:29	19:37	20:23	21:25
56°	02:57	03:53	04:36	19:30	20:13	21:09
54°	03:11	04:03	04:43	19:24	20:04	20:55
52°	03:23	04:11	04:48	19:18	19:56	20:43
50°	03:33	04:18	04:54	19:13	19:49	20:33
45°	03:54	04:33	05:05	19:02	19:34	20:12
N 40°	04:11	04:45	05:14	18:53	19:22	19:56
35°	04:23	04:55	05:22	18:45	19:12	19:44
30°	04:34	05:04	05:29	18:38	19:03	19:33
20°	04:51	05:18	05:41	18:27	18:50	19:16
N 10°	05:04	05:29	05:51	18:17	18:38	19:03
0°	05:15	05:39	06:01	18:07	18:28	18:53
S 10°	05:24	05:48	06:10	17:58	18:19	18:44
20°	05:31	05:57	06:20	17:48	18:11	18:37
30°	05:38	06:06	06:31	17:37	18:02	18:30
35°	05:42	06:11	06:37	17:31	17:57	18:27
40°	05:45	06:17	06:45	17:24	17:52	18:23
45°	05:48	06:23	06:53	17:15	17:46	18:20
S 50°	05:52	06:30	07:03	17:05	17:39	18:17
52°	05:53	06:33	07:08	17:01	17:36	18:16
54°	05:54	06:36	07:13	16:56	17:33	18:14
56°	05:56	06:39	07:18	16:50	17:29	18:13
58°	05:57	06:43	07:25	16:44	17:25	18:12
S 60°	05:59	06:48	07:32	16:37	17:21	18:10

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	20:31	19:59	19:30	02:46	04:58	06:56
N 70°	20:17	19:53	19:32	03:13	05:10	06:59
68°	20:05	19:48	19:33	03:33	05:20	07:01
66°	19:55	19:44	19:33	03:49	05:28	07:03
64°	19:47	19:40	19:34	04:02	05:35	07:05
62°	19:40	19:37	19:35	04:13	05:40	07:06
60°	19:33	19:34	19:35	04:22	05:45	07:07
N 58°	19:28	19:32	19:36	04:30	05:50	07:08
56°	19:23	19:30	19:36	04:37	05:54	07:09
54°	19:18	19:28	19:37	04:44	05:57	07:10
52°	19:14	19:26	19:37	04:49	06:00	07:11
50°	19:11	19:24	19:37	04:54	06:03	07:12
45°	19:03	19:21	19:38	05:05	06:09	07:13
N 40°	18:56	19:18	19:39	05:14	06:15	07:15
35°	18:50	19:15	19:39	05:22	06:19	07:16
30°	18:45	19:13	19:40	05:29	06:23	07:17
20°	18:36	19:09	19:41	05:40	06:30	07:18
N 10°	18:29	19:05	19:41	05:50	06:35	07:20
0°	18:21	19:02	19:42	06:00	06:41	07:21
S 10°	18:14	18:58	19:43	06:09	06:46	07:22
20°	18:06	18:55	19:44	06:19	06:52	07:24
30°	17:57	18:51	19:45	06:30	06:58	07:25
35°	17:52	18:48	19:45	06:37	07:02	07:26
40°	17:46	18:46	19:46	06:44	07:06	07:27
45°	17:39	18:42	19:47	06:52	07:11	07:28
S 50°	17:30	18:39	19:47	07:02	07:17	07:30
52°	17:26	18:37	19:48	07:07	07:19	07:30
54°	17:22	18:35	19:48	07:12	07:22	07:31
56°	17:17	18:33	19:49	07:18	07:25	07:32
58°	17:12	18:31	19:49	07:24	07:29	07:32
S 60°	17:06	18:28	19:50	07:31	07:32	07:33

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 15-17 100-97%
17	04:14	04:08	12:04	–:–	12:10	
18	04:01	03:55	12:04	00:31	12:51	
19	03:48	03:41	12:04	01:11	13:32	

August 20, 21, 22 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	328°06.6	176°30.3	N13°06.3	128°12.2	S08°31.1	170°42.4	N10°26.3	301°21.1	N08°13.5
1	343°09.1	191°29.8	05.3	143°13.1	31.7	185°44.4	26.1	316°23.6	13.5
2	358°11.5	206°29.3	04.2	158°14.1	32.3	200°46.3	25.9	331°26.1	13.4
3	13°14.0	221°28.8	·· 03.1	173°15.1	·· 32.9	215°48.3	·· 25.7	346°28.6	·· 13.4
4	28°16.5	236°28.2	02.1	188°16.1	33.6	230°50.2	25.5	1°31.1	13.4
5	43°18.9	251°27.7	01.0	203°17.1	34.2	245°52.2	25.3	16°33.6	13.4
6	58°21.4	266°27.2	N13°00.0	218°18.1	S08°34.8	260°54.1	N10°25.1	31°36.1	N08°13.3
7	73°23.9	281°26.7	12°58.9	233°19.1	35.4	275°56.1	24.9	46°38.6	13.3
8	88°26.3	296°26.2	57.8	248°20.1	36.1	290°58.0	24.7	61°41.1	13.3
9	103°28.8	311°25.7	·· 56.8	263°21.1	·· 36.7	306°00.0	·· 24.5	76°43.6	·· 13.3
10	118°31.3	326°25.1	55.7	278°22.1	37.3	321°01.9	24.3	91°46.1	13.2
11	133°33.7	341°24.6	54.7	293°23.0	37.9	336°03.9	24.1	106°48.6	13.2
12	148°36.2	356°24.1	N12°53.6	308°24.0	S08°38.5	351°05.9	N10°23.9	121°51.1	N08°13.2
13	163°38.6	11°23.6	52.5	323°25.0	39.2	6°07.8	23.7	136°53.7	13.2
14	178°41.1	26°23.1	51.5	338°26.0	39.8	21°09.8	23.5	151°56.2	13.1
15	193°43.6	41°22.6	·· 50.4	353°27.0	·· 40.4	36°11.7	·· 23.3	166°58.7	·· 13.1
16	208°46.0	56°22.1	49.3	8°28.0	41.0	51°13.7	23.1	182°01.2	13.1
17	223°48.5	71°21.5	48.3	23°29.0	41.7	66°15.6	22.9	197°03.7	13.1
18	238°51.0	86°21.0	N12°47.2	38°30.0	S08°42.3	81°17.6	N10°22.7	212°06.2	N08°13.0
19	253°53.4	101°20.5	46.1	53°30.9	42.9	96°19.5	22.5	227°08.7	13.0
20	268°55.9	116°20.0	45.1	68°31.9	43.5	111°21.5	22.3	242°11.2	13.0
21	283°58.4	131°19.5	·· 44.0	83°32.9	·· 44.1	126°23.4	·· 22.1	257°13.7	·· 12.9
22	299°00.8	146°19.0	42.9	98°33.9	44.8	141°25.4	21.9	272°16.2	12.9
23	314°03.3	161°18.5	41.8	113°34.9	45.4	156°27.3	21.7	287°18.7	12.9
Mer.pass.	02:07	ν -0.5′	d 1.1′	m -3.92	ν 1.0′	d 0.6′	m 1.32	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.38

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	329°05.7	176°18.0	N12°40.8	128°35.9	S08°46.0	171°29.3	N10°21.5	302°21.2	N08°12.9
1	344°08.2	191°17.5	39.7	143°36.9	46.6	186°31.2	21.3	317°23.7	12.8
2	359°10.7	206°16.9	38.6	158°37.9	47.2	201°33.2	21.1	332°26.2	12.8
3	14°13.1	221°16.4	·· 37.6	173°38.8	·· 47.9	216°35.1	·· 20.9	347°28.7	·· 12.8
4	29°15.6	236°15.9	36.5	188°39.8	48.5	231°37.1	20.7	2°31.2	12.8
5	44°18.1	251°15.4	35.4	203°40.8	49.1	246°39.0	20.6	17°33.7	12.7
6	59°20.5	266°14.9	N12°34.3	218°41.8	S08°49.7	261°41.0	N10°20.4	32°36.2	N08°12.7
7	74°23.0	281°14.4	33.3	233°42.8	50.4	276°43.0	20.2	47°38.8	12.7
8	89°25.5	296°13.9	32.2	248°43.8	51.0	291°44.9	20.0	62°41.3	12.6
9	104°27.9	311°13.4	·· 31.1	263°44.7	·· 51.6	306°46.9	·· 19.8	77°43.8	·· 12.6
10	119°30.4	326°12.9	30.0	278°45.7	52.2	321°48.8	19.6	92°46.3	12.6
11	134°32.9	341°12.4	28.9	293°46.7	52.8	336°50.8	19.4	107°48.8	12.6
12	149°35.3	356°11.9	N12°27.9	308°47.7	S08°53.5	351°52.7	N10°19.2	122°51.3	N08°12.5
13	164°37.8	11°11.4	26.8	323°48.7	54.1	6°54.7	19.0	137°53.8	12.5
14	179°40.2	26°10.9	25.7	338°49.7	54.7	21°56.6	18.8	152°56.3	12.5
15	194°42.7	41°10.4	·· 24.6	353°50.6	·· 55.3	36°58.6	·· 18.6	167°58.8	·· 12.5
16	209°45.2	56°09.9	23.6	8°51.6	55.9	52°00.5	18.4	183°01.3	12.4
17	224°47.6	71°09.4	22.5	23°52.6	56.6	67°02.5	18.2	198°03.8	12.4
18	239°50.1	86°08.9	N12°21.4	38°53.6	S08°57.2	82°04.4	N10°18.0	213°06.3	N08°12.4
19	254°52.6	101°08.4	20.3	53°54.6	57.8	97°06.4	17.8	228°08.8	12.3
20	269°55.0	116°07.8	19.2	68°55.6	58.4	112°08.3	17.6	243°11.4	12.3
21	284°57.5	131°07.3	·· 18.1	83°56.5	·· 59.0	127°10.3	·· 17.4	258°13.9	·· 12.3
22	300°00.0	146°06.8	17.1	98°57.5	08°59.7	142°12.2	17.2	273°16.4	12.3
23	315°02.4	161°06.3	16.0	113°58.5	09°00.3	157°14.2	17.0	288°18.9	12.2
Mer.pass.	02:03	ν -0.5′	d 1.1′	m -3.92	ν 1.0′	d 0.6′	m 1.32	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.38

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330°04.9	176°05.8	N12°14.9	128°59.5	S09°00.9	172°16.1	N10°16.8	303°21.4	N08°12.2
1	345°07.4	191°05.3	13.8	144°00.5	01.5	187°18.1	16.6	318°23.9	12.2
2	0°09.8	206°04.8	12.7	159°01.4	02.1	202°20.1	16.4	333°26.4	12.1
3	15°12.3	221°04.3	·· 11.6	174°02.4	·· 02.8	217°22.0	·· 16.2	348°28.9	·· 12.1
4	30°14.7	236°03.8	10.5	189°03.4	03.4	232°24.0	16.0	3°31.4	12.1
5	45°17.2	251°03.3	09.4	204°04.4	04.0	247°25.9	15.8	18°33.9	12.1
6	60°19.7	266°02.9	N12°08.4	219°05.3	S09°04.6	262°27.9	N10°15.6	33°36.5	N08°12.0
7	75°22.1	281°02.4	07.3	234°06.3	05.2	277°29.8	15.4	48°39.0	12.0
8	90°24.6	296°01.9	06.2	249°07.3	05.9	292°31.8	15.2	63°41.5	12.0
9	105°27.1	311°01.4	·· 05.1	264°08.3	·· 06.5	307°33.7	·· 15.0	78°44.0	·· 11.9
10	120°29.5	326°00.9	04.0	279°09.3	07.1	322°35.7	14.8	93°46.5	11.9
11	135°32.0	341°00.4	02.9	294°10.2	07.7	337°37.6	14.6	108°49.0	11.9
12	150°34.5	355°59.9	N12°01.8	309°11.2	S09°08.3	352°39.6	N10°14.4	123°51.5	N08°11.8
13	165°36.9	10°59.4	12°00.7	324°12.2	09.0	7°41.5	14.2	138°54.0	11.8
14	180°39.4	25°58.9	11°59.6	339°13.2	09.6	22°43.5	14.0	153°56.5	11.8
15	195°41.8	40°58.4	·· 58.5	354°14.1	·· 10.2	37°45.4	·· 13.8	168°59.1	·· 11.8
16	210°44.3	55°57.9	57.4	9°15.1	10.8	52°47.4	13.6	184°01.6	11.7
17	225°46.8	70°57.4	56.3	24°16.1	11.4	67°49.3	13.4	199°04.1	11.7
18	240°49.2	85°56.9	N11°55.2	39°17.1	S09°12.1	82°51.3	N10°13.2	214°06.6	N08°11.7
19	255°51.7	100°56.4	54.2	54°18.1	12.7	97°53.2	13.0	229°09.1	11.6
20	270°54.2	115°55.9	53.1	69°19.0	13.3	112°55.2	12.8	244°11.6	11.6
21	285°56.6	130°55.4	·· 52.0	84°20.0	·· 13.9	127°57.1	·· 12.6	259°14.1	·· 11.6
22	300°59.1	145°54.9	50.9	99°21.0	14.5	142°59.1	12.4	274°16.7	11.6
23	316°01.6	160°54.4	49.8	114°22.0	15.2	158°01.1	12.2	289°19.2	11.5
Mer.pass.	01:59	ν -0.5′	d 1.1′	m -3.92	ν 1.0′	d 0.6′	m 1.32	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.37

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.7	-42°09.0
Schedar	349°28.1	56°41.3
Diphda	348°44.9	-17°49.8
Achernar	335°18.3	-57°05.4
Hamal	327°48.6	23°35.6
Polaris	312°48.5	89°22.5
Acamar	315°10.1	-40°11.3
Menkar	314°03.8	4°12.0
Mirfak	308°25.1	49°57.4
Aldebaran	290°37.2	16°33.9
Rigel	281°01.9	-8°10.0
Capella	280°18.9	46°01.4
Bellatrix	278°20.7	6°22.5
Elnath	277°59.3	28°37.8
Alnilam	275°35.7	-1°11.0
Betelgeuse	270°49.9	7°24.8
Canopus	263°51.8	-52°42.3
Sirius	258°24.6	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°48.8	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°14.4	-59°35.8
Suhail	222°45.1	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.0	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.1	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.2	-63°15.4
Gacrux	171°49.6	-57°16.3
Alioth	166°11.5	55°48.8
Spica	158°20.2	-11°18.3
Alkaid	152°50.6	49°10.7
Hadar	148°33.1	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.5	-60°57.2
Kochab	137°20.2	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.1	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.2	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°40.9	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°22.9
Enif	33°36.3	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.1
Markab	13°27.4	15°21.4

Aug 20 Fri	SHA	Mer.pass
Venus	208°23.7	12:14
Mars	160°05.5	15:26
Jupiter	202°35.8	12:36
Saturn	333°14.5	03:54

Aug 21 Sat	SHA	Mer.pass
Venus	207°12.2	12:15
Mars	159°30.1	15:25
Jupiter	202°23.5	12:32
Saturn	333°15.5	03:50

Aug 22 Sun	SHA	Mer.pass
Venus	206°01.0	12:16
Mars	158°54.6	15:23
Jupiter	202°11.3	12:29
Saturn	333°16.5	03:46

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°06.5	N12°35.1	332°49.1	16.3′	N02°01.6	13.9′	54.8′
1	194°06.6	34.3	347°24.4	16.3′	02°15.5	13.9′	54.8′
2	209°06.8	33.5	1°59.7	16.3′	02°29.4	13.9′	54.8′
3	224°06.9	·· 32.7	16°34.9	16.2′	02°43.3	13.8′	54.8′
4	239°07.1	31.9	31°10.2	16.2′	02°57.1	13.9′	54.8′
5	254°07.2	31.0	45°45.4	16.2′	03°11.0	13.9′	54.9′
6	269°07.4	N12°30.2	60°20.6	16.2′	N03°24.9	13.9′	54.9′
7	284°07.5	29.4	74°55.7	16.1′	03°38.8	13.9′	54.9′
8	299°07.7	28.6	89°30.8	16.1′	03°52.7	13.8′	54.9′
9	314°07.8	·· 27.8	104°05.9	16.1′	04°06.5	13.9′	54.9′
10	329°08.0	26.9	118°41.0	16.0′	04°20.4	13.8′	54.9′
11	344°08.1	26.1	133°16.0	16.0′	04°34.2	13.9′	55.0′
12	359°08.3	N12°25.3	147°51.1	16.0′	N04°48.1	13.8′	55.0′
13	14°08.4	24.5	162°26.0	15.9′	05°01.9	13.8′	55.0′
14	29°08.6	23.6	177°01.0	15.9′	05°15.7	13.8′	55.0′
15	44°08.7	·· 22.8	191°35.9	15.9′	05°29.5	13.8′	55.0′
16	59°08.9	22.0	206°10.7	15.8′	05°43.3	13.8′	55.0′
17	74°09.0	21.2	220°45.5	15.8′	05°57.1	13.7′	55.1′
18	89°09.2	N12°20.3	235°20.3	15.7′	N06°10.8	13.8′	55.1′
19	104°09.3	19.5	249°55.1	15.7′	06°24.6	13.7′	55.1′
20	119°09.5	18.7	264°29.8	15.7′	06°38.3	13.7′	55.1′
21	134°09.6	·· 17.9	279°04.4	15.6′	06°52.0	13.7′	55.1′
22	149°09.8	17.0	293°39.1	15.6′	07°05.7	13.7′	55.2′
23	164°09.9	16.2	308°13.6	15.5′	07°19.4	13.6′	55.2′
	SD = 15.8′	d = 0.8′	SD = 14.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°10.1	N12°15.4	322°48.2	15.5′	N07°33.0	13.6′	55.2′
1	194°10.2	14.5	337°22.6	15.4′	07°46.6	13.6′	55.2′
2	209°10.4	13.7	351°57.1	15.4′	08°00.2	13.6′	55.2′
3	224°10.6	·· 12.9	6°31.4	15.3′	08°13.8	13.6′	55.2′
4	239°10.7	12.1	21°05.8	15.3′	08°27.4	13.5′	55.3′
5	254°10.9	11.2	35°40.1	15.2′	08°40.9	13.5′	55.3′
6	269°11.0	N12°10.4	50°14.3	15.2′	N08°54.4	13.5′	55.3′
7	284°11.2	09.6	64°48.5	15.1′	09°07.9	13.5′	55.3′
8	299°11.3	08.7	79°22.6	15.1′	09°21.4	13.4′	55.3′
9	314°11.5	·· 07.9	93°56.7	15.0′	09°34.8	13.4′	55.4′
10	329°11.6	07.1	108°30.7	15.0′	09°48.2	13.3′	55.4′
11	344°11.8	06.2	123°04.6	14.9′	10°01.5	13.4′	55.4′
12	359°11.9	N12°05.4	137°38.5	14.8′	N10°14.9	13.3′	55.4′
13	14°12.1	04.6	152°12.4	14.8′	10°28.2	13.2′	55.5′
14	29°12.2	03.7	166°46.1	14.7′	10°41.4	13.3′	55.5′
15	44°12.4	·· 02.9	181°19.9	14.7′	10°54.7	13.2′	55.5′
16	59°12.6	02.1	195°53.5	14.6′	11°07.9	13.1′	55.5′
17	74°12.7	01.2	210°27.1	14.5′	11°21.0	13.1′	55.5′
18	89°12.9	N12°00.4	225°00.6	14.5′	N11°34.1	13.1′	55.6′
19	104°13.0	11°59.6	239°34.1	14.4′	11°47.2	13.1′	55.6′
20	119°13.2	58.7	254°07.5	14.3′	12°00.3	13.0′	55.6′
21	134°13.3	·· 57.9	268°40.8	14.3′	12°13.3	12.9′	55.6′
22	149°13.5	57.1	283°14.1	14.2′	12°26.2	12.9′	55.6′
23	164°13.7	56.2	297°47.2	14.1′	12°39.1	12.9′	55.7′
	SD = 15.8′	d = 0.8′	SD = 15.1′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°13.8	N11°55.4	312°20.4	14.0′	N12°52.0	12.8′	55.7′
1	194°14.0	54.6	326°53.4	14.0′	13°04.8	12.8′	55.7′
2	209°14.1	53.7	341°26.4	13.9′	13°17.6	12.7′	55.7′
3	224°14.3	·· 52.9	355°59.3	13.8′	13°30.3	12.7′	55.8′
4	239°14.4	52.1	10°32.1	13.7′	13°43.0	12.7′	55.8′
5	254°14.6	51.2	25°04.8	13.7′	13°55.7	12.6′	55.8′
6	269°14.8	N11°50.4	39°37.5	13.6′	N14°08.3	12.5′	55.8′
7	284°14.9	49.5	54°10.1	13.5′	14°20.8	12.5′	55.9′
8	299°15.1	48.7	68°42.6	13.4′	14°33.3	12.4′	55.9′
9	314°15.2	·· 47.9	83°15.0	13.3′	14°45.7	12.4′	55.9′
10	329°15.4	47.0	97°47.3	13.3′	14°58.1	12.3′	55.9′
11	344°15.6	46.2	112°19.6	13.2′	15°10.4	12.3′	56.0′
12	359°15.7	N11°45.3	126°51.8	13.1′	N15°22.7	12.2′	56.0′
13	14°15.9	44.5	141°23.9	13.0′	15°34.9	12.1′	56.0′
14	29°16.0	43.7	155°55.9	12.9′	15°47.0	12.1′	56.0′
15	44°16.2	·· 42.8	170°27.8	12.8′	15°59.1	12.0′	56.1′
16	59°16.3	42.0	184°59.7	12.7′	16°11.1	11.9′	56.1′
17	74°16.5	41.1	199°31.4	12.7′	16°23.0	11.9′	56.1′
18	89°16.7	N11°40.3	214°03.1	12.6′	N16°34.9	11.9′	56.1′
19	104°16.8	39.5	228°34.6	12.5′	16°46.8	11.7′	56.2′
20	119°17.0	38.6	243°06.1	12.4′	16°58.5	11.7′	56.2′
21	134°17.2	·· 37.8	257°37.5	12.3′	17°10.2	11.6′	56.2′
22	149°17.3	36.9	272°08.8	12.2′	17°21.8	11.6′	56.2′
23	164°17.5	36.1	286°40.0	12.1′	17°33.4	11.5′	56.3′
	SD = 15.8′	d = 0.8′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	03:01	21:01	23:42	////
N 70°	////	01:42	03:25	20:38	22:16	////
68°	////	02:22	03:43	20:21	21:39	////
66°	////	02:49	03:57	20:07	21:14	23:45
64°	01:30	03:10	04:09	19:55	20:54	22:30
62°	02:06	03:26	04:19	19:45	20:38	21:56
60°	02:31	03:39	04:28	19:37	20:25	21:33
N 58°	02:50	03:50	04:35	19:29	20:14	21:14
56°	03:05	04:00	04:42	19:23	20:05	20:59
54°	03:18	04:09	04:48	19:17	19:56	20:46
52°	03:29	04:16	04:53	19:12	19:49	20:35
50°	03:39	04:23	04:58	19:07	19:42	20:26
45°	03:59	04:37	05:08	18:57	19:28	20:06
N 40°	04:14	04:48	05:17	18:49	19:17	19:52
35°	04:26	04:58	05:24	18:42	19:08	19:39
30°	04:36	05:06	05:31	18:35	19:00	19:29
20°	04:52	05:19	05:42	18:25	18:47	19:14
N 10°	05:04	05:30	05:51	18:15	18:37	19:02
0°	05:14	05:39	06:00	18:07	18:28	18:52
S 10°	05:22	05:47	06:09	17:58	18:19	18:44
20°	05:29	05:55	06:18	17:49	18:11	18:37
30°	05:35	06:04	06:28	17:39	18:03	18:31
35°	05:38	06:08	06:34	17:33	17:59	18:29
40°	05:41	06:13	06:40	17:26	17:54	18:26
45°	05:44	06:18	06:48	17:19	17:49	18:23
S 50°	05:46	06:24	06:57	17:10	17:43	18:21
52°	05:47	06:27	07:02	17:06	17:40	18:20
54°	05:48	06:30	07:06	17:01	17:38	18:19
56°	05:49	06:33	07:11	16:56	17:35	18:18
58°	05:50	06:36	07:17	16:50	17:31	18:17
S 60°	05:51	06:40	07:24	16:44	17:27	18:16

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	19:01	18:25	17:24	08:53	10:58	13:32
N 70°	19:10	18:44	18:06	08:47	10:41	12:52
68°	19:17	18:59	18:35	08:42	10:28	12:24
66°	19:23	19:11	18:57	08:38	10:17	12:04
64°	19:28	19:21	19:14	08:35	10:08	11:48
62°	19:32	19:30	19:29	08:32	10:01	11:34
60°	19:36	19:38	19:41	08:30	09:54	11:23
N 58°	19:40	19:45	19:52	08:28	09:49	11:13
56°	19:43	19:51	20:01	08:26	09:44	11:05
54°	19:46	19:56	20:09	08:24	09:39	10:57
52°	19:48	20:01	20:17	08:22	09:35	10:51
50°	19:51	20:06	20:23	08:21	09:31	10:45
45°	19:56	20:15	20:38	08:18	09:24	10:32
N 40°	20:00	20:23	20:50	08:15	09:17	10:21
35°	20:04	20:30	21:00	08:13	09:11	10:12
30°	20:07	20:37	21:09	08:11	09:06	10:04
20°	20:13	20:47	21:25	08:07	08:58	09:50
N 10°	20:18	20:57	21:39	08:04	08:50	09:38
0°	20:23	21:06	21:52	08:02	08:43	09:27
S 10°	20:28	21:15	22:05	07:59	08:36	09:16
20°	20:33	21:25	22:19	07:56	08:29	09:05
30°	20:39	21:36	22:35	07:52	08:21	08:51
35°	20:43	21:42	22:44	07:50	08:16	08:44
40°	20:47	21:50	22:55	07:48	08:10	08:35
45°	20:52	21:59	23:08	07:46	08:04	08:25
S 50°	20:57	22:09	23:24	07:43	07:57	08:12
52°	21:00	22:14	23:31	07:41	07:53	08:07
54°	21:03	22:20	23:40	07:40	07:49	08:01
56°	21:06	22:26	23:49	07:38	07:45	07:54
58°	21:09	22:32	·· ··	07:36	07:40	07:46
S 60°	21:13	22:40	·· ··	07:34	07:35	07:37

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 93-80%
20	03:34	03:27	12:03	01:52	14:12	
21	03:20	03:12	12:03	02:33	14:55	
22	03:05	02:57	12:03	03:17	15:39	

August 23, 24, 25 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	331°04.0	175°54.0	N11°48.7	129°22.9	S09°15.8	173°03.0	N10°12.0	304°21.7	N08°11.5
1	346°06.5	190°53.5	47.6	144°23.9	16.4	188°05.0	11.8	319°24.2	11.5
2	1°09.0	205°53.0	46.5	159°24.9	17.0	203°06.9	11.6	334°26.7	11.4
3	16°11.4	220°52.5	·· 45.4	174°25.9	·· 17.6	218°08.9	·· 11.4	349°29.2	·· 11.4
4	31°13.9	235°52.0	44.3	189°26.8	18.3	233°10.8	11.2	4°31.7	11.4
5	46°16.3	250°51.5	43.2	204°27.8	18.9	248°12.8	11.0	19°34.3	11.3
6	61°18.8	265°51.0	N11°42.1	219°28.8	S09°19.5	263°14.7	N10°10.9	34°36.8	N08°11.3
7	76°21.3	280°50.5	41.0	234°29.7	20.1	278°16.7	10.7	49°39.3	11.3
8	91°23.7	295°50.0	39.8	249°30.7	20.7	293°18.6	10.5	64°41.8	11.2
9	106°26.2	310°49.6	·· 38.7	264°31.7	·· 21.3	308°20.6	·· 10.3	79°44.3	·· 11.2
10	121°28.7	325°49.1	37.6	279°32.7	22.0	323°22.5	10.1	94°46.8	11.2
11	136°31.1	340°48.6	36.5	294°33.6	22.6	338°24.5	09.9	109°49.3	11.2
12	151°33.6	355°48.1	N11°35.4	309°34.6	S09°23.2	353°26.4	N10°09.7	124°51.9	N08°11.1
13	166°36.1	10°47.6	34.3	324°35.6	23.8	8°28.4	09.5	139°54.4	11.1
14	181°38.5	25°47.1	33.2	339°36.5	24.4	23°30.3	09.3	154°56.9	11.1
15	196°41.0	40°46.6	·· 32.1	354°37.5	·· 25.1	38°32.3	·· 09.1	169°59.4	·· 11.0
16	211°43.5	55°46.2	31.0	9°38.5	25.7	53°34.2	08.9	185°01.9	11.0
17	226°45.9	70°45.7	29.9	24°39.5	26.3	68°36.2	08.7	200°04.4	11.0
18	241°48.4	85°45.2	N11°28.8	39°40.4	S09°26.9	83°38.1	N10°08.5	215°07.0	N08°10.9
19	256°50.8	100°44.7	27.7	54°41.4	27.5	98°40.1	08.3	230°09.5	10.9
20	271°53.3	115°44.2	26.6	69°42.4	28.2	113°42.0	08.1	245°12.0	10.9
21	286°55.8	130°43.7	·· 25.5	84°43.3	·· 28.8	128°44.0	·· 07.9	260°14.5	·· 10.8
22	301°58.2	145°43.3	24.3	99°44.3	29.4	143°46.0	07.7	275°17.0	10.8
23	317°00.7	160°42.8	23.2	114°45.3	30.0	158°47.9	07.5	290°19.5	10.8
Mer.pass. 01:55		ν -0.5′	d 1.1′	m -3.92	ν 1.0′	d 0.6′	m 1.33	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.37

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°03.2	175°42.3	N11°22.1	129°46.2	S09°30.6	173°49.9	N10°07.3	305°22.1	N08°10.8
1	347°05.6	190°41.8	21.0	144°47.2	31.2	188°51.8	07.1	320°24.6	10.7
2	2°08.1	205°41.3	19.9	159°48.2	31.9	203°53.8	06.9	335°27.1	10.7
3	17°10.6	220°40.8	·· 18.8	174°49.1	·· 32.5	218°55.7	·· 06.7	350°29.6	·· 10.7
4	32°13.0	235°40.4	17.7	189°50.1	33.1	233°57.7	06.5	5°32.1	10.6
5	47°15.5	250°39.9	16.5	204°51.1	33.7	248°59.6	06.3	20°34.7	10.6
6	62°17.9	265°39.4	N11°15.4	219°52.1	S09°34.3	264°01.6	N10°06.1	35°37.2	N08°10.6
7	77°20.4	280°38.9	14.3	234°53.0	34.9	279°03.5	05.9	50°39.7	10.5
8	92°22.9	295°38.4	13.2	249°54.0	35.6	294°05.5	05.7	65°42.2	10.5
9	107°25.3	310°38.0	·· 12.1	264°55.0	·· 36.2	309°07.4	·· 05.5	80°44.7	·· 10.5
10	122°27.8	325°37.5	11.0	279°55.9	36.8	324°09.4	05.3	95°47.2	10.4
11	137°30.3	340°37.0	09.8	294°56.9	37.4	339°11.3	05.1	110°49.8	10.4
12	152°32.7	355°36.5	N11°08.7	309°57.9	S09°38.0	354°13.3	N10°04.9	125°52.3	N08°10.4
13	167°35.2	10°36.1	07.6	324°58.8	38.7	9°15.2	04.7	140°54.8	10.3
14	182°37.7	25°35.6	06.5	339°59.8	39.3	24°17.2	04.5	155°57.3	10.3
15	197°40.1	40°35.1	·· 05.4	355°00.7	·· 39.9	39°19.1	·· 04.3	170°59.8	·· 10.3
16	212°42.6	55°34.6	04.2	10°01.7	40.5	54°21.1	04.1	186°02.4	10.2
17	227°45.1	70°34.2	03.1	25°02.7	41.1	69°23.0	03.9	201°04.9	10.2
18	242°47.5	85°33.7	N11°02.0	40°03.6	S09°41.7	84°25.0	N10°03.7	216°07.4	N08°10.2
19	257°50.0	100°33.2	11°00.9	55°04.6	42.4	99°26.9	03.5	231°09.9	10.1
20	272°52.4	115°32.7	10°59.8	70°05.6	43.0	114°28.9	03.3	246°12.4	10.1
21	287°54.9	130°32.3	·· 58.6	85°06.5	·· 43.6	129°30.8	·· 03.1	261°15.0	·· 10.1
22	302°57.4	145°31.8	57.5	100°07.5	44.2	144°32.8	02.9	276°17.5	10.0
23	317°59.8	160°31.3	56.4	115°08.5	44.8	159°34.8	02.7	291°20.0	10.0
Mer.pass. 01:51		ν -0.5′	d 1.1′	m -3.92	ν 1.0′	d 0.6′	m 1.33	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.36

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	333°02.3	175°30.8	N10°55.3	130°09.4	S09°45.4	174°36.7	N10°02.5	306°22.5	N08°10.0
1	348°04.8	190°30.4	54.1	145°10.4	46.1	189°38.7	02.3	321°25.1	09.9
2	3°07.2	205°29.9	53.0	160°11.3	46.7	204°40.6	02.1	336°27.6	09.9
3	18°09.7	220°29.4	·· 51.9	175°12.3	·· 47.3	219°42.6	·· 01.9	351°30.1	·· 09.9
4	33°12.2	235°29.0	50.8	190°13.3	47.9	234°44.5	01.7	6°32.6	09.9
5	48°14.6	250°28.5	49.6	205°14.2	48.5	249°46.5	01.5	21°35.1	09.8
6	63°17.1	265°28.0	N10°48.5	220°15.2	S09°49.1	264°48.4	N10°01.3	36°37.7	N08°09.8
7	78°19.6	280°27.5	47.4	235°16.2	49.8	279°50.4	01.1	51°40.2	09.8
8	93°22.0	295°27.1	46.2	250°17.1	50.4	294°52.3	00.9	66°42.7	09.7
9	108°24.5	310°26.6	·· 45.1	265°18.1	·· 51.0	309°54.3	·· 00.7	81°45.2	·· 09.7
10	123°26.9	325°26.1	44.0	280°19.0	51.6	324°56.2	00.5	96°47.8	09.7
11	138°29.4	340°25.7	42.9	295°20.0	52.2	339°58.2	00.3	111°50.3	09.6
12	153°31.9	355°25.2	N10°41.7	310°21.0	S09°52.8	355°00.1	N10°00.1	126°52.8	N08°09.6
13	168°34.3	10°24.7	40.6	325°21.9	53.5	10°02.1	09°59.9	141°55.3	09.6
14	183°36.8	25°24.3	39.5	340°22.9	54.1	25°04.0	59.7	156°57.9	09.5
15	198°39.3	40°23.8	·· 38.3	355°23.8	·· 54.7	40°06.0	·· 59.5	172°00.4	·· 09.5
16	213°41.7	55°23.3	37.2	10°24.8	55.3	55°07.9	59.3	187°02.9	09.4
17	228°44.2	70°22.9	36.1	25°25.8	55.9	70°09.9	59.1	202°05.4	09.4
18	243°46.7	85°22.4	N10°34.9	40°26.7	S09°56.5	85°11.8	N09°58.9	217°08.0	N08°09.4
19	258°49.1	100°21.9	33.8	55°27.7	57.1	100°13.8	58.7	232°10.5	09.3
20	273°51.6	115°21.5	32.7	70°28.6	57.8	115°15.7	58.5	247°13.0	09.3
21	288°54.1	130°21.0	·· 31.5	85°29.6	·· 58.4	130°17.7	·· 58.3	262°15.5	·· 09.3
22	303°56.5	145°20.5	30.4	100°30.5	59.0	145°19.6	58.1	277°18.1	09.2
23	318°59.0	160°20.1	29.2	115°31.5	59.6	160°21.6	57.9	292°20.6	09.2
Mer.pass. 01:48		ν -0.5′	d 1.1′	m -3.92	ν 1.0′	d 0.6′	m 1.33	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.36

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.7	-42°09.0
Schedar	349°28.1	56°41.3
Diphda	348°44.9	-17°49.8
Achernar	335°18.3	-57°05.4
Hamal	327°48.6	23°35.6
Polaris	312°46.8	89°22.5
Acamar	315°10.0	-40°11.3
Menkar	314°03.8	4°12.0
Mirfak	308°25.0	49°57.4
Aldebaran	290°37.2	16°33.9
Rigel	281°01.9	-8°10.0
Capella	280°18.8	46°01.4
Bellatrix	278°20.7	6°22.5
Elnath	277°59.3	28°37.8
Alnilam	275°35.7	-1°11.0
Betelgeuse	270°49.9	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°24.5	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°48.8	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°14.4	-59°35.7
Suhail	222°45.1	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°45.9	-8°46.7
Regulus	207°32.5	11°50.0
Dubhe	193°39.1	61°36.2
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.2	-63°15.3
Gacrux	171°49.6	-57°16.3
Alioth	166°11.5	55°48.8
Spica	158°20.2	-11°18.3
Alkaid	152°50.6	49°10.7
Hadar	148°33.2	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.5	-60°57.2
Kochab	137°20.3	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°01.9	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.2	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.2	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°40.9	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°22.9
Enif	33°36.3	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.1
Markab	13°27.4	15°21.4

Aug 23 Mon	SHA	Mer.pass
Venus	204°49.9	12:17
Mars	158°18.9	15:21
Jupiter	201°59.0	12:26
Saturn	333°17.7	03:42

Aug 24 Tue	SHA	Mer.pass
Venus	203°39.1	12:18
Mars	157°43.1	15:20
Jupiter	201°46.7	12:23
Saturn	333°18.9	03:38

Aug 25 Wed	SHA	Mer.pass
Venus	202°28.5	12:18
Mars	157°07.1	15:18
Jupiter	201°34.4	12:20
Saturn	333°20.2	03:34

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.6	N11°35.2	301°11.1	12.0′	N17°44.9	11.4′	56.3′
1	194°17.8	34.4	315°42.1	11.9′	17°56.3	11.3′	56.3′
2	209°18.0	33.5	330°13.0	11.8′	18°07.6	11.3′	56.3′
3	224°18.1	·· 32.7	344°43.9	11.7′	18°18.9	11.1′	56.4′
4	239°18.3	31.9	359°14.6	11.6′	18°30.0	11.1′	56.4′
5	254°18.4	31.0	13°45.2	11.5′	18°41.1	11.0′	56.4′
6	269°18.6	N11°30.2	28°15.8	11.4′	N18°52.1	11.0′	56.5′
7	284°18.8	29.3	42°46.2	11.3′	19°03.1	10.8′	56.5′
8	299°18.9	28.5	57°16.5	11.2′	19°13.9	10.8′	56.5′
9	314°19.1	·· 27.6	71°46.7	11.1′	19°24.7	10.7′	56.5′
10	329°19.3	26.8	86°16.9	11.0′	19°35.4	10.6′	56.6′
11	344°19.4	25.9	100°46.9	10.9′	19°46.0	10.5′	56.6′
12	359°19.6	N11°25.1	115°16.8	10.8′	N19°56.5	10.4′	56.6′
13	14°19.8	24.2	129°46.6	10.7′	20°06.9	10.4′	56.7′
14	29°19.9	23.4	144°16.4	10.6′	20°17.3	10.2′	56.7′
15	44°20.1	·· 22.5	158°46.0	10.5′	20°27.5	10.2′	56.7′
16	59°20.2	21.7	173°15.5	10.4′	20°37.7	10.0′	56.7′
17	74°20.4	20.8	187°44.9	10.3′	20°47.7	10.0′	56.8′
18	89°20.6	N11°20.0	202°14.2	10.2′	N20°57.7	9.8′	56.8′
19	104°20.7	19.1	216°43.4	10.1′	21°07.5	9.8′	56.8′
20	119°20.9	18.3	231°12.4	10.0′	21°17.3	9.7′	56.9′
21	134°21.1	·· 17.4	245°41.4	9.9′	21°27.0	9.5′	56.9′
22	149°21.2	16.6	260°10.3	9.8′	21°36.5	9.5′	56.9′
23	164°21.4	15.7	274°39.0	9.7′	21°46.0	9.3′	56.9′
	SD = 15.8′	d = 0.8′		SD = 15.4′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°21.6	N11°14.9	289°07.7	9.5′	N21°55.3	9.3′	57.0′
1	194°21.7	14.0	303°36.2	9.4′	22°04.6	9.1′	57.0′
2	209°21.9	13.2	318°04.7	9.3′	22°13.7	9.0′	57.0′
3	224°22.1	·· 12.3	332°33.0	9.2′	22°22.7	9.0′	57.1′
4	239°22.2	11.5	347°01.2	9.1′	22°31.7	8.8′	57.1′
5	254°22.4	10.6	1°29.3	9.0′	22°40.5	8.7′	57.1′
6	269°22.6	N11°09.8	15°57.3	8.9′	N22°49.2	8.5′	57.2′
7	284°22.7	08.9	30°25.2	8.8′	22°57.7	8.5′	57.2′
8	299°22.9	08.1	44°53.0	8.7′	23°06.2	8.4′	57.2′
9	314°23.1	·· 07.2	59°20.7	8.6′	23°14.6	8.2′	57.3′
10	329°23.2	06.4	73°48.2	8.5′	23°22.8	8.1′	57.3′
11	344°23.4	05.5	88°15.7	8.3′	23°30.9	8.0′	57.3′
12	359°23.6	N11°04.7	102°43.0	8.2′	N23°38.9	7.8′	57.3′
13	14°23.7	03.8	117°10.3	8.1′	23°46.7	7.8′	57.4′
14	29°23.9	02.9	131°37.4	8.0′	23°54.5	7.6′	57.4′
15	44°24.1	·· 02.1	146°04.4	7.9′	24°02.1	7.4′	57.4′
16	59°24.2	01.2	160°31.3	7.8′	24°09.5	7.4′	57.5′
17	74°24.4	11°00.4	174°58.1	7.7′	24°16.9	7.2′	57.5′
18	89°24.6	N10°59.5	189°24.8	7.6′	N24°24.1	7.1′	57.5′
19	104°24.8	58.7	203°51.4	7.5′	24°31.2	6.9′	57.6′
20	119°24.9	57.8	218°17.9	7.4′	24°38.1	6.9′	57.6′
21	134°25.1	·· 56.9	232°44.2	7.3′	24°45.0	6.6′	57.6′
22	149°25.3	56.1	247°10.5	7.2′	24°51.6	6.6′	57.7′
23	164°25.4	55.2	261°36.7	7.1′	24°58.2	6.4′	57.7′
	SD = 15.8′	d = 0.9′		SD = 15.5′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°25.6	N10°54.4	276°02.7	7.0′	N25°04.6	6.2′	57.7′
1	194°25.8	53.5	290°28.7	6.9′	25°10.8	6.2′	57.8′
2	209°25.9	52.6	304°54.5	6.7′	25°17.0	5.9′	57.8′
3	224°26.1	·· 51.8	319°20.3	6.6′	25°22.9	5.9′	57.8′
4	239°26.3	50.9	333°45.9	6.5′	25°28.8	5.6′	57.9′
5	254°26.5	50.1	348°11.5	6.4′	25°34.4	5.6′	57.9′
6	269°26.6	N10°49.2	2°36.9	6.3′	N25°40.0	5.3′	57.9′
7	284°26.8	48.3	17°02.3	6.3′	25°45.3	5.3′	58.0′
8	299°27.0	47.5	31°27.5	6.2′	25°50.6	5.1′	58.0′
9	314°27.1	·· 46.6	45°52.7	6.1′	25°55.7	4.9′	58.0′
10	329°27.3	45.8	60°17.7	6.0′	26°00.6	4.7′	58.1′
11	344°27.5	44.9	74°42.7	5.9′	26°05.3	4.7′	58.1′
12	359°27.7	N10°44.0	89°07.6	5.8′	N26°10.0	4.4′	58.1′
13	14°27.8	43.2	103°32.3	5.7′	26°14.4	4.3′	58.2′
14	29°28.0	42.3	117°57.0	5.6′	26°18.7	4.1′	58.2′
15	44°28.2	·· 41.4	132°21.6	5.5′	26°22.8	4.0′	58.2′
16	59°28.4	40.6	146°46.1	5.4′	26°26.8	3.8′	58.3′
17	74°28.5	39.7	161°10.6	5.3′	26°30.6	3.7′	58.3′
18	89°28.7	N10°38.9	175°34.9	5.3′	N26°34.3	3.5′	58.3′
19	104°28.9	38.0	189°59.1	5.2′	26°37.8	3.3′	58.4′
20	119°29.0	37.1	204°23.3	5.1′	26°41.1	3.1′	58.4′
21	134°29.2	·· 36.3	218°47.4	5.0′	26°44.2	3.0′	58.4′
22	149°29.4	35.4	233°11.4	4.9′	26°47.2	2.8′	58.5′
23	164°29.6	34.5	247°35.3	4.9′	26°50.0	2.6′	58.5′
	SD = 15.8′	d = 0.9′		SD = 15.7′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	01:11	03:18	20:43	22:41	////
N 70°	////	02:07	03:39	20:23	21:52	////
68°	////	02:39	03:55	20:07	21:21	////
66°	01:01	03:03	04:08	19:55	20:59	22:52
64°	01:51	03:21	04:18	19:44	20:41	22:08
62°	02:20	03:35	04:27	19:36	20:27	21:40
60°	02:42	03:47	04:35	19:28	20:15	21:20
N 58°	02:59	03:58	04:42	19:21	20:05	21:03
56°	03:13	04:07	04:48	19:16	19:56	20:49
54°	03:25	04:15	04:53	19:10	19:49	20:38
52°	03:36	04:22	04:58	19:06	19:42	20:27
50°	03:45	04:28	05:03	19:01	19:36	20:19
45°	04:03	04:41	05:12	18:52	19:23	20:01
N 40°	04:17	04:52	05:20	18:44	19:13	19:47
35°	04:29	05:00	05:27	18:38	19:04	19:35
30°	04:38	05:08	05:32	18:32	18:57	19:26
20°	04:53	05:20	05:42	18:22	18:45	19:11
N 10°	05:05	05:30	05:51	18:14	18:35	19:00
0°	05:14	05:38	05:59	18:06	18:27	18:51
S 10°	05:21	05:46	06:07	17:58	18:19	18:44
20°	05:27	05:53	06:15	17:50	18:12	18:38
30°	05:32	06:00	06:25	17:41	18:05	18:33
35°	05:35	06:04	06:30	17:35	18:01	18:31
40°	05:37	06:09	06:36	17:29	17:57	18:28
45°	05:39	06:13	06:43	17:22	17:52	18:27
S 50°	05:41	06:18	06:51	17:14	17:47	18:25
52°	05:42	06:21	06:55	17:10	17:45	18:24
54°	05:42	06:23	06:59	17:06	17:43	18:24
56°	05:43	06:26	07:04	17:02	17:40	18:23
58°	05:43	06:29	07:09	16:57	17:37	18:23
S 60°	05:44	06:32	07:15	16:51	17:34	18:22

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	17:50	▭	▭	14:50	▭	▭
66°	18:35	▭	▭	14:06	▭	▭
64°	19:05	18:51	▭	13:37	15:41	▭
62°	19:28	19:31	19:42	13:15	15:02	16:50
60°	19:47	19:58	20:23	12:57	14:35	16:09
N 58°	20:02	20:20	20:52	12:42	14:14	15:41
56°	20:15	20:38	21:14	12:30	13:56	15:19
54°	20:27	20:53	21:32	12:19	13:42	15:01
52°	20:37	21:06	21:47	12:09	13:29	14:46
50°	20:46	21:17	22:01	12:01	13:18	14:33
45°	21:06	21:41	22:28	11:42	12:55	14:06
N 40°	21:21	22:01	22:50	11:28	12:36	13:45
35°	21:35	22:17	23:08	11:15	12:21	13:27
30°	21:47	22:31	23:23	11:04	12:07	13:12
20°	22:07	22:55	23:50	10:46	11:45	12:46
N 10°	22:25	23:16	·· ··	10:30	11:25	12:24
0°	22:41	23:35	·· ··	10:15	11:07	12:03
S 10°	22:58	23:55	·· ··	10:00	10:48	11:42
20°	23:16	·· ··	00:16	09:44	10:29	11:20
30°	23:37	·· ··	00:41	09:26	10:06	10:55
35°	23:49	·· ··	00:56	09:15	09:53	10:39
40°	·· ··	00:03	01:12	09:03	09:38	10:22
45°	·· ··	00:20	01:33	08:49	09:21	10:01
S 50°	·· ··	00:41	01:58	08:32	08:58	09:35
52°	·· ··	00:51	02:11	08:24	08:48	09:22
54°	·· ··	01:03	02:25	08:15	08:36	09:07
56°	·· ··	01:15	02:42	08:05	08:23	08:50
58°	00:00	01:31	03:02	07:54	08:07	08:30
S 60°	00:12	01:49	03:27	07:41	07:48	08:04

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 21-23 72-51%
23	02:49	02:42	12:03	04:03	16:28	
24	02:34	02:26	12:02	04:54	17:21	
25	02:18	02:09	12:02	05:49	18:18	

August 26, 27, 28 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	334°01.4	175°19.6	N10°28.1	130°32.5	S10°00.2	175°23.6	N09°57.7	307°23.1	N08°09.2
1	349°03.9	190°19.1	27.0	145°33.4	00.8	190°25.5	57.5	322°25.6	09.1
2	4°06.4	205°18.7	25.8	160°34.4	01.5	205°27.5	57.3	337°28.2	09.1
3	19°08.8	220°18.2	·· 24.7	175°35.3	·· 02.1	220°29.4	·· 57.1	352°30.7	·· 09.1
4	34°11.3	235°17.7	23.6	190°36.3	02.7	235°31.4	56.9	7°33.2	09.0
5	49°13.8	250°17.3	22.4	205°37.2	03.3	250°33.3	56.7	22°35.7	09.0
6	64°16.2	265°16.8	N10°21.3	220°38.2	S10°03.9	265°35.3	N09°56.5	37°38.3	N08°09.0
7	79°18.7	280°16.4	20.1	235°39.1	04.5	280°37.2	56.3	52°40.8	08.9
8	94°21.2	295°15.9	19.0	250°40.1	05.1	295°39.2	56.1	67°43.3	08.9
9	109°23.6	310°15.4	·· 17.9	265°41.1	·· 05.8	310°41.1	·· 55.9	82°45.8	·· 08.9
10	124°26.1	325°15.0	16.7	280°42.0	06.4	325°43.1	55.7	97°48.4	08.8
11	139°28.5	340°14.5	15.6	295°43.0	07.0	340°45.0	55.5	112°50.9	08.8
12	154°31.0	355°14.1	N10°14.4	310°43.9	S10°07.6	355°47.0	N09°55.3	127°53.4	N08°08.8
13	169°33.5	10°13.6	13.3	325°44.9	08.2	10°48.9	55.1	142°56.0	08.7
14	184°35.9	25°13.1	12.1	340°45.8	08.8	25°50.9	54.9	157°58.5	08.7
15	199°38.4	40°12.7	·· 11.0	355°46.8	·· 09.4	40°52.8	·· 54.7	173°01.0	·· 08.7
16	214°40.9	55°12.2	09.8	10°47.7	10.1	55°54.8	54.5	188°03.5	08.6
17	229°43.3	70°11.8	08.7	25°48.7	10.7	70°56.7	54.3	203°06.1	08.6
18	244°45.8	85°11.3	N10°07.6	40°49.6	S10°11.3	85°58.7	N09°54.1	218°08.6	N08°08.6
19	259°48.3	100°10.8	06.4	55°50.6	11.9	101°00.6	53.9	233°11.1	08.5
20	274°50.7	115°10.4	05.3	70°51.5	12.5	116°02.6	53.7	248°13.7	08.5
21	289°53.2	130°09.9	·· 04.1	85°52.5	·· 13.1	131°04.5	·· 53.5	263°16.2	·· 08.4
22	304°55.7	145°09.5	03.0	100°53.4	13.7	146°06.5	53.3	278°18.7	08.4
23	319°58.1	160°09.0	01.8	115°54.4	14.4	161°08.4	53.1	293°21.2	08.4
Mer.pass. 01:44		ν -0.5′ d 1.1′		m -3.92	ν 1.0′ d 0.6′		m 1.33	ν 2.0′ d 0.2′	m -1.70	ν 2.5′ d 0.0′	m 0.35

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°00.6	175°08.6	N10°00.7	130°55.3	S10°15.0	176°10.4	N09°52.9	308°23.8	N08°08.3
1	350°03.0	190°08.1	09°59.5	145°56.3	15.6	191°12.3	52.7	323°26.3	08.3
2	5°05.5	205°07.6	58.4	160°57.2	16.2	206°14.3	52.5	338°28.8	08.3
3	20°08.0	220°07.2	·· 57.2	175°58.2	·· 16.8	221°16.2	·· 52.3	353°31.4	·· 08.2
4	35°10.4	235°06.7	56.1	190°59.1	17.4	236°18.2	52.1	8°33.9	08.2
5	50°12.9	250°06.3	54.9	206°00.1	18.0	251°20.2	51.9	23°36.4	08.2
6	65°15.4	265°05.8	N09°53.8	221°01.0	S10°18.7	266°22.1	N09°51.7	38°39.0	N08°08.1
7	80°17.8	280°05.4	52.6	236°02.0	19.3	281°24.1	51.5	53°41.5	08.1
8	95°20.3	295°04.9	51.5	251°02.9	19.9	296°26.0	51.3	68°44.0	08.1
9	110°22.8	310°04.5	·· 50.3	266°03.9	·· 20.5	311°28.0	·· 51.1	83°46.5	·· 08.0
10	125°25.2	325°04.0	49.2	281°04.8	21.1	326°29.9	50.9	98°49.1	08.0
11	140°27.7	340°03.6	48.0	296°05.8	21.7	341°31.9	50.7	113°51.6	07.9
12	155°30.2	355°03.1	N09°46.8	311°06.7	S10°22.3	356°33.8	N09°50.5	128°54.1	N08°07.9
13	170°32.6	10°02.7	45.7	326°07.7	22.9	11°35.8	50.3	143°56.7	07.9
14	185°35.1	25°02.2	44.5	341°08.6	23.6	26°37.7	50.1	158°59.2	07.8
15	200°37.5	40°01.8	·· 43.4	356°09.6	·· 24.2	41°39.7	·· 49.9	174°01.7	·· 07.8
16	215°40.0	55°01.3	42.2	11°10.5	24.8	56°41.6	49.7	189°04.3	07.8
17	230°42.5	70°00.9	41.1	26°11.5	25.4	71°43.6	49.5	204°06.8	07.7
18	245°44.9	85°00.4	N09°39.9	41°12.4	S10°26.0	86°45.5	N09°49.3	219°09.3	N08°07.7
19	260°47.4	100°00.0	38.8	56°13.4	26.6	101°47.5	49.1	234°11.9	07.7
20	275°49.9	114°59.5	37.6	71°14.3	27.2	116°49.4	48.9	249°14.4	07.6
21	290°52.3	129°59.1	·· 36.4	86°15.3	·· 27.8	131°51.4	·· 48.7	264°16.9	·· 07.6
22	305°54.8	144°58.6	35.3	101°16.2	28.5	146°53.3	48.5	279°19.5	07.5
23	320°57.3	159°58.2	34.1	116°17.1	29.1	161°55.3	48.3	294°22.0	07.5
Mer.pass. 01:40		ν -0.5′ d 1.1′		m -3.92	ν 1.0′ d 0.6′		m 1.34	ν 2.0′ d 0.2′	m -1.70	ν 2.5′ d 0.0′	m 0.35

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°59.7	174°57.7	N09°33.0	131°18.1	S10°29.7	176°57.2	N09°48.1	309°24.5	N08°07.5
1	351°02.2	189°57.3	31.8	146°19.0	30.3	191°59.2	47.9	324°27.1	07.4
2	6°04.7	204°56.8	30.6	161°20.0	30.9	207°01.1	47.7	339°29.6	07.4
3	21°07.1	219°56.4	·· 29.5	176°20.9	·· 31.5	222°03.1	·· 47.5	354°32.1	·· 07.4
4	36°09.6	234°55.9	28.3	191°21.9	32.1	237°05.0	47.3	9°34.7	07.3
5	51°12.0	249°55.5	27.2	206°22.8	32.7	252°07.0	47.1	24°37.2	07.3
6	66°14.5	264°55.0	N09°26.0	221°23.8	S10°33.4	267°08.9	N09°46.9	39°39.7	N08°07.2
7	81°17.0	279°54.6	24.8	236°24.7	34.0	282°10.9	46.7	54°42.3	07.2
8	96°19.4	294°54.1	23.7	251°25.6	34.6	297°12.8	46.5	69°44.8	07.2
9	111°21.9	309°53.7	·· 22.5	266°26.6	·· 35.2	312°14.8	·· 46.3	84°47.3	·· 07.1
10	126°24.4	324°53.3	21.3	281°27.5	35.8	327°16.8	46.1	99°49.9	07.1
11	141°26.8	339°52.8	20.2	296°28.5	36.4	342°18.7	45.9	114°52.4	07.1
12	156°29.3	354°52.4	N09°19.0	311°29.4	S10°37.0	357°20.7	N09°45.7	129°54.9	N08°07.0
13	171°31.8	9°51.9	17.8	326°30.4	37.6	12°22.6	45.5	144°57.5	07.0
14	186°34.2	24°51.5	16.7	341°31.3	38.3	27°24.6	45.3	160°00.0	06.9
15	201°36.7	39°51.0	·· 15.5	356°32.2	·· 38.9	42°26.5	·· 45.1	175°02.5	·· 06.9
16	216°39.2	54°50.6	14.3	11°33.2	39.5	57°28.5	44.9	190°05.1	06.9
17	231°41.6	69°50.1	13.2	26°34.1	40.1	72°30.4	44.7	205°07.6	06.8
18	246°44.1	84°49.7	N09°12.0	41°35.1	S10°40.7	87°32.4	N09°44.5	220°10.2	N08°06.8
19	261°46.5	99°49.3	10.8	56°36.0	41.3	102°34.3	44.3	235°12.7	06.8
20	276°49.0	114°48.8	09.7	71°36.9	41.9	117°36.3	44.1	250°15.2	06.7
21	291°51.5	129°48.4	·· 08.5	86°37.9	·· 42.5	132°38.2	·· 43.9	265°17.8	·· 06.7
22	306°53.9	144°47.9	07.3	101°38.8	43.1	147°40.2	43.7	280°20.3	06.6
23	321°56.4	159°47.5	06.2	116°39.8	43.8	162°42.1	43.5	295°22.8	06.6
Mer.pass. 01:36		ν -0.4′ d 1.2′		m -3.92	ν 0.9′ d 0.6′		m 1.34	ν 2.0′ d 0.2′	m -1.70	ν 2.5′ d 0.0′	m 0.34

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.7	-42°09.0
Schedar	349°28.0	56°41.3
Diphda	348°44.9	-17°49.8
Achernar	335°18.3	-57°05.4
Hamal	327°48.5	23°35.6
Polaris	312°44.9	89°22.5
Acamar	315°10.0	-40°11.3
Menkar	314°03.8	4°12.0
Mirfak	308°25.0	49°57.4
Aldebaran	290°37.2	16°33.9
Rigel	281°01.9	-8°10.0
Capella	280°18.8	46°01.4
Bellatrix	278°20.6	6°22.5
Elnath	277°59.2	28°37.8
Alnilam	275°35.6	-1°10.9
Betelgeuse	270°49.9	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°24.5	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°48.8	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°14.4	-59°35.7
Suhail	222°45.1	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°45.9	-8°46.7
Regulus	207°32.5	11°49.9
Dubhe	193°39.1	61°36.1
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.8
Acrux	172°58.2	-63°15.3
Gacrux	171°49.6	-57°16.3
Alioth	166°11.5	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.6	49°10.7
Hadar	148°33.2	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.5	-60°57.2
Kochab	137°20.3	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.2	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°40.9	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.3
Al Na'ir	27°29.8	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.1
Markab	13°27.4	15°21.4

Aug 26 Thu	SHA	Mer.pass
Venus	201°18.2	12:19
Mars	156°31.0	15:17
Jupiter	201°22.1	12:17
Saturn	333°21.7	03:30

Aug 27 Fri	SHA	Mer.pass
Venus	200°08.0	12:20
Mars	155°54.8	15:15
Jupiter	201°09.8	12:14
Saturn	333°23.2	03:26

Aug 28 Sat	SHA	Mer.pass
Venus	198°58.0	12:21
Mars	155°18.4	15:14
Jupiter	200°57.5	12:11
Saturn	333°24.8	03:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0694 sec ΔT = TT-UT1 = +69.2534 sec

2027 August 26 to Aug. 28 UT

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°29.7	N10°33.7	261°59.2	4.8′	N26°52.6	2.5′	58.5′
1	194°29.9	32.8	276°23.0	4.7′	26°55.1	2.3′	58.6′
2	209°30.1	31.9	290°46.7	4.6′	26°57.4	2.1′	58.6′
3	224°30.3	·· 31.1	305°10.3	4.6′	26°59.5	1.9′	58.6′
4	239°30.4	30.2	319°33.9	4.5′	27°01.4	1.8′	58.7′
5	254°30.6	29.3	333°57.4	4.4′	27°03.2	1.6′	58.7′
6	269°30.8	N10°28.5	348°20.8	4.4′	N27°04.8	1.4′	58.7′
7	284°31.0	27.6	2°44.2	4.3′	27°06.2	1.2′	58.8′
8	299°31.1	26.7	17°07.5	4.3′	27°07.4	1.1′	58.8′
9	314°31.3	·· 25.9	31°30.8	4.2′	27°08.5	0.9′	58.8′
10	329°31.5	25.0	45°54.0	4.1′	27°09.4	0.6′	58.9′
11	344°31.7	24.1	60°17.1	4.1′	27°10.0	0.6′	58.9′
12	359°31.8	N10°23.2	74°40.2	4.0′	N27°10.6	0.3′	58.9′
13	14°32.0	22.4	89°03.3	4.0′	27°10.9	0.1′	59.0′
14	29°32.2	21.5	103°26.3	3.9′	27°11.0	0.0′	59.0′
15	44°32.4	·· 20.6	117°49.2	3.9′	27°11.0	0.3′	59.0′
16	59°32.6	19.8	132°12.1	3.9′	27°10.7	0.4′	59.1′
17	74°32.7	18.9	146°35.0	3.8′	27°10.3	0.6′	59.1′
18	89°32.9	N10°18.0	160°57.8	3.8′	N27°09.7	0.8′	59.1′
19	104°33.1	17.2	175°20.6	3.7′	27°08.9	0.9′	59.2′
20	119°33.3	16.3	189°43.3	3.7′	27°08.0	1.2′	59.2′
21	134°33.4	·· 15.4	204°06.0	3.7′	27°06.8	1.3′	59.2′
22	149°33.6	14.5	218°28.7	3.7′	27°05.5	1.6′	59.2′
23	164°33.8	13.7	232°51.4	3.6′	27°03.9	1.7′	59.3′
	SD = 15.8′	d = 0.9′	SD = 16.0′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°34.0	N10°12.8	247°14.0	3.6′	N27°02.2	1.9′	59.3′
1	194°34.2	11.9	261°36.6	3.6′	27°00.3	2.1′	59.3′
2	209°34.3	11.0	275°59.2	3.6′	26°58.2	2.3′	59.4′
3	224°34.5	·· 10.2	290°21.8	3.6′	26°55.9	2.5′	59.4′
4	239°34.7	09.3	304°44.3	3.5′	26°53.4	2.7′	59.4′
5	254°34.9	08.4	319°06.9	3.5′	26°50.7	2.8′	59.5′
6	269°35.0	N10°07.5	333°29.4	3.5′	N26°47.9	3.1′	59.5′
7	284°35.2	06.7	347°51.9	3.5′	26°44.8	3.2′	59.5′
8	299°35.4	05.8	2°14.4	3.5′	26°41.6	3.5′	59.6′
9	314°35.6	·· 04.9	16°36.9	3.5′	26°38.1	3.6′	59.6′
10	329°35.8	04.0	30°59.5	3.5′	26°34.5	3.8′	59.6′
11	344°35.9	03.2	45°22.0	3.5′	26°30.7	4.0′	59.7′
12	359°36.1	N10°02.3	59°44.5	3.5′	N26°26.7	4.2′	59.7′
13	14°36.3	01.4	74°07.0	3.5′	26°22.5	4.4′	59.7′
14	29°36.5	10°00.5	88°29.5	3.5′	26°18.1	4.5′	59.7′
15	44°36.7	09°59.7	102°52.0	3.5′	26°13.6	4.8′	59.8′
16	59°36.8	58.8	117°14.6	3.6′	26°08.8	5.0′	59.8′
17	74°37.0	57.9	131°37.1	3.6′	26°03.8	5.1′	59.8′
18	89°37.2	N09°57.0	145°59.7	3.6′	N25°58.7	5.3′	59.9′
19	104°37.4	56.2	160°22.3	3.6′	25°53.4	5.5′	59.9′
20	119°37.6	55.3	174°44.9	3.6′	25°47.9	5.7′	59.9′
21	134°37.8	·· 54.4	189°07.6	3.7′	25°42.2	5.9′	59.9′
22	149°37.9	53.5	203°30.2	3.7′	25°36.3	6.1′	60.0′
23	164°38.1	52.6	217°52.9	3.7′	25°30.2	6.2′	60.0′
	SD = 15.8′	d = 0.9′	SD = 16.2′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°38.3	N09°51.8	232°15.6	3.7′	N25°24.0	6.4′	60.0′
1	194°38.5	50.9	246°38.4	3.8′	25°17.6	6.7′	60.0′
2	209°38.7	50.0	261°01.2	3.8′	25°10.9	6.8′	60.1′
3	224°38.8	·· 49.1	275°24.0	3.9′	25°04.1	6.9′	60.1′
4	239°39.0	48.2	289°46.8	3.9′	24°57.2	7.2′	60.1′
5	254°39.2	47.4	304°09.7	3.9′	24°50.0	7.3′	60.2′
6	269°39.4	N09°46.5	318°32.7	4.0′	N24°42.7	7.6′	60.2′
7	284°39.6	45.6	332°55.6	4.0′	24°35.1	7.7′	60.2′
8	299°39.8	44.7	347°18.7	4.1′	24°27.4	7.8′	60.2′
9	314°39.9	·· 43.8	1°41.7	4.1′	24°19.6	8.1′	60.3′
10	329°40.1	42.9	16°04.8	4.2′	24°11.5	8.2′	60.3′
11	344°40.3	42.1	30°28.0	4.2′	24°03.3	8.4′	60.3′
12	359°40.5	N09°41.2	44°51.2	4.3′	N23°54.9	8.6′	60.3′
13	14°40.7	40.3	59°14.5	4.3′	23°46.3	8.7′	60.3′
14	29°40.9	39.4	73°37.8	4.4′	23°37.6	9.0′	60.4′
15	44°41.0	·· 38.5	88°01.2	4.4′	23°28.6	9.1′	60.4′
16	59°41.2	37.6	102°24.6	4.5′	23°19.5	9.2′	60.4′
17	74°41.4	36.8	116°48.1	4.6′	23°10.3	9.4′	60.4′
18	89°41.6	N09°35.9	131°11.7	4.6′	N23°00.9	9.6′	60.5′
19	104°41.8	35.0	145°35.3	4.7′	22°51.3	9.8′	60.5′
20	119°42.0	34.1	159°59.0	4.7′	22°41.5	9.9′	60.5′
21	134°42.2	·· 33.2	174°22.7	4.8′	22°31.6	10.1′	60.5′
22	149°42.3	32.3	188°46.5	4.9′	22°21.5	10.2′	60.5′
23	164°42.5	31.4	203°10.4	4.9′	22°11.3	10.4′	60.6′
	SD = 15.8′	d = 0.9′	SD = 16.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	01:47	03:34	20:25	22:08	////
N 70°	////	02:28	03:52	20:08	21:30	////
68°	////	02:55	04:06	19:54	21:04	23:36
66°	01:32	03:15	04:18	19:43	20:45	22:24
64°	02:09	03:31	04:27	19:34	20:29	21:50
62°	02:34	03:45	04:35	19:26	20:16	21:26
60°	02:53	03:56	04:42	19:19	20:05	21:07
N 58°	03:09	04:05	04:48	19:13	19:56	20:52
56°	03:21	04:13	04:54	19:08	19:48	20:40
54°	03:32	04:21	04:59	19:03	19:41	20:29
52°	03:42	04:27	05:03	18:59	19:35	20:20
50°	03:50	04:33	05:07	18:55	19:29	20:11
45°	04:08	04:45	05:16	18:47	19:17	19:55
N 40°	04:21	04:55	05:23	18:40	19:08	19:41
35°	04:32	05:03	05:29	18:34	19:00	19:31
30°	04:40	05:09	05:34	18:29	18:53	19:22
20°	04:54	05:21	05:43	18:20	18:42	19:09
N 10°	05:05	05:30	05:51	18:12	18:33	18:58
0°	05:13	05:37	05:58	18:05	18:26	18:50
S 10°	05:20	05:44	06:05	17:58	18:19	18:44
20°	05:25	05:51	06:13	17:50	18:13	18:39
30°	05:29	05:57	06:21	17:42	18:06	18:34
35°	05:31	06:01	06:26	17:37	18:03	18:33
40°	05:33	06:04	06:32	17:32	18:00	18:31
45°	05:34	06:08	06:38	17:26	17:56	18:30
S 50°	05:35	06:13	06:45	17:19	17:51	18:29
52°	05:35	06:15	06:49	17:15	17:50	18:29
54°	05:36	06:17	06:53	17:11	17:48	18:29
56°	05:36	06:19	06:57	17:07	17:45	18:29
58°	05:36	06:21	07:01	17:03	17:43	18:29
S 60°	05:36	06:24	07:07	16:58	17:40	18:29

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°						
N 70°						
68°						
66°			23:07			19:55
64°		21:11	23:48		19:41	19:13
62°	20:30	22:13	·· ··	18:10	18:38	18:45
60°	21:17	22:47	·· ··	17:23	18:04	18:23
N 58°	21:48	23:12	·· ··	16:52	17:38	18:05
56°	22:11	23:32	·· ··	16:29	17:18	17:50
54°	22:30	23:49	·· ··	16:10	17:01	17:36
52°	22:46	·· ··	00:03	15:54	16:47	17:25
50°	23:00	·· ··	00:15	15:40	16:34	17:15
45°	23:28	·· ··	00:41	15:12	16:08	16:53
N 40°	23:50	·· ··	01:01	14:49	15:47	16:35
35°	·· ··	00:09	01:18	14:31	15:29	16:20
30°	·· ··	00:24	01:32	14:15	15:14	16:07
20°	·· ··	00:51	01:57	13:48	14:49	15:45
N 10°	00:13	01:14	02:18	13:25	14:26	15:26
0°	00:34	01:36	02:38	13:03	14:06	15:07
S 10°	00:55	01:57	02:58	12:42	13:45	14:49
20°	01:19	02:20	03:19	12:18	13:22	14:29
30°	01:45	02:47	03:43	11:51	12:56	14:06
35°	02:01	03:03	03:58	11:35	12:40	13:53
40°	02:20	03:21	04:14	11:17	12:22	13:37
45°	02:42	03:43	04:34	10:54	12:01	13:18
S 50°	03:11	04:12	04:59	10:25	11:33	12:55
52°	03:25	04:25	05:10	10:11	11:19	12:43
54°	03:41	04:41	05:24	09:55	11:04	12:30
56°	04:00	05:00	05:39	09:36	10:45	12:15
58°	04:24	05:23	05:57	09:12	10:22	11:58
S 60°	04:56	05:53	06:20	08:40	09:53	11:36

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 24-26 40-19%
26	02:01	01:53	12:02	06:49	19:19	
27	01:44	01:36	12:02	07:51	20:22	
28	01:27	01:18	12:01	08:53	21:23	

August 29, 30, 31 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	336°58.9	174°47.1	N09°05.0	131°40.7	S10°44.4	177°44.1	N09°43.3	310°25.4	N08°06.6
1	352°01.3	189°46.6	03.8	146°41.6	45.0	192°46.0	43.1	325°27.9	06.5
2	7°03.8	204°46.2	02.6	161°42.6	45.6	207°48.0	42.9	340°30.5	06.5
3	22°06.3	219°45.7	·· 01.5	176°43.5	·· 46.2	222°49.9	·· 42.7	355°33.0	·· 06.5
4	37°08.7	234°45.3	09°00.3	191°44.4	46.8	237°51.9	42.5	10°35.5	06.4
5	52°11.2	249°44.9	08°59.1	206°45.4	47.4	252°53.8	42.3	25°38.1	06.4
6	67°13.6	264°44.4	N08°58.0	221°46.3	S10°48.0	267°55.8	N09°42.1	40°40.6	N08°06.3
7	82°16.1	279°44.0	56.8	236°47.3	48.6	282°57.7	41.9	55°43.1	06.3
8	97°18.6	294°43.5	55.6	251°48.2	49.2	297°59.7	41.7	70°45.7	06.3
9	112°21.0	309°43.1	·· 54.4	266°49.1	·· 49.9	313°01.6	·· 41.5	85°48.2	·· 06.2
10	127°23.5	324°42.7	53.3	281°50.1	50.5	328°03.6	41.3	100°50.8	06.2
11	142°26.0	339°42.2	52.1	296°51.0	51.1	343°05.5	41.1	115°53.3	06.1
12	157°28.4	354°41.8	N08°50.9	311°51.9	S10°51.7	358°07.5	N09°40.9	130°55.8	N08°06.1
13	172°30.9	9°41.4	49.7	326°52.9	52.3	13°09.5	40.7	145°58.4	06.1
14	187°33.4	24°40.9	48.6	341°53.8	52.9	28°11.4	40.5	161°00.9	06.0
15	202°35.8	39°40.5	·· 47.4	356°54.7	·· 53.5	43°13.4	·· 40.3	176°03.5	·· 06.0
16	217°38.3	54°40.1	46.2	11°55.7	54.1	58°15.3	40.1	191°06.0	05.9
17	232°40.8	69°39.6	45.0	26°56.6	54.7	73°17.3	39.9	206°08.5	05.9
18	247°43.2	84°39.2	N08°43.8	41°57.5	S10°55.3	88°19.2	N09°39.7	221°11.1	N08°05.9
19	262°45.7	99°38.7	42.7	56°58.5	56.0	103°21.2	39.5	236°13.6	05.8
20	277°48.1	114°38.3	41.5	71°59.4	56.6	118°23.1	39.3	251°16.2	05.8
21	292°50.6	129°37.9	·· 40.3	87°00.3	·· 57.2	133°25.1	·· 39.1	266°18.7	·· 05.7
22	307°53.1	144°37.4	39.1	102°01.3	57.8	148°27.0	38.9	281°21.2	05.7
23	322°55.5	159°37.0	38.0	117°02.2	58.4	163°29.0	38.7	296°23.8	05.7
Mer.pass. 01:32		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.34	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.34

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	337°58.0	174°36.6	N08°36.8	132°03.1	S10°59.0	178°30.9	N09°38.5	311°26.3	N08°05.6
1	353°00.5	189°36.1	35.6	147°04.1	10°59.6	193°32.9	38.3	326°28.9	05.6
2	8°02.9	204°35.7	34.4	162°05.0	11°00.2	208°34.8	38.1	341°31.4	05.6
3	23°05.4	219°35.3	·· 33.2	177°05.9	·· 00.8	223°36.8	·· 37.9	356°33.9	·· 05.5
4	38°07.9	234°34.8	32.0	192°06.9	01.4	238°38.7	37.7	11°36.5	05.5
5	53°10.3	249°34.4	30.9	207°07.8	02.0	253°40.7	37.5	26°39.0	05.4
6	68°12.8	264°34.0	N08°29.7	222°08.7	S11°02.6	268°42.6	N09°37.3	41°41.6	N08°05.4
7	83°15.3	279°33.6	28.5	237°09.7	03.3	283°44.6	37.1	56°44.1	05.4
8	98°17.7	294°33.1	27.3	252°10.6	03.9	298°46.5	36.9	71°46.7	05.3
9	113°20.2	309°32.7	·· 26.1	267°11.5	·· 04.5	313°48.5	·· 36.7	86°49.2	·· 05.3
10	128°22.6	324°32.3	24.9	282°12.5	05.1	328°50.4	36.5	101°51.7	05.2
11	143°25.1	339°31.8	23.8	297°13.4	05.7	343°52.4	36.3	116°54.3	05.2
12	158°27.6	354°31.4	N08°22.6	312°14.3	S11°06.3	358°54.3	N09°36.1	131°56.8	N08°05.2
13	173°30.0	9°31.0	21.4	327°15.2	06.9	13°56.3	35.9	146°59.4	05.1
14	188°32.5	24°30.5	20.2	342°16.2	07.5	28°58.2	35.7	162°01.9	05.1
15	203°35.0	39°30.1	·· 19.0	357°17.1	·· 08.1	44°00.2	·· 35.5	177°04.5	·· 05.0
16	218°37.4	54°29.7	17.8	12°18.0	08.7	59°02.2	35.3	192°07.0	05.0
17	233°39.9	69°29.3	16.6	27°19.0	09.3	74°04.1	35.1	207°09.5	04.9
18	248°42.4	84°28.8	N08°15.4	42°19.9	S11°09.9	89°06.1	N09°34.9	222°12.1	N08°04.9
19	263°44.8	99°28.4	14.3	57°20.8	10.6	104°08.0	34.7	237°14.6	04.9
20	278°47.3	114°28.0	13.1	72°21.7	11.2	119°10.0	34.5	252°17.2	04.8
21	293°49.7	129°27.6	·· 11.9	87°22.7	·· 11.8	134°11.9	·· 34.3	267°19.7	·· 04.8
22	308°52.2	144°27.1	10.7	102°23.6	12.4	149°13.9	34.1	282°22.3	04.7
23	323°54.7	159°26.7	09.5	117°24.5	13.0	164°15.8	33.9	297°24.8	04.7
Mer.pass. 01:28		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.34	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.33

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	338°57.1	174°26.3	N08°08.3	132°25.4	S11°13.6	179°17.8	N09°33.7	312°27.4	N08°04.7
1	353°59.6	189°25.8	07.1	147°26.4	14.2	194°19.7	33.5	327°29.9	04.6
2	9°02.1	204°25.4	05.9	162°27.3	14.8	209°21.7	33.3	342°32.5	04.6
3	24°04.5	219°25.0	·· 04.7	177°28.2	·· 15.4	224°23.6	·· 33.1	357°35.0	·· 04.5
4	39°07.0	234°24.6	03.6	192°29.1	16.0	239°25.6	32.9	12°37.5	04.5
5	54°09.5	249°24.1	02.4	207°30.1	16.6	254°27.5	32.7	27°40.1	04.5
6	69°11.9	264°23.7	N08°01.2	222°31.0	S11°17.2	269°29.5	N09°32.5	42°42.6	N08°04.4
7	84°14.4	279°23.3	08°00.0	237°31.9	17.8	284°31.4	32.3	57°45.2	04.4
8	99°16.9	294°22.9	07°58.8	252°32.8	18.4	299°33.4	32.1	72°47.7	04.3
9	114°19.3	309°22.5	·· 57.6	267°33.8	·· 19.0	314°35.3	·· 31.9	87°50.3	·· 04.3
10	129°21.8	324°22.0	56.4	282°34.7	19.7	329°37.3	31.7	102°52.8	04.3
11	144°24.2	339°21.6	55.2	297°35.6	20.3	344°39.2	31.5	117°55.4	04.2
12	159°26.7	354°21.2	N07°54.0	312°36.5	S11°20.9	359°41.2	N09°31.3	132°57.9	N08°04.2
13	174°29.2	9°20.8	52.8	327°37.5	21.5	14°43.2	31.1	148°00.5	04.1
14	189°31.6	24°20.3	51.6	342°38.4	22.1	29°45.1	30.9	163°03.0	04.1
15	204°34.1	39°19.9	·· 50.4	357°39.3	·· 22.7	44°47.1	·· 30.7	178°05.6	·· 04.0
16	219°36.6	54°19.5	49.2	12°40.2	23.3	59°49.0	30.5	193°08.1	04.0
17	234°39.0	69°19.1	48.0	27°41.2	23.9	74°51.0	30.3	208°10.6	04.0
18	249°41.5	84°18.7	N07°46.8	42°42.1	S11°24.5	89°52.9	N09°30.1	223°13.2	N08°03.9
19	264°44.0	99°18.2	45.6	57°43.0	25.1	104°54.9	29.9	238°15.7	03.9
20	279°46.4	114°17.8	44.4	72°43.9	25.7	119°56.8	29.7	253°18.3	03.8
21	294°48.9	129°17.4	·· 43.2	87°44.8	·· 26.3	134°58.8	·· 29.5	268°20.8	·· 03.8
22	309°51.4	144°17.0	42.0	102°45.8	26.9	150°00.7	29.3	283°23.4	03.7
23	324°53.8	159°16.6	40.8	117°46.7	27.5	165°02.7	29.1	298°25.9	03.7
Mer.pass. 01:24		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.34	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.33

Stars

	SHA	**Dec**
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.7	-42°09.0
Schedar	349°28.0	56°41.3
Diphda	348°44.8	-17°49.8
Achernar	335°18.2	-57°05.4
Hamal	327°48.5	23°35.7
Polaris	312°43.3	89°22.5
Acamar	315°10.0	-40°11.3
Menkar	314°03.7	4°12.0
Mirfak	308°25.0	49°57.4
Aldebaran	290°37.1	16°33.9
Rigel	281°01.8	-8°10.0
Capella	280°18.8	46°01.4
Bellatrix	278°20.6	6°22.6
Elnath	277°59.2	28°37.8
Alnilam	275°35.6	-1°10.9
Betelgeuse	270°49.8	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°24.5	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°48.8	5°09.3
Pollux	243°14.9	27°57.5
Avior	234°14.4	-59°35.7
Suhail	222°45.1	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°45.9	-8°46.7
Regulus	207°32.4	11°49.9
Dubhe	193°39.1	61°36.1
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.3
Gacrux	171°49.6	-57°16.2
Alioth	166°11.5	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.6	49°10.7
Hadar	148°33.2	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.5	-60°57.2
Kochab	137°20.4	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.2	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°41.0	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.3
Al Na'ir	27°29.7	-46°49.4
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.1
Markab	13°27.4	15°21.4

Aug 29 Sun	**SHA**	**Mer.pass**
Venus	197°48.2	12:21
Mars	154°41.8	15:12
Jupiter	200°45.2	12:07
Saturn	333°26.5	03:18

Aug 30 Mon	**SHA**	**Mer.pass**
Venus	196°38.6	12:22
Mars	154°05.1	15:11
Jupiter	200°32.9	12:04
Saturn	333°28.3	03:14

Aug 31 Tue	**SHA**	**Mer.pass**
Venus	195°29.1	12:23
Mars	153°28.3	15:09
Jupiter	200°20.6	12:01
Saturn	333°30.2	03:10

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°42.7	N09°30.6	217°34.3	5.0′	N22°00.9	10.5′	60.6′
1	194°42.9	29.7	231°58.3	5.1′	21°50.4	10.7′	60.6′
2	209°43.1	28.8	246°22.4	5.1′	21°39.7	10.9′	60.6′
3	224°43.3	·· 27.9	260°46.6	5.2′	21°28.8	11.0′	60.6′
4	239°43.5	27.0	275°10.8	5.3′	21°17.8	11.2′	60.6′
5	254°43.6	26.1	289°35.1	5.4′	21°06.6	11.3′	60.7′
6	269°43.8	N09°25.2	303°59.4	5.4′	N20°55.3	11.4′	60.7′
7	284°44.0	24.4	318°23.9	5.5′	20°43.9	11.6′	60.7′
8	299°44.2	23.5	332°48.4	5.6′	20°32.3	11.8′	60.7′
9	314°44.4	·· 22.6	347°13.0	5.7′	20°20.5	11.9′	60.7′
10	329°44.6	21.7	1°37.6	5.7′	20°08.6	12.0′	60.7′
11	344°44.8	20.8	16°02.4	5.8′	19°56.6	12.2′	60.8′
12	359°44.9	N09°19.9	30°27.2	5.9′	N19°44.4	12.3′	60.8′
13	14°45.1	19.0	44°52.1	6.0′	19°32.1	12.4′	60.8′
14	29°45.3	18.1	59°17.0	6.0′	19°19.7	12.6′	60.8′
15	44°45.5	·· 17.2	73°42.1	6.1′	19°07.1	12.7′	60.8′
16	59°45.7	16.3	88°07.2	6.2′	18°54.4	12.8′	60.8′
17	74°45.9	15.5	102°32.4	6.3′	18°41.6	13.0′	60.8′
18	89°46.1	N09°14.6	116°57.7	6.4′	N18°28.6	13.1′	60.8′
19	104°46.3	13.7	131°23.0	6.4′	18°15.5	13.2′	60.9′
20	119°46.5	12.8	145°48.5	6.5′	18°02.3	13.3′	60.9′
21	134°46.6	·· 11.9	160°14.0	6.6′	17°49.0	13.5′	60.9′
22	149°46.8	11.0	174°39.6	6.7′	17°35.5	13.6′	60.9′
23	164°47.0	10.1	189°05.2	6.7′	17°21.9	13.7′	60.9′
	SD = 15.8′	d = 0.9′		SD = 16.5′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°47.2	N09°09.2	203°31.0	6.8′	N17°08.2	13.8′	60.9′
1	194°47.4	08.3	217°56.8	6.9′	16°54.4	13.9′	60.9′
2	209°47.6	07.4	232°22.7	7.0′	16°40.5	14.0′	60.9′
3	224°47.8	·· 06.5	246°48.7	7.1′	16°26.5	14.2′	60.9′
4	239°48.0	05.6	261°14.8	7.1′	16°12.3	14.2′	60.9′
5	254°48.2	04.8	275°40.9	7.2′	15°58.1	14.3′	60.9′
6	269°48.3	N09°03.9	290°07.1	7.3′	N15°43.8	14.5′	60.9′
7	284°48.5	03.0	304°33.4	7.4′	15°29.3	14.5′	60.9′
8	299°48.7	02.1	318°59.8	7.5′	15°14.8	14.7′	61.0′
9	314°48.9	·· 01.2	333°26.2	7.5′	15°00.1	14.7′	61.0′
10	329°49.1	09°00.3	347°52.8	7.6′	14°45.4	14.9′	61.0′
11	344°49.3	08°59.4	2°19.4	7.7′	14°30.5	14.9′	61.0′
12	359°49.5	N08°58.5	16°46.0	7.8′	N14°15.6	15.0′	61.0′
13	14°49.7	57.6	31°12.8	7.8′	14°00.6	15.1′	61.0′
14	29°49.9	56.7	45°39.6	7.9′	13°45.5	15.2′	61.0′
15	44°50.1	·· 55.8	60°06.5	8.0′	13°30.3	15.3′	61.0′
16	59°50.3	54.9	74°33.5	8.1′	13°15.0	15.4′	61.0′
17	74°50.4	54.0	89°00.6	8.1′	12°59.6	15.4′	61.0′
18	89°50.6	N08°53.1	103°27.7	8.2′	N12°44.2	15.5′	61.0′
19	104°50.8	52.2	117°54.9	8.3′	12°28.7	15.6′	61.0′
20	119°51.0	51.3	132°22.2	8.3′	12°13.1	15.7′	61.0′
21	134°51.2	·· 50.4	146°49.5	8.4′	11°57.4	15.7′	61.0′
22	149°51.4	49.5	161°16.9	8.5′	11°41.7	15.8′	61.0′
23	164°51.6	48.6	175°44.4	8.5′	11°25.9	15.9′	61.0′
	SD = 15.8′	d = 0.9′		SD = 16.6′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.8	N08°47.7	190°11.9	8.6′	N11°10.0	16.0′	60.9′
1	194°52.0	46.8	204°39.5	8.7′	10°54.0	16.0′	60.9′
2	209°52.2	45.9	219°07.2	8.7′	10°38.0	16.0′	60.9′
3	224°52.4	·· 45.0	233°35.0	8.8′	10°22.0	16.1′	60.9′
4	239°52.6	44.1	248°02.8	8.9′	10°05.9	16.2′	60.9′
5	254°52.8	43.2	262°30.7	8.9′	09°49.7	16.3′	60.9′
6	269°52.9	N08°42.3	276°58.6	9.0′	N09°33.4	16.3′	60.9′
7	284°53.1	41.4	291°26.6	9.1′	09°17.1	16.3′	60.9′
8	299°53.3	40.5	305°54.7	9.1′	09°00.8	16.4′	60.9′
9	314°53.5	·· 39.6	320°22.8	9.2′	08°44.4	16.4′	60.9′
10	329°53.7	38.7	334°51.0	9.2′	08°28.0	16.5′	60.9′
11	344°53.9	37.8	349°19.2	9.3′	08°11.5	16.5′	60.9′
12	359°54.1	N08°36.9	3°47.5	9.4′	N07°55.0	16.6′	60.9′
13	14°54.3	36.0	18°15.9	9.4′	07°38.4	16.6′	60.8′
14	29°54.5	35.1	32°44.3	9.5′	07°21.8	16.6′	60.8′
15	44°54.7	·· 34.2	47°12.8	9.5′	07°05.2	16.7′	60.8′
16	59°54.9	33.3	61°41.3	9.6′	06°48.5	16.7′	60.8′
17	74°55.1	32.4	76°09.9	9.6′	06°31.8	16.7′	60.8′
18	89°55.3	N08°31.5	90°38.5	9.7′	N06°15.1	16.8′	60.8′
19	104°55.5	30.6	105°07.2	9.7′	05°58.3	16.7′	60.8′
20	119°55.7	29.7	119°36.0	9.8′	05°41.6	16.9′	60.8′
21	134°55.9	·· 28.8	134°04.8	9.8′	05°24.7	16.8′	60.7′
22	149°56.1	27.9	148°33.6	9.9′	05°07.9	16.8′	60.7′
23	164°56.3	27.0	163°02.5	9.9′	04°51.1	16.9′	60.7′
	SD = 15.8′	d = 0.9′		SD = 16.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:14	03:50	20:08	21:41	////
N 70°	////	02:46	04:05	19:53	21:10	////
68°	01:06	03:10	04:18	19:41	20:48	22:44
66°	01:55	03:28	04:28	19:32	20:31	22:01
64°	02:25	03:42	04:36	19:23	20:17	21:33
62°	02:46	03:54	04:43	19:16	20:05	21:12
60°	03:04	04:04	04:49	19:10	19:56	20:55
N 58°	03:18	04:12	04:55	19:05	19:47	20:42
56°	03:29	04:20	05:00	19:00	19:40	20:30
54°	03:39	04:26	05:04	18:56	19:34	20:20
52°	03:48	04:32	05:08	18:52	19:28	20:12
50°	03:56	04:38	05:12	18:49	19:23	20:04
45°	04:12	04:49	05:19	18:41	19:12	19:48
N 40°	04:24	04:58	05:26	18:35	19:03	19:36
35°	04:34	05:05	05:31	18:30	18:56	19:26
30°	04:42	05:11	05:36	18:25	18:50	19:18
20°	04:55	05:21	05:44	18:17	18:40	19:06
N 10°	05:05	05:30	05:51	18:10	18:32	18:56
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:43	06:04	17:58	18:19	18:44
20°	05:23	05:48	06:11	17:51	18:13	18:39
30°	05:26	05:54	06:18	17:44	18:08	18:36
35°	05:27	05:57	06:22	17:40	18:05	18:35
40°	05:28	06:00	06:27	17:35	18:02	18:34
45°	05:29	06:03	06:33	17:29	17:59	18:33
S 50°	05:29	06:07	06:39	17:23	17:56	18:33
52°	05:29	06:08	06:42	17:20	17:54	18:33
54°	05:29	06:10	06:46	17:17	17:53	18:33
56°	05:29	06:12	06:49	17:13	17:51	18:34
58°	05:28	06:14	06:53	17:09	17:49	18:34
S 60°	05:28	06:16	06:58	17:05	17:47	18:35

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	23:43	·· ··	03:13	21:27	19:55	19:12
N 70°	▭	00:43	03:30	20:25	19:35	19:04
68°	▭	01:18	03:44	19:49	19:19	18:58
66°	·· ··	01:42	03:55	19:23	19:06	18:52
64°	·· ··	02:01	04:04	19:03	18:55	18:48
62°	00:15	02:16	04:12	18:46	18:45	18:43
60°	00:37	02:29	04:19	18:32	18:37	18:40
N 58°	00:54	02:40	04:25	18:20	18:30	18:37
56°	01:08	02:50	04:30	18:10	18:23	18:34
54°	01:21	02:58	04:34	18:00	18:18	18:31
52°	01:32	03:06	04:39	17:52	18:12	18:29
50°	01:42	03:12	04:42	17:45	18:08	18:27
45°	02:02	03:27	04:51	17:28	17:57	18:22
N 40°	02:19	03:38	04:57	17:15	17:49	18:18
35°	02:32	03:48	05:03	17:04	17:41	18:15
30°	02:44	03:57	05:08	16:54	17:35	18:11
20°	03:05	04:12	05:17	16:37	17:23	18:06
N 10°	03:23	04:25	05:25	16:21	17:13	18:01
0°	03:39	04:37	05:32	16:07	17:03	17:57
S 10°	03:56	04:49	05:39	15:53	16:54	17:52
20°	04:13	05:02	05:47	15:37	16:43	17:47
30°	04:33	05:17	05:55	15:19	16:31	17:41
35°	04:45	05:25	06:00	15:09	16:24	17:38
40°	04:58	05:35	06:06	14:56	16:16	17:34
45°	05:14	05:46	06:12	14:42	16:07	17:30
S 50°	05:33	05:59	06:20	14:24	15:55	17:24
52°	05:42	06:05	06:23	14:16	15:50	17:22
54°	05:52	06:12	06:27	14:06	15:44	17:19
56°	06:04	06:20	06:31	13:56	15:37	17:16
58°	06:17	06:28	06:36	13:43	15:30	17:13
S 60°	06:32	06:38	06:41	13:29	15:21	17:09

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 27-0 11-1%
29	01:09	01:00	12:01	09:53	22:22	
30	00:51	00:42	12:01	10:50	23:18	
31	00:33	00:24	12:00	11:44	–:–	

September 01, 02, 03 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	339°56.3	174°16.1	N07°39.6	132°47.6	S11°28.1	180°04.6	N09°28.9	313°28.5	N08°03.7
1	354°58.7	189°15.7	38.4	147°48.5	28.7	195°06.6	28.7	328°31.0	03.6
2	10°01.2	204°15.3	37.2	162°49.4	29.3	210°08.5	28.5	343°33.6	03.6
3	25°03.7	219°14.9	·· 36.0	177°50.4	·· 29.9	225°10.5	·· 28.3	358°36.1	·· 03.5
4	40°06.1	234°14.5	34.8	192°51.3	30.6	240°12.4	28.1	13°38.7	03.5
5	55°08.6	249°14.0	33.6	207°52.2	31.2	255°14.4	27.9	28°41.2	03.5
6	70°11.1	264°13.6	N07°32.4	222°53.1	S11°31.8	270°16.3	N09°27.7	43°43.8	N08°03.4
7	85°13.5	279°13.2	31.2	237°54.0	32.4	285°18.3	27.5	58°46.3	03.4
8	100°16.0	294°12.8	30.0	252°54.9	33.0	300°20.2	27.3	73°48.9	03.3
9	115°18.5	309°12.4	·· 28.8	267°55.9	·· 33.6	315°22.2	·· 27.1	88°51.4	·· 03.3
10	130°20.9	324°12.0	27.6	282°56.8	34.2	330°24.2	26.9	103°54.0	03.2
11	145°23.4	339°11.5	26.4	297°57.7	34.8	345°26.1	26.7	118°56.5	03.2
12	160°25.8	354°11.1	N07°25.2	312°58.6	S11°35.4	0°28.1	N09°26.5	133°59.1	N08°03.2
13	175°28.3	9°10.7	24.0	327°59.5	36.0	15°30.0	26.3	149°01.6	03.1
14	190°30.8	24°10.3	22.8	343°00.5	36.6	30°32.0	26.1	164°04.2	03.1
15	205°33.2	39°09.9	·· 21.6	358°01.4	·· 37.2	45°33.9	·· 25.9	179°06.7	·· 03.0
16	220°35.7	54°09.5	20.4	13°02.3	37.8	60°35.9	25.7	194°09.3	03.0
17	235°38.2	69°09.0	19.2	28°03.2	38.4	75°37.8	25.5	209°11.8	02.9
18	250°40.6	84°08.6	N07°18.0	43°04.1	S11°39.0	90°39.8	N09°25.3	224°14.4	N08°02.9
19	265°43.1	99°08.2	16.8	58°05.0	39.6	105°41.7	25.1	239°16.9	02.8
20	280°45.6	114°07.8	15.6	73°05.9	40.2	120°43.7	24.9	254°19.5	02.8
21	295°48.0	129°07.4	·· 14.4	88°06.9	·· 40.8	135°45.6	·· 24.7	269°22.0	·· 02.8
22	310°50.5	144°07.0	13.2	103°07.8	41.4	150°47.6	24.5	284°24.6	02.7
23	325°53.0	159°06.6	12.0	118°08.7	42.0	165°49.5	24.3	299°27.2	02.7
Mer.pass. 01:20		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.34	ν 2.0′	d 0.2′ m -1.70	ν 2.5′	d 0.0′ m 0.32

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	340°55.4	174°06.1	N07°10.7	133°09.6	S11°42.6	180°51.5	N09°24.1	314°29.7	N08°02.6
1	355°57.9	189°05.7	09.5	148°10.5	43.2	195°53.4	23.9	329°32.3	02.6
2	11°00.3	204°05.3	08.3	163°11.4	43.8	210°55.4	23.7	344°34.8	02.5
3	26°02.8	219°04.9	·· 07.1	178°12.3	·· 44.4	225°57.3	·· 23.5	359°37.4	·· 02.5
4	41°05.3	234°04.5	05.9	193°13.3	45.0	240°59.3	23.3	14°39.9	02.5
5	56°07.7	249°04.1	04.7	208°14.2	45.6	256°01.2	23.1	29°42.5	02.4
6	71°10.2	264°03.7	N07°03.5	223°15.1	S11°46.2	271°03.2	N09°22.9	44°45.0	N08°02.4
7	86°12.7	279°03.3	02.3	238°16.0	46.8	286°05.2	22.7	59°47.6	02.3
8	101°15.1	294°02.9	07°01.1	253°16.9	47.4	301°07.1	22.5	74°50.1	02.3
9	116°17.6	309°02.4	06°59.9	268°17.8	·· 48.0	316°09.1	·· 22.3	89°52.7	·· 02.2
10	131°20.1	324°02.0	58.6	283°18.7	48.7	331°11.0	22.1	104°55.2	02.2
11	146°22.5	339°01.6	57.4	298°19.6	49.3	346°13.0	21.9	119°57.8	02.1
12	161°25.0	354°01.2	N06°56.2	313°20.5	S11°49.9	1°14.9	N09°21.7	135°00.3	N08°02.1
13	176°27.4	9°00.8	55.0	328°21.5	50.5	16°16.9	21.5	150°02.9	02.1
14	191°29.9	24°00.4	53.8	343°22.4	51.1	31°18.8	21.3	165°05.5	02.0
15	206°32.4	39°00.0	·· 52.6	358°23.3	·· 51.7	46°20.8	·· 21.1	180°08.0	·· 02.0
16	221°34.8	53°59.6	51.4	13°24.2	52.3	61°22.7	20.9	195°10.6	01.9
17	236°37.3	68°59.2	50.2	28°25.1	52.9	76°24.7	20.6	210°13.1	01.9
18	251°39.8	83°58.8	N06°48.9	43°26.0	S11°53.5	91°26.6	N09°20.4	225°15.7	N08°01.8
19	266°42.2	98°58.3	47.7	58°26.9	54.1	106°28.6	20.2	240°18.2	01.8
20	281°44.7	113°57.9	46.5	73°27.8	54.7	121°30.5	20.0	255°20.8	01.7
21	296°47.2	128°57.5	·· 45.3	88°28.7	·· 55.3	136°32.5	·· 19.8	270°23.3	·· 01.7
22	311°49.6	143°57.1	44.1	103°29.6	55.9	151°34.4	19.6	285°25.9	01.7
23	326°52.1	158°56.7	42.9	118°30.5	56.5	166°36.4	19.4	300°28.5	01.6
Mer.pass. 01:16		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.0′ m 0.32

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	341°54.6	173°56.3	N06°41.7	133°31.5	S11°57.1	181°38.4	N09°19.2	315°31.0	N08°01.6
1	356°57.0	188°55.9	40.4	148°32.4	57.7	196°40.3	19.0	330°33.6	01.5
2	11°59.5	203°55.5	39.2	163°33.3	58.3	211°42.3	18.8	345°36.1	01.5
3	27°01.9	218°55.1	·· 38.0	178°34.2	·· 58.9	226°44.2	·· 18.6	0°38.7	·· 01.4
4	42°04.4	233°54.7	36.8	193°35.1	11°59.5	241°46.2	18.4	15°41.2	01.4
5	57°06.9	248°54.3	35.6	208°36.0	12°00.1	256°48.1	18.2	30°43.8	01.3
6	72°09.3	263°53.9	N06°34.4	223°36.9	S12°00.7	271°50.1	N09°18.0	45°46.3	N08°01.3
7	87°11.8	278°53.5	33.1	238°37.8	01.3	286°52.0	17.8	60°48.9	01.3
8	102°14.3	293°53.1	31.9	253°38.7	01.9	301°54.0	17.6	75°51.5	01.2
9	117°16.7	308°52.7	·· 30.7	268°39.6	·· 02.5	316°55.9	·· 17.4	90°54.0	·· 01.2
10	132°19.2	323°52.3	29.5	283°40.5	03.1	331°57.9	17.2	105°56.6	01.1
11	147°21.7	338°51.8	28.3	298°41.4	03.7	346°59.8	17.0	120°59.1	01.1
12	162°24.1	353°51.4	N06°27.0	313°42.3	S12°04.3	2°01.8	N09°16.8	136°01.7	N08°01.0
13	177°26.6	8°51.0	25.8	328°43.2	04.9	17°03.7	16.6	151°04.3	01.0
14	192°29.0	23°50.6	24.6	343°44.1	05.5	32°05.7	16.4	166°06.8	00.9
15	207°31.5	38°50.2	·· 23.4	358°45.0	·· 06.1	47°07.6	·· 16.2	181°09.4	·· 00.9
16	222°34.0	53°49.8	22.2	13°45.9	06.7	62°09.6	16.0	196°11.9	00.8
17	237°36.4	68°49.4	20.9	28°46.8	07.3	77°11.6	15.8	211°14.5	00.8
18	252°38.9	83°49.0	N06°19.7	43°47.7	S12°07.9	92°13.5	N09°15.6	226°17.0	N08°00.8
19	267°41.4	98°48.6	18.5	58°48.6	08.5	107°15.5	15.4	241°19.6	00.7
20	282°43.8	113°48.2	17.3	73°49.5	09.1	122°17.4	15.2	256°22.2	00.7
21	297°46.3	128°47.8	·· 16.1	88°50.4	·· 09.7	137°19.4	·· 15.0	271°24.7	·· 00.6
22	312°48.8	143°47.4	14.8	103°51.3	10.3	152°21.3	14.8	286°27.3	00.6
23	327°51.2	158°47.0	13.6	118°52.3	10.9	167°23.3	14.6	301°29.8	00.5
Mer.pass. 01:12		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.0′ m 0.31

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.7
Ankaa	353°04.6	-42°09.0
Schedar	349°28.0	56°41.4
Diphda	348°44.8	-17°49.8
Achernar	335°18.2	-57°05.4
Hamal	327°48.5	23°35.7
Polaris	312°41.9	89°22.5
Acamar	315°10.0	-40°11.3
Menkar	314°03.7	4°12.0
Mirfak	308°24.9	49°57.4
Aldebaran	290°37.1	16°33.9
Rigel	281°01.8	-8°10.0
Capella	280°18.7	46°01.4
Bellatrix	278°20.6	6°22.6
Elnath	277°59.2	28°37.8
Alnilam	275°35.6	-1°10.9
Betelgeuse	270°49.8	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°24.5	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°48.8	5°09.3
Pollux	243°14.9	27°57.5
Avior	234°14.4	-59°35.7
Suhail	222°45.1	-43°32.5
Miaplacidus	221°38.6	-69°49.7
Alphard	217°45.9	-8°46.7
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.1
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.3
Gacrux	171°49.7	-57°16.2
Alioth	166°11.5	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.6	49°10.7
Hadar	148°33.2	-60°30.6
Menkent	147°55.2	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.6	-60°57.2
Kochab	137°20.4	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.1	-26°29.6
Atria	107°05.3	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°41.0	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.8	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.3
Al Na'ir	27°29.7	-46°49.5
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 01 Wed	SHA	Mer.pass
Venus	194°19.9	12:23
Mars	152°51.3	15:08
Jupiter	200°08.3	11:58
Saturn	333°32.2	03:06

Sep 02 Thu	SHA	Mer.pass
Venus	193°10.7	12:24
Mars	152°14.2	15:06
Jupiter	199°56.1	11:55
Saturn	333°34.3	03:02

Sep 03 Fri	SHA	Mer.pass
Venus	192°01.8	12:25
Mars	151°36.9	15:05
Jupiter	199°43.8	11:52
Saturn	333°36.5	02:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0707 sec ΔT = TT-UT1 = +69.2547 sec

2027 September 01 to Sep. 03 UT

h

Wed	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°56.4	N08°26.1	177°31.4	10.0′	N04°34.2	16.9′	60.7′
1	194°56.6	25.2	192°00.4	10.0′	04°17.3	16.9′	60.7′
2	209°56.8	24.3	206°29.4	10.1′	04°00.4	16.9′	60.7′
3	224°57.0	·· 23.4	220°58.5	10.1′	03°43.5	16.9′	60.6′
4	239°57.2	22.5	235°27.6	10.1′	03°26.6	17.0′	60.6′
5	254°57.4	21.6	249°56.7	10.2′	03°09.6	16.9′	60.6′
6	269°57.6	N08°20.7	264°25.9	10.2′	N02°52.7	16.9′	60.6′
7	284°57.8	19.8	278°55.1	10.3′	02°35.8	17.0′	60.6′
8	299°58.0	18.9	293°24.4	10.3′	02°18.8	16.9′	60.5′
9	314°58.2	·· 17.9	307°53.7	10.3′	02°01.9	17.0′	60.5′
10	329°58.4	17.0	322°23.0	10.4′	01°44.9	16.9′	60.5′
11	344°58.6	16.1	336°52.3	10.4′	01°28.0	17.0′	60.5′
12	359°58.8	N08°15.2	351°21.7	10.4′	N01°11.0	16.9′	60.5′
13	14°59.0	14.3	5°51.2	10.5′	00°54.1	16.9′	60.4′
14	29°59.2	13.4	20°20.6	10.5′	00°37.2	16.9′	60.4′
15	44°59.4	·· 12.5	34°50.1	10.5′	00°20.3	16.9′	60.4′
16	59°59.6	11.6	49°19.6	10.5′	N00°03.4	16.9′	60.4′
17	74°59.8	10.7	63°49.2	10.6′	S00°13.5	16.9′	60.3′
18	90°00.0	N08°09.8	78°18.8	10.6′	S00°30.4	16.8′	60.3′
19	105°00.2	08.9	92°48.4	10.6′	00°47.2	16.9′	60.3′
20	120°00.4	08.0	107°18.0	10.6′	01°04.1	16.8′	60.3′
21	135°00.6	·· 07.1	121°47.6	10.7′	01°20.9	16.8′	60.2′
22	150°00.8	06.1	136°17.3	10.7′	01°37.7	16.7′	60.2′
23	165°01.0	05.2	150°47.0	10.7′	01°54.4	16.8′	60.2′
	SD = 15.8′	d = 0.9′		SD = 16.6′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°01.2	N08°04.3	165°16.7	10.7′	S02°11.2	16.7′	60.2′
1	195°01.4	03.4	179°46.4	10.7′	02°27.9	16.7′	60.1′
2	210°01.6	02.5	194°16.2	10.8′	02°44.6	16.6′	60.1′
3	225°01.8	·· 01.6	208°45.9	10.8′	03°01.2	16.6′	60.1′
4	240°02.0	08°00.7	223°15.7	10.8′	03°17.8	16.6′	60.0′
5	255°02.2	07°59.8	237°45.5	10.8′	03°34.4	16.6′	60.0′
6	270°02.4	N07°58.9	252°15.3	10.8′	S03°51.0	16.5′	60.0′
7	285°02.6	58.0	266°45.1	10.8′	04°07.5	16.5′	60.0′
8	300°02.8	57.0	281°15.0	10.8′	04°24.0	16.4′	59.9′
9	315°03.0	·· 56.1	295°44.8	10.9′	04°40.4	16.4′	59.9′
10	330°03.2	55.2	310°14.7	10.9′	04°56.8	16.3′	59.9′
11	345°03.4	54.3	324°44.5	10.9′	05°13.1	16.3′	59.8′
12	0°03.6	N07°53.4	339°14.4	10.9′	S05°29.4	16.2′	59.8′
13	15°03.8	52.5	353°44.2	10.9′	05°45.6	16.2′	59.8′
14	30°04.0	51.6	8°14.1	10.9′	06°01.8	16.2′	59.7′
15	45°04.2	·· 50.7	22°44.0	10.9′	06°18.0	16.1′	59.7′
16	60°04.4	49.7	37°13.9	10.9′	06°34.1	16.0′	59.7′
17	75°04.6	48.8	51°43.8	10.9′	06°50.1	16.0′	59.6′
18	90°04.8	N07°47.9	66°13.7	10.9′	S07°06.1	15.9′	59.6′
19	105°05.0	47.0	80°43.6	10.9′	07°22.0	15.9′	59.6′
20	120°05.2	46.1	95°13.5	10.9′	07°37.9	15.8′	59.5′
21	135°05.4	·· 45.2	109°43.3	10.9′	07°53.7	15.8′	59.5′
22	150°05.6	44.3	124°13.2	10.9′	08°09.5	15.6′	59.5′
23	165°05.8	43.3	138°43.1	10.9′	08°25.1	15.7′	59.4′
	SD = 15.8′	d = 0.9′		SD = 16.4′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°06.0	N07°42.4	153°13.0	10.9′	S08°40.8	15.5′	59.4′
1	195°06.2	41.5	167°42.9	10.9′	08°56.3	15.5′	59.4′
2	210°06.4	40.6	182°12.7	10.9′	09°11.8	15.4′	59.3′
3	225°06.6	·· 39.7	196°42.6	10.9′	09°27.2	15.4′	59.3′
4	240°06.8	38.8	211°12.4	10.8′	09°42.6	15.3′	59.3′
5	255°07.0	37.9	225°42.3	10.8′	09°57.9	15.2′	59.2′
6	270°07.2	N07°36.9	240°12.1	10.8′	S10°13.1	15.1′	59.2′
7	285°07.4	36.0	254°42.0	10.8′	10°28.2	15.1′	59.2′
8	300°07.6	35.1	269°11.8	10.8′	10°43.3	14.9′	59.1′
9	315°07.8	·· 34.2	283°41.6	10.8′	10°58.2	15.0′	59.1′
10	330°08.0	33.3	298°11.4	10.8′	11°13.2	14.8′	59.0′
11	345°08.2	32.4	312°41.1	10.8′	11°28.0	14.7′	59.0′
12	0°08.4	N07°31.4	327°10.9	10.8′	S11°42.7	14.7′	59.0′
13	15°08.6	30.5	341°40.7	10.7′	11°57.4	14.6′	58.9′
14	30°08.8	29.6	356°10.4	10.7′	12°12.0	14.5′	58.9′
15	45°09.0	·· 28.7	10°40.1	10.7′	12°26.5	14.4′	58.9′
16	60°09.2	27.8	25°09.8	10.7′	12°40.9	14.3′	58.8′
17	75°09.4	26.8	39°39.5	10.7′	12°55.2	14.2′	58.8′
18	90°09.6	N07°25.9	54°09.2	10.6′	S13°09.4	14.2′	58.7′
19	105°09.9	25.0	68°38.8	10.6′	13°23.6	14.0′	58.7′
20	120°10.1	24.1	83°08.4	10.6′	13°37.6	14.0′	58.7′
21	135°10.3	·· 23.2	97°38.1	10.6′	13°51.6	13.9′	58.6′
22	150°10.5	22.2	112°07.6	10.6′	14°05.5	13.8′	58.6′
23	165°10.7	21.3	126°37.2	10.5′	14°19.3	13.7′	58.6′
	SD = 15.8′	d = 0.9′		SD = 16.2′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:36	04:05	19:51	21:17	////
N 70°	////	03:03	04:18	19:38	20:52	23:21
68°	01:38	03:24	04:29	19:28	20:33	22:14
66°	02:14	03:39	04:37	19:20	20:17	21:40
64°	02:39	03:52	04:45	19:13	20:05	21:17
62°	02:58	04:03	04:51	19:07	19:55	20:58
60°	03:13	04:12	04:57	19:01	19:46	20:43
N 58°	03:26	04:19	05:01	18:57	19:38	20:31
56°	03:37	04:26	05:06	18:53	19:32	20:21
54°	03:46	04:32	05:09	18:49	19:26	20:12
52°	03:54	04:38	05:13	18:46	19:21	20:04
50°	04:01	04:42	05:16	18:42	19:16	19:57
45°	04:16	04:52	05:23	18:36	19:06	19:42
N 40°	04:28	05:01	05:28	18:30	18:58	19:31
35°	04:37	05:07	05:33	18:26	18:52	19:22
30°	04:44	05:13	05:37	18:22	18:46	19:15
20°	04:56	05:22	05:45	18:15	18:37	19:03
N 10°	05:05	05:30	05:51	18:09	18:30	18:55
0°	05:11	05:36	05:56	18:03	18:24	18:48
S 10°	05:16	05:41	06:02	17:58	18:19	18:43
20°	05:20	05:46	06:08	17:52	18:14	18:40
30°	05:23	05:50	06:15	17:45	18:09	18:37
35°	05:23	05:53	06:18	17:42	18:07	18:37
40°	05:24	05:55	06:22	17:38	18:05	18:36
45°	05:24	05:58	06:27	17:33	18:02	18:36
S 50°	05:23	06:01	06:33	17:27	18:00	18:37
52°	05:23	06:02	06:36	17:25	17:59	18:38
54°	05:22	06:03	06:38	17:22	17:58	18:39
56°	05:21	06:04	06:42	17:19	17:56	18:39
58°	05:20	06:06	06:45	17:15	17:55	18:40
S 60°	05:19	06:07	06:49	17:12	17:54	18:42

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	05:48	08:13	10:45	18:38	18:03	17:18
N 70°	05:52	08:06	10:24	18:39	18:13	17:42
68°	05:55	08:01	10:07	18:40	18:21	18:00
66°	05:58	07:56	09:54	18:40	18:28	18:15
64°	06:00	07:52	09:44	18:41	18:34	18:27
62°	06:02	07:49	09:35	18:41	18:39	18:38
60°	06:04	07:46	09:27	18:42	18:44	18:47
N 58°	06:05	07:43	09:20	18:42	18:48	18:55
56°	06:07	07:41	09:14	18:43	18:52	19:02
54°	06:08	07:39	09:09	18:43	18:55	19:08
52°	06:09	07:37	09:04	18:44	18:58	19:14
50°	06:10	07:36	09:00	18:44	19:01	19:19
45°	06:12	07:32	08:50	18:44	19:07	19:30
N 40°	06:14	07:29	08:43	18:45	19:12	19:39
35°	06:16	07:27	08:36	18:45	19:16	19:47
30°	06:17	07:24	08:30	18:46	19:20	19:54
20°	06:20	07:21	08:20	18:47	19:26	20:07
N 10°	06:22	07:17	08:12	18:47	19:32	20:18
0°	06:24	07:14	08:04	18:48	19:38	20:28
S 10°	06:26	07:11	07:56	18:48	19:43	20:38
20°	06:28	07:08	07:48	18:49	19:49	20:49
30°	06:30	07:04	07:38	18:49	19:56	21:02
35°	06:32	07:02	07:33	18:50	20:00	21:09
40°	06:33	07:00	07:27	18:50	20:04	21:17
45°	06:35	06:57	07:20	18:51	20:10	21:27
S 50°	06:37	06:54	07:11	18:51	20:16	21:39
52°	06:39	06:53	07:08	18:51	20:19	21:45
54°	06:40	06:51	07:03	18:52	20:22	21:51
56°	06:41	06:50	06:59	18:52	20:25	21:58
58°	06:42	06:48	06:54	18:52	20:29	22:05
S 60°	06:44	06:46	06:48	18:52	20:34	22:14

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 0-7%
01	00:14	00:05	12:00	12:36	00:10	
02	00:05	00:14	12:00	13:26	01:01	
03	00:24	00:34	11:59	14:16	01:51	



September 04, 05, 06 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	342°53.7	173°46.6	N06°12.4	133°53.2	S12°11.5	182°25.2	N09°14.4	316°32.4	N08°00.5
1	357°56.2	188°46.2	11.2	148°54.1	12.1	197°27.2	14.2	331°35.0	00.4
2	12°58.6	203°45.8	09.9	163°55.0	12.7	212°29.1	14.0	346°37.5	00.4
3	28°01.1	218°45.4	·· 08.7	178°55.9	·· 13.3	227°31.1	·· 13.8	1°40.1	·· 00.3
4	43°03.5	233°45.0	07.5	193°56.8	13.9	242°33.0	13.6	16°42.6	00.3
5	58°06.0	248°44.6	06.3	208°57.7	14.5	257°35.0	13.4	31°45.2	00.2
6	73°08.5	263°44.2	N06°05.0	223°58.6	S12°15.0	272°36.9	N09°13.2	46°47.8	N08°00.2
7	88°10.9	278°43.8	03.8	238°59.5	15.6	287°38.9	13.0	61°50.3	00.2
8	103°13.4	293°43.4	02.6	254°00.4	16.2	302°40.9	12.8	76°52.9	00.1
9	118°15.9	308°43.0	·· 01.4	269°01.2	·· 16.8	317°42.8	·· 12.6	91°55.4	·· 00.1
10	133°18.3	323°42.6	06°00.1	284°02.1	17.4	332°44.8	12.4	106°58.0	00.0
11	148°20.8	338°42.2	05°58.9	299°03.0	18.0	347°46.7	12.2	122°00.6	08°00.0
12	163°23.3	353°41.8	N05°57.7	314°03.9	S12°18.6	2°48.7	N09°12.0	137°03.1	N07°59.9
13	178°25.7	8°41.4	56.5	329°04.8	19.2	17°50.6	11.8	152°05.7	59.9
14	193°28.2	23°41.0	55.2	344°05.7	19.8	32°52.6	11.6	167°08.3	59.8
15	208°30.7	38°40.6	·· 54.0	359°06.6	·· 20.4	47°54.5	·· 11.4	182°10.8	·· 59.8
16	223°33.1	53°40.2	52.8	14°07.5	21.0	62°56.5	11.2	197°13.4	59.7
17	238°35.6	68°39.8	51.5	29°08.4	21.6	77°58.4	11.0	212°15.9	59.7
18	253°38.0	83°39.4	N05°50.3	44°09.3	S12°22.2	93°00.4	N09°10.8	227°18.5	N07°59.6
19	268°40.5	98°39.0	49.1	59°10.2	22.8	108°02.3	10.6	242°21.1	59.6
20	283°43.0	113°38.6	47.9	74°11.1	23.4	123°04.3	10.4	257°23.6	59.5
21	298°45.4	128°38.2	·· 46.6	89°12.0	·· 24.0	138°06.2	·· 10.2	272°26.2	·· 59.5
22	313°47.9	143°37.8	45.4	104°12.9	24.6	153°08.2	10.0	287°28.8	59.4
23	328°50.4	158°37.4	44.2	119°13.8	25.2	168°10.2	09.8	302°31.3	59.4
Mer.pass. 01:08		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.0′ m 0.31

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°52.8	173°37.0	N05°42.9	134°14.7	S12°25.8	183°12.1	N09°09.6	317°33.9	N07°59.4
1	358°55.3	188°36.6	41.7	149°15.6	26.4	198°14.1	09.4	332°36.4	59.3
2	13°57.8	203°36.3	40.5	164°16.5	27.0	213°16.0	09.2	347°39.0	59.3
3	29°00.2	218°35.9	·· 39.2	179°17.4	·· 27.6	228°18.0	·· 09.0	2°41.6	·· 59.2
4	44°02.7	233°35.5	38.0	194°18.3	28.2	243°19.9	08.8	17°44.1	59.2
5	59°05.1	248°35.1	36.8	209°19.2	28.8	258°21.9	08.6	32°46.7	59.1
6	74°07.6	263°34.7	N05°35.5	224°20.1	S12°29.4	273°23.8	N09°08.4	47°49.3	N07°59.1
7	89°10.1	278°34.3	34.3	239°21.0	30.0	288°25.8	08.2	62°51.8	59.0
8	104°12.5	293°33.9	33.1	254°21.8	30.6	303°27.7	08.0	77°54.4	59.0
9	119°15.0	308°33.5	·· 31.8	269°22.7	·· 31.2	318°29.7	·· 07.8	92°57.0	·· 58.9
10	134°17.5	323°33.1	30.6	284°23.6	31.7	333°31.6	07.6	107°59.5	58.9
11	149°19.9	338°32.7	29.4	299°24.5	32.3	348°33.6	07.4	123°02.1	58.8
12	164°22.4	353°32.3	N05°28.1	314°25.4	S12°32.9	3°35.6	N09°07.2	138°04.7	N07°58.8
13	179°24.9	8°31.9	26.9	329°26.3	33.5	18°37.5	07.0	153°07.2	58.7
14	194°27.3	23°31.5	25.7	344°27.2	34.1	33°39.5	06.8	168°09.8	58.7
15	209°29.8	38°31.1	·· 24.4	359°28.1	·· 34.7	48°41.4	·· 06.6	183°12.4	·· 58.6
16	224°32.3	53°30.7	23.2	14°29.0	35.3	63°43.4	06.3	198°14.9	58.6
17	239°34.7	68°30.3	22.0	29°29.9	35.9	78°45.3	06.1	213°17.5	58.5
18	254°37.2	83°29.9	N05°20.7	44°30.8	S12°36.5	93°47.3	N09°05.9	228°20.0	N07°58.5
19	269°39.6	98°29.6	19.5	59°31.6	37.1	108°49.2	05.7	243°22.6	58.4
20	284°42.1	113°29.2	18.3	74°32.5	37.7	123°51.2	05.5	258°25.2	58.4
21	299°44.6	128°28.8	·· 17.0	89°33.4	·· 38.3	138°53.1	·· 05.3	273°27.7	·· 58.3
22	314°47.0	143°28.4	15.8	104°34.3	38.9	153°55.1	05.1	288°30.3	58.3
23	329°49.5	158°28.0	14.6	119°35.2	39.5	168°57.0	04.9	303°32.9	58.3
Mer.pass. 01:04		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.0′ m 0.30

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°52.0	173°27.6	N05°13.3	134°36.1	S12°40.1	183°59.0	N09°04.7	318°35.4	N07°58.2
1	359°54.4	188°27.2	12.1	149°37.0	40.7	199°01.0	04.5	333°38.0	58.2
2	14°56.9	203°26.8	10.8	164°37.9	41.3	214°02.9	04.3	348°40.6	58.1
3	29°59.4	218°26.4	·· 09.6	179°38.8	·· 41.8	229°04.9	·· 04.1	3°43.1	·· 58.1
4	45°01.8	233°26.0	08.4	194°39.6	42.4	244°06.8	03.9	18°45.7	58.0
5	60°04.3	248°25.6	07.1	209°40.5	43.0	259°08.8	03.7	33°48.3	58.0
6	75°06.8	263°25.3	N05°05.9	224°41.4	S12°43.6	274°10.7	N09°03.5	48°50.9	N07°57.9
7	90°09.2	278°24.9	04.7	239°42.3	44.2	289°12.7	03.3	63°53.4	57.9
8	105°11.7	293°24.5	03.4	254°43.2	44.8	304°14.6	03.1	78°56.0	57.8
9	120°14.1	308°24.1	·· 02.2	269°44.1	·· 45.4	319°16.6	·· 02.9	93°58.6	·· 57.8
10	135°16.6	323°23.7	05°00.9	284°45.0	46.0	334°18.5	02.7	109°01.1	57.7
11	150°19.1	338°23.3	04°59.7	299°45.8	46.6	349°20.5	02.5	124°03.7	57.7
12	165°21.5	353°22.9	N04°58.5	314°46.7	S12°47.2	4°22.4	N09°02.3	139°06.3	N07°57.6
13	180°24.0	8°22.5	57.2	329°47.6	47.8	19°24.4	02.1	154°08.8	57.6
14	195°26.5	23°22.1	56.0	344°48.5	48.4	34°26.4	01.9	169°11.4	57.5
15	210°28.9	38°21.7	·· 54.7	359°49.4	·· 49.0	49°28.3	·· 01.7	184°14.0	·· 57.5
16	225°31.4	53°21.4	53.5	14°50.3	49.6	64°30.3	01.5	199°16.5	57.4
17	240°33.9	68°21.0	52.3	29°51.2	50.1	79°32.2	01.3	214°19.1	57.4
18	255°36.3	83°20.6	N04°51.0	44°52.0	S12°50.7	94°34.2	N09°01.1	229°21.7	N07°57.3
19	270°38.8	98°20.2	49.8	59°52.9	51.3	109°36.1	00.9	244°24.2	57.3
20	285°41.2	113°19.8	48.5	74°53.8	51.9	124°38.1	00.7	259°26.8	57.2
21	300°43.7	128°19.4	·· 47.3	89°54.7	·· 52.5	139°40.0	·· 00.5	274°29.4	·· 57.2
22	315°46.2	143°19.0	46.0	104°55.6	53.1	154°42.0	00.3	289°32.0	57.1
23	330°48.6	158°18.6	44.8	119°56.5	53.7	169°43.9	00.1	304°34.5	57.1
Mer.pass. 01:00		ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.0′ m 0.30

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.7
Ankaa	353°04.6	-42°09.1
Schedar	349°28.0	56°41.4
Diphda	348°44.8	-17°49.8
Achernar	335°18.2	-57°05.4
Hamal	327°48.5	23°35.7
Polaris	312°40.3	89°22.5
Acamar	315°09.9	-40°11.3
Menkar	314°03.7	4°12.0
Mirfak	308°24.9	49°57.4
Aldebaran	290°37.1	16°33.9
Rigel	281°01.8	-8°10.0
Capella	280°18.7	46°01.4
Bellatrix	278°20.6	6°22.6
Elnath	277°59.2	28°37.8
Alnilam	275°35.6	-1°10.9
Betelgeuse	270°49.8	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°24.5	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.8	5°09.3
Pollux	243°14.9	27°57.5
Avior	234°14.3	-59°35.7
Suhail	222°45.1	-43°32.5
Miaplacidus	221°38.6	-69°49.7
Alphard	217°45.9	-8°46.7
Regulus	207°32.4	11°49.9
Dubhe	193°39.1	61°36.1
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.3
Gacrux	171°49.7	-57°16.2
Alioth	166°11.6	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.6	49°10.7
Hadar	148°33.2	-60°30.6
Menkent	147°55.3	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.6	-60°57.2
Kochab	137°20.5	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.3	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.4	12°32.6
Eltanin	90°41.0	51°29.4
Kaus Aust.	83°29.4	-34°22.3
Vega	80°31.5	38°48.8
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.8	-56°38.7
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.3
Al Na'ir	27°29.7	-46°49.5
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 04 Sat	SHA	Mer.pass
Venus	190°52.9	12:25
Mars	150°59.5	15:04
Jupiter	199°31.5	11:49
Saturn	333°38.7	02:53

Sep 05 Sun	SHA	Mer.pass
Venus	189°44.2	12:26
Mars	150°21.9	15:02
Jupiter	199°19.3	11:46
Saturn	333°41.1	02:49

Sep 06 Mon	SHA	Mer.pass
Venus	188°35.6	12:26
Mars	149°44.1	15:01
Jupiter	199°07.0	11:43
Saturn	333°43.5	02:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0713 sec ΔT = TT-UT1 = +69.2553 sec

2027 September 04 to Sep. 06 UT

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°10.9	N07°20.4	141°06.8	10.5′	S14°33.0	13.5′	58.5′
1	195°11.1	19.5	155°36.3	10.5′	14°46.5	13.5′	58.5′
2	210°11.3	18.6	170°05.8	10.5′	15°00.0	13.4′	58.4′
3	225°11.5	·· 17.6	184°35.3	10.5′	15°13.4	13.3′	58.4′
4	240°11.7	16.7	199°04.7	10.4′	15°26.7	13.2′	58.4′
5	255°11.9	15.8	213°34.1	10.4′	15°39.9	13.1′	58.3′
6	270°12.1	N07°14.9	228°03.6	10.4′	S15°53.0	13.0′	58.3′
7	285°12.3	14.0	242°32.9	10.4′	16°06.0	12.9′	58.2′
8	300°12.5	13.0	257°02.3	10.3′	16°18.9	12.8′	58.2′
9	315°12.7	·· 12.1	271°31.6	10.3′	16°31.7	12.7′	58.2′
10	330°12.9	11.2	286°00.9	10.3′	16°44.4	12.5′	58.1′
11	345°13.1	10.3	300°30.2	10.3′	16°56.9	12.5′	58.1′
12	0°13.3	N07°09.4	314°59.5	10.2′	S17°09.4	12.4′	58.0′
13	15°13.5	08.4	329°28.7	10.2′	17°21.8	12.2′	58.0′
14	30°13.8	07.5	343°57.9	10.2′	17°34.0	12.2′	58.0′
15	45°14.0	·· 06.6	358°27.0	10.1′	17°46.2	12.0′	57.9′
16	60°14.2	05.7	12°56.2	10.1′	17°58.2	11.9′	57.9′
17	75°14.4	04.7	27°25.3	10.1′	18°10.1	11.8′	57.9′
18	90°14.6	N07°03.8	41°54.4	10.1′	S18°21.9	11.7′	57.8′
19	105°14.8	02.9	56°23.4	10.0′	18°33.6	11.6′	57.8′
20	120°15.0	02.0	70°52.5	10.0′	18°45.2	11.4′	57.7′
21	135°15.2	·· 01.0	85°21.5	10.0′	18°56.6	11.4′	57.7′
22	150°15.4	07°00.1	99°50.4	9.9′	19°08.0	11.2′	57.7′
23	165°15.6	06°59.2	114°19.4	9.9′	19°19.2	11.1′	57.6′
	SD = 15.8′	d = 0.9′		SD = 16.0′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.8	N06°58.3	128°48.3	9.9′	S19°30.3	11.0′	57.6′
1	195°16.0	57.3	143°17.2	9.9′	19°41.3	10.9′	57.5′
2	210°16.2	56.4	157°46.0	9.8′	19°52.2	10.7′	57.5′
3	225°16.4	·· 55.5	172°14.9	9.8′	20°02.9	10.6′	57.5′
4	240°16.7	54.6	186°43.7	9.8′	20°13.5	10.5′	57.4′
5	255°16.9	53.6	201°12.4	9.7′	20°24.0	10.4′	57.4′
6	270°17.1	N06°52.7	215°41.2	9.7′	S20°34.4	10.3′	57.3′
7	285°17.3	51.8	230°09.9	9.7′	20°44.7	10.1′	57.3′
8	300°17.5	50.9	244°38.6	9.7′	20°54.8	10.0′	57.3′
9	315°17.7	·· 49.9	259°07.2	9.6′	21°04.8	9.9′	57.2′
10	330°17.9	49.0	273°35.8	9.6′	21°14.7	9.8′	57.2′
11	345°18.1	48.1	288°04.4	9.6′	21°24.5	9.6′	57.2′
12	0°18.3	N06°47.2	302°33.0	9.5′	S21°34.1	9.5′	57.1′
13	15°18.5	46.2	317°01.5	9.5′	21°43.6	9.4′	57.1′
14	30°18.7	45.3	331°30.1	9.5′	21°53.0	9.2′	57.0′
15	45°18.9	·· 44.4	345°58.5	9.5′	22°02.2	9.1′	57.0′
16	60°19.2	43.5	0°27.0	9.4′	22°11.3	9.0′	57.0′
17	75°19.4	42.5	14°55.4	9.4′	22°20.3	8.9′	56.9′
18	90°19.6	N06°41.6	29°23.8	9.4′	S22°29.2	8.7′	56.9′
19	105°19.8	40.7	43°52.2	9.4′	22°37.9	8.6′	56.9′
20	120°20.0	39.7	58°20.6	9.3′	22°46.5	8.4′	56.8′
21	135°20.2	·· 38.8	72°48.9	9.3′	22°54.9	8.4′	56.8′
22	150°20.4	37.9	87°17.2	9.3′	23°03.3	8.2′	56.7′
23	165°20.6	37.0	101°45.5	9.3′	23°11.5	8.0′	56.7′
	SD = 15.9′	d = 0.9′		SD = 15.7′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°20.8	N06°36.0	116°13.7	9.2′	S23°19.5	7.9′	56.7′
1	195°21.0	35.1	130°42.0	9.2′	23°27.4	7.8′	56.6′
2	210°21.3	34.2	145°10.2	9.2′	23°35.2	7.7′	56.6′
3	225°21.5	·· 33.2	159°38.4	9.2′	23°42.9	7.5′	56.6′
4	240°21.7	32.3	174°06.5	9.1′	23°50.4	7.4′	56.5′
5	255°21.9	31.4	188°34.7	9.1′	23°57.8	7.2′	56.5′
6	270°22.1	N06°30.4	203°02.8	9.1′	S24°05.0	7.1′	56.5′
7	285°22.3	29.5	217°30.9	9.1′	24°12.1	7.0′	56.4′
8	300°22.5	28.6	231°59.0	9.1′	24°19.1	6.8′	56.4′
9	315°22.7	·· 27.7	246°27.1	9.0′	24°25.9	6.7′	56.4′
10	330°22.9	26.7	260°55.1	9.0′	24°32.6	6.6′	56.3′
11	345°23.1	25.8	275°23.2	9.0′	24°39.2	6.4′	56.3′
12	0°23.4	N06°24.9	289°51.2	9.0′	S24°45.6	6.3′	56.3′
13	15°23.6	23.9	304°19.2	9.0′	24°51.9	6.1′	56.2′
14	30°23.8	23.0	318°47.1	9.0′	24°58.0	6.0′	56.2′
15	45°24.0	·· 22.1	333°15.1	9.0′	25°04.0	5.9′	56.2′
16	60°24.2	21.1	347°43.1	8.9′	25°09.9	5.7′	56.1′
17	75°24.4	20.2	2°11.0	8.9′	25°15.6	5.6′	56.1′
18	90°24.6	N06°19.3	16°38.9	8.9′	S25°21.2	5.4′	56.1′
19	105°24.8	18.3	31°06.9	8.9′	25°26.6	5.3′	56.0′
20	120°25.1	17.4	45°34.8	8.9′	25°31.9	5.1′	56.0′
21	135°25.3	·· 16.5	60°02.7	8.9′	25°37.0	5.1′	56.0′
22	150°25.5	15.5	74°30.6	8.9′	25°42.1	4.8′	55.9′
23	165°25.7	14.6	88°58.5	8.9′	25°46.9	4.8′	55.9′
	SD = 15.9′	d = 0.9′		SD = 15.5′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:57	04:20	19:35	20:56	////
N 70°	01:14	03:19	04:31	19:24	20:34	22:33
68°	02:02	03:37	04:40	19:15	20:18	21:50
66°	02:31	03:51	04:47	19:08	20:04	21:22
64°	02:52	04:02	04:54	19:02	19:53	21:02
62°	03:09	04:11	04:59	18:57	19:44	20:45
60°	03:23	04:19	05:04	18:52	19:36	20:32
N 58°	03:34	04:26	05:08	18:48	19:29	20:21
56°	03:44	04:33	05:11	18:45	19:23	20:11
54°	03:53	04:38	05:15	18:42	19:18	20:03
52°	04:00	04:43	05:18	18:39	19:13	19:56
50°	04:07	04:47	05:20	18:36	19:09	19:49
45°	04:20	04:56	05:26	18:30	19:00	19:36
N 40°	04:31	05:04	05:31	18:26	18:53	19:26
35°	04:39	05:10	05:35	18:22	18:47	19:18
30°	04:46	05:15	05:39	18:18	18:42	19:11
20°	04:57	05:23	05:45	18:12	18:34	19:00
N 10°	05:05	05:29	05:51	18:07	18:28	18:53
0°	05:11	05:35	05:56	18:02	18:23	18:47
S 10°	05:15	05:39	06:00	17:57	18:18	18:43
20°	05:18	05:43	06:05	17:52	18:15	18:40
30°	05:19	05:47	06:11	17:47	18:11	18:39
35°	05:19	05:49	06:14	17:44	18:09	18:39
40°	05:19	05:51	06:18	17:40	18:08	18:39
45°	05:18	05:52	06:22	17:36	18:06	18:40
S 50°	05:17	05:54	06:27	17:32	18:04	18:42
52°	05:16	05:55	06:29	17:30	18:03	18:42
54°	05:15	05:56	06:31	17:27	18:03	18:44
56°	05:14	05:57	06:34	17:25	18:02	18:45
58°	05:12	05:58	06:37	17:22	18:01	18:47
S 60°	05:11	05:59	06:40	17:19	18:00	18:49

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	14:30	▬	▬	15:20	▬	▬
N 70°	13:02	▬	▬	16:50	▬	▬
68°	12:24	▬	▬	17:30	▬	▬
66°	11:57	14:16	▬	17:58	17:27	▬
64°	11:37	13:36	15:50	18:19	18:08	17:44
62°	11:21	13:08	14:55	18:36	18:36	18:39
60°	11:07	12:47	14:23	18:51	18:58	19:12
N 58°	10:56	12:30	13:59	19:03	19:16	19:36
56°	10:46	12:15	13:40	19:14	19:31	19:56
54°	10:37	12:03	13:24	19:24	19:44	20:12
52°	10:29	11:52	13:10	19:32	19:56	20:27
50°	10:22	11:42	12:58	19:40	20:06	20:39
45°	10:07	11:22	12:33	19:56	20:27	21:05
N 40°	09:55	11:06	12:13	20:10	20:45	21:25
35°	09:45	10:52	11:56	20:21	20:59	21:42
30°	09:36	10:40	11:42	20:31	21:12	21:57
20°	09:20	10:20	11:18	20:49	21:34	22:22
N 10°	09:07	10:02	10:57	21:04	21:53	22:43
0°	08:54	09:46	10:38	21:19	22:11	23:04
S 10°	08:42	09:29	10:19	21:33	22:29	23:24
20°	08:29	09:12	09:59	21:49	22:48	23:46
30°	08:14	08:53	09:35	22:06	23:10	·· ··
35°	08:05	08:41	09:21	22:17	23:23	·· ··
40°	07:56	08:28	09:05	22:29	23:38	·· ··
45°	07:44	08:13	08:47	22:43	23:56	·· ··
S 50°	07:31	07:54	08:23	23:01	·· ··	00:19
52°	07:24	07:45	08:12	23:09	·· ··	00:30
54°	07:17	07:35	07:59	23:18	·· ··	00:42
56°	07:10	07:24	07:45	23:29	·· ··	00:56
58°	07:01	07:11	07:28	23:40	·· ··	01:12
S 60°	06:51	06:57	07:07	23:54	·· ··	01:33

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 14-32%
04	00:43	00:53	11:59	15:06	02:41	
05	01:03	01:13	11:59	15:58	03:32	
06	01:23	01:33	11:58	16:51	04:24	

September 07, 08, 09 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	345°51.1	173°18.3	N04°43.6	134°57.3	S12°54.3	184°45.9	N08°59.9	319°37.1	N07°57.0
1	0°53.6	188°17.9	42.3	149°58.2	54.9	199°47.9	59.7	334°39.7	57.0
2	15°56.0	203°17.5	41.1	164°59.1	55.5	214°49.8	59.5	349°42.2	56.9
3	30°58.5	218°17.1	·· 39.8	180°00.0	·· 56.1	229°51.8	·· 59.3	4°44.8	·· 56.9
4	46°01.0	233°16.7	38.6	195°00.9	56.6	244°53.7	59.1	19°47.4	56.8
5	61°03.4	248°16.3	37.3	210°01.7	57.2	259°55.7	58.9	34°50.0	56.8
6	76°05.9	263°15.9	N04°36.1	225°02.6	S12°57.8	274°57.6	N08°58.7	49°52.5	N07°56.7
7	91°08.4	278°15.6	34.9	240°03.5	58.4	289°59.6	58.5	64°55.1	56.7
8	106°10.8	293°15.2	33.6	255°04.4	59.0	305°01.5	58.3	79°57.7	56.6
9	121°13.3	308°14.8	·· 32.4	270°05.3	12°59.6	320°03.5	·· 58.1	95°00.2	·· 56.6
10	136°15.7	323°14.4	31.1	285°06.1	13°00.2	335°05.4	57.9	110°02.8	56.5
11	151°18.2	338°14.0	29.9	300°07.0	00.8	350°07.4	57.7	125°05.4	56.5
12	166°20.7	353°13.6	N04°28.6	315°07.9	S13°01.4	5°09.4	N08°57.5	140°08.0	N07°56.4
13	181°23.1	8°13.2	27.4	330°08.8	02.0	20°11.3	57.3	155°10.5	56.4
14	196°25.6	23°12.9	26.1	345°09.7	02.5	35°13.3	57.1	170°13.1	56.3
15	211°28.1	38°12.5	·· 24.9	0°10.5	·· 03.1	50°15.2	·· 56.9	185°15.7	·· 56.3
16	226°30.5	53°12.1	23.6	15°11.4	03.7	65°17.2	56.7	200°18.2	56.2
17	241°33.0	68°11.7	22.4	30°12.3	04.3	80°19.1	56.5	215°20.8	56.2
18	256°35.5	83°11.3	N04°21.1	45°13.2	S13°04.9	95°21.1	N08°56.3	230°23.4	N07°56.1
19	271°37.9	98°10.9	19.9	60°14.0	05.5	110°23.0	56.1	245°26.0	56.1
20	286°40.4	113°10.6	18.7	75°14.9	06.1	125°25.0	55.9	260°28.5	56.0
21	301°42.9	128°10.2	·· 17.4	90°15.8	·· 06.7	140°27.0	·· 55.7	275°31.1	·· 56.0
22	316°45.3	143°09.8	16.2	105°16.7	07.3	155°28.9	55.5	290°33.7	55.9
23	331°47.8	158°09.4	14.9	120°17.5	07.8	170°30.9	55.3	305°36.3	55.9
Mer.pass.	00:56	ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.0′ m 0.29

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	346°50.2	173°09.0	N04°13.7	135°18.4	S13°08.4	185°32.8	N08°55.1	320°38.8	N07°55.8
1	1°52.7	188°08.6	12.4	150°19.3	09.0	200°34.8	54.9	335°41.4	55.8
2	16°55.2	203°08.3	11.2	165°20.2	09.6	215°36.7	54.7	350°44.0	55.7
3	31°57.6	218°07.9	·· 09.9	180°21.0	·· 10.2	230°38.7	·· 54.5	5°46.6	·· 55.7
4	47°00.1	233°07.5	08.7	195°21.9	10.8	245°40.6	54.3	20°49.1	55.6
5	62°02.6	248°07.1	07.4	210°22.8	11.4	260°42.6	54.0	35°51.7	55.6
6	77°05.0	263°06.7	N04°06.2	225°23.7	S13°12.0	275°44.5	N08°53.8	50°54.3	N07°55.5
7	92°07.5	278°06.4	04.9	240°24.5	12.5	290°46.5	53.6	65°56.8	55.5
8	107°10.0	293°06.0	03.7	255°25.4	13.1	305°48.5	53.4	80°59.4	55.4
9	122°12.4	308°05.6	·· 02.4	270°26.3	·· 13.7	320°50.4	·· 53.2	96°02.0	·· 55.4
10	137°14.9	323°05.2	04°01.2	285°27.2	14.3	335°52.4	53.0	111°04.6	55.3
11	152°17.4	338°04.8	03°59.9	300°28.0	14.9	350°54.3	52.8	126°07.1	55.3
12	167°19.8	353°04.4	N03°58.7	315°28.9	S13°15.5	5°56.3	N08°52.6	141°09.7	N07°55.2
13	182°22.3	8°04.1	57.4	330°29.8	16.1	20°58.2	52.4	156°12.3	55.2
14	197°24.7	23°03.7	56.2	345°30.7	16.7	36°00.2	52.2	171°14.9	55.1
15	212°27.2	38°03.3	·· 54.9	0°31.5	·· 17.2	51°02.1	·· 52.0	186°17.5	·· 55.1
16	227°29.7	53°02.9	53.7	15°32.4	17.8	66°04.1	51.8	201°20.0	55.0
17	242°32.1	68°02.5	52.4	30°33.3	18.4	81°06.1	51.6	216°22.6	54.9
18	257°34.6	83°02.2	N03°51.2	45°34.1	S13°19.0	96°08.0	N08°51.4	231°25.2	N07°54.9
19	272°37.1	98°01.8	49.9	60°35.0	19.6	111°10.0	51.2	246°27.8	54.8
20	287°39.5	113°01.4	48.7	75°35.9	20.2	126°11.9	51.0	261°30.3	54.8
21	302°42.0	128°01.0	·· 47.4	90°36.7	·· 20.8	141°13.9	·· 50.8	276°32.9	·· 54.7
22	317°44.5	143°00.6	46.1	105°37.6	21.3	156°15.8	50.6	291°35.5	54.7
23	332°46.9	158°00.3	44.9	120°38.5	21.9	171°17.8	50.4	306°38.1	54.6
Mer.pass.	00:53	ν -0.4′	d 1.2′	m -3.91	ν 0.9′	d 0.6′	m 1.35	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.1′ m 0.29

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	347°49.4	172°59.9	N03°43.6	135°39.4	S13°22.5	186°19.7	N08°50.2	321°40.6	N07°54.6
1	2°51.8	187°59.5	42.4	150°40.2	23.1	201°21.7	50.0	336°43.2	54.5
2	17°54.3	202°59.1	41.1	165°41.1	23.7	216°23.7	49.8	351°45.8	54.5
3	32°56.8	217°58.8	·· 39.9	180°42.0	·· 24.3	231°25.6	·· 49.6	6°48.4	·· 54.4
4	47°59.2	232°58.4	38.6	195°42.8	24.9	246°27.6	49.4	21°51.0	54.4
5	63°01.7	247°58.0	37.4	210°43.7	25.4	261°29.5	49.2	36°53.5	54.3
6	78°04.2	262°57.6	N03°36.1	225°44.6	S13°26.0	276°31.5	N08°49.0	51°56.1	N07°54.3
7	93°06.6	277°57.2	34.9	240°45.4	26.6	291°33.4	48.8	66°58.7	54.2
8	108°09.1	292°56.9	33.6	255°46.3	27.2	306°35.4	48.6	82°01.3	54.2
9	123°11.6	307°56.5	·· 32.3	270°47.2	·· 27.8	321°37.3	·· 48.4	97°03.8	·· 54.1
10	138°14.0	322°56.1	31.1	285°48.0	28.4	336°39.3	48.2	112°06.4	54.1
11	153°16.5	337°55.7	29.8	300°48.9	28.9	351°41.3	48.0	127°09.0	54.0
12	168°19.0	352°55.4	N03°28.6	315°49.8	S13°29.5	6°43.2	N08°47.8	142°11.6	N07°54.0
13	183°21.4	7°55.0	27.3	330°50.6	30.1	21°45.2	47.6	157°14.2	53.9
14	198°23.9	22°54.6	26.1	345°51.5	30.7	36°47.1	47.4	172°16.7	53.9
15	213°26.3	37°54.2	·· 24.8	0°52.4	·· 31.3	51°49.1	·· 47.2	187°19.3	·· 53.8
16	228°28.8	52°53.8	23.6	15°53.2	31.9	66°51.0	47.0	202°21.9	53.7
17	243°31.3	67°53.5	22.3	30°54.1	32.4	81°53.0	46.8	217°24.5	53.7
18	258°33.7	82°53.1	N03°21.0	45°55.0	S13°33.0	96°55.0	N08°46.6	232°27.1	N07°53.6
19	273°36.2	97°52.7	19.8	60°55.8	33.6	111°56.9	46.4	247°29.6	53.6
20	288°38.7	112°52.3	18.5	75°56.7	34.2	126°58.9	46.2	262°32.2	53.5
21	303°41.1	127°52.0	·· 17.3	90°57.5	·· 34.8	142°00.8	·· 46.0	277°34.8	·· 53.5
22	318°43.6	142°51.6	16.0	105°58.4	35.4	157°02.8	45.8	292°37.4	53.4
23	333°46.1	157°51.2	14.8	120°59.3	35.9	172°04.7	45.6	307°40.0	53.4
Mer.pass.	00:49	ν -0.4′	d 1.3′	m -3.91	ν 0.9′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.1′ m 0.28

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°28.0	56°41.4
Diphda	348°44.8	-17°49.8
Achernar	335°18.1	-57°05.4
Hamal	327°48.5	23°35.7
Polaris	312°38.6	89°22.5
Acamar	315°09.9	-40°11.3
Menkar	314°03.7	4°12.0
Mirfak	308°24.9	49°57.4
Aldebaran	290°37.1	16°33.9
Rigel	281°01.8	-8°10.0
Capella	280°18.7	46°01.4
Bellatrix	278°20.6	6°22.6
Elnath	277°59.1	28°37.8
Alnilam	275°35.6	-1°10.9
Betelgeuse	270°49.8	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°24.4	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.7	5°09.3
Pollux	243°14.9	27°57.5
Avior	234°14.3	-59°35.7
Suhail	222°45.1	-43°32.5
Miaplacidus	221°38.6	-69°49.7
Alphard	217°45.9	-8°46.7
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.1
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.3
Gacrux	171°49.7	-57°16.2
Alioth	166°11.6	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.7
Hadar	148°33.3	-60°30.6
Menkent	147°55.3	-36°30.5
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.6	-60°57.2
Kochab	137°20.5	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.4	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.0	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.6	38°48.8
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.9	-56°38.7
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.3
Al Na'ir	27°29.7	-46°49.5
Fomalhaut	15°11.8	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 07 Tue	SHA	Mer.pass
Venus	187°27.2	12:27
Mars	149°06.2	14:59
Jupiter	198°54.8	11:39
Saturn	333°46.0	02:41

Sep 08 Wed	SHA	Mer.pass
Venus	186°18.8	12:28
Mars	148°28.2	14:58
Jupiter	198°42.6	11:36
Saturn	333°48.6	02:37

Sep 09 Thu	SHA	Mer.pass
Venus	185°10.5	12:28
Mars	147°50.0	14:57
Jupiter	198°30.4	11:33
Saturn	333°51.3	02:33

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0719 sec ΔT = TT-UT1 = +69.2559 sec

2027 September 07 to Sep. 09 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°25.9	N06°13.7	103°26.3	8.9′	S25°51.7	4.5′	55.9′
1	195°26.1	12.7	117°54.2	8.9′	25°56.2	4.5′	55.8′
2	210°26.3	11.8	132°22.1	8.9′	26°00.7	4.3′	55.8′
3	225°26.5	·· 10.9	146°49.9	8.9′	26°05.0	4.1′	55.8′
4	240°26.8	09.9	161°17.8	8.9′	26°09.1	4.1′	55.7′
5	255°27.0	09.0	175°45.6	8.9′	26°13.2	3.8′	55.7′
6	270°27.2	N06°08.1	190°13.5	8.9′	S26°17.0	3.8′	55.7′
7	285°27.4	07.1	204°41.4	8.9′	26°20.8	3.6′	55.7′
8	300°27.6	06.2	219°09.2	8.9′	26°24.4	3.4′	55.6′
9	315°27.8	·· 05.3	233°37.1	8.9′	26°27.8	3.3′	55.6′
10	330°28.0	04.3	248°04.9	8.9′	26°31.1	3.2′	55.6′
11	345°28.2	03.4	262°32.8	8.9′	26°34.3	3.0′	55.5′
12	0°28.5	N06°02.5	277°00.7	8.9′	S26°37.3	2.9′	55.5′
13	15°28.7	01.5	291°28.5	8.9′	26°40.2	2.7′	55.5′
14	30°28.9	06°00.6	305°56.4	8.9′	26°42.9	2.6′	55.5′
15	45°29.1	05°59.6	320°24.3	8.9′	26°45.5	2.4′	55.4′
16	60°29.3	58.7	334°52.2	8.9′	26°47.9	2.4′	55.4′
17	75°29.5	57.8	349°20.1	8.9′	26°50.3	2.1′	55.4′
18	90°29.7	N05°56.8	3°48.0	8.9′	S26°52.4	2.0′	55.3′
19	105°30.0	55.9	18°16.0	8.9′	26°54.4	1.9′	55.3′
20	120°30.2	55.0	32°43.9	9.0′	26°56.3	1.8′	55.3′
21	135°30.4	·· 54.0	47°11.9	9.0′	26°58.1	1.6′	55.3′
22	150°30.6	53.1	61°39.9	9.0′	26°59.7	1.4′	55.2′
23	165°30.8	52.2	76°07.9	9.0′	27°01.1	1.3′	55.2′
	SD = 15.9′	d = 0.9′	SD = 15.2′				

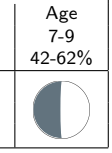
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°31.0	N05°51.2	90°35.9	9.0′	S27°02.4	1.2′	55.2′
1	195°31.2	50.3	105°03.9	9.0′	27°03.6	1.0′	55.2′
2	210°31.5	49.3	119°31.9	9.1′	27°04.6	0.9′	55.1′
3	225°31.7	·· 48.4	134°00.0	9.1′	27°05.5	0.8′	55.1′
4	240°31.9	47.5	148°28.1	9.1′	27°06.3	0.6′	55.1′
5	255°32.1	46.5	162°56.2	9.1′	27°06.9	0.5′	55.1′
6	270°32.3	N05°45.6	177°24.3	9.2′	S27°07.4	0.3′	55.0′
7	285°32.5	44.6	191°52.5	9.2′	27°07.7	0.2′	55.0′
8	300°32.7	43.7	206°20.7	9.2′	27°07.9	0.1′	55.0′
9	315°33.0	·· 42.8	220°48.9	9.2′	27°08.0	0.1′	55.0′
10	330°33.2	41.8	235°17.1	9.3′	27°07.9	0.2′	54.9′
11	345°33.4	40.9	249°45.4	9.3′	27°07.7	0.4′	54.9′
12	0°33.6	N05°39.9	264°13.7	9.3′	S27°07.3	0.5′	54.9′
13	15°33.8	39.0	278°42.0	9.4′	27°06.8	0.6′	54.9′
14	30°34.0	38.1	293°10.4	9.4′	27°06.2	0.8′	54.9′
15	45°34.3	·· 37.1	307°38.8	9.4′	27°05.4	0.9′	54.8′
16	60°34.5	36.2	322°07.2	9.5′	27°04.5	1.0′	54.8′
17	75°34.7	35.2	336°35.7	9.5′	27°03.5	1.2′	54.8′
18	90°34.9	N05°34.3	351°04.2	9.5′	S27°02.3	1.3′	54.8′
19	105°35.1	33.4	5°32.7	9.6′	27°01.0	1.4′	54.8′
20	120°35.3	32.4	20°01.3	9.6′	26°59.6	1.6′	54.7′
21	135°35.5	·· 31.5	34°29.9	9.7′	26°58.0	1.7′	54.7′
22	150°35.8	30.5	48°58.6	9.7′	26°56.3	1.9′	54.7′
23	165°36.0	29.6	63°27.3	9.7′	26°54.4	2.0′	54.7′
	SD = 15.9′	d = 0.9′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°36.2	N05°28.7	77°56.0	9.8′	S26°52.4	2.1′	54.7′
1	195°36.4	27.7	92°24.8	9.8′	26°50.3	2.2′	54.6′
2	210°36.6	26.8	106°53.6	9.9′	26°48.1	2.4′	54.6′
3	225°36.8	·· 25.8	121°22.4	9.9′	26°45.7	2.5′	54.6′
4	240°37.1	24.9	135°51.4	10.0′	26°43.2	2.6′	54.6′
5	255°37.3	24.0	150°20.3	10.0′	26°40.6	2.8′	54.6′
6	270°37.5	N05°23.0	164°49.3	10.0′	S26°37.8	2.8′	54.6′
7	285°37.7	22.1	179°18.3	10.1′	26°35.0	3.1′	54.5′
8	300°37.9	21.1	193°47.4	10.1′	26°31.9	3.1′	54.5′
9	315°38.1	·· 20.2	208°16.6	10.2′	26°28.8	3.3′	54.5′
10	330°38.4	19.2	222°45.8	10.2′	26°25.5	3.4′	54.5′
11	345°38.6	18.3	237°15.0	10.3′	26°22.1	3.5′	54.5′
12	0°38.8	N05°17.4	251°44.3	10.3′	S26°18.6	3.6′	54.5′
13	15°39.0	16.4	266°13.6	10.4′	26°15.0	3.8′	54.4′
14	30°39.2	15.5	280°43.0	10.4′	26°11.2	3.9′	54.4′
15	45°39.5	·· 14.5	295°12.5	10.5′	26°07.3	4.0′	54.4′
16	60°39.7	13.6	309°42.0	10.5′	26°03.3	4.2′	54.4′
17	75°39.9	12.6	324°11.5	10.6′	25°59.1	4.2′	54.4′
18	90°40.1	N05°11.7	338°41.1	10.7′	S25°54.9	4.4′	54.4′
19	105°40.3	10.7	353°10.8	10.7′	25°50.5	4.5′	54.4′
20	120°40.5	09.8	7°40.5	10.8′	25°46.0	4.7′	54.3′
21	135°40.8	·· 08.9	22°10.2	10.8′	25°41.3	4.7′	54.3′
22	150°41.0	07.9	36°40.1	10.9′	25°36.6	4.9′	54.3′
23	165°41.2	07.0	51°09.9	10.9′	25°31.7	4.9′	54.3′
	SD = 15.9′	d = 0.9′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	00:28	03:15	04:34	19:19	20:36	23:03
N 70°	01:46	03:34	04:43	19:10	20:18	22:02
68°	02:22	03:49	04:51	19:03	20:03	21:29
66°	02:46	04:02	04:57	18:57	19:51	21:05
64°	03:05	04:12	05:02	18:52	19:42	20:47
62°	03:20	04:20	05:07	18:47	19:34	20:33
60°	03:32	04:27	05:11	18:43	19:27	20:21
N 58°	03:43	04:33	05:14	18:40	19:20	20:11
56°	03:51	04:39	05:17	18:37	19:15	20:02
54°	03:59	04:44	05:20	18:34	19:10	19:55
52°	04:06	04:48	05:23	18:32	19:06	19:48
50°	04:12	04:52	05:25	18:30	19:03	19:42
45°	04:24	05:00	05:30	18:25	18:55	19:30
N 40°	04:34	05:07	05:34	18:21	18:48	19:21
35°	04:42	05:12	05:38	18:17	18:43	19:13
30°	04:48	05:16	05:41	18:14	18:39	19:07
20°	04:58	05:24	05:46	18:09	18:32	18:57
N 10°	05:05	05:29	05:50	18:05	18:26	18:51
0°	05:10	05:34	05:55	18:01	18:22	18:46
S 10°	05:13	05:37	05:59	17:57	18:18	18:43
20°	05:15	05:41	06:03	17:53	18:15	18:41
30°	05:16	05:43	06:07	17:49	18:13	18:40
35°	05:15	05:45	06:10	17:46	18:11	18:41
40°	05:15	05:46	06:13	17:43	18:10	18:42
45°	05:13	05:47	06:16	17:40	18:09	18:43
S 50°	05:11	05:48	06:20	17:36	18:08	18:46
52°	05:09	05:48	06:22	17:34	18:08	18:47
54°	05:08	05:49	06:24	17:32	18:08	18:49
56°	05:06	05:49	06:26	17:30	18:08	18:51
58°	05:04	05:49	06:29	17:28	18:07	18:53
S 60°	05:02	05:50	06:31	17:25	18:07	18:55

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	19:08	▬	▬	19:54
62°	16:33	17:33	17:52	18:53	19:42	21:11
60°	15:46	16:44	17:15	19:40	20:32	21:47
N 58°	15:16	16:13	16:49	20:10	21:03	22:12
56°	14:53	15:49	16:29	20:33	21:26	22:33
54°	14:34	15:30	16:12	20:52	21:45	22:50
52°	14:18	15:14	15:57	21:08	22:01	23:04
50°	14:05	15:01	15:44	21:22	22:15	23:17
45°	13:37	14:32	15:18	21:50	22:43	23:42
N 40°	13:15	14:10	14:57	22:12	23:05	·· ··
35°	12:57	13:52	14:39	22:30	23:23	·· ··
30°	12:41	13:36	14:24	22:46	23:39	·· ··
20°	12:15	13:09	13:59	23:13	·· ··	00:05
N 10°	11:52	12:46	13:37	23:36	·· ··	00:28
0°	11:31	12:24	13:16	23:57	·· ··	00:50
S 10°	11:10	12:03	12:55	·· ··	00:18	01:11
20°	10:48	11:40	12:33	·· ··	00:41	01:33
30°	10:22	11:13	12:07	00:11	01:08	02:00
35°	10:07	10:57	11:52	00:26	01:24	02:15
40°	09:49	10:39	11:35	00:43	01:42	02:33
45°	09:28	10:17	11:13	01:04	02:04	02:55
S 50°	09:01	09:49	10:46	01:31	02:32	03:22
52°	08:48	09:35	10:33	01:43	02:46	03:35
54°	08:33	09:19	10:18	01:58	03:02	03:51
56°	08:15	09:00	10:00	02:15	03:21	04:09
58°	07:54	08:37	09:39	02:36	03:44	04:31
S 60°	07:27	08:06	09:11	03:03	04:15	04:59

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 42-62%
07	01:44	01:54	11:58	17:44	05:18	
08	02:04	02:14	11:58	18:37	06:11	
09	02:25	02:35	11:57	19:28	07:03	



September 10, 11, 12 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	348°48.5	172°50.8	N03°13.5	136°00.1	S13°36.5	187°06.7	N08°45.4	322°42.5	N07°53.3
1	3°51.0	187°50.5	12.2	151°01.0	37.1	202°08.6	45.2	337°45.1	53.3
2	18°53.5	202°50.1	11.0	166°01.9	37.7	217°10.6	45.0	352°47.7	53.2
3	33°55.9	217°49.7	·· 09.7	181°02.7	·· 38.3	232°12.6	·· 44.8	7°50.3	·· 53.2
4	48°58.4	232°49.3	08.5	196°03.6	38.9	247°14.5	44.6	22°52.9	53.1
5	64°00.8	247°49.0	07.2	211°04.4	39.4	262°16.5	44.4	37°55.4	53.1
6	79°03.3	262°48.6	N03°06.0	226°05.3	S13°40.0	277°18.4	N08°44.2	52°58.0	N07°53.0
7	94°05.8	277°48.2	04.7	241°06.2	40.6	292°20.4	44.0	68°00.6	53.0
8	109°08.2	292°47.8	03.4	256°07.0	41.2	307°22.3	43.8	83°03.2	52.9
9	124°10.7	307°47.5	·· 02.2	271°07.9	·· 41.8	322°24.3	·· 43.6	98°05.8	·· 52.8
10	139°13.2	322°47.1	03°00.9	286°08.7	42.3	337°26.3	43.4	113°08.3	52.8
11	154°15.6	337°46.7	02°59.7	301°09.6	42.9	352°28.2	43.2	128°10.9	52.7
12	169°18.1	352°46.3	N02°58.4	316°10.5	S13°43.5	7°30.2	N08°43.0	143°13.5	N07°52.7
13	184°20.6	7°46.0	57.1	331°11.3	44.1	22°32.1	42.8	158°16.1	52.6
14	199°23.0	22°45.6	55.9	346°12.2	44.7	37°34.1	42.6	173°18.7	52.6
15	214°25.5	37°45.2	·· 54.6	1°13.0	·· 45.2	52°36.0	·· 42.4	188°21.3	·· 52.5
16	229°28.0	52°44.8	53.4	16°13.9	45.8	67°38.0	42.2	203°23.8	52.5
17	244°30.4	67°44.5	52.1	31°14.8	46.4	82°40.0	41.9	218°26.4	52.4
18	259°32.9	82°44.1	N02°50.8	46°15.6	S13°47.0	97°41.9	N08°41.7	233°29.0	N07°52.4
19	274°35.3	97°43.7	49.6	61°16.5	47.6	112°43.9	41.5	248°31.6	52.3
20	289°37.8	112°43.3	48.3	76°17.3	48.1	127°45.8	41.3	263°34.2	52.3
21	304°40.3	127°43.0	·· 47.0	91°18.2	·· 48.7	142°47.8	·· 41.1	278°36.8	·· 52.2
22	319°42.7	142°42.6	45.8	106°19.0	49.3	157°49.7	40.9	293°39.3	52.1
23	334°45.2	157°42.2	44.5	121°19.9	49.9	172°51.7	40.7	308°41.9	52.1
Mer.pass. 00:45		ν -0.4′ d 1.3′	m -3.91	ν 0.9′ d 0.6′	m 1.36	ν 2.0′ d 0.2′	m -1.70	ν 2.6′ d 0.1′	m 0.28

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°47.7	172°41.8	N02°43.3	136°20.8	S13°50.5	187°53.7	N08°40.5	323°44.5	N07°52.0
1	4°50.1	187°41.5	42.0	151°21.6	51.0	202°55.6	40.3	338°47.1	52.0
2	19°52.6	202°41.1	40.7	166°22.5	51.6	217°57.6	40.1	353°49.7	51.9
3	34°55.1	217°40.7	·· 39.5	181°23.3	·· 52.2	232°59.5	·· 39.9	8°52.3	·· 51.9
4	49°57.5	232°40.4	38.2	196°24.2	52.8	248°01.5	39.7	23°54.8	51.8
5	65°00.0	247°40.0	37.0	211°25.0	53.4	263°03.4	39.5	38°57.4	51.8
6	80°02.4	262°39.6	N02°35.7	226°25.9	S13°53.9	278°05.4	N08°39.3	54°00.0	N07°51.7
7	95°04.9	277°39.2	34.4	241°26.7	54.5	293°07.4	39.1	69°02.6	51.7
8	110°07.4	292°38.9	33.2	256°27.6	55.1	308°09.3	38.9	84°05.2	51.6
9	125°09.8	307°38.5	·· 31.9	271°28.4	·· 55.7	323°11.3	·· 38.7	99°07.8	·· 51.5
10	140°12.3	322°38.1	30.6	286°29.3	56.3	338°13.2	38.5	114°10.4	51.5
11	155°14.8	337°37.8	29.4	301°30.2	56.8	353°15.2	38.3	129°12.9	51.4
12	170°17.2	352°37.4	N02°28.1	316°31.0	S13°57.4	8°17.1	N08°38.1	144°15.5	N07°51.4
13	185°19.7	7°37.0	26.8	331°31.9	58.0	23°19.1	37.9	159°18.1	51.3
14	200°22.2	22°36.6	25.6	346°32.7	58.6	38°21.1	37.7	174°20.7	51.3
15	215°24.6	37°36.3	·· 24.3	1°33.6	·· 59.1	53°23.0	·· 37.5	189°23.3	·· 51.2
16	230°27.1	52°35.9	23.1	16°34.4	13°59.7	68°25.0	37.3	204°25.9	51.2
17	245°29.6	67°35.5	21.8	31°35.3	14°00.3	83°26.9	37.1	219°28.5	51.1
18	260°32.0	82°35.2	N02°20.5	46°36.1	S14°00.9	98°28.9	N08°36.9	234°31.0	N07°51.1
19	275°34.5	97°34.8	19.3	61°37.0	01.4	113°30.8	36.7	249°33.6	51.0
20	290°36.9	112°34.4	18.0	76°37.8	02.0	128°32.8	36.5	264°36.2	50.9
21	305°39.4	127°34.0	·· 16.7	91°38.7	·· 02.6	143°34.8	·· 36.3	279°38.8	·· 50.9
22	320°41.9	142°33.7	15.5	106°39.5	03.2	158°36.7	36.1	294°41.4	50.8
23	335°44.3	157°33.3	14.2	121°40.4	03.8	173°38.7	35.9	309°44.0	50.8
Mer.pass. 00:41		ν -0.4′ d 1.3′	m -3.90	ν 0.9′ d 0.6′	m 1.36	ν 2.0′ d 0.2′	m -1.70	ν 2.6′ d 0.1′	m 0.27

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°46.8	172°32.9	N02°12.9	136°41.2	S14°04.3	188°40.6	N08°35.7	324°46.6	N07°50.7
1	5°49.3	187°32.6	11.7	151°42.1	04.9	203°42.6	35.5	339°49.1	50.7
2	20°51.7	202°32.2	10.4	166°42.9	05.5	218°44.5	35.3	354°51.7	50.6
3	35°54.2	217°31.8	·· 09.1	181°43.8	·· 06.1	233°46.5	·· 35.1	9°54.3	·· 50.6
4	50°56.7	232°31.4	07.9	196°44.6	06.6	248°48.5	34.9	24°56.9	50.5
5	65°59.1	247°31.1	06.6	211°45.5	07.2	263°50.4	34.7	39°59.5	50.5
6	81°01.6	262°30.7	N02°05.3	226°46.3	S14°07.8	278°52.4	N08°34.5	55°02.1	N07°50.4
7	96°04.1	277°30.3	04.1	241°47.2	08.4	293°54.3	34.3	70°04.7	50.3
8	111°06.5	292°30.0	02.8	256°48.0	08.9	308°56.3	34.1	85°07.3	50.3
9	126°09.0	307°29.6	·· 01.5	271°48.9	·· 09.5	323°58.2	·· 33.9	100°09.8	·· 50.2
10	141°11.4	322°29.2	02°00.3	286°49.7	10.1	339°00.2	33.7	115°12.4	50.2
11	156°13.9	337°28.9	01°59.0	301°50.5	10.7	354°02.2	33.5	130°15.0	50.1
12	171°16.4	352°28.5	N01°57.7	316°51.4	S14°11.2	9°04.1	N08°33.3	145°17.6	N07°50.1
13	186°18.8	7°28.1	56.5	331°52.2	11.8	24°06.1	33.1	160°20.2	50.0
14	201°21.3	22°27.7	55.2	346°53.1	12.4	39°08.0	32.9	175°22.8	49.9
15	216°23.8	37°27.4	·· 53.9	1°53.9	·· 13.0	54°10.0	·· 32.7	190°25.4	·· 49.9
16	231°26.2	52°27.0	52.7	16°54.8	13.5	69°12.0	32.5	205°28.0	49.8
17	246°28.7	67°26.6	51.4	31°55.6	14.1	84°13.9	32.3	220°30.6	49.8
18	261°31.2	82°26.3	N01°50.1	46°56.5	S14°14.7	99°15.9	N08°32.1	235°33.1	N07°49.7
19	276°33.6	97°25.9	48.9	61°57.3	15.3	114°17.8	31.9	250°35.7	49.7
20	291°36.1	112°25.5	47.6	76°58.2	15.8	129°19.8	31.7	265°38.3	49.6
21	306°38.5	127°25.2	·· 46.3	91°59.0	·· 16.4	144°21.7	·· 31.5	280°40.9	·· 49.6
22	321°41.0	142°24.8	45.1	106°59.8	17.0	159°23.7	31.3	295°43.5	49.5
23	336°43.5	157°24.4	43.8	122°00.7	17.5	174°25.7	31.1	310°46.1	49.4
Mer.pass. 00:37		ν -0.4′ d 1.3′	m -3.90	ν 0.8′ d 0.6′	m 1.36	ν 2.0′ d 0.2′	m -1.70	ν 2.6′ d 0.1′	m 0.27

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°27.9	56°41.4
Diphda	348°44.8	-17°49.8
Achernar	335°18.1	-57°05.5
Hamal	327°48.4	23°35.7
Polaris	312°37.0	89°22.5
Acamar	315°09.9	-40°11.3
Menkar	314°03.7	4°12.1
Mirfak	308°24.8	49°57.4
Aldebaran	290°37.0	16°33.9
Rigel	281°01.8	-8°10.0
Capella	280°18.6	46°01.4
Bellatrix	278°20.5	6°22.6
Elnath	277°59.1	28°37.8
Alnilam	275°35.5	-1°10.9
Betelgeuse	270°49.8	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°24.4	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.7	5°09.3
Pollux	243°14.8	27°57.5
Avior	234°14.3	-59°35.7
Suhail	222°45.0	-43°32.5
Miaplacidus	221°38.6	-69°49.7
Alphard	217°45.9	-8°46.7
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.1
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.3
Gacrux	171°49.7	-57°16.2
Alioth	166°11.6	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.7
Hadar	148°33.3	-60°30.6
Menkent	147°55.3	-36°30.4
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.6	-60°57.2
Kochab	137°20.6	74°02.7
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.4	-69°04.8
Sabik	102°00.2	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.1	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.6	38°48.9
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.9	-56°38.7
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.4
Al Na'ir	27°29.7	-46°49.5
Fomalhaut	15°11.7	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 10 Fri	SHA	Mer.pass
Venus	184°02.3	12:29
Mars	147°11.6	14:55
Jupiter	198°18.2	11:30
Saturn	333°54.0	02:29

Sep 11 Sat	SHA	Mer.pass
Venus	182°54.2	12:30
Mars	146°33.1	14:54
Jupiter	198°06.0	11:27
Saturn	333°56.8	02:25

Sep 12 Sun	SHA	Mer.pass
Venus	181°46.1	12:30
Mars	145°54.4	14:52
Jupiter	197°53.8	11:24
Saturn	333°59.8	02:20

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°41.4	N05°06.0	65°39.9	11.0′	S25°26.8	5.1′	54.3′
1	195°41.6	05.1	80°09.9	11.1′	25°21.7	5.3′	54.3′
2	210°41.9	04.1	94°39.9	11.1′	25°16.4	5.3′	54.3′
3	225°42.1	·· 03.2	109°10.0	11.2′	25°11.1	5.4′	54.3′
4	240°42.3	02.2	123°40.2	11.2′	25°05.7	5.6′	54.2′
5	255°42.5	01.3	138°10.4	11.3′	25°00.1	5.7′	54.2′
6	270°42.7	N05°00.3	152°40.7	11.3′	S24°54.4	5.8′	54.2′
7	285°42.9	04°59.4	167°11.1	11.4′	24°48.6	5.9′	54.2′
8	300°43.2	58.5	181°41.5	11.5′	24°42.7	6.0′	54.2′
9	315°43.4	·· 57.5	196°12.0	11.5′	24°36.7	6.1′	54.2′
10	330°43.6	56.6	210°42.5	11.6′	24°30.6	6.2′	54.2′
11	345°43.8	55.6	225°13.1	11.7′	24°24.4	6.4′	54.2′
12	0°44.0	N04°54.7	239°43.7	11.7′	S24°18.0	6.4′	54.2′
13	15°44.3	53.7	254°14.4	11.8′	24°11.6	6.6′	54.2′
14	30°44.5	52.8	268°45.2	11.8′	24°05.0	6.6′	54.2′
15	45°44.7	·· 51.8	283°16.1	11.9′	23°58.4	6.8′	54.1′
16	60°44.9	50.9	297°46.9	12.0′	23°51.6	6.9′	54.1′
17	75°45.1	49.9	312°17.9	12.0′	23°44.7	7.0′	54.1′
18	90°45.4	N04°49.0	326°48.9	12.1′	S23°37.7	7.0′	54.1′
19	105°45.6	48.0	341°20.0	12.1′	23°30.7	7.2′	54.1′
20	120°45.8	47.1	355°51.2	12.2′	23°23.5	7.3′	54.1′
21	135°46.0	·· 46.1	10°22.4	12.3′	23°16.2	7.4′	54.1′
22	150°46.2	45.2	24°53.6	12.3′	23°08.8	7.5′	54.1′
23	165°46.5	44.2	39°25.0	12.4′	23°01.3	7.6′	54.1′
	SD = 15.9′	d = 0.9′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°46.7	N04°43.3	53°56.4	12.5′	S22°53.7	7.7′	54.1′
1	195°46.9	42.3	68°27.8	12.5′	22°46.0	7.8′	54.1′
2	210°47.1	41.4	82°59.3	12.6′	22°38.2	7.9′	54.1′
3	225°47.3	·· 40.4	97°30.9	12.6′	22°30.3	7.9′	54.1′
4	240°47.5	39.5	112°02.5	12.7′	22°22.4	8.1′	54.1′
5	255°47.8	38.6	126°34.2	12.8′	22°14.3	8.2′	54.1′
6	270°48.0	N04°37.6	141°06.0	12.8′	S22°06.1	8.3′	54.1′
7	285°48.2	36.7	155°37.8	12.9′	21°57.8	8.3′	54.1′
8	300°48.4	35.7	170°09.7	12.9′	21°49.5	8.5′	54.0′
9	315°48.7	·· 34.8	184°41.7	13.0′	21°41.0	8.5′	54.0′
10	330°48.9	33.8	199°13.7	13.1′	21°32.5	8.7′	54.0′
11	345°49.1	32.9	213°45.8	13.1′	21°23.8	8.7′	54.0′
12	0°49.3	N04°31.9	228°17.9	13.2′	S21°15.1	8.8′	54.0′
13	15°49.5	31.0	242°50.1	13.3′	21°06.3	9.0′	54.0′
14	30°49.8	30.0	257°22.3	13.3′	20°57.3	9.0′	54.0′
15	45°50.0	·· 29.1	271°54.7	13.4′	20°48.3	9.0′	54.0′
16	60°50.2	28.1	286°27.0	13.4′	20°39.3	9.2′	54.0′
17	75°50.4	27.2	300°59.5	13.5′	20°30.1	9.3′	54.0′
18	90°50.6	N04°26.2	315°31.9	13.6′	S20°20.8	9.3′	54.0′
19	105°50.9	25.2	330°04.5	13.6′	20°11.5	9.4′	54.0′
20	120°51.1	24.3	344°37.1	13.7′	20°02.1	9.6′	54.0′
21	135°51.3	·· 23.3	359°09.8	13.7′	19°52.5	9.6′	54.0′
22	150°51.5	22.4	13°42.5	13.8′	19°42.9	9.6′	54.0′
23	165°51.7	21.4	28°15.3	13.8′	19°33.3	9.8′	54.0′
	SD = 15.9′	d = 0.9′	SD = 14.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°52.0	N04°20.5	42°48.1	13.9′	S19°23.5	9.8′	54.0′
1	195°52.2	19.5	57°21.0	14.0′	19°13.7	10.0′	54.0′
2	210°52.4	18.6	71°54.0	14.0′	19°03.7	10.0′	54.0′
3	225°52.6	·· 17.6	86°27.0	14.1′	18°53.7	10.0′	54.0′
4	240°52.8	16.7	101°00.0	14.1′	18°43.7	10.2′	54.0′
5	255°53.1	15.7	115°33.2	14.2′	18°33.5	10.2′	54.0′
6	270°53.3	N04°14.8	130°06.3	14.2′	S18°23.3	10.3′	54.0′
7	285°53.5	13.8	144°39.6	14.3′	18°13.0	10.4′	54.0′
8	300°53.7	12.9	159°12.8	14.3′	18°02.6	10.5′	54.0′
9	315°54.0	·· 11.9	173°46.2	14.4′	17°52.1	10.5′	54.0′
10	330°54.2	11.0	188°19.6	14.4′	17°41.6	10.6′	54.0′
11	345°54.4	10.0	202°53.0	14.5′	17°31.0	10.7′	54.0′
12	0°54.6	N04°09.1	217°26.5	14.5′	S17°20.3	10.7′	54.0′
13	15°54.8	08.1	232°00.0	14.6′	17°09.6	10.8′	54.0′
14	30°55.1	07.2	246°33.6	14.6′	16°58.8	10.9′	54.0′
15	45°55.3	·· 06.2	261°07.3	14.7′	16°47.9	11.0′	54.0′
16	60°55.5	05.2	275°40.9	14.7′	16°36.9	11.0′	54.0′
17	75°55.7	04.3	290°14.7	14.8′	16°25.9	11.1′	54.1′
18	90°55.9	N04°03.3	304°48.5	14.8′	S16°14.8	11.1′	54.1′
19	105°56.2	02.4	319°22.3	14.9′	16°03.7	11.3′	54.1′
20	120°56.4	01.4	333°56.2	14.9′	15°52.4	11.2′	54.1′
21	135°56.6	04°00.5	348°30.1	15.0′	15°41.2	11.4′	54.1′
22	150°56.8	03°59.5	3°04.1	15.0′	15°29.8	11.4′	54.1′
23	165°57.1	58.6	17°38.1	15.1′	15°18.4	11.5′	54.1′
	SD = 15.9′	d = 1.0′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	01:24	03:32	04:48	19:03	20:17	22:18
N 70°	02:10	03:49	04:55	18:56	20:01	21:37
68°	02:39	04:02	05:01	18:50	19:49	21:10
66°	03:00	04:12	05:06	18:45	19:39	20:50
64°	03:17	04:21	05:11	18:41	19:30	20:34
62°	03:30	04:28	05:14	18:37	19:23	20:21
60°	03:41	04:35	05:18	18:34	19:17	20:10
N 58°	03:50	04:40	05:21	18:31	19:12	20:01
56°	03:58	04:45	05:23	18:29	19:07	19:53
54°	04:05	04:49	05:25	18:27	19:03	19:46
52°	04:12	04:53	05:28	18:25	18:59	19:40
50°	04:17	04:57	05:29	18:23	18:56	19:35
45°	04:28	05:04	05:33	18:19	18:49	19:24
N 40°	04:37	05:10	05:37	18:16	18:43	19:15
35°	04:44	05:14	05:40	18:13	18:39	19:09
30°	04:50	05:18	05:42	18:11	18:35	19:03
20°	04:59	05:24	05:46	18:07	18:29	18:55
N 10°	05:05	05:29	05:50	18:03	18:24	18:49
0°	05:09	05:33	05:53	18:00	18:21	18:45
S 10°	05:11	05:36	05:57	17:57	18:18	18:42
20°	05:12	05:38	06:00	17:54	18:16	18:41
30°	05:12	05:40	06:04	17:50	18:14	18:42
35°	05:11	05:40	06:06	17:48	18:14	18:43
40°	05:10	05:41	06:08	17:46	18:13	18:44
45°	05:07	05:41	06:11	17:44	18:13	18:47
S 50°	05:04	05:42	06:14	17:41	18:13	18:50
52°	05:02	05:42	06:15	17:39	18:13	18:52
54°	05:01	05:41	06:17	17:38	18:13	18:54
56°	04:58	05:41	06:18	17:36	18:13	18:56
58°	04:56	05:41	06:20	17:34	18:14	18:59
S 60°	04:53	05:41	06:22	17:32	18:14	19:02

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▬	▬	19:51	▬	▬	▬
N 70°	▬	20:53	19:13	▬	21:30	·· ··
68°	▬	19:23	18:46	▬	22:59	·· ··
66°	19:28	18:44	18:25	21:17	23:37	·· ··
64°	18:29	18:17	18:09	22:15	·· ··	00:03
62°	17:56	17:56	17:55	22:48	·· ··	00:23
60°	17:31	17:39	17:43	23:12	·· ··	00:40
N 58°	17:11	17:24	17:33	23:32	·· ··	00:54
56°	16:54	17:12	17:24	23:48	·· ··	01:06
54°	16:40	17:01	17:16	·· ··	00:01	01:16
52°	16:28	16:51	17:08	·· ··	00:13	01:25
50°	16:17	16:42	17:02	·· ··	00:24	01:33
45°	15:54	16:24	16:48	·· ··	00:46	01:51
N 40°	15:36	16:09	16:36	00:03	01:03	02:05
35°	15:21	15:56	16:26	00:20	01:18	02:17
30°	15:07	15:45	16:18	00:34	01:31	02:27
20°	14:44	15:25	16:03	00:59	01:52	02:45
N 10°	14:24	15:08	15:49	01:20	02:11	03:00
0°	14:06	14:53	15:37	01:40	02:29	03:14
S 10°	13:47	14:37	15:24	02:00	02:46	03:28
20°	13:27	14:20	15:11	02:21	03:04	03:44
30°	13:04	14:00	14:56	02:45	03:25	04:01
35°	12:50	13:48	14:47	03:00	03:38	04:11
40°	12:34	13:35	14:36	03:16	03:52	04:22
45°	12:15	13:19	14:24	03:36	04:09	04:35
S 50°	11:51	13:00	14:09	04:00	04:29	04:51
52°	11:40	12:50	14:03	04:12	04:39	04:59
54°	11:27	12:40	13:55	04:25	04:50	05:07
56°	11:12	12:28	13:46	04:41	05:02	05:17
58°	10:54	12:15	13:36	04:59	05:16	05:27
S 60°	10:32	11:58	13:25	05:22	05:33	05:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 10-12 71-86%
10	02:46	02:56	11:57	20:17	07:53	
11	03:07	03:17	11:57	21:03	08:41	
12	03:28	03:38	11:56	21:47	09:26	

September 13, 14, 15 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	351°45.9	172°24.1	N01°42.5	137°01.5	S14°18.1	189°27.6	N08°30.9	325°48.7	N07°49.4
1	6°48.4	187°23.7	41.3	152°02.4	18.7	204°29.6	30.7	340°51.3	49.3
2	21°50.9	202°23.3	40.0	167°03.2	19.3	219°31.5	30.5	355°53.9	49.3
3	36°53.3	217°23.0	·· 38.7	182°04.1	·· 19.8	234°33.5	·· 30.3	10°56.5	·· 49.2
4	51°55.8	232°22.6	37.5	197°04.9	20.4	249°35.5	30.1	25°59.0	49.2
5	66°58.3	247°22.2	36.2	212°05.7	21.0	264°37.4	29.9	41°01.6	49.1
6	82°00.7	262°21.8	N01°34.9	227°06.6	S14°21.6	279°39.4	N08°29.7	56°04.2	N07°49.1
7	97°03.2	277°21.5	33.7	242°07.4	22.1	294°41.3	29.5	71°06.8	49.0
8	112°05.7	292°21.1	32.4	257°08.3	22.7	309°43.3	29.3	86°09.4	48.9
9	127°08.1	307°20.7	·· 31.1	272°09.1	·· 23.3	324°45.3	·· 29.0	101°12.0	·· 48.9
10	142°10.6	322°20.4	29.8	287°09.9	23.8	339°47.2	28.8	116°14.6	48.8
11	157°13.0	337°20.0	28.6	302°10.8	24.4	354°49.2	28.6	131°17.2	48.8
12	172°15.5	352°19.6	N01°27.3	317°11.6	S14°25.0	9°51.1	N08°28.4	146°19.8	N07°48.7
13	187°18.0	7°19.3	26.0	332°12.5	25.6	24°53.1	28.2	161°22.4	48.7
14	202°20.4	22°18.9	24.8	347°13.3	26.1	39°55.0	28.0	176°25.0	48.6
15	217°22.9	37°18.5	·· 23.5	2°14.1	·· 26.7	54°57.0	·· 27.8	191°27.5	·· 48.5
16	232°25.4	52°18.2	22.2	17°15.0	27.3	69°59.0	27.6	206°30.1	48.5
17	247°27.8	67°17.8	21.0	32°15.8	27.8	85°00.9	27.4	221°32.7	48.4
18	262°30.3	82°17.4	N01°19.7	47°16.7	S14°28.4	100°02.9	N08°27.2	236°35.3	N07°48.4
19	277°32.8	97°17.1	18.4	62°17.5	29.0	115°04.8	27.0	251°37.9	48.3
20	292°35.2	112°16.7	17.1	77°18.3	29.5	130°06.8	26.8	266°40.5	48.3
21	307°37.7	127°16.3	·· 15.9	92°19.2	·· 30.1	145°08.8	·· 26.6	281°43.1	·· 48.2
22	322°40.2	142°16.0	14.6	107°20.0	30.7	160°10.7	26.4	296°45.7	48.1
23	337°42.6	157°15.6	13.3	122°20.8	31.3	175°12.7	26.2	311°48.3	48.1
Mer.pass. 00:33		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.1′ m 0.26

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	352°45.1	172°15.2	N01°12.1	137°21.7	S14°31.8	190°14.6	N08°26.0	326°50.9	N07°48.0
1	7°47.5	187°14.9	10.8	152°22.5	32.4	205°16.6	25.8	341°53.5	48.0
2	22°50.0	202°14.5	09.5	167°23.3	33.0	220°18.6	25.6	356°56.1	47.9
3	37°52.5	217°14.1	·· 08.3	182°24.2	·· 33.5	235°20.5	·· 25.4	11°58.7	·· 47.9
4	52°54.9	232°13.8	07.0	197°25.0	34.1	250°22.5	25.2	27°01.3	47.8
5	67°57.4	247°13.4	05.7	212°25.9	34.7	265°24.4	25.0	42°03.9	47.7
6	82°59.9	262°13.0	N01°04.4	227°26.7	S14°35.2	280°26.4	N08°24.8	57°06.4	N07°47.7
7	98°02.3	277°12.7	03.2	242°27.5	35.8	295°28.4	24.6	72°09.0	47.6
8	113°04.8	292°12.3	01.9	257°28.4	36.4	310°30.3	24.4	87°11.6	47.6
9	128°07.3	307°11.9	01°00.6	272°29.2	·· 36.9	325°32.3	·· 24.2	102°14.2	·· 47.5
10	143°09.7	322°11.6	00°59.4	287°30.0	37.5	340°34.2	24.0	117°16.8	47.5
11	158°12.2	337°11.2	58.1	302°30.9	38.1	355°36.2	23.8	132°19.4	47.4
12	173°14.6	352°10.8	N00°56.8	317°31.7	S14°38.6	10°38.1	N08°23.6	147°22.0	N07°47.3
13	188°17.1	7°10.5	55.5	332°32.5	39.2	25°40.1	23.4	162°24.6	47.3
14	203°19.6	22°10.1	54.3	347°33.4	39.8	40°42.1	23.2	177°27.2	47.2
15	218°22.0	37°09.7	·· 53.0	2°34.2	·· 40.4	55°44.0	·· 23.0	192°29.8	·· 47.2
16	233°24.5	52°09.4	51.7	17°35.0	40.9	70°46.0	22.8	207°32.4	47.1
17	248°27.0	67°09.0	50.4	32°35.8	41.5	85°47.9	22.6	222°35.0	47.0
18	263°29.4	82°08.6	N00°49.2	47°36.7	S14°42.1	100°49.9	N08°22.4	237°37.6	N07°47.0
19	278°31.9	97°08.3	47.9	62°37.5	42.6	115°51.9	22.2	252°40.2	46.9
20	293°34.4	112°07.9	46.6	77°38.3	43.2	130°53.8	22.0	267°42.8	46.9
21	308°36.8	127°07.5	·· 45.4	92°39.2	·· 43.8	145°55.8	·· 21.8	282°45.4	·· 46.8
22	323°39.3	142°07.2	44.1	107°40.0	44.3	160°57.7	21.6	297°48.0	46.8
23	338°41.8	157°06.8	42.8	122°40.8	44.9	175°59.7	21.4	312°50.6	46.7
Mer.pass. 00:29		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.1′ m 0.26

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	353°44.2	172°06.4	N00°41.5	137°41.7	S14°45.5	191°01.7	N08°21.2	327°53.2	N07°46.6
1	8°46.7	187°06.1	40.3	152°42.5	46.0	206°03.6	21.0	342°55.8	46.6
2	23°49.1	202°05.7	39.0	167°43.3	46.6	221°05.6	20.8	357°58.3	46.5
3	38°51.6	217°05.3	·· 37.7	182°44.1	·· 47.1	236°07.5	·· 20.6	13°00.9	·· 46.5
4	53°54.1	232°05.0	36.5	197°45.0	47.7	251°09.5	20.4	28°03.5	46.4
5	68°56.5	247°04.6	35.2	212°45.8	48.3	266°11.5	20.2	43°06.1	46.3
6	83°59.0	262°04.2	N00°33.9	227°46.6	S14°48.8	281°13.4	N08°20.0	58°08.7	N07°46.3
7	99°01.5	277°03.9	32.6	242°47.5	49.4	296°15.4	19.8	73°11.3	46.2
8	114°03.9	292°03.5	31.4	257°48.3	50.0	311°17.3	19.6	88°13.9	46.2
9	129°06.4	307°03.1	·· 30.1	272°49.1	·· 50.5	326°19.3	·· 19.4	103°16.5	·· 46.1
10	144°08.9	322°02.8	28.8	287°49.9	51.1	341°21.3	19.2	118°19.1	46.1
11	159°11.3	337°02.4	27.5	302°50.8	51.7	356°23.2	19.0	133°21.7	46.0
12	174°13.8	352°02.0	N00°26.3	317°51.6	S14°52.2	11°25.2	N08°18.8	148°24.3	N07°45.9
13	189°16.2	7°01.7	25.0	332°52.4	52.8	26°27.2	18.6	163°26.9	45.9
14	204°18.7	22°01.3	23.7	347°53.2	53.4	41°29.1	18.4	178°29.5	45.8
15	219°21.2	37°00.9	·· 22.4	2°54.1	·· 53.9	56°31.1	·· 18.2	193°32.1	·· 45.8
16	234°23.6	52°00.6	21.2	17°54.9	54.5	71°33.0	18.0	208°34.7	45.7
17	249°26.1	67°00.2	19.9	32°55.7	55.0	86°35.0	17.8	223°37.3	45.6
18	264°28.6	81°59.8	N00°18.6	47°56.5	S14°55.6	101°37.0	N08°17.6	238°39.9	N07°45.6
19	279°31.0	96°59.5	17.3	62°57.4	56.2	116°38.9	17.4	253°42.5	45.5
20	294°33.5	111°59.1	16.1	77°58.2	56.7	131°40.9	17.2	268°45.1	45.5
21	309°36.0	126°58.7	·· 14.8	92°59.0	·· 57.3	146°42.8	·· 17.0	283°47.7	·· 45.4
22	324°38.4	141°58.4	13.5	107°59.8	57.9	161°44.8	16.8	298°50.3	45.3
23	339°40.9	156°58.0	12.3	123°00.7	58.4	176°46.8	16.6	313°52.9	45.3
Mer.pass. 00:25		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.70	ν 2.6′	d 0.1′ m 0.25

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°27.9	56°41.4
Diphda	348°44.8	-17°49.8
Achernar	335°18.1	-57°05.5
Hamal	327°48.4	23°35.7
Polaris	312°35.7	89°22.6
Acamar	315°09.9	-40°11.3
Menkar	314°03.7	4°12.1
Mirfak	308°24.8	49°57.5
Aldebaran	290°37.0	16°33.9
Rigel	281°01.7	-8°10.0
Capella	280°18.6	46°01.4
Bellatrix	278°20.5	6°22.6
Elnath	277°59.1	28°37.8
Alnilam	275°35.5	-1°10.9
Betelgeuse	270°49.7	7°24.8
Canopus	263°51.5	-52°42.3
Sirius	258°24.4	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.7	5°09.3
Pollux	243°14.8	27°57.5
Avior	234°14.3	-59°35.7
Suhail	222°45.0	-43°32.5
Miaplacidus	221°38.5	-69°49.7
Alphard	217°45.9	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.0
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.3
Gacrux	171°49.7	-57°16.2
Alioth	166°11.6	55°48.7
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.3	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.6	-60°57.2
Kochab	137°20.6	74°02.7
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.0	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.4	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.3	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.1	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.6	38°48.9
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.9	-56°38.8
Deneb	49°23.9	45°23.0
Enif	33°36.3	10°00.4
Al Na'ir	27°29.7	-46°49.5
Fomalhaut	15°11.7	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 13 Mon	SHA	Mer.pass
Venus	180°38.1	12:31
Mars	145°15.6	14:51
Jupiter	197°41.7	11:21
Saturn	334°02.7	02:16

Sep 14 Tue	SHA	Mer.pass
Venus	179°30.1	12:31
Mars	144°36.6	14:50
Jupiter	197°29.6	11:18
Saturn	334°05.8	02:12

Sep 15 Wed	SHA	Mer.pass
Venus	178°22.2	12:32
Mars	143°57.4	14:48
Jupiter	197°17.5	11:14
Saturn	334°08.9	02:08

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0732 sec ΔT = TT-UT1 = +69.2572 sec

2027 September 13 to Sep. 15 UT

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°57.3	N03°57.6	32°12.2	15.1′	S15°06.9	11.5′	54.1′
1	195°57.5	56.7	46°46.3	15.1′	14°55.4	11.6′	54.1′
2	210°57.7	55.7	61°20.4	15.2′	14°43.8	11.7′	54.1′
3	225°57.9	·· 54.7	75°54.6	15.2′	14°32.1	11.7′	54.1′
4	240°58.2	53.8	90°28.8	15.3′	14°20.4	11.8′	54.1′
5	255°58.4	52.8	105°03.1	15.3′	14°08.6	11.8′	54.1′
6	270°58.6	N03°51.9	119°37.4	15.4′	S13°56.8	11.9′	54.1′
7	285°58.8	50.9	134°11.8	15.4′	13°44.9	11.9′	54.1′
8	300°59.1	50.0	148°46.2	15.4′	13°33.0	12.0′	54.1′
9	315°59.3	·· 49.0	163°20.6	15.5′	13°21.0	12.1′	54.1′
10	330°59.5	48.1	177°55.1	15.5′	13°08.9	12.1′	54.1′
11	345°59.7	47.1	192°29.6	15.5′	12°56.8	12.2′	54.2′
12	1°00.0	N03°46.1	207°04.1	15.6′	S12°44.6	12.2′	54.2′
13	16°00.2	45.2	221°38.7	15.6′	12°32.4	12.3′	54.2′
14	31°00.4	44.2	236°13.3	15.6′	12°20.1	12.3′	54.2′
15	46°00.6	·· 43.3	250°47.9	15.7′	12°07.8	12.4′	54.2′
16	61°00.8	42.3	265°22.6	15.7′	11°55.4	12.4′	54.2′
17	76°01.1	41.4	279°57.3	15.7′	11°43.0	12.5′	54.2′
18	91°01.3	N03°40.4	294°32.1	15.8′	S11°30.5	12.5′	54.2′
19	106°01.5	39.5	309°06.8	15.8′	11°18.0	12.6′	54.2′
20	121°01.7	38.5	323°41.6	15.8′	11°05.4	12.6′	54.2′
21	136°02.0	·· 37.5	338°16.5	15.9′	10°52.8	12.6′	54.2′
22	151°02.2	36.6	352°51.3	15.9′	10°40.2	12.7′	54.2′
23	166°02.4	35.6	7°26.2	15.9′	10°27.5	12.8′	54.2′
	SD = 15.9′	d = 1.0′		SD = 14.7′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°02.6	N03°34.7	22°01.1	15.9′	S10°14.7	12.8′	54.3′
1	196°02.8	33.7	36°36.1	16.0′	10°01.9	12.8′	54.3′
2	211°03.1	32.8	51°11.0	16.0′	09°49.1	12.9′	54.3′
3	226°03.3	·· 31.8	65°46.0	16.0′	09°36.2	12.9′	54.3′
4	241°03.5	30.8	80°21.0	16.0′	09°23.3	12.9′	54.3′
5	256°03.7	29.9	94°56.1	16.1′	09°10.4	13.0′	54.3′
6	271°04.0	N03°28.9	109°31.1	16.1′	S08°57.4	13.1′	54.3′
7	286°04.2	28.0	124°06.2	16.1′	08°44.3	13.1′	54.3′
8	301°04.4	27.0	138°41.3	16.1′	08°31.2	13.1′	54.3′
9	316°04.6	·· 26.0	153°16.4	16.1′	08°18.1	13.1′	54.3′
10	331°04.9	25.1	167°51.6	16.2′	08°05.0	13.2′	54.4′
11	346°05.1	24.1	182°26.7	16.2′	07°51.8	13.2′	54.4′
12	1°05.3	N03°23.2	197°01.9	16.2′	S07°38.6	13.3′	54.4′
13	16°05.5	22.2	211°37.1	16.2′	07°25.3	13.3′	54.4′
14	31°05.8	21.2	226°12.3	16.2′	07°12.0	13.3′	54.4′
15	46°06.0	·· 20.3	240°47.5	16.2′	06°58.7	13.3′	54.4′
16	61°06.2	19.3	255°22.7	16.2′	06°45.4	13.4′	54.4′
17	76°06.4	18.4	269°58.0	16.3′	06°32.0	13.4′	54.4′
18	91°06.6	N03°17.4	284°33.2	16.3′	S06°18.6	13.5′	54.4′
19	106°06.9	16.5	299°08.5	16.3′	06°05.1	13.4′	54.5′
20	121°07.1	15.5	313°43.7	16.3′	05°51.7	13.5′	54.5′
21	136°07.3	·· 14.5	328°19.0	16.3′	05°38.2	13.5′	54.5′
22	151°07.5	13.6	342°54.3	16.3′	05°24.7	13.6′	54.5′
23	166°07.8	12.6	357°29.6	16.3′	05°11.1	13.6′	54.5′
	SD = 15.9′	d = 1.0′		SD = 14.8′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°08.0	N03°11.7	12°04.9	16.3′	S04°57.5	13.6′	54.5′
1	196°08.2	10.7	26°40.2	16.3′	04°43.9	13.6′	54.5′
2	211°08.4	09.7	41°15.5	16.3′	04°30.3	13.7′	54.5′
3	226°08.7	·· 08.8	55°50.8	16.3′	04°16.6	13.6′	54.6′
4	241°08.9	07.8	70°26.2	16.3′	04°03.0	13.7′	54.6′
5	256°09.1	06.9	85°01.5	16.3′	03°49.3	13.7′	54.6′
6	271°09.3	N03°05.9	99°36.8	16.3′	S03°35.6	13.8′	54.6′
7	286°09.6	04.9	114°12.1	16.3′	03°21.8	13.7′	54.6′
8	301°09.8	04.0	128°47.4	16.3′	03°08.1	13.8′	54.6′
9	316°10.0	·· 03.0	143°22.8	16.3′	02°54.3	13.8′	54.6′
10	331°10.2	02.0	157°58.1	16.3′	02°40.5	13.8′	54.7′
11	346°10.4	01.1	172°33.4	16.3′	02°26.7	13.8′	54.7′
12	1°10.7	N03°00.1	187°08.7	16.3′	S02°12.9	13.9′	54.7′
13	16°10.9	02°59.2	201°44.0	16.3′	01°59.0	13.8′	54.7′
14	31°11.1	58.2	216°19.3	16.3′	01°45.2	13.9′	54.7′
15	46°11.3	·· 57.2	230°54.5	16.3′	01°31.3	13.9′	54.7′
16	61°11.6	56.3	245°29.8	16.3′	01°17.4	13.8′	54.7′
17	76°11.8	55.3	260°05.1	16.3′	01°03.6	13.9′	54.7′
18	91°12.0	N02°54.4	274°40.3	16.2′	S00°49.7	14.0′	54.8′
19	106°12.2	53.4	289°15.6	16.2′	00°35.7	13.9′	54.8′
20	121°12.5	52.4	303°50.8	16.2′	00°21.8	13.9′	54.8′
21	136°12.7	·· 51.5	318°26.0	16.2′	S00°07.9	14.0′	54.8′
22	151°12.9	50.5	333°01.2	16.2′	N00°06.1	13.9′	54.8′
23	166°13.1	49.5	347°36.4	16.2′	00°20.0	13.9′	54.8′
	SD = 15.9′	d = 1.0′		SD = 14.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:56	03:48	05:01	18:47	19:59	21:47
N 70°	02:31	04:02	05:07	18:42	19:46	21:15
68°	02:55	04:14	05:12	18:37	19:35	20:52
66°	03:13	04:23	05:16	18:33	19:26	20:35
64°	03:28	04:30	05:19	18:30	19:19	20:21
62°	03:40	04:37	05:22	18:27	19:13	20:09
60°	03:50	04:42	05:25	18:25	19:07	20:00
N 58°	03:58	04:47	05:27	18:23	19:03	19:51
56°	04:05	04:51	05:29	18:21	18:59	19:44
54°	04:12	04:55	05:31	18:19	18:55	19:38
52°	04:17	04:58	05:32	18:18	18:52	19:33
50°	04:22	05:01	05:34	18:16	18:49	19:28
45°	04:32	05:07	05:37	18:13	18:43	19:18
N 40°	04:40	05:12	05:40	18:11	18:38	19:10
35°	04:47	05:16	05:42	18:09	18:34	19:04
30°	04:52	05:20	05:44	18:07	18:31	18:59
20°	04:59	05:25	05:47	18:04	18:26	18:52
N 10°	05:04	05:29	05:50	18:01	18:22	18:47
0°	05:08	05:32	05:52	17:59	18:20	18:44
S 10°	05:09	05:34	05:55	17:57	18:18	18:42
20°	05:10	05:35	05:57	17:54	18:16	18:42
30°	05:08	05:36	06:00	17:52	18:16	18:43
35°	05:07	05:36	06:01	17:50	18:16	18:45
40°	05:05	05:36	06:03	17:49	18:16	18:47
45°	05:02	05:36	06:05	17:47	18:16	18:50
S 50°	04:58	05:35	06:07	17:45	18:17	18:55
52°	04:55	05:35	06:08	17:44	18:18	18:57
54°	04:53	05:34	06:09	17:43	18:18	19:00
56°	04:50	05:34	06:10	17:42	18:19	19:02
58°	04:47	05:33	06:12	17:41	18:20	19:06
S 60°	04:43	05:32	06:13	17:39	18:21	19:10

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	18:57	18:22	17:53	00:05	02:27	04:29
N 70°	18:38	18:13	17:52	00:41	02:44	04:35
68°	18:24	18:06	17:51	01:07	02:57	04:39
66°	18:12	18:00	17:50	01:27	03:07	04:43
64°	18:01	17:55	17:49	01:42	03:16	04:47
62°	17:53	17:51	17:48	01:55	03:23	04:50
60°	17:45	17:47	17:48	02:06	03:30	04:52
N 58°	17:39	17:43	17:47	02:15	03:35	04:54
56°	17:33	17:40	17:47	02:23	03:40	04:56
54°	17:27	17:37	17:46	02:31	03:45	04:58
52°	17:23	17:35	17:46	02:37	03:49	05:00
50°	17:18	17:32	17:46	02:43	03:52	05:01
45°	17:09	17:27	17:45	02:56	04:00	05:04
N 40°	17:01	17:23	17:44	03:06	04:06	05:07
35°	16:54	17:19	17:44	03:15	04:12	05:09
30°	16:48	17:16	17:43	03:22	04:17	05:11
20°	16:37	17:10	17:43	03:36	04:25	05:14
N 10°	16:28	17:05	17:42	03:47	04:33	05:17
0°	16:19	17:01	17:41	03:58	04:39	05:20
S 10°	16:11	16:56	17:41	04:08	04:46	05:23
20°	16:01	16:51	17:40	04:19	04:53	05:26
30°	15:51	16:45	17:39	04:32	05:01	05:29
35°	15:44	16:41	17:39	04:40	05:06	05:31
40°	15:37	16:38	17:38	04:48	05:11	05:33
45°	15:29	16:33	17:38	04:58	05:17	05:35
S 50°	15:19	16:28	17:37	05:09	05:24	05:38
52°	15:14	16:25	17:37	05:15	05:28	05:39
54°	15:09	16:23	17:36	05:20	05:31	05:41
56°	15:03	16:20	17:36	05:27	05:35	05:42
58°	14:57	16:16	17:35	05:34	05:40	05:44
S 60°	14:50	16:13	17:35	05:43	05:45	05:46

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	13-15 92-99%
13	03:49	04:00	11:56	22:29	10:09	
14	04:10	04:21	11:56	23:10	10:50	
15	04:32	04:43	11:55	23:51	11:31	



September 16, 17, 18 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	354°43.4	171°57.6	N00°11.0	138°01.5	S14°59.0	191°48.7	N08°16.4	328°55.5	N07°45.2
1	9°45.8	186°57.3	09.7	153°02.3	14°59.6	206°50.7	16.2	343°58.1	45.2
2	24°48.3	201°56.9	08.4	168°03.1	15°00.1	221°52.6	16.0	359°00.7	45.1
3	39°50.7	216°56.5	·· 07.2	183°04.0	·· 00.7	236°54.6	·· 15.8	14°03.3	·· 45.1
4	54°53.2	231°56.2	05.9	198°04.8	01.2	251°56.6	15.6	29°05.9	45.0
5	69°55.7	246°55.8	04.6	213°05.6	01.8	266°58.5	15.4	44°08.5	44.9
6	84°58.1	261°55.5	N00°03.3	228°06.4	S15°02.4	282°00.5	N08°15.2	59°11.1	N07°44.9
7	100°00.6	276°55.1	02.1	243°07.2	02.9	297°02.4	15.0	74°13.7	44.8
8	115°03.1	291°54.7	N00°00.8	258°08.1	03.5	312°04.4	14.8	89°16.3	44.8
9	130°05.5	306°54.4	S00°00.5	273°08.9	·· 04.0	327°06.4	·· 14.6	104°18.9	·· 44.7
10	145°08.0	321°54.0	01.8	288°09.7	04.6	342°08.3	14.4	119°21.5	44.6
11	160°10.5	336°53.6	03.0	303°10.5	05.2	357°10.3	14.2	134°24.1	44.6
12	175°12.9	351°53.3	S00°04.3	318°11.3	S15°05.7	12°12.3	N08°14.0	149°26.7	N07°44.5
13	190°15.4	6°52.9	05.6	333°12.2	06.3	27°14.2	13.8	164°29.3	44.5
14	205°17.8	21°52.5	06.9	348°13.0	06.8	42°16.2	13.6	179°31.9	44.4
15	220°20.3	36°52.2	·· 08.1	3°13.8	·· 07.4	57°18.1	·· 13.4	194°34.5	·· 44.3
16	235°22.8	51°51.8	09.4	18°14.6	08.0	72°20.1	13.1	209°37.1	44.3
17	250°25.2	66°51.4	10.7	33°15.4	08.5	87°22.1	12.9	224°39.7	44.2
18	265°27.7	81°51.1	S00°12.0	48°16.2	S15°09.1	102°24.0	N08°12.7	239°42.3	N07°44.2
19	280°30.2	96°50.7	13.2	63°17.1	09.6	117°26.0	12.5	254°44.9	44.1
20	295°32.6	111°50.3	14.5	78°17.9	10.2	132°27.9	12.3	269°47.5	44.0
21	310°35.1	126°50.0	·· 15.8	93°18.7	·· 10.8	147°29.9	·· 12.1	284°50.1	·· 44.0
22	325°37.6	141°49.6	17.1	108°19.5	11.3	162°31.9	11.9	299°52.7	43.9
23	340°40.0	156°49.2	18.3	123°20.3	11.9	177°33.8	11.7	314°55.3	43.9
Mer.pass.	00:21	ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.25

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°42.5	171°48.9	S00°19.6	138°21.1	S15°12.4	192°35.8	N08°11.5	329°57.9	N07°43.8
1	10°45.0	186°48.5	20.9	153°22.0	13.0	207°37.8	11.3	345°00.5	43.7
2	25°47.4	201°48.1	22.2	168°22.8	13.6	222°39.7	11.1	0°03.1	43.7
3	40°49.9	216°47.8	·· 23.4	183°23.6	·· 14.1	237°41.7	·· 10.9	15°05.7	·· 43.6
4	55°52.3	231°47.4	24.7	198°24.4	14.7	252°43.6	10.7	30°08.3	43.6
5	70°54.8	246°47.0	26.0	213°25.2	15.2	267°45.6	10.5	45°10.9	43.5
6	85°57.3	261°46.7	S00°27.3	228°26.0	S15°15.8	282°47.6	N08°10.3	60°13.5	N07°43.4
7	100°59.7	276°46.3	28.5	243°26.9	16.3	297°49.5	10.1	75°16.1	43.4
8	116°02.2	291°45.9	29.8	258°27.7	16.9	312°51.5	09.9	90°18.7	43.3
9	131°04.7	306°45.6	·· 31.1	273°28.5	·· 17.5	327°53.5	·· 09.7	105°21.3	·· 43.3
10	146°07.1	321°45.2	32.4	288°29.3	18.0	342°55.4	09.5	120°23.9	43.2
11	161°09.6	336°44.9	33.6	303°30.1	18.6	357°57.4	09.3	135°26.5	43.1
12	176°12.1	351°44.5	S00°34.9	318°30.9	S15°19.1	12°59.3	N08°09.1	150°29.2	N07°43.1
13	191°14.5	6°44.1	36.2	333°31.7	19.7	28°01.3	08.9	165°31.8	43.0
14	206°17.0	21°43.8	37.5	348°32.5	20.2	43°03.3	08.7	180°34.4	43.0
15	221°19.4	36°43.4	·· 38.7	3°33.4	·· 20.8	58°05.2	·· 08.5	195°37.0	·· 42.9
16	236°21.9	51°43.0	40.0	18°34.2	21.4	73°07.2	08.3	210°39.6	42.8
17	251°24.4	66°42.7	41.3	33°35.0	21.9	88°09.2	08.1	225°42.2	42.8
18	266°26.8	81°42.3	S00°42.6	48°35.8	S15°22.5	103°11.1	N08°07.9	240°44.8	N07°42.7
19	281°29.3	96°41.9	43.8	63°36.6	23.0	118°13.1	07.7	255°47.4	42.6
20	296°31.8	111°41.6	45.1	78°37.4	23.6	133°15.0	07.5	270°50.0	42.6
21	311°34.2	126°41.2	·· 46.4	93°38.2	·· 24.1	148°17.0	·· 07.3	285°52.6	·· 42.5
22	326°36.7	141°40.8	47.7	108°39.0	24.7	163°19.0	07.1	300°55.2	42.5
23	341°39.2	156°40.5	48.9	123°39.8	25.2	178°20.9	06.9	315°57.8	42.4
Mer.pass.	00:17	ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.24

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°41.6	171°40.1	S00°50.2	138°40.6	S15°25.8	193°22.9	N08°06.7	331°00.4	N07°42.3
1	11°44.1	186°39.7	51.5	153°41.5	26.4	208°24.9	06.5	346°03.0	42.3
2	26°46.6	201°39.4	52.8	168°42.3	26.9	223°26.8	06.3	1°05.6	42.2
3	41°49.0	216°39.0	·· 54.1	183°43.1	·· 27.5	238°28.8	·· 06.1	16°08.2	·· 42.2
4	56°51.5	231°38.6	55.3	198°43.9	28.0	253°30.7	05.9	31°10.8	42.1
5	71°53.9	246°38.3	56.6	213°44.7	28.6	268°32.7	05.7	46°13.4	42.0
6	86°56.4	261°37.9	S00°57.9	228°45.5	S15°29.1	283°34.7	N08°05.5	61°16.0	N07°42.0
7	101°58.9	276°37.5	00°59.2	243°46.3	29.7	298°36.6	05.3	76°18.6	41.9
8	117°01.3	291°37.2	01°00.4	258°47.1	30.2	313°38.6	05.1	91°21.2	41.9
9	132°03.8	306°36.8	·· 01.7	273°47.9	·· 30.8	328°40.6	·· 04.9	106°23.9	·· 41.8
10	147°06.3	321°36.4	03.0	288°48.7	31.3	343°42.5	04.7	121°26.5	41.7
11	162°08.7	336°36.1	04.3	303°49.5	31.9	358°44.5	04.5	136°29.1	41.7
12	177°11.2	351°35.7	S01°05.5	318°50.3	S15°32.4	13°46.4	N08°04.3	151°31.7	N07°41.6
13	192°13.7	6°35.3	06.8	333°51.1	33.0	28°48.4	04.1	166°34.3	41.5
14	207°16.1	21°35.0	08.1	348°51.9	33.6	43°50.4	03.9	181°36.9	41.5
15	222°18.6	36°34.6	·· 09.4	3°52.8	·· 34.1	58°52.3	·· 03.7	196°39.5	·· 41.4
16	237°21.1	51°34.2	10.6	18°53.6	34.7	73°54.3	03.5	211°42.1	41.4
17	252°23.5	66°33.9	11.9	33°54.4	35.2	88°56.3	03.3	226°44.7	41.3
18	267°26.0	81°33.5	S01°13.2	48°55.2	S15°35.8	103°58.2	N08°03.1	241°47.3	N07°41.2
19	282°28.4	96°33.1	14.5	63°56.0	36.3	119°00.2	02.9	256°49.9	41.2
20	297°30.9	111°32.8	15.7	78°56.8	36.9	134°02.2	02.7	271°52.5	41.1
21	312°33.4	126°32.4	·· 17.0	93°57.6	·· 37.4	149°04.1	·· 02.5	286°55.1	·· 41.1
22	327°35.8	141°32.0	18.3	108°58.4	38.0	164°06.1	02.3	301°57.7	41.0
23	342°38.3	156°31.7	19.6	123°59.2	38.5	179°08.0	02.1	317°00.3	40.9
Mer.pass.	00:13	ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.24

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°27.9	56°41.4
Diphda	348°44.8	-17°49.8
Achernar	335°18.1	-57°05.5
Hamal	327°48.4	23°35.7
Polaris	312°34.5	89°22.6
Acamar	315°09.8	-40°11.3
Menkar	314°03.6	4°12.1
Mirfak	308°24.8	49°57.5
Aldebaran	290°37.0	16°33.9
Rigel	281°01.7	-8°10.0
Capella	280°18.6	46°01.4
Bellatrix	278°20.5	6°22.6
Elnath	277°59.1	28°37.8
Alnilam	275°35.5	-1°10.9
Betelgeuse	270°49.7	7°24.8
Canopus	263°51.5	-52°42.3
Sirius	258°24.4	-16°45.1
Adhara	255°04.3	-29°00.3
Procyon	244°48.7	5°09.3
Pollux	243°14.8	27°57.5
Avior	234°14.2	-59°35.7
Suhail	222°45.0	-43°32.5
Miaplacidus	221°38.5	-69°49.7
Alphard	217°45.9	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.0
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.2
Alioth	166°11.6	55°48.6
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.3	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.1	19°02.4
Rigil Kent.	139°37.7	-60°57.2
Kochab	137°20.7	74°02.7
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.5	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.1	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.6	38°48.9
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.9	-56°38.8
Deneb	49°24.0	45°23.1
Enif	33°36.3	10°00.4
Al Na'ir	27°29.7	-46°49.5
Fomalhaut	15°11.7	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 16 Thu	SHA	Mer.pass
Venus	177°14.3	12:32
Mars	143°18.1	14:47
Jupiter	197°05.4	11:11
Saturn	334°12.1	02:04

Sep 17 Fri	SHA	Mer.pass
Venus	176°06.4	12:33
Mars	142°38.7	14:46
Jupiter	196°53.3	11:08
Saturn	334°15.4	02:00

Sep 18 Sat	SHA	Mer.pass
Venus	174°58.5	12:34
Mars	141°59.0	14:44
Jupiter	196°41.3	11:05
Saturn	334°18.8	01:56

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°13.4	N02°48.6	2°11.6	16.2′	N00°33.9	14.0′	54.9′
1	196°13.6	47.6	16°46.7	16.1′	00°47.9	14.0′	54.9′
2	211°13.8	46.7	31°21.9	16.1′	01°01.9	13.9′	54.9′
3	226°14.0	·· 45.7	45°57.0	16.1′	01°15.8	14.0′	54.9′
4	241°14.3	44.7	60°32.1	16.1′	01°29.8	14.0′	54.9′
5	256°14.5	43.8	75°07.2	16.1′	01°43.8	13.9′	54.9′
6	271°14.7	N02°42.8	89°42.2	16.0′	N01°57.7	14.0′	54.9′
7	286°14.9	41.8	104°17.2	16.0′	02°11.7	14.0′	55.0′
8	301°15.2	40.9	118°52.2	16.0′	02°25.7	13.9′	55.0′
9	316°15.4	·· 39.9	133°27.2	16.0′	02°39.6	14.0′	55.0′
10	331°15.6	39.0	148°02.2	15.9′	02°53.6	14.0′	55.0′
11	346°15.8	38.0	162°37.1	15.9′	03°07.6	13.9′	55.0′
12	1°16.1	N02°37.0	177°12.0	15.9′	N03°21.5	14.0′	55.0′
13	16°16.3	36.1	191°46.9	15.8′	03°35.5	13.9′	55.1′
14	31°16.5	35.1	206°21.7	15.8′	03°49.4	14.0′	55.1′
15	46°16.7	·· 34.1	220°56.5	15.8′	04°03.4	13.9′	55.1′
16	61°16.9	33.2	235°31.3	15.7′	04°17.3	13.9′	55.1′
17	76°17.2	32.2	250°06.0	15.7′	04°31.2	13.9′	55.1′
18	91°17.4	N02°31.2	264°40.7	15.7′	N04°45.1	13.9′	55.1′
19	106°17.6	30.3	279°15.4	15.6′	04°59.0	13.9′	55.2′
20	121°17.8	29.3	293°50.1	15.6′	05°12.9	13.9′	55.2′
21	136°18.1	·· 28.4	308°24.7	15.6′	05°26.8	13.9′	55.2′
22	151°18.3	27.4	322°59.2	15.5′	05°40.7	13.8′	55.2′
23	166°18.5	26.4	337°33.7	15.5′	05°54.5	13.9′	55.2′
	SD = 15.9′	d = 1.0′	SD = 15.0′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°18.7	N02°25.5	352°08.2	15.4′	N06°08.4	13.8′	55.2′
1	196°19.0	24.5	6°42.7	15.4′	06°22.2	13.8′	55.3′
2	211°19.2	23.5	21°17.1	15.4′	06°36.0	13.8′	55.3′
3	226°19.4	·· 22.6	35°51.4	15.3′	06°49.8	13.7′	55.3′
4	241°19.6	21.6	50°25.7	15.3′	07°03.5	13.8′	55.3′
5	256°19.9	20.6	65°00.0	15.2′	07°17.3	13.7′	55.3′
6	271°20.1	N02°19.7	79°34.2	15.2′	N07°31.0	13.7′	55.3′
7	286°20.3	18.7	94°08.4	15.1′	07°44.7	13.7′	55.4′
8	301°20.5	17.7	108°42.5	15.1′	07°58.4	13.6′	55.4′
9	316°20.8	·· 16.8	123°16.6	15.0′	08°12.0	13.6′	55.4′
10	331°21.0	15.8	137°50.7	15.0′	08°25.6	13.6′	55.4′
11	346°21.2	14.8	152°24.6	14.9′	08°39.2	13.6′	55.4′
12	1°21.4	N02°13.9	166°58.6	14.9′	N08°52.8	13.6′	55.5′
13	16°21.7	12.9	181°32.4	14.8′	09°06.4	13.5′	55.5′
14	31°21.9	11.9	196°06.3	14.8′	09°19.9	13.5′	55.5′
15	46°22.1	·· 11.0	210°40.0	14.7′	09°33.4	13.4′	55.5′
16	61°22.3	10.0	225°13.7	14.7′	09°46.8	13.4′	55.5′
17	76°22.6	09.1	239°47.4	14.6′	10°00.2	13.4′	55.5′
18	91°22.8	N02°08.1	254°21.0	14.5′	N10°13.6	13.4′	55.6′
19	106°23.0	07.1	268°54.5	14.5′	10°27.0	13.3′	55.6′
20	121°23.2	06.2	283°28.0	14.4′	10°40.3	13.3′	55.6′
21	136°23.5	·· 05.2	298°01.4	14.4′	10°53.6	13.2′	55.6′
22	151°23.7	04.2	312°34.8	14.3′	11°06.8	13.2′	55.6′
23	166°23.9	03.3	327°08.1	14.2′	11°20.0	13.2′	55.7′
	SD = 15.9′	d = 1.0′	SD = 15.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°24.1	N02°02.3	341°41.3	14.2′	N11°33.2	13.1′	55.7′
1	196°24.3	01.3	356°14.5	14.1′	11°46.3	13.1′	55.7′
2	211°24.6	02°00.4	10°47.6	14.0′	11°59.4	13.0′	55.7′
3	226°24.8	01°59.4	25°20.6	14.0′	12°12.4	13.0′	55.7′
4	241°25.0	58.4	39°53.6	13.9′	12°25.4	13.0′	55.8′
5	256°25.2	57.5	54°26.5	13.8′	12°38.4	12.9′	55.8′
6	271°25.5	N01°56.5	68°59.3	13.8′	N12°51.3	12.8′	55.8′
7	286°25.7	55.5	83°32.1	13.7′	13°04.1	12.8′	55.8′
8	301°25.9	54.6	98°04.8	13.6′	13°16.9	12.8′	55.8′
9	316°26.1	·· 53.6	112°37.4	13.6′	13°29.7	12.7′	55.9′
10	331°26.4	52.6	127°10.0	13.5′	13°42.4	12.7′	55.9′
11	346°26.6	51.7	141°42.5	13.4′	13°55.1	12.6′	55.9′
12	1°26.8	N01°50.7	156°14.9	13.3′	N14°07.7	12.5′	55.9′
13	16°27.0	49.7	170°47.2	13.3′	14°20.2	12.5′	55.9′
14	31°27.3	48.8	185°19.4	13.2′	14°32.7	12.4′	56.0′
15	46°27.5	·· 47.8	199°51.6	13.1′	14°45.1	12.4′	56.0′
16	61°27.7	46.8	214°23.7	13.0′	14°57.5	12.3′	56.0′
17	76°27.9	45.8	228°55.7	12.9′	15°09.8	12.3′	56.0′
18	91°28.2	N01°44.9	243°27.7	12.9′	N15°22.1	12.2′	56.0′
19	106°28.4	43.9	257°59.6	12.8′	15°34.3	12.1′	56.1′
20	121°28.6	42.9	272°31.3	12.7′	15°46.4	12.1′	56.1′
21	136°28.8	·· 42.0	287°03.0	12.6′	15°58.5	12.0′	56.1′
22	151°29.1	41.0	301°34.7	12.5′	16°10.5	11.9′	56.1′
23	166°29.3	40.0	316°06.2	12.5′	16°22.4	11.9′	56.1′
	SD = 15.9′	d = 1.0′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:22	04:04	05:15	18:32	19:42	21:21
N 70°	02:50	04:16	05:19	18:28	19:31	20:55
68°	03:10	04:25	05:23	18:25	19:21	20:35
66°	03:26	04:33	05:25	18:22	19:14	20:20
64°	03:39	04:39	05:28	18:20	19:08	20:08
62°	03:49	04:45	05:30	18:18	19:02	19:58
60°	03:58	04:50	05:32	18:16	18:58	19:49
N 58°	04:06	04:54	05:33	18:14	18:54	19:42
56°	04:12	04:57	05:35	18:13	18:50	19:35
54°	04:18	05:00	05:36	18:12	18:47	19:30
52°	04:23	05:03	05:37	18:11	18:45	19:25
50°	04:27	05:06	05:38	18:10	18:42	19:21
45°	04:36	05:11	05:41	18:08	18:37	19:12
N 40°	04:43	05:15	05:42	18:06	18:33	19:05
35°	04:49	05:19	05:44	18:05	18:30	18:59
30°	04:53	05:21	05:45	18:03	18:27	18:55
20°	05:00	05:26	05:48	18:01	18:23	18:49
N 10°	05:04	05:29	05:50	17:59	18:20	18:45
0°	05:07	05:31	05:51	17:58	18:18	18:42
S 10°	05:08	05:32	05:53	17:56	18:17	18:42
20°	05:07	05:33	05:55	17:55	18:17	18:42
30°	05:05	05:32	05:56	17:53	18:17	18:45
35°	05:03	05:32	05:57	17:53	18:18	18:47
40°	05:00	05:31	05:58	17:52	18:19	18:50
45°	04:56	05:30	05:59	17:51	18:20	18:54
S 50°	04:51	05:28	06:01	17:49	18:22	18:59
52°	04:48	05:28	06:01	17:49	18:23	19:02
54°	04:45	05:27	06:02	17:48	18:24	19:05
56°	04:42	05:26	06:03	17:48	18:25	19:08
58°	04:38	05:24	06:03	17:47	18:26	19:12
S 60°	04:34	05:23	06:04	17:46	18:28	19:17

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	17:24	16:51	16:04	06:26	08:28	10:49
N 70°	17:30	17:06	16:35	06:23	08:16	10:20
68°	17:35	17:18	16:57	06:21	08:05	09:58
66°	17:39	17:28	17:16	06:19	07:57	09:42
64°	17:43	17:37	17:30	06:17	07:50	09:28
62°	17:46	17:44	17:43	06:16	07:44	09:17
60°	17:49	17:51	17:53	06:15	07:39	09:07
N 58°	17:51	17:56	18:03	06:14	07:35	08:59
56°	17:54	18:01	18:11	06:13	07:31	08:52
54°	17:56	18:06	18:18	06:12	07:27	08:45
52°	17:57	18:10	18:25	06:11	07:24	08:39
50°	17:59	18:14	18:31	06:10	07:21	08:34
45°	18:03	18:22	18:44	06:09	07:15	08:23
N 40°	18:06	18:29	18:54	06:08	07:09	08:13
35°	18:09	18:35	19:04	06:06	07:05	08:05
30°	18:11	18:40	19:12	06:05	07:01	07:58
20°	18:15	18:49	19:26	06:04	06:54	07:46
N 10°	18:19	18:57	19:38	06:02	06:48	07:36
0°	18:22	19:05	19:50	06:01	06:43	07:26
S 10°	18:26	19:13	20:02	05:59	06:37	07:16
20°	18:30	19:21	20:15	05:58	06:31	07:06
30°	18:34	19:30	20:29	05:56	06:24	06:54
35°	18:37	19:36	20:38	05:55	06:20	06:48
40°	18:39	19:42	20:47	05:54	06:16	06:40
45°	18:43	19:50	20:59	05:53	06:11	06:31
S 50°	18:47	19:59	21:13	05:51	06:05	06:20
52°	18:49	20:03	21:20	05:50	06:02	06:16
54°	18:51	20:07	21:27	05:50	05:59	06:10
56°	18:53	20:12	21:35	05:49	05:56	06:04
58°	18:56	20:18	21:44	05:48	05:52	05:57
S 60°	18:58	20:25	21:55	05:47	05:48	05:50

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 16-18 100-96%
16	04:53	05:04	11:55	–:–	12:12	
17	05:15	05:26	11:55	00:32	12:54	
18	05:36	05:47	11:54	01:15	13:38	

September 19, 20, 21 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	357°40.8	171°31.3	S01°20.8	139°00.0	S15°39.1	194°10.0	N08°01.9	332°03.0	N07°40.9
1	12°43.2	186°30.9	22.1	154°00.8	39.6	209°12.0	01.7	347°05.6	40.8
2	27°45.7	201°30.6	23.4	169°01.6	40.2	224°13.9	01.5	2°08.2	40.7
3	42°48.2	216°30.2	·· 24.7	184°02.4	·· 40.7	239°15.9	·· 01.3	17°10.8	·· 40.7
4	57°50.6	231°29.8	25.9	199°03.2	41.3	254°17.9	01.1	32°13.4	40.6
5	72°53.1	246°29.5	27.2	214°04.0	41.8	269°19.8	00.9	47°16.0	40.6
6	87°55.5	261°29.1	S01°28.5	229°04.8	S15°42.4	284°21.8	N08°00.7	62°18.6	N07°40.5
7	102°58.0	276°28.7	29.8	244°05.6	42.9	299°23.8	00.5	77°21.2	40.4
8	118°00.5	291°28.4	31.0	259°06.4	43.5	314°25.7	00.3	92°23.8	40.4
9	133°02.9	306°28.0	·· 32.3	274°07.2	·· 44.0	329°27.7	08°00.1	107°26.4	·· 40.3
10	148°05.4	321°27.6	33.6	289°08.0	44.6	344°29.7	07°59.9	122°29.0	40.2
11	163°07.9	336°27.3	34.9	304°08.8	45.1	359°31.6	59.7	137°31.6	40.2
12	178°10.3	351°26.9	S01°36.1	319°09.6	S15°45.7	14°33.6	N07°59.5	152°34.3	N07°40.1
13	193°12.8	6°26.5	37.4	334°10.4	46.2	29°35.5	59.3	167°36.9	40.1
14	208°15.3	21°26.2	38.7	349°11.2	46.8	44°37.5	59.1	182°39.5	40.0
15	223°17.7	36°25.8	·· 40.0	4°12.0	·· 47.3	59°39.5	·· 58.9	197°42.1	·· 39.9
16	238°20.2	51°25.4	41.2	19°12.8	47.9	74°41.4	58.7	212°44.7	39.9
17	253°22.7	66°25.1	42.5	34°13.6	48.4	89°43.4	58.5	227°47.3	39.8
18	268°25.1	81°24.7	S01°43.8	49°14.4	S15°49.0	104°45.4	N07°58.3	242°49.9	N07°39.7
19	283°27.6	96°24.3	45.1	64°15.2	49.5	119°47.3	58.1	257°52.5	39.7
20	298°30.0	111°24.0	46.4	79°16.0	50.1	134°49.3	57.9	272°55.1	39.6
21	313°32.5	126°23.6	·· 47.6	94°16.8	·· 50.6	149°51.3	·· 57.7	287°57.7	·· 39.6
22	328°35.0	141°23.2	48.9	109°17.6	51.1	164°53.2	57.5	303°00.3	39.5
23	343°37.4	156°22.9	50.2	124°18.4	51.7	179°55.2	57.3	318°03.0	39.4
Mer.pass. 00:09		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.6′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.23

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	358°39.9	171°22.5	S01°51.5	139°19.1	S15°52.2	194°57.2	N07°57.1	333°05.6	N07°39.4
1	13°42.4	186°22.1	52.7	154°19.9	52.8	209°59.1	56.9	348°08.2	39.3
2	28°44.8	201°21.8	54.0	169°20.7	53.3	225°01.1	56.7	3°10.8	39.2
3	43°47.3	216°21.4	·· 55.3	184°21.5	·· 53.9	240°03.1	·· 56.5	18°13.4	·· 39.2
4	58°49.8	231°21.0	56.6	199°22.3	54.4	255°05.0	56.3	33°16.0	39.1
5	73°52.2	246°20.7	57.8	214°23.1	55.0	270°07.0	56.1	48°18.6	39.1
6	88°54.7	261°20.3	S01°59.1	229°23.9	S15°55.5	285°08.9	N07°55.9	63°21.2	N07°39.0
7	103°57.1	276°19.9	02°00.4	244°24.7	56.1	300°10.9	55.7	78°23.8	38.9
8	118°59.6	291°19.6	01.7	259°25.5	56.6	315°12.9	55.5	93°26.5	38.9
9	134°02.1	306°19.2	·· 02.9	274°26.3	·· 57.2	330°14.8	·· 55.3	108°29.1	·· 38.8
10	149°04.5	321°18.8	04.2	289°27.1	57.7	345°16.8	55.1	123°31.7	38.7
11	164°07.0	336°18.4	05.5	304°27.9	58.2	0°18.8	54.9	138°34.3	38.7
12	179°09.5	351°18.1	S02°06.8	319°28.7	S15°58.8	15°20.7	N07°54.7	153°36.9	N07°38.6
13	194°11.9	6°17.7	08.0	334°29.5	59.3	30°22.7	54.5	168°39.5	38.5
14	209°14.4	21°17.3	09.3	349°30.3	15°59.9	45°24.7	54.3	183°42.1	38.5
15	224°16.9	36°17.0	·· 10.6	4°31.0	16°00.4	60°26.6	·· 54.1	198°44.7	·· 38.4
16	239°19.3	51°16.6	11.8	19°31.8	01.0	75°28.6	53.9	213°47.3	38.4
17	254°21.8	66°16.2	13.1	34°32.6	01.5	90°30.6	53.7	228°50.0	38.3
18	269°24.3	81°15.9	S02°14.4	49°33.4	S16°02.1	105°32.5	N07°53.5	243°52.6	N07°38.2
19	284°26.7	96°15.5	15.7	64°34.2	02.6	120°34.5	53.3	258°55.2	38.2
20	299°29.2	111°15.1	16.9	79°35.0	03.1	135°36.5	53.1	273°57.8	38.1
21	314°31.6	126°14.8	·· 18.2	94°35.8	·· 03.7	150°38.4	·· 52.9	289°00.4	·· 38.0
22	329°34.1	141°14.4	19.5	109°36.6	04.2	165°40.4	52.7	304°03.0	38.0
23	344°36.6	156°14.0	20.8	124°37.4	04.8	180°42.4	52.5	319°05.6	37.9
Mer.pass. 00:05		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.23

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	359°39.0	171°13.6	S02°22.0	139°38.1	S16°05.3	195°44.3	N07°52.3	334°08.3	N07°37.9
1	14°41.5	186°13.3	23.3	154°38.9	05.9	210°46.3	52.1	349°10.9	37.8
2	29°44.0	201°12.9	24.6	169°39.7	06.4	225°48.3	51.9	4°13.5	37.7
3	44°46.4	216°12.5	·· 25.9	184°40.5	·· 06.9	240°50.2	·· 51.7	19°16.1	·· 37.7
4	59°48.9	231°12.2	27.1	199°41.3	07.5	255°52.2	51.5	34°18.7	37.6
5	74°51.4	246°11.8	28.4	214°42.1	08.0	270°54.2	51.3	49°21.3	37.5
6	89°53.8	261°11.4	S02°29.7	229°42.9	S16°08.6	285°56.1	N07°51.1	64°23.9	N07°37.5
7	104°56.3	276°11.1	31.0	244°43.7	09.1	300°58.1	50.9	79°26.5	37.4
8	119°58.8	291°10.7	32.2	259°44.4	09.7	316°00.1	50.7	94°29.2	37.3
9	135°01.2	306°10.3	·· 33.5	274°45.2	·· 10.2	331°02.0	·· 50.5	109°31.8	·· 37.3
10	150°03.7	321°09.9	34.8	289°46.0	10.7	346°04.0	50.3	124°34.4	37.2
11	165°06.1	336°09.6	36.1	304°46.8	11.3	1°06.0	50.1	139°37.0	37.1
12	180°08.6	351°09.2	S02°37.3	319°47.6	S16°11.8	16°07.9	N07°49.9	154°39.6	N07°37.1
13	195°11.1	6°08.8	38.6	334°48.4	12.4	31°09.9	49.7	169°42.2	37.0
14	210°13.5	21°08.5	39.9	349°49.2	12.9	46°11.9	49.5	184°44.8	37.0
15	225°16.0	36°08.1	·· 41.1	4°49.9	·· 13.4	61°13.8	·· 49.3	199°47.5	·· 36.9
16	240°18.5	51°07.7	42.4	19°50.7	14.0	76°15.8	49.1	214°50.1	36.8
17	255°20.9	66°07.4	43.7	34°51.5	14.5	91°17.8	48.9	229°52.7	36.8
18	270°23.4	81°07.0	S02°45.0	49°52.3	S16°15.1	106°19.7	N07°48.7	244°55.3	N07°36.7
19	285°25.9	96°06.6	46.2	64°53.1	15.6	121°21.7	48.5	259°57.9	36.6
20	300°28.3	111°06.2	47.5	79°53.9	16.1	136°23.7	48.3	275°00.5	36.6
21	315°30.8	126°05.9	·· 48.8	94°54.6	·· 16.7	151°25.6	·· 48.1	290°03.1	·· 36.5
22	330°33.3	141°05.5	50.1	109°55.4	17.2	166°27.6	47.9	305°05.8	36.4
23	345°35.7	156°05.1	51.3	124°56.2	17.8	181°29.6	47.7	320°08.4	36.4
Mer.pass. 23:57		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.23

Stars

	SHA	**Dec**
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°27.9	56°41.5
Diphda	348°44.8	-17°49.8
Achernar	335°18.1	-57°05.5
Hamal	327°48.4	23°35.7
Polaris	312°33.0	89°22.6
Acamar	315°09.8	-40°11.3
Menkar	314°03.6	4°12.1
Mirfak	308°24.8	49°57.5
Aldebaran	290°37.0	16°33.9
Rigel	281°01.7	-8°10.0
Capella	280°18.5	46°01.4
Bellatrix	278°20.5	6°22.6
Elnath	277°59.0	28°37.8
Alnilam	275°35.5	-1°10.9
Betelgeuse	270°49.7	7°24.8
Canopus	263°51.5	-52°42.3
Sirius	258°24.4	-16°45.1
Adhara	255°04.2	-29°00.3
Procyon	244°48.7	5°09.3
Pollux	243°14.8	27°57.5
Avior	234°14.2	-59°35.6
Suhail	222°45.0	-43°32.5
Miaplacidus	221°38.5	-69°49.7
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.0
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.2
Alioth	166°11.6	55°48.6
Spica	158°20.3	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.3	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°20.7	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.5	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.1	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.6	38°48.9
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.9	-56°38.8
Deneb	49°24.0	45°23.1
Enif	33°36.3	10°00.4
Al Na'ir	27°29.8	-46°49.5
Fomalhaut	15°11.7	-29°28.3
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 19 Sun	**SHA**	**Mer.pass**
Venus	173°50.5	12:34
Mars	141°19.2	14:43
Jupiter	196°29.2	11:02
Saturn	334°22.2	01:51

Sep 20 Mon	**SHA**	**Mer.pass**
Venus	172°42.6	12:35
Mars	140°39.2	14:42
Jupiter	196°17.3	10:59
Saturn	334°25.7	01:47

Sep 21 Tue	**SHA**	**Mer.pass**
Venus	171°34.6	12:35
Mars	139°59.1	14:41
Jupiter	196°05.3	10:56
Saturn	334°29.2	01:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°29.5	N01°39.1	330°37.7	12.4′	N16°34.3	11.7′	56.2′
1	196°29.7	38.1	345°09.0	12.3′	16°46.0	11.8′	56.2′
2	211°29.9	37.1	359°40.3	12.2′	16°57.8	11.6′	56.2′
3	226°30.2	·· 36.2	14°11.5	12.1′	17°09.4	11.6′	56.2′
4	241°30.4	35.2	28°42.6	12.0′	17°21.0	11.5′	56.2′
5	256°30.6	34.2	43°13.6	11.9′	17°32.5	11.4′	56.3′
6	271°30.8	N01°33.3	57°44.6	11.9′	N17°43.9	11.4′	56.3′
7	286°31.1	32.3	72°15.4	11.8′	17°55.3	11.3′	56.3′
8	301°31.3	31.3	86°46.2	11.7′	18°06.6	11.2′	56.3′
9	316°31.5	·· 30.4	101°16.9	11.6′	18°17.8	11.1′	56.3′
10	331°31.7	29.4	115°47.5	11.5′	18°28.9	11.0′	56.4′
11	346°32.0	28.4	130°18.0	11.4′	18°39.9	11.0′	56.4′
12	1°32.2	N01°27.4	144°48.4	11.3′	N18°50.9	10.8′	56.4′
13	16°32.4	26.5	159°18.7	11.2′	19°01.7	10.8′	56.4′
14	31°32.6	25.5	173°48.9	11.1′	19°12.5	10.7′	56.5′
15	46°32.9	·· 24.5	188°19.0	11.0′	19°23.2	10.6′	56.5′
16	61°33.1	23.6	202°49.0	10.9′	19°33.8	10.5′	56.5′
17	76°33.3	22.6	217°19.0	10.8′	19°44.3	10.5′	56.5′
18	91°33.5	N01°21.6	231°48.8	10.8′	N19°54.8	10.3′	56.5′
19	106°33.8	20.7	246°18.6	10.7′	20°05.1	10.2′	56.6′
20	121°34.0	19.7	260°48.2	10.6′	20°15.3	10.2′	56.6′
21	136°34.2	·· 18.7	275°17.8	10.5′	20°25.5	10.0′	56.6′
22	151°34.4	17.8	289°47.3	10.4′	20°35.5	10.0′	56.6′
23	166°34.6	16.8	304°16.7	10.3′	20°45.5	9.8′	56.6′
	SD = 15.9′	d = 1.0′		SD = 15.3′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°34.9	N01°15.8	318°45.9	10.2′	N20°55.3	9.8′	56.7′
1	196°35.1	14.8	333°15.1	10.1′	21°05.1	9.6′	56.7′
2	211°35.3	13.9	347°44.2	10.0′	21°14.7	9.6′	56.7′
3	226°35.5	·· 12.9	2°13.2	9.9′	21°24.3	9.4′	56.7′
4	241°35.8	11.9	16°42.1	9.8′	21°33.7	9.3′	56.8′
5	256°36.0	11.0	31°10.9	9.7′	21°43.0	9.3′	56.8′
6	271°36.2	N01°10.0	45°39.6	9.6′	N21°52.3	9.1′	56.8′
7	286°36.4	09.0	60°08.2	9.5′	22°01.4	9.0′	56.8′
8	301°36.7	08.1	74°36.7	9.4′	22°10.4	8.9′	56.8′
9	316°36.9	·· 07.1	89°05.1	9.3′	22°19.3	8.8′	56.9′
10	331°37.1	06.1	103°33.4	9.2′	22°28.1	8.6′	56.9′
11	346°37.3	05.1	118°01.6	9.1′	22°36.7	8.6′	56.9′
12	1°37.5	N01°04.2	132°29.8	9.0′	N22°45.3	8.4′	56.9′
13	16°37.8	03.2	146°57.8	8.9′	22°53.7	8.4′	57.0′
14	31°38.0	02.2	161°25.7	8.8′	23°02.1	8.2′	57.0′
15	46°38.2	·· 01.3	175°53.6	8.7′	23°10.3	8.0′	57.0′
16	61°38.4	01°00.3	190°21.3	8.6′	23°18.3	8.0′	57.0′
17	76°38.7	00°59.3	204°48.9	8.5′	23°26.3	7.8′	57.1′
18	91°38.9	N00°58.4	219°16.5	8.5′	N23°34.1	7.7′	57.1′
19	106°39.1	57.4	233°43.9	8.4′	23°41.8	7.6′	57.1′
20	121°39.3	56.4	248°11.3	8.3′	23°49.4	7.5′	57.1′
21	136°39.6	·· 55.4	262°38.6	8.2′	23°56.9	7.3′	57.1′
22	151°39.8	54.5	277°05.7	8.1′	24°04.2	7.2′	57.2′
23	166°40.0	53.5	291°32.8	8.0′	24°11.4	7.1′	57.2′
	SD = 15.9′	d = 1.0′		SD = 15.5′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°40.2	N00°52.5	305°59.8	7.9′	N24°18.5	6.9′	57.2′
1	196°40.4	51.6	320°26.7	7.8′	24°25.4	6.8′	57.2′
2	211°40.7	50.6	334°53.5	7.7′	24°32.2	6.7′	57.3′
3	226°40.9	·· 49.6	349°20.2	7.6′	24°38.9	6.5′	57.3′
4	241°41.1	48.6	3°46.8	7.5′	24°45.4	6.4′	57.3′
5	256°41.3	47.7	18°13.4	7.4′	24°51.8	6.2′	57.3′
6	271°41.6	N00°46.7	32°39.8	7.4′	N24°58.0	6.1′	57.4′
7	286°41.8	45.7	47°06.2	7.3′	25°04.1	6.0′	57.4′
8	301°42.0	44.8	61°32.4	7.2′	25°10.1	5.8′	57.4′
9	316°42.2	·· 43.8	75°58.6	7.1′	25°15.9	5.7′	57.4′
10	331°42.4	42.8	90°24.7	7.0′	25°21.6	5.5′	57.5′
11	346°42.7	41.8	104°50.7	6.9′	25°27.1	5.4′	57.5′
12	1°42.9	N00°40.9	119°16.7	6.8′	N25°32.5	5.3′	57.5′
13	16°43.1	39.9	133°42.5	6.8′	25°37.8	5.1′	57.5′
14	31°43.3	38.9	148°08.3	6.7′	25°42.9	4.9′	57.5′
15	46°43.6	·· 38.0	162°34.0	6.6′	25°47.8	4.8′	57.6′
16	61°43.8	37.0	176°59.6	6.5′	25°52.6	4.6′	57.6′
17	76°44.0	36.0	191°25.1	6.5′	25°57.2	4.5′	57.6′
18	91°44.2	N00°35.0	205°50.6	6.4′	N26°01.7	4.4′	57.6′
19	106°44.4	34.1	220°15.9	6.3′	26°06.1	4.2′	57.7′
20	121°44.7	33.1	234°41.3	6.2′	26°10.3	4.0′	57.7′
21	136°44.9	·· 32.1	249°06.5	6.2′	26°14.3	3.8′	57.7′
22	151°45.1	31.2	263°31.6	6.1′	26°18.1	3.7′	57.7′
23	166°45.3	30.2	277°56.7	6.0′	26°21.8	3.6′	57.8′
	SD = 15.9′	d = 1.0′		SD = 15.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:43	04:19	05:28	18:16	19:25	20:58
N 70°	03:07	04:29	05:31	18:14	19:16	20:36
68°	03:24	04:36	05:33	18:12	19:08	20:20
66°	03:38	04:43	05:35	18:10	19:02	20:06
64°	03:49	04:48	05:36	18:09	18:57	19:55
62°	03:58	04:53	05:38	18:08	18:52	19:47
60°	04:06	04:57	05:39	18:07	18:48	19:39
N 58°	04:13	05:00	05:40	18:06	18:45	19:32
56°	04:19	05:03	05:41	18:05	18:42	19:27
54°	04:24	05:06	05:41	18:04	18:40	19:22
52°	04:28	05:08	05:42	18:04	18:37	19:18
50°	04:32	05:10	05:43	18:03	18:35	19:14
45°	04:40	05:15	05:44	18:02	18:31	19:06
N 40°	04:46	05:18	05:45	18:01	18:28	19:00
35°	04:51	05:21	05:46	18:00	18:25	18:55
30°	04:55	05:23	05:47	17:59	18:23	18:51
20°	05:01	05:26	05:48	17:58	18:20	18:46
N 10°	05:04	05:28	05:49	17:57	18:18	18:43
0°	05:06	05:30	05:50	17:57	18:17	18:41
S 10°	05:06	05:30	05:51	17:56	18:17	18:41
20°	05:04	05:30	05:52	17:56	18:18	18:43
30°	05:01	05:29	05:52	17:55	18:19	18:47
35°	04:58	05:28	05:53	17:55	18:20	18:49
40°	04:55	05:26	05:53	17:54	18:21	18:53
45°	04:50	05:24	05:54	17:54	18:23	18:58
S 50°	04:44	05:22	05:54	17:54	18:26	19:04
52°	04:41	05:21	05:54	17:54	18:27	19:07
54°	04:38	05:19	05:54	17:54	18:29	19:11
56°	04:34	05:18	05:55	17:54	18:31	19:15
58°	04:29	05:16	05:55	17:53	18:33	19:19
S 60°	04:24	05:14	05:55	17:53	18:35	19:24

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°						
N 70°	15:28			13:05		
68°	16:24			12:10		
66°	16:58	16:21		11:37	14:01	
64°	17:23	17:12	16:44	11:14	13:11	15:34
62°	17:42	17:44	17:53	10:55	12:39	14:26
60°	17:59	18:08	18:28	10:40	12:16	13:51
N 58°	18:12	18:28	18:54	10:27	11:57	13:26
56°	18:24	18:44	19:15	10:16	11:42	13:05
54°	18:35	18:58	19:32	10:06	11:28	12:49
52°	18:44	19:10	19:46	09:57	11:17	12:34
50°	18:52	19:20	19:59	09:49	11:06	12:22
45°	19:10	19:43	20:25	09:33	10:45	11:56
N 40°	19:25	20:01	20:46	09:20	10:28	11:36
35°	19:37	20:16	21:04	09:08	10:13	11:19
30°	19:48	20:30	21:19	08:58	10:00	11:04
20°	20:07	20:53	21:45	08:41	09:39	10:39
N 10°	20:23	21:12	22:07	08:27	09:20	10:18
0°	20:39	21:31	22:28	08:13	09:03	09:58
S 10°	20:54	21:50	22:48	07:59	08:46	09:38
20°	21:11	22:10	23:11	07:45	08:28	09:16
30°	21:30	22:33	23:37	07:28	08:07	08:52
35°	21:42	22:47	23:52	07:18	07:54	08:37
40°	21:55	23:03	·· ··	07:07	07:40	08:21
45°	22:10	23:23	·· ··	06:55	07:24	08:01
S 50°	22:30	23:47	·· ··	06:39	07:03	07:36
52°	22:39	23:58	·· ··	06:32	06:54	07:24
54°	22:49	·· ··	00:12	06:24	06:43	07:10
56°	23:01	·· ··	00:27	06:15	06:31	06:54
58°	23:14	·· ··	00:45	06:05	06:16	06:36
S 60°	23:30	·· ··	01:08	05:53	06:00	06:13

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 91-75%
19	05:58	06:09	11:54	02:01	14:26	
20	06:19	06:30	11:53	02:51	15:17	
21	06:41	06:52	11:53	03:44	16:13	

September 22, 23, 24 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	0°38.2	171°04.8	S02°52.6	139°57.0	S16°18.3	196°31.5	N07°47.5	335°11.0	N07°36.3
1	15°40.6	186°04.4	53.9	154°57.8	18.8	211°33.5	47.3	350°13.6	36.3
2	30°43.1	201°04.0	55.2	169°58.5	19.4	226°35.5	47.1	5°16.2	36.2
3	45°45.6	216°03.6	·· 56.4	184°59.3	·· 19.9	241°37.4	·· 46.9	20°18.8	·· 36.1
4	60°48.0	231°03.3	57.7	200°00.1	20.4	256°39.4	46.7	35°21.5	36.1
5	75°50.5	246°02.9	02°59.0	215°00.9	21.0	271°41.4	46.5	50°24.1	36.0
6	90°53.0	261°02.5	S03°00.2	230°01.7	S16°21.5	286°43.3	N07°46.3	65°26.7	N07°35.9
7	105°55.4	276°02.1	01.5	245°02.4	22.1	301°45.3	46.1	80°29.3	35.9
8	120°57.9	291°01.8	02.8	260°03.2	22.6	316°47.3	45.9	95°31.9	35.8
9	136°00.4	306°01.4	·· 04.1	275°04.0	·· 23.1	331°49.2	·· 45.7	110°34.5	·· 35.7
10	151°02.8	321°01.0	05.3	290°04.8	23.7	346°51.2	45.5	125°37.2	35.7
11	166°05.3	336°00.7	06.6	305°05.6	24.2	1°53.2	45.3	140°39.8	35.6
12	181°07.7	351°00.3	S03°07.9	320°06.3	S16°24.7	16°55.1	N07°45.1	155°42.4	N07°35.5
13	196°10.2	5°59.9	09.1	335°07.1	25.3	31°57.1	44.9	170°45.0	35.5
14	211°12.7	20°59.5	10.4	350°07.9	25.8	46°59.1	44.7	185°47.6	35.4
15	226°15.1	35°59.2	·· 11.7	5°08.7	·· 26.4	62°01.0	·· 44.5	200°50.2	·· 35.3
16	241°17.6	50°58.8	13.0	20°09.4	26.9	77°03.0	44.3	215°52.9	35.3
17	256°20.1	65°58.4	14.2	35°10.2	27.4	92°05.0	44.1	230°55.5	35.2
18	271°22.5	80°58.0	S03°15.5	50°11.0	S16°28.0	107°06.9	N07°43.9	245°58.1	N07°35.2
19	286°25.0	95°57.7	16.8	65°11.8	28.5	122°08.9	43.7	261°00.7	35.1
20	301°27.5	110°57.3	18.0	80°12.5	29.0	137°10.9	43.5	276°03.3	35.0
21	316°29.9	125°56.9	·· 19.3	95°13.3	·· 29.6	152°12.8	·· 43.3	291°05.9	·· 35.0
22	331°32.4	140°56.5	20.6	110°14.1	30.1	167°14.8	43.1	306°08.6	34.9
23	346°34.9	155°56.2	21.9	125°14.9	30.6	182°16.8	42.9	321°11.2	34.8
Mer.pass. 23:54		ν -0.4′	d 1.3′	m -3.90	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.22

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	1°37.3	170°55.8	S03°23.1	140°15.6	S16°31.2	197°18.7	N07°42.7	336°13.8	N07°34.8
1	16°39.8	185°55.4	24.4	155°16.4	31.7	212°20.7	42.5	351°16.4	34.7
2	31°42.2	200°55.0	25.7	170°17.2	32.2	227°22.7	42.3	6°19.0	34.6
3	46°44.7	215°54.7	·· 26.9	185°18.0	·· 32.8	242°24.6	·· 42.1	21°21.7	·· 34.6
4	61°47.2	230°54.3	28.2	200°18.7	33.3	257°26.6	41.9	36°24.3	34.5
5	76°49.6	245°53.9	29.5	215°19.5	33.8	272°28.6	41.7	51°26.9	34.4
6	91°52.1	260°53.5	S03°30.7	230°20.3	S16°34.4	287°30.6	N07°41.5	66°29.5	N07°34.4
7	106°54.6	275°53.2	32.0	245°21.0	34.9	302°32.5	41.3	81°32.1	34.3
8	121°57.0	290°52.8	33.3	260°21.8	35.4	317°34.5	41.1	96°34.7	34.2
9	136°59.5	305°52.4	·· 34.6	275°22.6	·· 36.0	332°36.5	·· 40.9	111°37.4	·· 34.2
10	152°02.0	320°52.0	35.8	290°23.4	36.5	347°38.4	40.7	126°40.0	34.1
11	167°04.4	335°51.7	37.1	305°24.1	37.0	2°40.4	40.5	141°42.6	34.0
12	182°06.9	350°51.3	S03°38.4	320°24.9	S16°37.6	17°42.4	N07°40.3	156°45.2	N07°34.0
13	197°09.4	5°50.9	39.6	335°25.7	38.1	32°44.3	40.1	171°47.8	33.9
14	212°11.8	20°50.5	40.9	350°26.4	38.6	47°46.3	39.9	186°50.5	33.8
15	227°14.3	35°50.2	·· 42.2	5°27.2	·· 39.2	62°48.3	·· 39.7	201°53.1	·· 33.8
16	242°16.7	50°49.8	43.4	20°28.0	39.7	77°50.2	39.5	216°55.7	33.7
17	257°19.2	65°49.4	44.7	35°28.8	40.2	92°52.2	39.3	231°58.3	33.6
18	272°21.7	80°49.0	S03°46.0	50°29.5	S16°40.8	107°54.2	N07°39.1	247°00.9	N07°33.6
19	287°24.1	95°48.7	47.2	65°30.3	41.3	122°56.1	38.9	262°03.6	33.5
20	302°26.6	110°48.3	48.5	80°31.1	41.8	137°58.1	38.7	277°06.2	33.5
21	317°29.1	125°47.9	·· 49.8	95°31.8	·· 42.3	153°00.1	·· 38.5	292°08.8	·· 33.4
22	332°31.5	140°47.5	51.1	110°32.6	42.9	168°02.1	38.3	307°11.4	33.3
23	347°34.0	155°47.2	52.3	125°33.4	43.4	183°04.0	38.1	322°14.0	33.3
Mer.pass. 23:50		ν -0.4′	d 1.3′	m -3.89	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.22

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	2°36.5	170°46.8	S03°53.6	140°34.1	S16°43.9	198°06.0	N07°37.9	337°16.7	N07°33.2
1	17°38.9	185°46.4	54.9	155°34.9	44.5	213°08.0	37.7	352°19.3	33.1
2	32°41.4	200°46.0	56.1	170°35.7	45.0	228°09.9	37.5	7°21.9	33.1
3	47°43.9	215°45.6	·· 57.4	185°36.4	·· 45.5	243°11.9	·· 37.3	22°24.5	·· 33.0
4	62°46.3	230°45.3	58.7	200°37.2	46.1	258°13.9	37.1	37°27.1	32.9
5	77°48.8	245°44.9	03°59.9	215°38.0	46.6	273°15.8	36.9	52°29.8	32.9
6	92°51.2	260°44.5	S04°01.2	230°38.7	S16°47.1	288°17.8	N07°36.7	67°32.4	N07°32.8
7	107°53.7	275°44.1	02.5	245°39.5	47.6	303°19.8	36.5	82°35.0	32.7
8	122°56.2	290°43.7	03.7	260°40.3	48.2	318°21.8	36.3	97°37.6	32.7
9	137°58.6	305°43.4	·· 05.0	275°41.0	·· 48.7	333°23.7	·· 36.1	112°40.2	·· 32.6
10	153°01.1	320°43.0	06.3	290°41.8	49.2	348°25.7	35.9	127°42.9	32.5
11	168°03.6	335°42.6	07.5	305°42.5	49.7	3°27.7	35.7	142°45.5	32.5
12	183°06.0	350°42.2	S04°08.8	320°43.3	S16°50.3	18°29.6	N07°35.5	157°48.1	N07°32.4
13	198°08.5	5°41.9	10.1	335°44.1	50.8	33°31.6	35.3	172°50.7	32.3
14	213°11.0	20°41.5	11.3	350°44.8	51.3	48°33.6	35.1	187°53.4	32.3
15	228°13.4	35°41.1	·· 12.6	5°45.6	·· 51.9	63°35.5	·· 34.9	202°56.0	·· 32.2
16	243°15.9	50°40.7	13.9	20°46.4	52.4	78°37.5	34.7	217°58.6	32.1
17	258°18.4	65°40.3	15.1	35°47.1	52.9	93°39.5	34.5	233°01.2	32.1
18	273°20.8	80°40.0	S04°16.4	50°47.9	S16°53.4	108°41.5	N07°34.3	248°03.8	N07°32.0
19	288°23.3	95°39.6	17.7	65°48.6	54.0	123°43.4	34.1	263°06.5	31.9
20	303°25.7	110°39.2	18.9	80°49.4	54.5	138°45.4	33.9	278°09.1	31.9
21	318°28.2	125°38.8	·· 20.2	95°50.2	·· 55.0	153°47.4	·· 33.7	293°11.7	·· 31.8
22	333°30.7	140°38.4	21.5	110°50.9	55.5	168°49.3	33.5	308°14.3	31.7
23	348°33.1	155°38.1	22.7	125°51.7	56.1	183°51.3	33.3	323°17.0	31.7
Mer.pass. 23:46		ν -0.4′	d 1.3′	m -3.89	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.21

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°27.9	56°41.5
Diphda	348°44.8	-17°49.8
Achernar	335°18.0	-57°05.5
Hamal	327°48.4	23°35.7
Polaris	312°31.4	89°22.6
Acamar	315°09.8	-40°11.3
Menkar	314°03.6	4°12.1
Mirfak	308°24.7	49°57.5
Aldebaran	290°36.9	16°33.9
Rigel	281°01.7	-8°10.0
Capella	280°18.5	46°01.4
Bellatrix	278°20.4	6°22.6
Elnath	277°59.0	28°37.8
Alnilam	275°35.4	-1°10.9
Betelgeuse	270°49.7	7°24.8
Canopus	263°51.5	-52°42.3
Sirius	258°24.3	-16°45.1
Adhara	255°04.2	-29°00.3
Procyon	244°48.6	5°09.3
Pollux	243°14.8	27°57.5
Avior	234°14.2	-59°35.6
Suhail	222°45.0	-43°32.5
Miaplacidus	221°38.4	-69°49.7
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.0
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.6
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.3	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°20.8	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.5	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.2	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.7	38°48.9
Nunki	75°44.9	-26°15.7
Altair	61°57.6	8°56.7
Peacock	53°01.9	-56°38.8
Deneb	49°24.0	45°23.1
Enif	33°36.3	10°00.4
Al Na'ir	27°29.8	-46°49.5
Fomalhaut	15°11.7	-29°28.4
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 22 Wed	SHA	Mer.pass
Venus	170°26.6	12:36
Mars	139°18.8	14:39
Jupiter	195°53.3	10:52
Saturn	334°32.8	01:39

Sep 23 Thu	SHA	Mer.pass
Venus	169°18.5	12:37
Mars	138°38.3	14:38
Jupiter	195°41.4	10:49
Saturn	334°36.5	01:35

Sep 24 Fri	SHA	Mer.pass
Venus	168°10.3	12:37
Mars	137°57.7	14:37
Jupiter	195°29.5	10:46
Saturn	334°40.2	01:31

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0751 sec ΔT = TT-UT1 = +69.2591 sec

2027 September 22 to Sep. 24 UT

h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°45.5	N00°29.2	292°21.7	6.0′	N26°25.4	3.4′	57.8′
1	196°45.8	28.2	306°46.7	5.9′	26°28.8	3.2′	57.8′
2	211°46.0	27.3	321°11.6	5.8′	26°32.0	3.1′	57.8′
3	226°46.2	·· 26.3	335°36.4	5.8′	26°35.1	2.9′	57.9′
4	241°46.4	25.3	350°01.2	5.7′	26°38.0	2.7′	57.9′
5	256°46.7	24.4	4°25.9	5.6′	26°40.7	2.6′	57.9′
6	271°46.9	N00°23.4	18°50.5	5.6′	N26°43.3	2.4′	57.9′
7	286°47.1	22.4	33°15.1	5.5′	26°45.7	2.2′	58.0′
8	301°47.3	21.4	47°39.6	5.5′	26°47.9	2.1′	58.0′
9	316°47.5	·· 20.5	62°04.1	5.4′	26°50.0	1.9′	58.0′
10	331°47.8	19.5	76°28.5	5.4′	26°51.9	1.8′	58.0′
11	346°48.0	18.5	90°52.9	5.3′	26°53.7	1.5′	58.1′
12	1°48.2	N00°17.5	105°17.2	5.3′	N26°55.2	1.4′	58.1′
13	16°48.4	16.6	119°41.4	5.2′	26°56.6	1.3′	58.1′
14	31°48.6	15.6	134°05.7	5.2′	26°57.9	1.0′	58.1′
15	46°48.9	·· 14.6	148°29.8	5.1′	26°58.9	0.9′	58.2′
16	61°49.1	13.7	162°54.0	5.1′	26°59.8	0.7′	58.2′
17	76°49.3	12.7	177°18.1	5.1′	27°00.5	0.6′	58.2′
18	91°49.5	N00°11.7	191°42.1	5.0′	N27°01.1	0.3′	58.2′
19	106°49.7	10.7	206°06.2	5.0′	27°01.4	0.2′	58.3′
20	121°50.0	09.8	220°30.1	5.0′	27°01.6	0.0′	58.3′
21	136°50.2	·· 08.8	234°54.1	4.9′	27°01.6	0.1′	58.3′
22	151°50.4	07.8	249°18.0	4.9′	27°01.5	0.3′	58.3′
23	166°50.6	06.8	263°41.9	4.9′	27°01.2	0.6′	58.4′
	SD = 15.9′	d = 1.0′	SD = 15.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°50.8	N00°05.9	278°05.8	4.8′	N27°00.6	0.6′	58.4′
1	196°51.1	04.9	292°29.6	4.8′	27°00.0	0.9′	58.4′
2	211°51.3	03.9	306°53.4	4.8′	26°59.1	1.0′	58.4′
3	226°51.5	·· 03.0	321°17.2	4.8′	26°58.1	1.2′	58.4′
4	241°51.7	02.0	335°41.0	4.8′	26°56.9	1.4′	58.5′
5	256°51.9	01.0	350°04.8	4.7′	26°55.5	1.6′	58.5′
6	271°52.2	N00°00.0	4°28.5	4.7′	N26°53.9	1.8′	58.5′
7	286°52.4	S00°00.9	18°52.2	4.7′	26°52.1	1.9′	58.5′
8	301°52.6	01.9	33°16.0	4.7′	26°50.2	2.1′	58.6′
9	316°52.8	·· 02.9	47°39.7	4.7′	26°48.1	2.3′	58.6′
10	331°53.0	03.9	62°03.4	4.7′	26°45.8	2.4′	58.6′
11	346°53.3	04.8	76°27.1	4.7′	26°43.4	2.6′	58.6′
12	1°53.5	S00°05.8	90°50.8	4.7′	N26°40.8	2.8′	58.7′
13	16°53.7	06.8	105°14.5	4.7′	26°38.0	3.0′	58.7′
14	31°53.9	07.8	119°38.2	4.7′	26°35.0	3.2′	58.7′
15	46°54.1	·· 08.7	134°01.9	4.7′	26°31.8	3.3′	58.7′
16	61°54.4	09.7	148°25.6	4.7′	26°28.5	3.6′	58.8′
17	76°54.6	10.7	162°49.3	4.7′	26°24.9	3.7′	58.8′
18	91°54.8	S00°11.6	177°13.0	4.7′	N26°21.2	3.8′	58.8′
19	106°55.0	12.6	191°36.8	4.7′	26°17.4	4.1′	58.8′
20	121°55.2	13.6	206°00.5	4.8′	26°13.3	4.2′	58.9′
21	136°55.5	·· 14.6	220°24.3	4.8′	26°09.1	4.4′	58.9′
22	151°55.7	15.5	234°48.0	4.8′	26°04.7	4.6′	58.9′
23	166°55.9	16.5	249°11.8	4.8′	26°00.1	4.7′	58.9′
	SD = 15.9′	d = 1.0′	SD = 15.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°56.1	S00°17.5	263°35.7	4.8′	N25°55.4	5.0′	59.0′
1	196°56.3	18.5	277°59.5	4.9′	25°50.4	5.1′	59.0′
2	211°56.6	19.4	292°23.3	4.9′	25°45.3	5.2′	59.0′
3	226°56.8	·· 20.4	306°47.2	4.9′	25°40.1	5.5′	59.0′
4	241°57.0	21.4	321°11.1	4.9′	25°34.6	5.6′	59.0′
5	256°57.2	22.4	335°35.1	5.0′	25°29.0	5.8′	59.1′
6	271°57.4	S00°23.3	349°59.0	5.0′	N25°23.2	6.0′	59.1′
7	286°57.6	24.3	4°23.0	5.0′	25°17.2	6.1′	59.1′
8	301°57.9	25.3	18°47.1	5.1′	25°11.1	6.3′	59.1′
9	316°58.1	·· 26.2	33°11.2	5.1′	25°04.8	6.5′	59.2′
10	331°58.3	27.2	47°35.3	5.1′	24°58.3	6.6′	59.2′
11	346°58.5	28.2	61°59.4	5.2′	24°51.7	6.8′	59.2′
12	1°58.7	S00°29.2	76°23.6	5.2′	N24°44.9	7.0′	59.2′
13	16°59.0	30.1	90°47.8	5.3′	24°37.9	7.2′	59.2′
14	31°59.2	31.1	105°12.1	5.3′	24°30.7	7.3′	59.3′
15	46°59.4	·· 32.1	119°36.4	5.4′	24°23.4	7.4′	59.3′
16	61°59.6	33.1	134°00.7	5.4′	24°16.0	7.7′	59.3′
17	76°59.8	34.0	148°25.1	5.4′	24°08.3	7.8′	59.3′
18	92°00.0	S00°35.0	162°49.6	5.5′	N24°00.5	7.9′	59.4′
19	107°00.3	36.0	177°14.1	5.5′	23°52.6	8.2′	59.4′
20	122°00.5	37.0	191°38.6	5.6′	23°44.4	8.3′	59.4′
21	137°00.7	·· 37.9	206°03.2	5.7′	23°36.1	8.4′	59.4′
22	152°00.9	38.9	220°27.9	5.7′	23°27.7	8.6′	59.4′
23	167°01.1	39.9	234°52.6	5.8′	23°19.1	8.8′	59.5′
	SD = 15.9′	d = 1.0′	SD = 16.1′				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	03:03	04:33	05:42	18:01	19:09	20:38
N 70°	03:22	04:41	05:43	18:00	19:01	20:19
68°	03:37	04:48	05:44	17:59	18:55	20:04
66°	03:49	04:53	05:44	17:59	18:50	19:53
64°	03:59	04:57	05:45	17:58	18:46	19:43
62°	04:07	05:01	05:45	17:58	18:42	19:36
60°	04:14	05:04	05:46	17:58	18:39	19:29
N 58°	04:20	05:07	05:46	17:57	18:36	19:23
56°	04:25	05:09	05:47	17:57	18:34	19:18
54°	04:30	05:11	05:47	17:57	18:32	19:14
52°	04:33	05:13	05:47	17:57	18:30	19:10
50°	04:37	05:15	05:47	17:57	18:29	19:07
45°	04:44	05:18	05:48	17:56	18:26	19:00
N 40°	04:49	05:21	05:48	17:56	18:23	18:55
35°	04:54	05:23	05:48	17:56	18:21	18:51
30°	04:57	05:25	05:49	17:56	18:20	18:47
20°	05:01	05:27	05:49	17:56	18:18	18:43
N 10°	05:04	05:28	05:49	17:56	18:17	18:41
0°	05:05	05:29	05:49	17:56	18:16	18:40
S 10°	05:04	05:28	05:49	17:56	18:17	18:41
20°	05:01	05:27	05:49	17:56	18:18	18:44
30°	04:57	05:25	05:49	17:57	18:21	18:48
35°	04:54	05:23	05:48	17:57	18:22	18:52
40°	04:50	05:21	05:48	17:57	18:24	18:56
45°	04:44	05:19	05:48	17:58	18:27	19:02
S 50°	04:37	05:15	05:47	17:58	18:31	19:09
52°	04:34	05:14	05:47	17:59	18:32	19:12
54°	04:30	05:12	05:47	17:59	18:34	19:16
56°	04:25	05:10	05:47	17:59	18:37	19:21
58°	04:20	05:07	05:46	18:00	18:39	19:26
S 60°	04:15	05:04	05:46	18:00	18:42	19:32

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°			19:58			18:37
64°			21:05			17:29
62°	18:24	19:47	21:40	15:57	16:41	16:53
60°	19:10	20:26	22:06	15:11	16:02	16:28
N 58°	19:40	20:53	22:26	14:41	15:35	16:07
56°	20:03	21:14	22:42	14:19	15:14	15:50
54°	20:22	21:31	22:56	14:00	14:56	15:35
52°	20:38	21:46	23:08	13:44	14:41	15:23
50°	20:52	21:59	23:19	13:30	14:28	15:11
45°	21:20	22:26	23:42	13:03	14:01	14:48
N 40°	21:42	22:47	·· ··	12:41	13:39	14:29
35°	22:00	23:04	·· ··	12:22	13:21	14:13
30°	22:16	23:19	·· ··	12:07	13:06	13:59
20°	22:42	23:45	·· ··	11:40	12:40	13:36
N 10°	23:05	·· ··	00:07	11:17	12:17	13:15
0°	23:27	·· ··	00:27	10:56	11:56	12:56
S 10°	23:48	·· ··	00:48	10:34	11:35	12:37
20°	·· ··	00:12	01:10	10:11	11:12	12:16
30°	·· ··	00:38	01:35	09:45	10:45	11:52
35°	·· ··	00:54	01:50	09:29	10:29	11:37
40°	00:10	01:13	02:07	09:11	10:11	11:21
45°	00:32	01:35	02:28	08:49	09:49	11:01
S 50°	01:00	02:03	02:54	08:21	09:21	10:35
52°	01:13	02:17	03:06	08:07	09:07	10:23
54°	01:29	02:33	03:21	07:51	08:51	10:09
56°	01:47	02:52	03:37	07:33	08:32	09:53
58°	02:10	03:16	03:57	07:10	08:09	09:33
S 60°	02:39	03:46	04:22	06:41	07:38	09:09

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	66-44%
22	07:02	07:13	11:53	04:42	17:11	
23	07:23	07:34	11:52	05:41	18:12	
24	07:44	07:55	11:52	06:42	19:12	

September 25, 26, 27 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	3°35.6	170°37.7	S04°24.0	140°52.4	S16°56.6	198°53.3	N07°33.1	338°19.6	N07°31.6
1	18°38.1	185°37.3	25.3	155°53.2	57.1	213°55.2	32.9	353°22.2	31.5
2	33°40.5	200°36.9	26.5	170°54.0	57.6	228°57.2	32.7	8°24.8	31.5
3	48°43.0	215°36.5	·· 27.8	185°54.7	·· 58.2	243°59.2	·· 32.5	23°27.4	·· 31.4
4	63°45.5	230°36.1	29.0	200°55.5	58.7	259°01.2	32.3	38°30.1	31.3
5	78°47.9	245°35.8	30.3	215°56.2	59.2	274°03.1	32.1	53°32.7	31.3
6	93°50.4	260°35.4	S04°31.6	230°57.0	S16°59.7	289°05.1	N07°31.9	68°35.3	N07°31.2
7	108°52.8	275°35.0	32.8	245°57.8	17°00.3	304°07.1	31.7	83°37.9	31.1
8	123°55.3	290°34.6	34.1	260°58.5	00.8	319°09.0	31.5	98°40.6	31.1
9	138°57.8	305°34.2	·· 35.4	275°59.3	·· 01.3	334°11.0	·· 31.3	113°43.2	·· 31.0
10	154°00.2	320°33.8	36.6	291°00.0	01.8	349°13.0	31.1	128°45.8	30.9
11	169°02.7	335°33.5	37.9	306°00.8	02.4	4°15.0	30.9	143°48.4	30.9
12	184°05.2	350°33.1	S04°39.2	321°01.5	S17°02.9	19°16.9	N07°30.7	158°51.1	N07°30.8
13	199°07.6	5°32.7	40.4	336°02.3	03.4	34°18.9	30.5	173°53.7	30.7
14	214°10.1	20°32.3	41.7	351°03.0	03.9	49°20.9	30.3	188°56.3	30.7
15	229°12.6	35°31.9	·· 42.9	6°03.8	·· 04.4	64°22.8	·· 30.1	203°58.9	·· 30.6
16	244°15.0	50°31.6	44.2	21°04.6	05.0	79°24.8	29.9	219°01.6	30.5
17	259°17.5	65°31.2	45.5	36°05.3	05.5	94°26.8	29.7	234°04.2	30.5
18	274°20.0	80°30.8	S04°46.7	51°06.1	S17°06.0	109°28.8	N07°29.5	249°06.8	N07°30.4
19	289°22.4	95°30.4	48.0	66°06.8	06.5	124°30.7	29.3	264°09.4	30.3
20	304°24.9	110°30.0	49.3	81°07.6	07.1	139°32.7	29.1	279°12.1	30.3
21	319°27.3	125°29.6	·· 50.5	96°08.3	·· 07.6	154°34.7	·· 28.9	294°14.7	·· 30.2
22	334°29.8	140°29.2	51.8	111°09.1	08.1	169°36.6	28.7	309°17.3	30.1
23	349°32.3	155°28.9	53.0	126°09.8	08.6	184°38.6	28.5	324°19.9	30.1
Mer.pass. 23:42		ν -0.4′	d 1.3′	m -3.89	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.71	ν 2.6′	d 0.1′ m 0.21

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	4°34.7	170°28.5	S04°54.3	141°10.6	S17°09.1	199°40.6	N07°28.3	339°22.6	N07°30.0
1	19°37.2	185°28.1	55.6	156°11.3	09.7	214°42.6	28.1	354°25.2	29.9
2	34°39.7	200°27.7	56.8	171°12.1	10.2	229°44.5	27.9	9°27.8	29.9
3	49°42.1	215°27.3	·· 58.1	186°12.8	·· 10.7	244°46.5	·· 27.7	24°30.4	·· 29.8
4	64°44.6	230°26.9	04°59.3	201°13.6	11.2	259°48.5	27.5	39°33.1	29.7
5	79°47.1	245°26.5	05°00.6	216°14.3	11.7	274°50.4	27.3	54°35.7	29.7
6	94°49.5	260°26.2	S05°01.9	231°15.1	S17°12.3	289°52.4	N07°27.1	69°38.3	N07°29.6
7	109°52.0	275°25.8	03.1	246°15.8	12.8	304°54.4	26.9	84°40.9	29.5
8	124°54.5	290°25.4	04.4	261°16.6	13.3	319°56.4	26.8	99°43.6	29.5
9	139°56.9	305°25.0	·· 05.7	276°17.3	·· 13.8	334°58.3	·· 26.6	114°46.2	·· 29.4
10	154°59.4	320°24.6	06.9	291°18.1	14.3	350°00.3	26.4	129°48.8	29.3
11	170°01.8	335°24.2	08.2	306°18.8	14.8	5°02.3	26.2	144°51.4	29.3
12	185°04.3	350°23.8	S05°09.4	321°19.6	S17°15.4	20°04.3	N07°26.0	159°54.1	N07°29.2
13	200°06.8	5°23.5	10.7	336°20.3	15.9	35°06.2	25.8	174°56.7	29.1
14	215°09.2	20°23.1	11.9	351°21.1	16.4	50°08.2	25.6	189°59.3	29.0
15	230°11.7	35°22.7	·· 13.2	6°21.8	·· 16.9	65°10.2	·· 25.4	205°01.9	·· 29.0
16	245°14.2	50°22.3	14.5	21°22.6	17.4	80°12.1	25.2	220°04.6	28.9
17	260°16.6	65°21.9	15.7	36°23.3	18.0	95°14.1	25.0	235°07.2	28.8
18	275°19.1	80°21.5	S05°17.0	51°24.1	S17°18.5	110°16.1	N07°24.8	250°09.8	N07°28.8
19	290°21.6	95°21.1	18.2	66°24.8	19.0	125°18.1	24.6	265°12.4	28.7
20	305°24.0	110°20.7	19.5	81°25.6	19.5	140°20.0	24.4	280°15.1	28.6
21	320°26.5	125°20.3	·· 20.8	96°26.3	·· 20.0	155°22.0	·· 24.2	295°17.7	·· 28.6
22	335°28.9	140°20.0	22.0	111°27.1	20.5	170°24.0	24.0	310°20.3	28.5
23	350°31.4	155°19.6	23.3	126°27.8	21.1	185°26.0	23.8	325°23.0	28.4
Mer.pass. 23:38		ν -0.4′	d 1.3′	m -3.89	ν 0.8′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.72	ν 2.6′	d 0.1′ m 0.20

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°33.9	170°19.2	S05°24.5	141°28.6	S17°21.6	200°27.9	N07°23.6	340°25.6	N07°28.4
1	20°36.3	185°18.8	25.8	156°29.3	22.1	215°29.9	23.4	355°28.2	28.3
2	35°38.8	200°18.4	27.0	171°30.0	22.6	230°31.9	23.2	10°30.8	28.2
3	50°41.3	215°18.0	·· 28.3	186°30.8	·· 23.1	245°33.9	·· 23.0	25°33.5	·· 28.2
4	65°43.7	230°17.6	29.6	201°31.5	23.6	260°35.8	22.8	40°36.1	28.1
5	80°46.2	245°17.2	30.8	216°32.3	24.1	275°37.8	22.6	55°38.7	28.0
6	95°48.7	260°16.8	S05°32.1	231°33.0	S17°24.7	290°39.8	N07°22.4	70°41.3	N07°28.0
7	110°51.1	275°16.4	33.3	246°33.8	25.2	305°41.7	22.2	85°44.0	27.9
8	125°53.6	290°16.1	34.6	261°34.5	25.7	320°43.7	22.0	100°46.6	27.8
9	140°56.1	305°15.7	·· 35.8	276°35.2	·· 26.2	335°45.7	·· 21.8	115°49.2	·· 27.8
10	155°58.5	320°15.3	37.1	291°36.0	26.7	350°47.7	21.6	130°51.9	27.7
11	171°01.0	335°14.9	38.3	306°36.7	27.2	5°49.6	21.4	145°54.5	27.6
12	186°03.4	350°14.5	S05°39.6	321°37.5	S17°27.7	20°51.6	N07°21.2	160°57.1	N07°27.6
13	201°05.9	5°14.1	40.9	336°38.2	28.3	35°53.6	21.0	175°59.7	27.5
14	216°08.4	20°13.7	42.1	351°39.0	28.8	50°55.6	20.8	191°02.4	27.4
15	231°10.8	35°13.3	·· 43.4	6°39.7	·· 29.3	65°57.5	·· 20.6	206°05.0	·· 27.3
16	246°13.3	50°12.9	44.6	21°40.4	29.8	80°59.5	20.4	221°07.6	27.3
17	261°15.8	65°12.5	45.9	36°41.2	30.3	96°01.5	20.2	236°10.3	27.2
18	276°18.2	80°12.1	S05°47.1	51°41.9	S17°30.8	111°03.5	N07°20.0	251°12.9	N07°27.1
19	291°20.7	95°11.7	48.4	66°42.7	31.3	126°05.4	19.8	266°15.5	27.1
20	306°23.2	110°11.4	49.6	81°43.4	31.8	141°07.4	19.6	281°18.1	27.0
21	321°25.6	125°11.0	·· 50.9	96°44.1	·· 32.4	156°09.4	·· 19.4	296°20.8	·· 26.9
22	336°28.1	140°10.6	52.1	111°44.9	32.9	171°11.4	19.2	311°23.4	26.9
23	351°30.6	155°10.2	53.4	126°45.6	33.4	186°13.3	19.0	326°26.0	26.8
Mer.pass. 23:34		ν -0.4′	d 1.3′	m -3.89	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.72	ν 2.6′	d 0.1′ m 0.20

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.6	-42°09.1
Schedar	349°27.9	56°41.5
Diphda	348°44.7	-17°49.8
Achernar	335°18.0	-57°05.5
Hamal	327°48.4	23°35.7
Polaris	312°30.0	89°22.6
Acamar	315°09.8	-40°11.3
Menkar	314°03.6	4°12.1
Mirfak	308°24.7	49°57.5
Aldebaran	290°36.9	16°33.9
Rigel	281°01.6	-8°10.0
Capella	280°18.5	46°01.4
Bellatrix	278°20.4	6°22.6
Elnath	277°59.0	28°37.8
Alnilam	275°35.4	-1°10.9
Betelgeuse	270°49.6	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.3	-16°45.1
Adhara	255°04.2	-29°00.3
Procyon	244°48.6	5°09.3
Pollux	243°14.7	27°57.5
Avior	234°14.1	-59°35.6
Suhail	222°45.0	-43°32.5
Miaplacidus	221°38.4	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.4	11°49.9
Dubhe	193°39.0	61°36.0
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.6
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.3	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°20.8	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.5
Antares	112°13.2	-26°29.6
Atria	107°05.6	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.2	51°29.4
Kaus Aust.	83°29.5	-34°22.3
Vega	80°31.7	38°48.9
Nunki	75°44.9	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°01.9	-56°38.8
Deneb	49°24.0	45°23.1
Enif	33°36.3	10°00.4
Al Na'ir	27°29.8	-46°49.5
Fomalhaut	15°11.7	-29°28.4
Scheat	13°42.7	28°14.2
Markab	13°27.4	15°21.5

Sep 25 Sat	SHA	Mer.pass
Venus	167°02.1	12:38
Mars	137°16.8	14:36
Jupiter	195°17.7	10:43
Saturn	334°44.0	01:26

Sep 26 Sun	SHA	Mer.pass
Venus	165°53.7	12:38
Mars	136°35.8	14:35
Jupiter	195°05.8	10:40
Saturn	334°47.8	01:22

Sep 27 Mon	SHA	Mer.pass
Venus	164°45.3	12:39
Mars	135°54.7	14:33
Jupiter	194°54.1	10:37
Saturn	334°51.7	01:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0757 sec ΔT = TT-UT1 = +69.2597 sec

2027 September 25 to Sep. 27 UT

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°01.3	S00°40.9	249°17.4	5.8′	N23°10.3	8.9′	59.5′
1	197°01.6	41.8	263°42.2	5.9′	23°01.4	9.0′	59.5′
2	212°01.8	42.8	278°07.1	5.9′	22°52.4	9.3′	59.5′
3	227°02.0	·· 43.8	292°32.0	6.0′	22°43.1	9.3′	59.5′
4	242°02.2	44.7	306°57.0	6.0′	22°33.8	9.6′	59.6′
5	257°02.4	45.7	321°22.0	6.1′	22°24.2	9.6′	59.6′
6	272°02.6	S00°46.7	335°47.1	6.2′	N22°14.6	9.9′	59.6′
7	287°02.9	47.7	350°12.3	6.2′	22°04.7	9.9′	59.6′
8	302°03.1	48.6	4°37.5	6.3′	21°54.8	10.1′	59.6′
9	317°03.3	·· 49.6	19°02.8	6.4′	21°44.7	10.3′	59.7′
10	332°03.5	50.6	33°28.2	6.4′	21°34.4	10.4′	59.7′
11	347°03.7	51.6	47°53.6	6.5′	21°24.0	10.6′	59.7′
12	2°03.9	S00°52.5	62°19.0	6.5′	N21°13.4	10.6′	59.7′
13	17°04.2	53.5	76°44.6	6.6′	21°02.8	10.9′	59.7′
14	32°04.4	54.5	91°10.2	6.7′	20°51.9	10.9′	59.7′
15	47°04.6	·· 55.5	105°35.9	6.7′	20°41.0	11.1′	59.8′
16	62°04.8	56.4	120°01.6	6.8′	20°29.9	11.3′	59.8′
17	77°05.0	57.4	134°27.4	6.9′	20°18.6	11.3′	59.8′
18	92°05.2	S00°58.4	148°53.3	6.9′	N20°07.3	11.6′	59.8′
19	107°05.5	00°59.4	163°19.2	7.0′	19°55.7	11.6′	59.8′
20	122°05.7	01°00.3	177°45.2	7.1′	19°44.1	11.8′	59.8′
21	137°05.9	·· 01.3	192°11.3	7.1′	19°32.3	11.8′	59.9′
22	152°06.1	02.3	206°37.4	7.2′	19°20.5	12.1′	59.9′
23	167°06.3	03.2	221°03.6	7.3′	19°08.4	12.1′	59.9′
	SD = 15.9′	d = 1.0′	SD = 16.2′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°06.5	S01°04.2	235°29.9	7.3′	N18°56.3	12.3′	59.9′
1	197°06.7	05.2	249°56.2	7.4′	18°44.0	12.4′	59.9′
2	212°07.0	06.2	264°22.7	7.5′	18°31.6	12.5′	59.9′
3	227°07.2	·· 07.1	278°49.1	7.5′	18°19.1	12.6′	59.9′
4	242°07.4	08.1	293°15.7	7.6′	18°06.5	12.8′	60.0′
5	257°07.6	09.1	307°42.3	7.7′	17°53.7	12.8′	60.0′
6	272°07.8	S01°10.1	322°09.0	7.7′	N17°40.9	13.0′	60.0′
7	287°08.0	11.0	336°35.7	7.8′	17°27.9	13.1′	60.0′
8	302°08.2	12.0	351°02.5	7.9′	17°14.8	13.2′	60.0′
9	317°08.5	·· 13.0	5°29.4	7.9′	17°01.6	13.3′	60.0′
10	332°08.7	14.0	19°56.3	8.0′	16°48.3	13.4′	60.0′
11	347°08.9	14.9	34°23.3	8.1′	16°34.9	13.5′	60.1′
12	2°09.1	S01°15.9	48°50.4	8.1′	N16°21.4	13.7′	60.1′
13	17°09.3	16.9	63°17.6	8.2′	16°07.7	13.7′	60.1′
14	32°09.5	17.9	77°44.8	8.3′	15°54.0	13.8′	60.1′
15	47°09.7	·· 18.8	92°12.0	8.3′	15°40.2	13.9′	60.1′
16	62°10.0	19.8	106°39.4	8.4′	15°26.3	14.1′	60.1′
17	77°10.2	20.8	121°06.8	8.5′	15°12.2	14.1′	60.1′
18	92°10.4	S01°21.8	135°34.2	8.5′	N14°58.1	14.2′	60.1′
19	107°10.6	22.7	150°01.8	8.6′	14°43.9	14.3′	60.1′
20	122°10.8	23.7	164°29.4	8.7′	14°29.6	14.4′	60.1′
21	137°11.0	·· 24.7	178°57.0	8.7′	14°15.2	14.5′	60.2′
22	152°11.2	25.6	193°24.7	8.8′	14°00.7	14.6′	60.2′
23	167°11.5	26.6	207°52.5	8.8′	13°46.1	14.6′	60.2′
	SD = 15.9′	d = 1.0′	SD = 16.3′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°11.7	S01°27.6	222°20.3	8.9′	N13°31.5	14.8′	60.2′
1	197°11.9	28.6	236°48.2	9.0′	13°16.7	14.8′	60.2′
2	212°12.1	29.5	251°16.2	9.0′	13°01.9	14.9′	60.2′
3	227°12.3	·· 30.5	265°44.2	9.1′	12°47.0	15.0′	60.2′
4	242°12.5	31.5	280°12.3	9.1′	12°32.0	15.1′	60.2′
5	257°12.7	32.5	294°40.4	9.2′	12°16.9	15.1′	60.2′
6	272°12.9	S01°33.4	309°08.6	9.2′	N12°01.8	15.2′	60.2′
7	287°13.2	34.4	323°36.8	9.3′	11°46.6	15.3′	60.2′
8	302°13.4	35.4	338°05.1	9.3′	11°31.3	15.4′	60.2′
9	317°13.6	·· 36.4	352°33.5	9.4′	11°15.9	15.4′	60.2′
10	332°13.8	37.3	7°01.9	9.5′	11°00.5	15.5′	60.2′
11	347°14.0	38.3	21°30.3	9.5′	10°45.0	15.5′	60.2′
12	2°14.2	S01°39.3	35°58.8	9.6′	N10°29.5	15.6′	60.2′
13	17°14.4	40.3	50°27.4	9.6′	10°13.9	15.7′	60.2′
14	32°14.6	41.2	64°56.0	9.7′	09°58.2	15.7′	60.3′
15	47°14.8	·· 42.2	79°24.7	9.7′	09°42.5	15.8′	60.3′
16	62°15.1	43.2	93°53.4	9.8′	09°26.7	15.8′	60.3′
17	77°15.3	44.1	108°22.1	9.8′	09°10.9	15.9′	60.3′
18	92°15.5	S01°45.1	122°50.9	9.8′	N08°55.0	16.0′	60.3′
19	107°15.7	46.1	137°19.8	9.9′	08°39.0	16.0′	60.3′
20	122°15.9	47.1	151°48.7	9.9′	08°23.0	16.0′	60.3′
21	137°16.1	·· 48.0	166°17.6	10.0′	08°07.0	16.1′	60.3′
22	152°16.3	49.0	180°46.6	10.0′	07°50.9	16.2′	60.3′
23	167°16.5	50.0	195°15.6	10.1′	07°34.7	16.1′	60.3′
	SD = 15.9′	d = 1.0′	SD = 16.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:20	04:47	05:55	17:45	18:53	20:18
N 70°	03:37	04:53	05:55	17:46	18:47	20:02
68°	03:50	04:58	05:54	17:47	18:42	19:50
66°	04:00	05:03	05:54	17:47	18:38	19:40
64°	04:09	05:06	05:53	17:48	18:35	19:32
62°	04:16	05:09	05:53	17:48	18:32	19:25
60°	04:22	05:11	05:53	17:49	18:30	19:19
N 58°	04:27	05:14	05:53	17:49	18:28	19:14
56°	04:31	05:15	05:52	17:49	18:26	19:10
54°	04:35	05:17	05:52	17:49	18:25	19:06
52°	04:39	05:18	05:52	17:50	18:23	19:03
50°	04:42	05:20	05:52	17:50	18:22	19:00
45°	04:48	05:22	05:51	17:51	18:20	18:54
N 40°	04:53	05:24	05:51	17:51	18:18	18:50
35°	04:56	05:25	05:51	17:52	18:17	18:46
30°	04:59	05:26	05:50	17:52	18:16	18:44
20°	05:02	05:28	05:50	17:53	18:15	18:40
N 10°	05:04	05:28	05:49	17:54	18:15	18:39
0°	05:03	05:27	05:48	17:55	18:15	18:39
S 10°	05:02	05:26	05:47	17:56	18:17	18:41
20°	04:59	05:24	05:46	17:57	18:19	18:44
30°	04:53	05:21	05:45	17:58	18:22	18:50
35°	04:49	05:19	05:44	17:59	18:24	18:54
40°	04:44	05:16	05:43	18:00	18:27	18:59
45°	04:38	05:13	05:42	18:01	18:31	19:05
S 50°	04:30	05:08	05:41	18:03	18:35	19:14
52°	04:26	05:06	05:40	18:04	18:38	19:18
54°	04:22	05:04	05:39	18:04	18:40	19:22
56°	04:17	05:01	05:39	18:05	18:43	19:28
58°	04:11	04:58	05:38	18:06	18:46	19:33
S 60°	04:04	04:55	05:37	18:07	18:49	19:40

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°			00:03		18:34	17:42
N 70°	21:13	·· ··	00:31	19:26	18:04	17:29
68°	22:18	·· ··	00:51	18:20	17:41	17:19
66°	22:53	·· ··	01:07	17:43	17:24	17:10
64°	23:18	·· ··	01:20	17:17	17:09	17:02
62°	23:37	·· ··	01:31	16:57	16:57	16:56
60°	23:53	·· ··	01:40	16:40	16:46	16:50
N 58°	·· ··	00:07	01:49	16:26	16:37	16:45
56°	·· ··	00:18	01:56	16:13	16:29	16:41
54°	·· ··	00:28	02:02	16:02	16:22	16:37
52°	·· ··	00:37	02:08	15:53	16:15	16:33
50°	·· ··	00:45	02:13	15:44	16:09	16:30
45°	·· ··	01:02	02:24	15:26	15:56	16:22
N 40°	00:00	01:16	02:33	15:11	15:46	16:16
35°	00:15	01:27	02:40	14:58	15:37	16:11
30°	00:28	01:38	02:47	14:47	15:28	16:06
20°	00:50	01:55	02:59	14:27	15:14	15:58
N 10°	01:09	02:10	03:09	14:10	15:02	15:50
0°	01:27	02:24	03:18	13:54	14:50	15:43
S 10°	01:45	02:38	03:28	13:38	14:38	15:36
20°	02:04	02:53	03:38	13:21	14:26	15:29
30°	02:26	03:10	03:49	13:01	14:11	15:20
35°	02:38	03:20	03:56	12:49	14:02	15:15
40°	02:53	03:31	04:03	12:36	13:52	15:09
45°	03:10	03:44	04:12	12:19	13:41	15:02
S 50°	03:31	04:00	04:22	11:59	13:27	14:54
52°	03:42	04:07	04:27	11:50	13:20	14:50
54°	03:53	04:15	04:32	11:39	13:13	14:46
56°	04:06	04:25	04:38	11:27	13:04	14:41
58°	04:21	04:35	04:44	11:12	12:55	14:36
S 60°	04:39	04:47	04:51	10:55	12:44	14:30

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 25-27 33-13%
25	08:05	08:16	11:52	07:41	20:09	
26	08:26	08:36	11:51	08:37	21:04	
27	08:47	08:57	11:51	09:31	21:57	



September 28, 29, 30 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°33.0	170°09.8	S05°54.7	141°46.3	S17°33.9	201°15.3	N07°18.8	341°28.7	N07°26.7
1	21°35.5	185°09.4	55.9	156°47.1	34.4	216°17.3	18.6	356°31.3	26.7
2	36°37.9	200°09.0	57.2	171°47.8	34.9	231°19.3	18.4	11°33.9	26.6
3	51°40.4	215°08.6	·· 58.4	186°48.6	·· 35.4	246°21.2	·· 18.2	26°36.6	·· 26.5
4	66°42.9	230°08.2	05°59.7	201°49.3	35.9	261°23.2	18.0	41°39.2	26.5
5	81°45.3	245°07.8	06°00.9	216°50.0	36.4	276°25.2	17.8	56°41.8	26.4
6	96°47.8	260°07.4	S06°02.2	231°50.8	S17°36.9	291°27.2	N07°17.6	71°44.4	N07°26.3
7	111°50.3	275°07.0	03.4	246°51.5	37.5	306°29.1	17.4	86°47.1	26.3
8	126°52.7	290°06.6	04.7	261°52.2	38.0	321°31.1	17.2	101°49.7	26.2
9	141°55.2	305°06.2	·· 05.9	276°53.0	·· 38.5	336°33.1	·· 17.0	116°52.3	·· 26.1
10	156°57.7	320°05.8	07.2	291°53.7	39.0	351°35.1	16.8	131°55.0	26.0
11	172°00.1	335°05.4	08.4	306°54.4	39.5	6°37.0	16.6	146°57.6	26.0
12	187°02.6	350°05.0	S06°09.7	321°55.2	S17°40.0	21°39.0	N07°16.5	162°00.2	N07°25.9
13	202°05.0	5°04.6	10.9	336°55.9	40.5	36°41.0	16.3	177°02.9	25.8
14	217°07.5	20°04.2	12.2	351°56.6	41.0	51°43.0	16.1	192°05.5	25.8
15	232°10.0	35°03.8	·· 13.4	6°57.4	·· 41.5	66°44.9	·· 15.9	207°08.1	·· 25.7
16	247°12.4	50°03.4	14.7	21°58.1	42.0	81°46.9	15.7	222°10.7	25.6
17	262°14.9	65°03.0	15.9	36°58.8	42.5	96°48.9	15.5	237°13.4	25.6
18	277°17.4	80°02.6	S06°17.2	51°59.6	S17°43.0	111°50.9	N07°15.3	252°16.0	N07°25.5
19	292°19.8	95°02.2	18.4	67°00.3	43.5	126°52.8	15.1	267°18.6	25.4
20	307°22.3	110°01.8	19.7	82°01.0	44.1	141°54.8	14.9	282°21.3	25.4
21	322°24.8	125°01.4	·· 20.9	97°01.8	·· 44.6	156°56.8	·· 14.7	297°23.9	·· 25.3
22	337°27.2	140°01.0	22.2	112°02.5	45.1	171°58.8	14.5	312°26.5	25.2
23	352°29.7	155°00.6	23.4	127°03.2	45.6	187°00.7	14.3	327°29.2	25.2
Mer.pass.	23:30	ν -0.4′	d 1.3′	m -3.89	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.72	ν 2.6′	d 0.1′ m 0.19

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	7°32.2	170°00.2	S06°24.7	142°04.0	S17°46.1	202°02.7	N07°14.1	342°31.8	N07°25.1
1	22°34.6	184°59.8	25.9	157°04.7	46.6	217°04.7	13.9	357°34.4	25.0
2	37°37.1	199°59.4	27.1	172°05.4	47.1	232°06.7	13.7	12°37.1	24.9
3	52°39.5	214°59.0	·· 28.4	187°06.2	·· 47.6	247°08.6	·· 13.5	27°39.7	·· 24.9
4	67°42.0	229°58.6	29.6	202°06.9	48.1	262°10.6	13.3	42°42.3	24.8
5	82°44.5	244°58.2	30.9	217°07.6	48.6	277°12.6	13.1	57°45.0	24.7
6	97°46.9	259°57.8	S06°32.1	232°08.3	S17°49.1	292°14.6	N07°12.9	72°47.6	N07°24.7
7	112°49.4	274°57.4	33.4	247°09.1	49.6	307°16.6	12.7	87°50.2	24.6
8	127°51.9	289°57.0	34.6	262°09.8	50.1	322°18.5	12.5	102°52.8	24.5
9	142°54.3	304°56.6	·· 35.9	277°10.5	·· 50.6	337°20.5	·· 12.3	117°55.5	·· 24.5
10	157°56.8	319°56.2	37.1	292°11.3	51.1	352°22.5	12.1	132°58.1	24.4
11	172°59.3	334°55.8	38.4	307°12.0	51.6	7°24.5	11.9	148°00.7	24.3
12	188°01.7	349°55.4	S06°39.6	322°12.7	S17°52.1	22°26.4	N07°11.7	163°03.4	N07°24.3
13	203°04.2	4°55.0	40.8	337°13.4	52.6	37°28.4	11.5	178°06.0	24.2
14	218°06.6	19°54.6	42.1	352°14.2	53.1	52°30.4	11.3	193°08.6	24.1
15	233°09.1	34°54.2	·· 43.3	7°14.9	·· 53.6	67°32.4	·· 11.1	208°11.3	·· 24.0
16	248°11.6	49°53.8	44.6	22°15.6	54.1	82°34.3	10.9	223°13.9	24.0
17	263°14.0	64°53.4	45.8	37°16.3	54.6	97°36.3	10.7	238°16.5	23.9
18	278°16.5	79°53.0	S06°47.1	52°17.1	S17°55.1	112°38.3	N07°10.5	253°19.2	N07°23.8
19	293°19.0	94°52.6	48.3	67°17.8	55.6	127°40.3	10.3	268°21.8	23.8
20	308°21.4	109°52.2	49.6	82°18.5	56.1	142°42.3	10.1	283°24.4	23.7
21	323°23.9	124°51.8	·· 50.8	97°19.2	·· 56.6	157°44.2	·· 09.9	298°27.1	·· 23.6
22	338°26.4	139°51.4	52.0	112°20.0	57.1	172°46.2	09.7	313°29.7	23.6
23	353°28.8	154°51.0	53.3	127°20.7	57.6	187°48.2	09.5	328°32.3	23.5
Mer.pass.	23:26	ν -0.4′	d 1.2′	m -3.89	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.72	ν 2.6′	d 0.1′ m 0.19

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°31.3	169°50.6	S06°54.5	142°21.4	S17°58.1	202°50.2	N07°09.4	343°35.0	N07°23.4
1	23°33.8	184°50.2	55.8	157°22.1	58.6	217°52.1	09.2	358°37.6	23.3
2	38°36.2	199°49.8	57.0	172°22.9	59.1	232°54.1	09.0	13°40.2	23.3
3	53°38.7	214°49.4	·· 58.2	187°23.6	17°59.6	247°56.1	·· 08.8	28°42.9	·· 23.2
4	68°41.1	229°49.0	06°59.5	202°24.3	18°00.1	262°58.1	08.6	43°45.5	23.1
5	83°43.6	244°48.6	07°00.7	217°25.0	00.6	278°00.1	08.4	58°48.1	23.1
6	98°46.1	259°48.2	S07°02.0	232°25.7	S18°01.1	293°02.0	N07°08.2	73°50.8	N07°23.0
7	113°48.5	274°47.7	03.2	247°26.5	01.6	308°04.0	08.0	88°53.4	22.9
8	128°51.0	289°47.3	04.4	262°27.2	02.1	323°06.0	07.8	103°56.0	22.9
9	143°53.5	304°46.9	·· 05.7	277°27.9	·· 02.6	338°08.0	·· 07.6	118°58.7	·· 22.8
10	158°55.9	319°46.5	06.9	292°28.6	03.1	353°09.9	07.4	134°01.3	22.7
11	173°58.4	334°46.1	08.2	307°29.3	03.6	8°11.9	07.2	149°03.9	22.6
12	189°00.9	349°45.7	S07°09.4	322°30.1	S18°04.1	23°13.9	N07°07.0	164°06.6	N07°22.6
13	204°03.3	4°45.3	10.6	337°30.8	04.6	38°15.9	06.8	179°09.2	22.5
14	219°05.8	19°44.9	11.9	352°31.5	05.1	53°17.9	06.6	194°11.8	22.4
15	234°08.2	34°44.5	·· 13.1	7°32.2	·· 05.6	68°19.8	·· 06.4	209°14.5	·· 22.4
16	249°10.7	49°44.1	14.4	22°32.9	06.1	83°21.8	06.2	224°17.1	22.3
17	264°13.2	64°43.7	15.6	37°33.7	06.6	98°23.8	06.0	239°19.7	22.2
18	279°15.6	79°43.3	S07°16.8	52°34.4	S18°07.1	113°25.8	N07°05.8	254°22.4	N07°22.2
19	294°18.1	94°42.8	18.1	67°35.1	07.6	128°27.8	05.6	269°25.0	22.1
20	309°20.6	109°42.4	19.3	82°35.8	08.1	143°29.7	05.4	284°27.6	22.0
21	324°23.0	124°42.0	·· 20.5	97°36.5	·· 08.6	158°31.7	·· 05.2	299°30.3	·· 21.9
22	339°25.5	139°41.6	21.8	112°37.2	09.1	173°33.7	05.0	314°32.9	21.9
23	354°28.0	154°41.2	23.0	127°38.0	09.6	188°35.7	04.8	329°35.6	21.8
Mer.pass.	23:22	ν -0.4′	d 1.2′	m -3.89	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.72	ν 2.6′	d 0.1′ m 0.19

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.5	-42°09.1
Schedar	349°27.9	56°41.5
Diphda	348°44.7	-17°49.8
Achernar	335°18.0	-57°05.5
Hamal	327°48.3	23°35.7
Polaris	312°29.0	89°22.6
Acamar	315°09.8	-40°11.3
Menkar	314°03.6	4°12.1
Mirfak	308°24.7	49°57.5
Aldebaran	290°36.9	16°33.9
Rigel	281°01.6	-8°10.0
Capella	280°18.4	46°01.4
Bellatrix	278°20.4	6°22.6
Elnath	277°58.9	28°37.8
Alnilam	275°35.4	-1°10.9
Betelgeuse	270°49.6	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.3	-16°45.1
Adhara	255°04.2	-29°00.3
Procyon	244°48.6	5°09.3
Pollux	243°14.7	27°57.4
Avior	234°14.1	-59°35.6
Suhail	222°44.9	-43°32.5
Miaplacidus	221°38.4	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.3	11°49.9
Dubhe	193°39.0	61°36.0
Denebola	182°23.0	14°25.1
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.6
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.4	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°20.9	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.5
Antares	112°13.3	-26°29.6
Atria	107°05.6	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.5	12°32.6
Eltanin	90°41.2	51°29.4
Kaus Aust.	83°29.6	-34°22.3
Vega	80°31.7	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.0	-56°38.8
Deneb	49°24.0	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.5
Fomalhaut	15°11.7	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Sep 28 Tue	SHA	Mer.pass
Venus	163°36.8	12:40
Mars	135°13.3	14:32
Jupiter	194°42.3	10:34
Saturn	334°55.6	01:14

Sep 29 Wed	SHA	Mer.pass
Venus	162°28.1	12:40
Mars	134°31.8	14:31
Jupiter	194°30.6	10:30
Saturn	334°59.6	01:10

Sep 30 Thu	SHA	Mer.pass
Venus	161°19.3	12:41
Mars	133°50.1	14:30
Jupiter	194°18.9	10:27
Saturn	335°03.7	01:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°16.7	S01°51.0	209°44.6	10.1′	N07°18.6	16.3′	60.3′
1	197°17.0	51.9	224°13.7	10.1′	07°02.3	16.2′	60.3′
2	212°17.2	52.9	238°42.9	10.2′	06°46.1	16.3′	60.3′
3	227°17.4	·· 53.9	253°12.1	10.2′	06°29.8	16.3′	60.2′
4	242°17.6	54.9	267°41.3	10.2′	06°13.5	16.4′	60.2′
5	257°17.8	55.8	282°10.5	10.3′	05°57.1	16.4′	60.2′
6	272°18.0	S01°56.8	296°39.8	10.3′	N05°40.7	16.4′	60.2′
7	287°18.2	57.8	311°09.1	10.4′	05°24.3	16.5′	60.2′
8	302°18.4	58.7	325°38.5	10.4′	05°07.8	16.5′	60.2′
9	317°18.6	01°59.7	340°07.8	10.4′	04°51.3	16.5′	60.2′
10	332°18.8	02°00.7	354°37.3	10.4′	04°34.8	16.5′	60.2′
11	347°19.1	01.7	9°06.7	10.5′	04°18.3	16.5′	60.2′
12	2°19.3	S02°02.6	23°36.2	10.5′	N04°01.8	16.6′	60.2′
13	17°19.5	03.6	38°05.7	10.5′	03°45.2	16.6′	60.2′
14	32°19.7	04.6	52°35.2	10.6′	03°28.6	16.6′	60.2′
15	47°19.9	·· 05.6	67°04.8	10.6′	03°12.0	16.6′	60.2′
16	62°20.1	06.5	81°34.3	10.6′	02°55.4	16.6′	60.2′
17	77°20.3	07.5	96°03.9	10.6′	02°38.8	16.7′	60.2′
18	92°20.5	S02°08.5	110°33.6	10.6′	N02°22.1	16.6′	60.2′
19	107°20.7	09.4	125°03.2	10.7′	02°05.5	16.7′	60.1′
20	122°20.9	10.4	139°32.9	10.7′	01°48.8	16.6′	60.1′
21	137°21.2	·· 11.4	154°02.5	10.7′	01°32.2	16.7′	60.1′
22	152°21.4	12.4	168°32.2	10.7′	01°15.5	16.6′	60.1′
23	167°21.6	13.3	183°02.0	10.7′	00°58.9	16.7′	60.1′
	SD = 16.0′	d = 1.0′	SD = 16.4′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°21.8	S02°14.3	197°31.7	10.7′	N00°42.2	16.7′	60.1′
1	197°22.0	15.3	212°01.4	10.8′	00°25.5	16.6′	60.1′
2	212°22.2	16.3	226°31.2	10.8′	N00°08.9	16.7′	60.1′
3	227°22.4	·· 17.2	241°01.0	10.8′	S00°07.8	16.6′	60.1′
4	242°22.6	18.2	255°30.8	10.8′	00°24.4	16.6′	60.0′
5	257°22.8	19.2	270°00.6	10.8′	00°41.0	16.7′	60.0′
6	272°23.0	S02°20.1	284°30.4	10.8′	S00°57.7	16.6′	60.0′
7	287°23.2	21.1	299°00.2	10.8′	01°14.3	16.6′	60.0′
8	302°23.4	22.1	313°30.0	10.8′	01°30.9	16.5′	60.0′
9	317°23.6	·· 23.1	327°59.9	10.8′	01°47.4	16.6′	60.0′
10	332°23.9	24.0	342°29.7	10.8′	02°04.0	16.5′	60.0′
11	347°24.1	25.0	356°59.5	10.8′	02°20.5	16.5′	59.9′
12	2°24.3	S02°26.0	11°29.4	10.8′	S02°37.0	16.5′	59.9′
13	17°24.5	26.9	25°59.2	10.9′	02°53.5	16.5′	59.9′
14	32°24.7	27.9	40°29.1	10.9′	03°10.0	16.5′	59.9′
15	47°24.9	·· 28.9	54°58.9	10.9′	03°26.5	16.4′	59.9′
16	62°25.1	29.9	69°28.8	10.8′	03°42.9	16.4′	59.9′
17	77°25.3	30.8	83°58.6	10.8′	03°59.3	16.3′	59.8′
18	92°25.5	S02°31.8	98°28.5	10.8′	S04°15.6	16.3′	59.8′
19	107°25.7	32.8	112°58.3	10.8′	04°31.9	16.3′	59.8′
20	122°25.9	33.8	127°28.2	10.8′	04°48.2	16.3′	59.8′
21	137°26.1	·· 34.7	141°58.0	10.8′	05°04.5	16.2′	59.8′
22	152°26.3	35.7	156°27.8	10.8′	05°20.7	16.1′	59.7′
23	167°26.5	36.7	170°57.7	10.8′	05°36.8	16.2′	59.7′
	SD = 16.0′	d = 1.0′	SD = 16.4′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°26.7	S02°37.6	185°27.5	10.8′	S05°53.0	16.1′	59.7′
1	197°26.9	38.6	199°57.3	10.8′	06°09.1	16.0′	59.7′
2	212°27.2	39.6	214°27.1	10.8′	06°25.1	16.0′	59.7′
3	227°27.4	·· 40.6	228°56.8	10.8′	06°41.1	15.9′	59.6′
4	242°27.6	41.5	243°26.6	10.8′	06°57.0	15.9′	59.6′
5	257°27.8	42.5	257°56.4	10.7′	07°12.9	15.9′	59.6′
6	272°28.0	S02°43.5	272°26.1	10.7′	S07°28.8	15.8′	59.6′
7	287°28.2	44.4	286°55.9	10.7′	07°44.6	15.7′	59.6′
8	302°28.4	45.4	301°25.6	10.7′	08°00.3	15.7′	59.5′
9	317°28.6	·· 46.4	315°55.3	10.7′	08°16.0	15.6′	59.5′
10	332°28.8	47.4	330°25.0	10.7′	08°31.6	15.6′	59.5′
11	347°29.0	48.3	344°54.6	10.6′	08°47.2	15.5′	59.5′
12	2°29.2	S02°49.3	359°24.3	10.6′	S09°02.7	15.4′	59.4′
13	17°29.4	50.3	13°53.9	10.6′	09°18.1	15.4′	59.4′
14	32°29.6	51.2	28°23.5	10.6′	09°33.5	15.3′	59.4′
15	47°29.8	·· 52.2	42°53.1	10.6′	09°48.8	15.3′	59.4′
16	62°30.0	53.2	57°22.7	10.5′	10°04.1	15.1′	59.3′
17	77°30.2	54.1	71°52.2	10.5′	10°19.2	15.1′	59.3′
18	92°30.4	S02°55.1	86°21.7	10.5′	S10°34.3	15.1′	59.3′
19	107°30.6	56.1	100°51.2	10.5′	10°49.4	15.0′	59.2′
20	122°30.8	57.1	115°20.7	10.4′	11°04.4	14.8′	59.2′
21	137°31.0	·· 58.0	129°50.1	10.4′	11°19.2	14.9′	59.2′
22	152°31.2	02°59.0	144°19.6	10.4′	11°34.1	14.7′	59.2′
23	167°31.4	03°00.0	158°48.9	10.4′	11°48.8	14.7′	59.1′
	SD = 16.0′	d = 1.0′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:37	05:01	06:09	17:30	18:37	20:00
N 70°	03:51	05:06	06:06	17:32	18:33	19:46
68°	04:02	05:09	06:05	17:34	18:29	19:36
66°	04:11	05:12	06:03	17:36	18:27	19:27
64°	04:18	05:15	06:02	17:37	18:24	19:20
62°	04:24	05:17	06:01	17:38	18:22	19:15
60°	04:29	05:19	06:00	17:39	18:21	19:10
N 58°	04:34	05:20	05:59	17:40	18:19	19:05
56°	04:38	05:21	05:58	17:41	18:18	19:02
54°	04:41	05:22	05:58	17:42	18:17	18:58
52°	04:44	05:23	05:57	17:43	18:16	18:56
50°	04:47	05:24	05:56	17:43	18:16	18:53
45°	04:52	05:26	05:55	17:45	18:14	18:48
N 40°	04:55	05:27	05:54	17:46	18:13	18:45
35°	04:58	05:28	05:53	17:47	18:12	18:42
30°	05:00	05:28	05:52	17:48	18:12	18:40
20°	05:03	05:28	05:50	17:50	18:12	18:38
N 10°	05:03	05:28	05:49	17:52	18:13	18:37
0°	05:02	05:26	05:47	17:54	18:14	18:38
S 10°	05:00	05:24	05:45	17:55	18:16	18:41
20°	04:56	05:22	05:44	17:58	18:20	18:45
30°	04:49	05:17	05:41	18:00	18:24	18:52
35°	04:45	05:15	05:40	18:01	18:27	18:57
40°	04:39	05:11	05:38	18:03	18:30	19:02
45°	04:32	05:07	05:36	18:05	18:35	19:09
S 50°	04:23	05:02	05:34	18:08	18:40	19:19
52°	04:19	04:59	05:33	18:09	18:43	19:23
54°	04:14	04:56	05:32	18:10	18:46	19:28
56°	04:08	04:53	05:31	18:11	18:49	19:34
58°	04:02	04:50	05:29	18:13	18:53	19:41
S 60°	03:54	04:46	05:28	18:15	18:57	19:49

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	02:46	05:11	07:37	17:06	16:33	15:56
N 70°	02:56	05:10	07:24	17:03	16:38	16:11
68°	03:04	05:09	07:14	17:00	16:43	16:24
66°	03:10	05:08	07:05	16:58	16:47	16:35
64°	03:16	05:08	06:58	16:56	16:50	16:43
62°	03:21	05:07	06:52	16:54	16:53	16:51
60°	03:25	05:06	06:47	16:53	16:55	16:58
N 58°	03:28	05:06	06:43	16:51	16:57	17:04
56°	03:31	05:06	06:39	16:50	16:59	17:09
54°	03:34	05:05	06:35	16:49	17:01	17:14
52°	03:37	05:05	06:32	16:48	17:03	17:18
50°	03:39	05:04	06:29	16:47	17:04	17:22
45°	03:44	05:04	06:22	16:45	17:07	17:30
N 40°	03:49	05:03	06:17	16:43	17:10	17:37
35°	03:52	05:03	06:13	16:42	17:12	17:43
30°	03:55	05:02	06:09	16:41	17:14	17:49
20°	04:01	05:02	06:02	16:38	17:18	17:58
N 10°	04:06	05:01	05:56	16:36	17:21	18:07
0°	04:10	05:01	05:51	16:34	17:24	18:14
S 10°	04:15	05:00	05:45	16:32	17:27	18:22
20°	04:20	05:00	05:39	16:30	17:30	18:31
30°	04:25	04:59	05:33	16:27	17:34	18:40
35°	04:28	04:59	05:29	16:26	17:36	18:46
40°	04:32	04:58	05:25	16:24	17:39	18:52
45°	04:36	04:58	05:20	16:22	17:41	19:00
S 50°	04:41	04:58	05:15	16:20	17:45	19:09
52°	04:43	04:57	05:12	16:19	17:46	19:13
54°	04:45	04:57	05:09	16:18	17:48	19:18
56°	04:48	04:57	05:06	16:16	17:50	19:23
58°	04:51	04:57	05:03	16:15	17:52	19:28
S 60°	04:54	04:56	04:59	16:13	17:54	19:35

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-0 6-0%
28	09:07	09:17	11:51	10:22	22:47	
29	09:27	09:37	11:50	11:12	23:37	
30	09:47	09:57	11:50	12:02	–:–	

October 01, 02, 03 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°30.4	169°40.8	S07°24.2	142°38.7	S18°10.1	203°37.7	N07°04.6	344°38.2	N07°21.7
1	24°32.9	184°40.4	25.5	157°39.4	10.6	218°39.6	04.4	359°40.8	21.7
2	39°35.4	199°40.0	26.7	172°40.1	11.1	233°41.6	04.2	14°43.5	21.6
3	54°37.8	214°39.6	·· 28.0	187°40.8	·· 11.6	248°43.6	·· 04.0	29°46.1	·· 21.5
4	69°40.3	229°39.1	29.2	202°41.5	12.1	263°45.6	03.8	44°48.7	21.5
5	84°42.7	244°38.7	30.4	217°42.2	12.6	278°47.6	03.7	59°51.4	21.4
6	99°45.2	259°38.3	S07°31.7	232°43.0	S18°13.1	293°49.5	N07°03.5	74°54.0	N07°21.3
7	114°47.7	274°37.9	32.9	247°43.7	13.5	308°51.5	03.3	89°56.6	21.2
8	129°50.1	289°37.5	34.1	262°44.4	14.0	323°53.5	03.1	104°59.3	21.2
9	144°52.6	304°37.1	·· 35.4	277°45.1	·· 14.5	338°55.5	·· 02.9	120°01.9	·· 21.1
10	159°55.1	319°36.7	36.6	292°45.8	15.0	353°57.5	02.7	135°04.5	21.0
11	174°57.5	334°36.3	37.8	307°46.5	15.5	8°59.4	02.5	150°07.2	21.0
12	190°00.0	349°35.8	S07°39.1	322°47.2	S18°16.0	24°01.4	N07°02.3	165°09.8	N07°20.9
13	205°02.5	4°35.4	40.3	337°47.9	16.5	39°03.4	02.1	180°12.5	20.8
14	220°04.9	19°35.0	41.5	352°48.7	17.0	54°05.4	01.9	195°15.1	20.8
15	235°07.4	34°34.6	·· 42.8	7°49.4	·· 17.5	69°07.4	·· 01.7	210°17.7	·· 20.7
16	250°09.9	49°34.2	44.0	22°50.1	18.0	84°09.3	01.5	225°20.4	20.6
17	265°12.3	64°33.8	45.2	37°50.8	18.5	99°11.3	01.3	240°23.0	20.5
18	280°14.8	79°33.3	S07°46.4	52°51.5	S18°19.0	114°13.3	N07°01.1	255°25.6	N07°20.5
19	295°17.2	94°32.9	47.7	67°52.2	19.4	129°15.3	00.9	270°28.3	20.4
20	310°19.7	109°32.5	48.9	82°52.9	19.9	144°17.3	00.7	285°30.9	20.3
21	325°22.2	124°32.1	·· 50.1	97°53.6	·· 20.4	159°19.2	·· 00.5	300°33.5	·· 20.3
22	340°24.6	139°31.7	51.4	112°54.3	20.9	174°21.2	00.3	315°36.2	20.2
23	355°27.1	154°31.3	52.6	127°55.1	21.4	189°23.2	00.1	330°38.8	20.1
Mer.pass.	23:18	ν -0.4′	d 1.2′	ν 0.7′	d 0.5′	ν 2.0′	d 0.2′	ν 2.6′	d 0.1′
		m -3.89		m 1.36		m -1.72		m 0.18	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°29.6	169°30.8	S07°53.8	142°55.8	S18°21.9	204°25.2	N06°59.9	345°41.5	N07°20.1
1	25°32.0	184°30.4	55.0	157°56.5	22.4	219°27.2	59.7	0°44.1	20.0
2	40°34.5	199°30.0	56.3	172°57.2	22.9	234°29.1	59.5	15°46.7	19.9
3	55°37.0	214°29.6	·· 57.5	187°57.9	·· 23.4	249°31.1	·· 59.3	30°49.4	·· 19.8
4	70°39.4	229°29.2	07°58.7	202°58.6	23.9	264°33.1	59.1	45°52.0	19.8
5	85°41.9	244°28.8	08°00.0	217°59.3	24.3	279°35.1	58.9	60°54.6	19.7
6	100°44.3	259°28.3	S08°01.2	233°00.0	S18°24.8	294°37.1	N06°58.8	75°57.3	N07°19.6
7	115°46.8	274°27.9	02.4	248°00.7	25.3	309°39.0	58.6	90°59.9	19.6
8	130°49.3	289°27.5	03.6	263°01.4	25.8	324°41.0	58.4	106°02.5	19.5
9	145°51.7	304°27.1	·· 04.9	278°02.1	·· 26.3	339°43.0	·· 58.2	121°05.2	·· 19.4
10	160°54.2	319°26.7	06.1	293°02.8	26.8	354°45.0	58.0	136°07.8	19.3
11	175°56.7	334°26.2	07.3	308°03.5	27.3	9°47.0	57.8	151°10.5	19.3
12	190°59.1	349°25.8	S08°08.5	323°04.2	S18°27.8	24°49.0	N06°57.6	166°13.1	N07°19.2
13	206°01.6	4°25.4	09.8	338°04.9	28.2	39°50.9	57.4	181°15.7	19.1
14	221°04.1	19°25.0	11.0	353°05.6	28.7	54°52.9	57.2	196°18.4	19.1
15	236°06.5	34°24.6	·· 12.2	8°06.4	·· 29.2	69°54.9	·· 57.0	211°21.0	·· 19.0
16	251°09.0	49°24.1	13.4	23°07.1	29.7	84°56.9	56.8	226°23.6	18.9
17	266°11.5	64°23.7	14.7	38°07.8	30.2	99°58.9	56.6	241°26.3	18.8
18	281°13.9	79°23.3	S08°15.9	53°08.5	S18°30.7	115°00.8	N06°56.4	256°28.9	N07°18.8
19	296°16.4	94°22.9	17.1	68°09.2	31.2	130°02.8	56.2	271°31.6	18.7
20	311°18.8	109°22.4	18.3	83°09.9	31.6	145°04.8	56.0	286°34.2	18.6
21	326°21.3	124°22.0	·· 19.6	98°10.6	·· 32.1	160°06.8	·· 55.8	301°36.8	·· 18.6
22	341°23.8	139°21.6	20.8	113°11.3	32.6	175°08.8	55.6	316°39.5	18.5
23	356°26.2	154°21.2	22.0	128°12.0	33.1	190°10.8	55.4	331°42.1	18.4
Mer.pass.	23:14	ν -0.4′	d 1.2′	ν 0.7′	d 0.5′	ν 2.0′	d 0.2′	ν 2.6′	d 0.1′
		m -3.89		m 1.36		m -1.72		m 0.18	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	11°28.7	169°20.7	S08°23.2	143°12.7	S18°33.6	205°12.7	N06°55.2	346°44.8	N07°18.4
1	26°31.2	184°20.3	24.4	158°13.4	34.1	220°14.7	55.0	1°47.4	18.3
2	41°33.6	199°19.9	25.7	173°14.1	34.5	235°16.7	54.8	16°50.0	18.2
3	56°36.1	214°19.5	·· 26.9	188°14.8	·· 35.0	250°18.7	·· 54.6	31°52.7	·· 18.1
4	71°38.6	229°19.0	28.1	203°15.5	35.5	265°20.7	54.5	46°55.3	18.1
5	86°41.0	244°18.6	29.3	218°16.2	36.0	280°22.7	54.3	61°57.9	18.0
6	101°43.5	259°18.2	S08°30.5	233°16.9	S18°36.5	295°24.6	N06°54.1	77°00.6	N07°17.9
7	116°46.0	274°17.8	31.8	248°17.6	37.0	310°26.6	53.9	92°03.2	17.9
8	131°48.4	289°17.3	33.0	263°18.3	37.4	325°28.6	53.7	107°05.9	17.8
9	146°50.9	304°16.9	·· 34.2	278°19.0	·· 37.9	340°30.6	·· 53.5	122°08.5	·· 17.7
10	161°53.3	319°16.5	35.4	293°19.7	38.4	355°32.6	53.3	137°11.1	17.6
11	176°55.8	334°16.1	36.6	308°20.4	38.9	10°34.6	53.1	152°13.8	17.6
12	191°58.3	349°15.6	S08°37.9	323°21.1	S18°39.4	25°36.5	N06°52.9	167°16.4	N07°17.5
13	207°00.7	4°15.2	39.1	338°21.8	39.8	40°38.5	52.7	182°19.1	17.4
14	222°03.2	19°14.8	40.3	353°22.5	40.3	55°40.5	52.5	197°21.7	17.4
15	237°05.7	34°14.3	·· 41.5	8°23.2	·· 40.8	70°42.5	·· 52.3	212°24.3	·· 17.3
16	252°08.1	49°13.9	42.7	23°23.9	41.3	85°44.5	52.1	227°27.0	17.2
17	267°10.6	64°13.5	43.9	38°24.6	41.8	100°46.5	51.9	242°29.6	17.1
18	282°13.1	79°13.1	S08°45.2	53°25.2	S18°42.2	115°48.4	N06°51.7	257°32.3	N07°17.1
19	297°15.5	94°12.6	46.4	68°25.9	42.7	130°50.4	51.5	272°34.9	17.0
20	312°18.0	109°12.2	47.6	83°26.6	43.2	145°52.4	51.3	287°37.5	16.9
21	327°20.4	124°11.8	·· 48.8	98°27.3	·· 43.7	160°54.4	·· 51.1	302°40.2	·· 16.9
22	342°22.9	139°11.3	50.0	113°28.0	44.2	175°56.4	50.9	317°42.8	16.8
23	357°25.4	154°10.9	51.2	128°28.7	44.6	190°58.4	50.7	332°45.5	16.7
Mer.pass.	23:10	ν -0.4′	d 1.2′	ν 0.7′	d 0.5′	ν 2.0′	d 0.2′	ν 2.6′	d 0.1′
		m -3.89		m 1.36		m -1.72		m 0.17	

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.5	-42°09.1
Schedar	349°27.9	56°41.5
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.5
Hamal	327°48.3	23°35.7
Polaris	312°27.7	89°22.6
Acamar	315°09.8	-40°11.3
Menkar	314°03.6	4°12.1
Mirfak	308°24.7	49°57.5
Aldebaran	290°36.9	16°33.9
Rigel	281°01.6	-8°10.0
Capella	280°18.4	46°01.4
Bellatrix	278°20.4	6°22.6
Elnath	277°58.9	28°37.8
Alnilam	275°35.4	-1°10.9
Betelgeuse	270°49.6	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.3	-16°45.1
Adhara	255°04.1	-29°00.3
Procyon	244°48.6	5°09.3
Pollux	243°14.7	27°57.4
Avior	234°14.1	-59°35.6
Suhail	222°44.9	-43°32.5
Miaplacidus	221°38.3	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.3	11°49.9
Dubhe	193°39.0	61°35.9
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.6
Spica	158°20.3	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.4	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°20.9	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.5
Antares	112°13.3	-26°29.6
Atria	107°05.7	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.2	51°29.4
Kaus Aust.	83°29.6	-34°22.3
Vega	80°31.7	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.0	-56°38.8
Deneb	49°24.0	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.5
Fomalhaut	15°11.7	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 01 Fri	SHA	Mer.pass
Venus	160°10.4	12:42
Mars	133°08.2	14:29
Jupiter	194°07.2	10:24
Saturn	335°07.8	01:01

Oct 02 Sat	SHA	Mer.pass
Venus	159°01.3	12:42
Mars	132°26.2	14:28
Jupiter	193°55.6	10:21
Saturn	335°11.9	00:57

Oct 03 Sun	SHA	Mer.pass
Venus	157°52.0	12:43
Mars	131°44.0	14:26
Jupiter	193°44.0	10:18
Saturn	335°16.1	00:53

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°31.6	S03°00.9	173°18.3	10.3′	S12°03.5	14.5′	59.1′
1	197°31.8	01.9	187°47.7	10.3′	12°18.0	14.5′	59.1′
2	212°32.0	02.9	202°17.0	10.3′	12°32.5	14.4′	59.1′
3	227°32.3	·· 03.9	216°46.3	10.3′	12°46.9	14.4′	59.0′
4	242°32.5	04.8	231°15.5	10.2′	13°01.3	14.2′	59.0′
5	257°32.7	05.8	245°44.7	10.2′	13°15.5	14.2′	59.0′
6	272°32.9	S03°06.8	260°13.9	10.2′	S13°29.7	14.0′	58.9′
7	287°33.1	07.7	274°43.1	10.1′	13°43.7	14.0′	58.9′
8	302°33.3	08.7	289°12.2	10.1′	13°57.7	13.9′	58.9′
9	317°33.5	·· 09.7	303°41.3	10.1′	14°11.6	13.8′	58.8′
10	332°33.7	10.6	318°10.4	10.0′	14°25.4	13.7′	58.8′
11	347°33.9	11.6	332°39.4	10.0′	14°39.1	13.6′	58.8′
12	2°34.1	S03°12.6	347°08.4	10.0′	S14°52.7	13.5′	58.7′
13	17°34.3	13.6	1°37.4	9.9′	15°06.2	13.4′	58.7′
14	32°34.5	14.5	16°06.4	9.9′	15°19.6	13.4′	58.7′
15	47°34.7	·· 15.5	30°35.3	9.9′	15°33.0	13.2′	58.7′
16	62°34.9	16.5	45°04.1	9.8′	15°46.2	13.1′	58.6′
17	77°35.1	17.4	59°33.0	9.8′	15°59.3	13.0′	58.6′
18	92°35.3	S03°18.4	74°01.8	9.8′	S16°12.3	12.9′	58.6′
19	107°35.5	19.4	88°30.5	9.7′	16°25.2	12.8′	58.5′
20	122°35.7	20.3	102°59.3	9.7′	16°38.0	12.7′	58.5′
21	137°35.9	·· 21.3	117°27.9	9.7′	16°50.7	12.6′	58.5′
22	152°36.1	22.3	131°56.6	9.6′	17°03.3	12.5′	58.4′
23	167°36.3	23.2	146°25.2	9.6′	17°15.8	12.4′	58.4′
	SD = 16.0′	d = 1.0′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°36.5	S03°24.2	160°53.8	9.6′	S17°28.2	12.2′	58.4′
1	197°36.7	25.2	175°22.4	9.5′	17°40.4	12.2′	58.3′
2	212°36.9	26.1	189°50.9	9.5′	17°52.6	12.0′	58.3′
3	227°37.1	·· 27.1	204°19.4	9.4′	18°04.6	11.9′	58.3′
4	242°37.3	28.1	218°47.8	9.4′	18°16.5	11.8′	58.2′
5	257°37.5	29.1	233°16.2	9.4′	18°28.3	11.7′	58.2′
6	272°37.7	S03°30.0	247°44.6	9.3′	S18°40.0	11.6′	58.2′
7	287°37.9	31.0	262°12.9	9.3′	18°51.6	11.4′	58.1′
8	302°38.1	32.0	276°41.2	9.3′	19°03.0	11.4′	58.1′
9	317°38.3	·· 32.9	291°09.5	9.2′	19°14.4	11.2′	58.1′
10	332°38.5	33.9	305°37.7	9.2′	19°25.6	11.1′	58.0′
11	347°38.7	34.9	320°05.9	9.2′	19°36.7	11.0′	58.0′
12	2°38.9	S03°35.8	334°34.1	9.1′	S19°47.7	10.8′	58.0′
13	17°39.1	36.8	349°02.2	9.1′	19°58.5	10.7′	57.9′
14	32°39.3	37.8	3°30.3	9.1′	20°09.2	10.6′	57.9′
15	47°39.5	·· 38.7	17°58.3	9.0′	20°19.8	10.5′	57.8′
16	62°39.7	39.7	32°26.3	9.0′	20°30.3	10.3′	57.8′
17	77°39.9	40.7	46°54.3	8.9′	20°40.6	10.3′	57.8′
18	92°40.1	S03°41.6	61°22.3	8.9′	S20°50.9	10.0′	57.7′
19	107°40.3	42.6	75°50.2	8.9′	21°00.9	10.0′	57.7′
20	122°40.4	43.6	90°18.1	8.8′	21°10.9	9.8′	57.7′
21	137°40.6	·· 44.5	104°45.9	8.8′	21°20.7	9.7′	57.6′
22	152°40.8	45.5	119°13.7	8.8′	21°30.4	9.6′	57.6′
23	167°41.0	46.5	133°41.5	8.8′	21°40.0	9.4′	57.6′
	SD = 16.0′	d = 1.0′	SD = 15.9′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°41.2	S03°47.4	148°09.3	8.7′	S21°49.4	9.3′	57.5′
1	197°41.4	48.4	162°37.0	8.7′	21°58.7	9.2′	57.5′
2	212°41.6	49.4	177°04.7	8.7′	22°07.9	9.0′	57.5′
3	227°41.8	·· 50.3	191°32.4	8.6′	22°16.9	8.9′	57.4′
4	242°42.0	51.3	206°00.0	8.6′	22°25.8	8.8′	57.4′
5	257°42.2	52.3	220°27.6	8.6′	22°34.6	8.6′	57.4′
6	272°42.4	S03°53.2	234°55.2	8.6′	S22°43.2	8.5′	57.3′
7	287°42.6	54.2	249°22.7	8.5′	22°51.7	8.3′	57.3′
8	302°42.8	55.2	263°50.3	8.5′	23°00.0	8.2′	57.3′
9	317°43.0	·· 56.1	278°17.7	8.5′	23°08.2	8.1′	57.2′
10	332°43.2	57.1	292°45.2	8.4′	23°16.3	7.9′	57.2′
11	347°43.4	58.1	307°12.7	8.4′	23°24.2	7.8′	57.1′
12	2°43.6	S03°59.0	321°40.1	8.4′	S23°32.0	7.6′	57.1′
13	17°43.8	04°00.0	336°07.5	8.4′	23°39.6	7.6′	57.1′
14	32°44.0	01.0	350°34.9	8.4′	23°47.2	7.3′	57.0′
15	47°44.2	·· 01.9	5°02.2	8.3′	23°54.5	7.2′	57.0′
16	62°44.4	02.9	19°29.6	8.3′	24°01.7	7.1′	57.0′
17	77°44.6	03.9	33°56.9	8.3′	24°08.8	6.9′	56.9′
18	92°44.8	S04°04.8	48°24.2	8.3′	S24°15.7	6.8′	56.9′
19	107°44.9	05.8	62°51.5	8.3′	24°22.5	6.7′	56.9′
20	122°45.1	06.8	77°18.7	8.2′	24°29.2	6.5′	56.8′
21	137°45.3	·· 07.7	91°46.0	8.2′	24°35.7	6.3′	56.8′
22	152°45.5	08.7	106°13.2	8.2′	24°42.0	6.2′	56.8′
23	167°45.7	09.7	120°40.4	8.2′	24°48.2	6.1′	56.7′
	SD = 16.0′	d = 1.0′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:53	05:15	06:22	17:15	18:21	19:42
N 70°	04:05	05:18	06:18	17:18	18:19	19:31
68°	04:14	05:20	06:15	17:22	18:17	19:22
66°	04:21	05:22	06:13	17:24	18:15	19:15
64°	04:27	05:23	06:11	17:27	18:14	19:09
62°	04:33	05:25	06:09	17:29	18:13	19:04
60°	04:37	05:26	06:07	17:30	18:12	19:00
N 58°	04:41	05:27	06:06	17:32	18:11	18:57
56°	04:44	05:27	06:04	17:33	18:10	18:54
54°	04:47	05:28	06:03	17:35	18:10	18:51
52°	04:49	05:28	06:02	17:36	18:09	18:49
50°	04:51	05:29	06:01	17:37	18:09	18:46
45°	04:55	05:30	05:59	17:39	18:08	18:42
N 40°	04:58	05:30	05:57	17:41	18:08	18:40
35°	05:01	05:30	05:55	17:43	18:08	18:38
30°	05:02	05:30	05:54	17:45	18:09	18:36
20°	05:03	05:29	05:51	17:47	18:10	18:35
N 10°	05:03	05:28	05:49	17:50	18:11	18:35
0°	05:01	05:25	05:46	17:53	18:13	18:37
S 10°	04:58	05:23	05:44	17:55	18:16	18:41
20°	04:53	05:19	05:41	17:58	18:20	18:46
30°	04:46	05:14	05:38	18:02	18:26	18:54
35°	04:40	05:10	05:36	18:04	18:29	18:59
40°	04:34	05:06	05:33	18:06	18:33	19:06
45°	04:26	05:01	05:31	18:09	18:38	19:14
S 50°	04:16	04:55	05:28	18:12	18:45	19:24
52°	04:11	04:52	05:26	18:14	18:48	19:29
54°	04:06	04:49	05:25	18:15	18:51	19:35
56°	03:59	04:45	05:23	18:17	18:55	19:41
58°	03:52	04:41	05:21	18:19	18:59	19:49
S 60°	03:44	04:36	05:19	18:22	19:04	19:57

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	10:22	▬	▬	14:58	▬	▬
N 70°	09:49	▬	▬	15:34	▬	▬
68°	09:24	11:57	▬	16:00	15:17	▬
66°	09:06	11:16	14:24	16:20	15:59	14:43
64°	08:51	10:48	12:54	16:36	16:28	16:14
62°	08:39	10:27	12:16	16:50	16:50	16:52
60°	08:28	10:10	11:50	17:01	17:08	17:19
N 58°	08:19	09:56	11:30	17:11	17:23	17:40
56°	08:12	09:44	11:13	17:20	17:35	17:57
54°	08:05	09:33	10:58	17:28	17:47	18:12
52°	07:58	09:24	10:46	17:35	17:57	18:25
50°	07:53	09:16	10:35	17:42	18:06	18:36
45°	07:41	08:58	10:12	17:55	18:25	19:00
N 40°	07:31	08:43	09:54	18:07	18:40	19:19
35°	07:22	08:31	09:39	18:17	18:53	19:35
30°	07:15	08:21	09:26	18:25	19:05	19:49
20°	07:02	08:03	09:03	18:40	19:25	20:12
N 10°	06:51	07:47	08:44	18:53	19:42	20:33
0°	06:41	07:33	08:26	19:06	19:58	20:52
S 10°	06:31	07:19	08:08	19:18	20:14	21:11
20°	06:20	07:03	07:49	19:31	20:32	21:32
30°	06:08	06:46	07:28	19:46	20:52	21:56
35°	06:01	06:36	07:15	19:55	21:04	22:10
40°	05:53	06:25	07:00	20:06	21:18	22:26
45°	05:44	06:11	06:43	20:18	21:34	22:46
S 50°	05:33	05:55	06:22	20:32	21:54	23:11
52°	05:28	05:47	06:12	20:39	22:03	23:22
54°	05:23	05:39	06:01	20:47	22:14	23:36
56°	05:17	05:30	05:48	20:55	22:26	23:52
58°	05:10	05:19	05:33	21:05	22:41	·· ··
S 60°	05:02	05:07	05:16	21:16	22:57	·· ··

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 1-11%
01	10:07	10:16	11:50	12:53	00:28	
02	10:26	10:35	11:49	13:45	01:19	
03	10:45	10:54	11:49	14:39	02:12	

October 04, 05, 06 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	12°27.8	169°10.5	S08°52.4	143°29.4	S18°45.1	206°00.4	N06°50.6	347°48.1	N07°16.6
1	27°30.3	184°10.0	53.7	158°30.1	45.6	221°02.3	50.4	2°50.7	16.6
2	42°32.8	199°09.6	54.9	173°30.8	46.1	236°04.3	50.2	17°53.4	16.5
3	57°35.2	214°09.2	·· 56.1	188°31.5	·· 46.6	251°06.3	·· 50.0	32°56.0	·· 16.4
4	72°37.7	229°08.7	57.3	203°32.2	47.0	266°08.3	49.8	47°58.7	16.4
5	87°40.2	244°08.3	58.5	218°32.9	47.5	281°10.3	49.6	63°01.3	16.3
6	102°42.6	259°07.9	S08°59.7	233°33.6	S18°48.0	296°12.3	N06°49.4	78°03.9	N07°16.2
7	117°45.1	274°07.4	09°00.9	248°34.3	48.5	311°14.2	49.2	93°06.6	16.1
8	132°47.6	289°07.0	02.1	263°35.0	48.9	326°16.2	49.0	108°09.2	16.1
9	147°50.0	304°06.6	·· 03.3	278°35.6	·· 49.4	341°18.2	·· 48.8	123°11.9	·· 16.0
10	162°52.5	319°06.1	04.6	293°36.3	49.9	356°20.2	48.6	138°14.5	15.9
11	177°54.9	334°05.7	05.8	308°37.0	50.4	11°22.2	48.4	153°17.1	15.9
12	192°57.4	349°05.3	S09°07.0	323°37.7	S18°50.8	26°24.2	N06°48.2	168°19.8	N07°15.8
13	207°59.9	4°04.8	08.2	338°38.4	51.3	41°26.2	48.0	183°22.4	15.7
14	223°02.3	19°04.4	09.4	353°39.1	51.8	56°28.1	47.8	198°25.1	15.6
15	238°04.8	34°04.0	·· 10.6	8°39.8	·· 52.3	71°30.1	·· 47.6	213°27.7	·· 15.6
16	253°07.3	49°03.5	11.8	23°40.5	52.7	86°32.1	47.4	228°30.3	15.5
17	268°09.7	64°03.1	13.0	38°41.2	53.2	101°34.1	47.2	243°33.0	15.4
18	283°12.2	79°02.7	S09°14.2	53°41.9	S18°53.7	116°36.1	N06°47.1	258°35.6	N07°15.4
19	298°14.7	94°02.2	15.4	68°42.5	54.2	131°38.1	46.9	273°38.3	15.3
20	313°17.1	109°01.8	16.6	83°43.2	54.6	146°40.1	46.7	288°40.9	15.2
21	328°19.6	124°01.3	·· 17.8	98°43.9	·· 55.1	161°42.0	·· 46.5	303°43.5	·· 15.1
22	343°22.1	139°00.9	19.1	113°44.6	55.6	176°44.0	46.3	318°46.2	15.1
23	358°24.5	154°00.5	20.3	128°45.3	56.1	191°46.0	46.1	333°48.8	15.0
Mer.pass. 23:06		ν -0.4′	d 1.2′	m -3.89	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.73	ν 2.6′	d 0.1′ m 0.17

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°27.0	169°00.0	S09°21.5	143°46.0	S18°56.5	206°48.0	N06°45.9	348°51.5	N07°14.9
1	28°29.4	183°59.6	22.7	158°46.7	57.0	221°50.0	45.7	3°54.1	14.9
2	43°31.9	198°59.1	23.9	173°47.4	57.5	236°52.0	45.5	18°56.7	14.8
3	58°34.4	213°58.7	·· 25.1	188°48.0	·· 57.9	251°54.0	·· 45.3	33°59.4	·· 14.7
4	73°36.8	228°58.3	26.3	203°48.7	58.4	266°55.9	45.1	49°02.0	14.6
5	88°39.3	243°57.8	27.5	218°49.4	58.9	281°57.9	44.9	64°04.7	14.6
6	103°41.8	258°57.4	S09°28.7	233°50.1	S18°59.4	296°59.9	N06°44.7	79°07.3	N07°14.5
7	118°44.2	273°56.9	29.9	248°50.8	18°59.8	312°01.9	44.5	94°10.0	14.4
8	133°46.7	288°56.5	31.1	263°51.5	19°00.3	327°03.9	44.3	109°12.6	14.4
9	148°49.2	303°56.1	·· 32.3	278°52.1	·· 00.8	342°05.9	·· 44.1	124°15.2	·· 14.3
10	163°51.6	318°55.6	33.5	293°52.8	01.2	357°07.9	43.9	139°17.9	14.2
11	178°54.1	333°55.2	34.7	308°53.5	01.7	12°09.9	43.8	154°20.5	14.1
12	193°56.5	348°54.7	S09°35.9	323°54.2	S19°02.2	27°11.8	N06°43.6	169°23.2	N07°14.1
13	208°59.0	3°54.3	37.1	338°54.9	02.6	42°13.8	43.4	184°25.8	14.0
14	224°01.5	18°53.8	38.3	353°55.6	03.1	57°15.8	43.2	199°28.5	13.9
15	239°03.9	33°53.4	·· 39.5	8°56.2	·· 03.6	72°17.8	·· 43.0	214°31.1	·· 13.9
16	254°06.4	48°53.0	40.7	23°56.9	04.0	87°19.8	42.8	229°33.7	13.8
17	269°08.9	63°52.5	41.9	38°57.6	04.5	102°21.8	42.6	244°36.4	13.7
18	284°11.3	78°52.1	S09°43.1	53°58.3	S19°05.0	117°23.8	N06°42.4	259°39.0	N07°13.6
19	299°13.8	93°51.6	44.3	68°59.0	05.5	132°25.8	42.2	274°41.7	13.6
20	314°16.3	108°51.2	45.5	83°59.7	05.9	147°27.7	42.0	289°44.3	13.5
21	329°18.7	123°50.7	·· 46.7	99°00.3	·· 06.4	162°29.7	·· 41.8	304°46.9	·· 13.4
22	344°21.2	138°50.3	47.9	114°01.0	06.9	177°31.7	41.6	319°49.6	13.4
23	359°23.7	153°49.8	49.1	129°01.7	07.3	192°33.7	41.4	334°52.2	13.3
Mer.pass. 23:02		ν -0.4′	d 1.2′	m -3.88	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.73	ν 2.6′	d 0.1′ m 0.17

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°26.1	168°49.4	S09°50.3	144°02.4	S19°07.8	207°35.7	N06°41.2	349°54.9	N07°13.2
1	29°28.6	183°48.9	51.5	159°03.1	08.3	222°37.7	41.0	4°57.5	13.1
2	44°31.0	198°48.5	52.7	174°03.7	08.7	237°39.7	40.9	20°00.2	13.1
3	59°33.5	213°48.0	·· 53.9	189°04.4	·· 09.2	252°41.7	·· 40.7	35°02.8	·· 13.0
4	74°36.0	228°47.6	55.1	204°05.1	09.6	267°43.6	40.5	50°05.4	12.9
5	89°38.4	243°47.1	56.3	219°05.8	10.1	282°45.6	40.3	65°08.1	12.9
6	104°40.9	258°46.7	S09°57.5	234°06.4	S19°10.6	297°47.6	N06°40.1	80°10.7	N07°12.8
7	119°43.4	273°46.2	58.6	249°07.1	11.0	312°49.6	39.9	95°13.4	12.7
8	134°45.8	288°45.8	09°59.8	264°07.8	11.5	327°51.6	39.7	110°16.0	12.6
9	149°48.3	303°45.3	10°01.0	279°08.5	·· 12.0	342°53.6	·· 39.5	125°18.7	·· 12.6
10	164°50.8	318°44.9	02.2	294°09.2	12.4	357°55.6	39.3	140°21.3	12.5
11	179°53.2	333°44.4	03.4	309°09.8	12.9	12°57.6	39.1	155°23.9	12.4
12	194°55.7	348°44.0	S10°04.6	324°10.5	S19°13.4	27°59.6	N06°38.9	170°26.6	N07°12.3
13	209°58.2	3°43.5	05.8	339°11.2	13.8	43°01.5	38.7	185°29.2	12.3
14	225°00.6	18°43.1	07.0	354°11.9	14.3	58°03.5	38.5	200°31.9	12.2
15	240°03.1	33°42.6	·· 08.2	9°12.5	·· 14.8	73°05.5	·· 38.3	215°34.5	·· 12.1
16	255°05.5	48°42.2	09.4	24°13.2	15.2	88°07.5	38.1	230°37.2	12.1
17	270°08.0	63°41.7	10.6	39°13.9	15.7	103°09.5	38.0	245°39.8	12.0
18	285°10.5	78°41.3	S10°11.7	54°14.6	S19°16.1	118°11.5	N06°37.8	260°42.4	N07°11.9
19	300°12.9	93°40.8	12.9	69°15.2	16.6	133°13.5	37.6	275°45.1	11.8
20	315°15.4	108°40.4	14.1	84°15.9	17.1	148°15.5	37.4	290°47.7	11.8
21	330°17.9	123°39.9	·· 15.3	99°16.6	·· 17.5	163°17.5	·· 37.2	305°50.4	·· 11.7
22	345°20.3	138°39.5	16.5	114°17.2	18.0	178°19.5	37.0	320°53.0	11.6
23	0°22.8	153°39.0	17.7	129°17.9	18.4	193°21.4	36.8	335°55.7	11.6
Mer.pass. 22:58		ν -0.4′	d 1.2′	m -3.88	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.73	ν 2.6′	d 0.1′ m 0.16

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.8
Ankaa	353°04.5	-42°09.1
Schedar	349°27.9	56°41.5
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.7
Polaris	312°26.4	89°22.6
Acamar	315°09.7	-40°11.3
Menkar	314°03.5	4°12.1
Mirfak	308°24.6	49°57.5
Aldebaran	290°36.9	16°33.9
Rigel	281°01.6	-8°10.0
Capella	280°18.4	46°01.4
Bellatrix	278°20.4	6°22.6
Elnath	277°58.9	28°37.8
Alnilam	275°35.4	-1°10.9
Betelgeuse	270°49.6	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.2	-16°45.1
Adhara	255°04.1	-29°00.3
Procyon	244°48.6	5°09.3
Pollux	243°14.7	27°57.4
Avior	234°14.0	-59°35.6
Suhail	222°44.9	-43°32.5
Miaplacidus	221°38.3	-69°49.6
Alphard	217°45.8	-8°46.6
Regulus	207°32.3	11°49.9
Dubhe	193°38.9	61°35.9
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.2
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.5
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.6
Hadar	148°33.4	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°20.9	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.7	-69°04.8
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.5
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°29.6	-34°22.3
Vega	80°31.7	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.0	-56°38.8
Deneb	49°24.1	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 04 Mon	SHA	Mer.pass
Venus	156°42.6	12:44
Mars	131°01.6	14:25
Jupiter	193°32.5	10:15
Saturn	335°20.3	00:49

Oct 05 Tue	SHA	Mer.pass
Venus	155°33.0	12:44
Mars	130°19.0	14:24
Jupiter	193°21.0	10:11
Saturn	335°24.5	00:44

Oct 06 Wed	SHA	Mer.pass
Venus	154°23.3	12:45
Mars	129°36.3	14:23
Jupiter	193°09.6	10:08
Saturn	335°28.8	00:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°45.9	S04°10.6	135°07.6	8.2′	S24°54.3	5.9′	56.7′
1	197°46.1	11.6	149°34.8	8.2′	25°00.2	5.8′	56.7′
2	212°46.3	12.6	164°02.0	8.2′	25°06.0	5.6′	56.6′
3	227°46.5	·· 13.5	178°29.2	8.2′	25°11.6	5.5′	56.6′
4	242°46.7	14.5	192°56.3	8.2′	25°17.1	5.3′	56.6′
5	257°46.9	15.5	207°23.5	8.1′	25°22.4	5.2′	56.5′
6	272°47.1	S04°16.4	221°50.6	8.1′	S25°27.6	5.0′	56.5′
7	287°47.3	17.4	236°17.8	8.1′	25°32.6	4.9′	56.5′
8	302°47.5	18.4	250°44.9	8.1′	25°37.5	4.7′	56.4′
9	317°47.7	·· 19.3	265°12.1	8.1′	25°42.2	4.6′	56.4′
10	332°47.8	20.3	279°39.2	8.1′	25°46.8	4.5′	56.4′
11	347°48.0	21.2	294°06.3	8.1′	25°51.3	4.3′	56.3′
12	2°48.2	S04°22.2	308°33.5	8.1′	S25°55.6	4.1′	56.3′
13	17°48.4	23.2	323°00.6	8.1′	25°59.7	4.0′	56.3′
14	32°48.6	24.1	337°27.7	8.1′	26°03.7	3.9′	56.2′
15	47°48.8	·· 25.1	351°54.9	8.1′	26°07.6	3.7′	56.2′
16	62°49.0	26.1	6°22.0	8.2′	26°11.3	3.5′	56.2′
17	77°49.2	27.0	20°49.2	8.2′	26°14.8	3.4′	56.1′
18	92°49.4	S04°28.0	35°16.3	8.2′	S26°18.2	3.3′	56.1′
19	107°49.6	29.0	49°43.5	8.2′	26°21.5	3.1′	56.1′
20	122°49.8	29.9	64°10.7	8.2′	26°24.6	3.0′	56.0′
21	137°49.9	·· 30.9	78°37.8	8.2′	26°27.6	2.8′	56.0′
22	152°50.1	31.8	93°05.0	8.2′	26°30.4	2.6′	56.0′
23	167°50.3	32.8	107°32.3	8.2′	26°33.0	2.5′	56.0′
	SD = 16.0′	d = 1.0′	SD = 15.5′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°50.5	S04°33.8	121°59.5	8.2′	S26°35.5	2.4′	55.9′
1	197°50.7	34.7	136°26.7	8.3′	26°37.9	2.2′	55.9′
2	212°50.9	35.7	150°54.0	8.3′	26°40.1	2.1′	55.9′
3	227°51.1	·· 36.7	165°21.3	8.3′	26°42.2	1.9′	55.8′
4	242°51.3	37.6	179°48.6	8.3′	26°44.1	1.8′	55.8′
5	257°51.5	38.6	194°15.9	8.3′	26°45.9	1.7′	55.8′
6	272°51.7	S04°39.5	208°43.2	8.4′	S26°47.6	1.4′	55.7′
7	287°51.8	40.5	223°10.6	8.4′	26°49.0	1.4′	55.7′
8	302°52.0	41.5	237°38.0	8.4′	26°50.4	1.2′	55.7′
9	317°52.2	·· 42.4	252°05.4	8.4′	26°51.6	1.0′	55.7′
10	332°52.4	43.4	266°32.8	8.5′	26°52.6	0.9′	55.6′
11	347°52.6	44.4	281°00.3	8.5′	26°53.5	0.8′	55.6′
12	2°52.8	S04°45.3	295°27.8	8.5′	S26°54.3	0.6′	55.6′
13	17°53.0	46.3	309°55.3	8.6′	26°54.9	0.5′	55.5′
14	32°53.2	47.2	324°22.9	8.6′	26°55.4	0.3′	55.5′
15	47°53.4	·· 48.2	338°50.4	8.6′	26°55.7	0.2′	55.5′
16	62°53.5	49.2	353°18.1	8.7′	26°55.9	0.1′	55.5′
17	77°53.7	50.1	7°45.7	8.7′	26°56.0	0.1′	55.4′
18	92°53.9	S04°51.1	22°13.4	8.7′	S26°55.9	0.3′	55.4′
19	107°54.1	52.0	36°41.1	8.8′	26°55.6	0.4′	55.4′
20	122°54.3	53.0	51°08.9	8.8′	26°55.2	0.5′	55.4′
21	137°54.5	·· 54.0	65°36.7	8.8′	26°54.7	0.6′	55.3′
22	152°54.7	54.9	80°04.6	8.9′	26°54.1	0.8′	55.3′
23	167°54.8	55.9	94°32.5	8.9′	26°53.3	1.0′	55.3′
	SD = 16.0′	d = 1.0′	SD = 15.3′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°55.0	S04°56.8	109°00.4	9.0′	S26°52.3	1.1′	55.3′
1	197°55.2	57.8	123°28.4	9.0′	26°51.2	1.2′	55.2′
2	212°55.4	58.8	137°56.4	9.1′	26°50.0	1.3′	55.2′
3	227°55.6	04°59.7	152°24.4	9.1′	26°48.7	1.5′	55.2′
4	242°55.8	05°00.7	166°52.5	9.2′	26°47.2	1.7′	55.2′
5	257°56.0	01.6	181°20.7	9.2′	26°45.5	1.7′	55.1′
6	272°56.1	S05°02.6	195°48.9	9.3′	S26°43.8	1.9′	55.1′
7	287°56.3	03.6	210°17.2	9.3′	26°41.9	2.1′	55.1′
8	302°56.5	04.5	224°45.5	9.4′	26°39.8	2.1′	55.1′
9	317°56.7	·· 05.5	239°13.8	9.4′	26°37.7	2.3′	55.0′
10	332°56.9	06.4	253°42.2	9.5′	26°35.4	2.5′	55.0′
11	347°57.1	07.4	268°10.7	9.5′	26°32.9	2.5′	55.0′
12	2°57.3	S05°08.4	282°39.2	9.6′	S26°30.4	2.8′	55.0′
13	17°57.4	09.3	297°07.8	9.6′	26°27.6	2.8′	54.9′
14	32°57.6	10.3	311°36.4	9.7′	26°24.8	2.9′	54.9′
15	47°57.8	·· 11.2	326°05.1	9.7′	26°21.9	3.1′	54.9′
16	62°58.0	12.2	340°33.8	9.8′	26°18.8	3.3′	54.9′
17	77°58.2	13.2	355°02.6	9.8′	26°15.5	3.3′	54.9′
18	92°58.4	S05°14.1	9°31.4	9.9′	S26°12.2	3.5′	54.8′
19	107°58.5	15.1	24°00.4	10.0′	26°08.7	3.6′	54.8′
20	122°58.7	16.0	38°29.3	10.0′	26°05.1	3.7′	54.8′
21	137°58.9	·· 17.0	52°58.3	10.1′	26°01.4	3.9′	54.8′
22	152°59.1	17.9	67°27.4	10.1′	25°57.5	3.9′	54.8′
23	167°59.3	18.9	81°56.6	10.2′	25°53.6	4.1′	54.7′
	SD = 16.0′	d = 1.0′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:08	05:28	06:36	16:59	18:06	19:26
N 70°	04:17	05:30	06:30	17:05	18:05	19:17
68°	04:25	05:31	06:26	17:09	18:04	19:09
66°	04:31	05:31	06:22	17:13	18:04	19:03
64°	04:36	05:32	06:19	17:16	18:03	18:59
62°	04:41	05:32	06:17	17:19	18:03	18:54
60°	04:44	05:33	06:14	17:21	18:03	18:51
N 58°	04:47	05:33	06:12	17:24	18:03	18:48
56°	04:50	05:33	06:10	17:26	18:03	18:46
54°	04:52	05:33	06:09	17:27	18:03	18:43
52°	04:54	05:33	06:07	17:29	18:03	18:42
50°	04:56	05:33	06:06	17:30	18:03	18:40
45°	04:59	05:33	06:03	17:34	18:03	18:37
N 40°	05:01	05:33	06:00	17:36	18:03	18:35
35°	05:03	05:32	05:58	17:39	18:04	18:33
30°	05:04	05:32	05:55	17:41	18:05	18:33
20°	05:04	05:30	05:52	17:45	18:07	18:32
N 10°	05:03	05:27	05:48	17:48	18:09	18:34
0°	05:00	05:24	05:45	17:52	18:12	18:37
S 10°	04:56	05:21	05:42	17:55	18:16	18:41
20°	04:50	05:16	05:38	17:59	18:21	18:47
30°	04:42	05:10	05:34	18:04	18:28	18:56
35°	04:36	05:06	05:31	18:06	18:32	19:02
40°	04:29	05:01	05:29	18:09	18:36	19:09
45°	04:20	04:56	05:25	18:13	18:42	19:18
S 50°	04:09	04:48	05:21	18:17	18:50	19:29
52°	04:04	04:45	05:19	18:19	18:53	19:35
54°	03:57	04:41	05:17	18:21	18:57	19:41
56°	03:50	04:37	05:15	18:23	19:02	19:48
58°	03:42	04:32	05:12	18:26	19:06	19:57
S 60°	03:33	04:27	05:09	18:29	19:12	20:06

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	14:01	15:20	15:54	17:02	17:35	18:51
60°	13:22	14:32	15:14	17:41	18:23	19:31
N 58°	12:54	14:02	14:47	18:08	18:54	19:58
56°	12:33	13:38	14:25	18:30	19:17	20:20
54°	12:16	13:19	14:07	18:48	19:36	20:37
52°	12:01	13:04	13:52	19:03	19:52	20:52
50°	11:48	12:50	13:39	19:16	20:06	21:05
45°	11:21	12:22	13:12	19:43	20:34	21:32
N 40°	11:00	12:00	12:51	20:04	20:56	21:53
35°	10:43	11:41	12:33	20:22	21:14	22:10
30°	10:28	11:26	12:17	20:37	21:30	22:25
20°	10:03	10:59	11:51	21:03	21:57	22:51
N 10°	09:41	10:36	11:29	21:26	22:19	23:13
0°	09:20	10:15	11:08	21:47	22:41	23:33
S 10°	09:00	09:54	10:47	22:08	23:02	23:53
20°	08:39	09:31	10:25	22:30	23:25	·· ··
30°	08:14	09:04	09:58	22:56	23:51	·· ··
35°	07:59	08:49	09:43	23:12	·· ··	00:07
40°	07:42	08:31	09:25	23:29	·· ··	00:25
45°	07:22	08:09	09:04	23:51	·· ··	00:47
S 50°	06:57	07:41	08:36	·· ··	00:18	01:14
52°	06:45	07:28	08:23	·· ··	00:32	01:28
54°	06:31	07:12	08:07	·· ··	00:47	01:43
56°	06:15	06:54	07:49	·· ··	01:05	02:01
58°	05:56	06:32	07:27	00:11	01:27	02:24
S 60°	05:32	06:03	06:58	00:34	01:56	02:53

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 4-6 18-36%
04	11:04	11:13	11:49	15:34	03:06	
05	11:22	11:31	11:48	16:28	04:01	
06	11:40	11:49	11:48	17:21	04:54	

October 07, 08, 09 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	15°25.3	168°38.6	S10°18.9	144°18.6	S19°18.9	208°23.4	N06°36.6	350°58.3	N07°11.5
1	30°27.7	183°38.1	20.1	159°19.3	19.4	223°25.4	36.4	6°01.0	11.4
2	45°30.2	198°37.6	21.2	174°19.9	19.8	238°27.4	36.2	21°03.6	11.3
3	60°32.7	213°37.2	·· 22.4	189°20.6	·· 20.3	253°29.4	·· 36.0	36°06.2	·· 11.3
4	75°35.1	228°36.7	23.6	204°21.3	20.7	268°31.4	35.8	51°08.9	11.2
5	90°37.6	243°36.3	24.8	219°22.0	21.2	283°33.4	35.6	66°11.5	11.1
6	105°40.0	258°35.8	S10°26.0	234°22.6	S19°21.7	298°35.4	N06°35.4	81°14.2	N07°11.0
7	120°42.5	273°35.4	27.2	249°23.3	22.1	313°37.4	35.3	96°16.8	11.0
8	135°45.0	288°34.9	28.4	264°24.0	22.6	328°39.4	35.1	111°19.5	10.9
9	150°47.4	303°34.4	·· 29.5	279°24.6	·· 23.0	343°41.3	·· 34.9	126°22.1	·· 10.8
10	165°49.9	318°34.0	30.7	294°25.3	23.5	358°43.3	34.7	141°24.8	10.8
11	180°52.4	333°33.5	31.9	309°26.0	23.9	13°45.3	34.5	156°27.4	10.7
12	195°54.8	348°33.1	S10°33.1	324°26.6	S19°24.4	28°47.3	N06°34.3	171°30.0	N07°10.6
13	210°57.3	3°32.6	34.3	339°27.3	24.9	43°49.3	34.1	186°32.7	10.5
14	225°59.8	18°32.1	35.4	354°28.0	25.3	58°51.3	33.9	201°35.3	10.5
15	241°02.2	33°31.7	·· 36.6	9°28.6	·· 25.8	73°53.3	·· 33.7	216°38.0	·· 10.4
16	256°04.7	48°31.2	37.8	24°29.3	26.2	88°55.3	33.5	231°40.6	10.3
17	271°07.2	63°30.8	39.0	39°30.0	26.7	103°57.3	33.3	246°43.3	10.3
18	286°09.6	78°30.3	S10°40.2	54°30.6	S19°27.1	118°59.3	N06°33.1	261°45.9	N07°10.2
19	301°12.1	93°29.8	41.3	69°31.3	27.6	134°01.3	32.9	276°48.6	10.1
20	316°14.5	108°29.4	42.5	84°32.0	28.1	149°03.2	32.8	291°51.2	10.0
21	331°17.0	123°28.9	·· 43.7	99°32.6	·· 28.5	164°05.2	·· 32.6	306°53.8	·· 10.0
22	346°19.5	138°28.5	44.9	114°33.3	29.0	179°07.2	32.4	321°56.5	09.9
23	1°21.9	153°28.0	46.1	129°34.0	29.4	194°09.2	32.2	336°59.1	09.8
Mer.pass.	22:55	ν -0.5′	d 1.2′	m -3.88	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.73	ν 2.6′	d 0.1′ m 0.16

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°24.4	168°27.5	S10°47.2	144°34.6	S19°29.9	209°11.2	N06°32.0	352°01.8	N07°09.7
1	31°26.9	183°27.1	48.4	159°35.3	30.3	224°13.2	31.8	7°04.4	09.7
2	46°29.3	198°26.6	49.6	174°36.0	30.8	239°15.2	31.6	22°07.1	09.6
3	61°31.8	213°26.1	·· 50.8	189°36.6	·· 31.2	254°17.2	·· 31.4	37°09.7	·· 09.5
4	76°34.3	228°25.7	51.9	204°37.3	31.7	269°19.2	31.2	52°12.4	09.5
5	91°36.7	243°25.2	53.1	219°38.0	32.1	284°21.2	31.0	67°15.0	09.4
6	106°39.2	258°24.7	S10°54.3	234°38.6	S19°32.6	299°23.2	N06°30.8	82°17.6	N07°09.3
7	121°41.6	273°24.3	55.5	249°39.3	33.0	314°25.2	30.6	97°20.3	09.2
8	136°44.1	288°23.8	56.6	264°39.9	33.5	329°27.2	30.5	112°22.9	09.2
9	151°46.6	303°23.3	·· 57.8	279°40.6	·· 33.9	344°29.1	·· 30.3	127°25.6	·· 09.1
10	166°49.0	318°22.9	10°59.0	294°41.3	34.4	359°31.1	30.1	142°28.2	09.0
11	181°51.5	333°22.4	11°00.2	309°41.9	34.8	14°33.1	29.9	157°30.9	09.0
12	196°54.0	348°21.9	S11°01.3	324°42.6	S19°35.3	29°35.1	N06°29.7	172°33.5	N07°08.9
13	211°56.4	3°21.5	02.5	339°43.3	35.7	44°37.1	29.5	187°36.2	08.8
14	226°58.9	18°21.0	03.7	354°43.9	36.2	59°39.1	29.3	202°38.8	08.7
15	242°01.4	33°20.5	·· 04.8	9°44.6	·· 36.6	74°41.1	·· 29.1	217°41.5	·· 08.7
16	257°03.8	48°20.1	06.0	24°45.2	37.1	89°43.1	28.9	232°44.1	08.6
17	272°06.3	63°19.6	07.2	39°45.9	37.5	104°45.1	28.7	247°46.7	08.5
18	287°08.8	78°19.1	S11°08.3	54°46.6	S19°38.0	119°47.1	N06°28.5	262°49.4	N07°08.4
19	302°11.2	93°18.6	09.5	69°47.2	38.4	134°49.1	28.3	277°52.0	08.4
20	317°13.7	108°18.2	10.7	84°47.9	38.9	149°51.1	28.2	292°54.7	08.3
21	332°16.1	123°17.7	·· 11.9	99°48.5	·· 39.3	164°53.1	·· 28.0	307°57.3	·· 08.2
22	347°18.6	138°17.2	13.0	114°49.2	39.8	179°55.1	27.8	323°00.0	08.2
23	2°21.1	153°16.8	14.2	129°49.9	40.2	194°57.1	27.6	338°02.6	08.1
Mer.pass.	22:51	ν -0.5′	d 1.2′	m -3.88	ν 0.7′	d 0.5′	m 1.36	ν 2.0′	d 0.2′ m -1.73	ν 2.6′	d 0.1′ m 0.15

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°23.5	168°16.3	S11°15.4	144°50.5	S19°40.7	209°59.0	N06°27.4	353°05.3	N07°08.0
1	32°26.0	183°15.8	16.5	159°51.2	41.1	225°01.0	27.2	8°07.9	07.9
2	47°28.5	198°15.3	17.7	174°51.8	41.6	240°03.0	27.0	23°10.6	07.9
3	62°30.9	213°14.9	·· 18.8	189°52.5	·· 42.0	255°05.0	·· 26.8	38°13.2	·· 07.8
4	77°33.4	228°14.4	20.0	204°53.1	42.5	270°07.0	26.6	53°15.9	07.7
5	92°35.9	243°13.9	21.2	219°53.8	42.9	285°09.0	26.4	68°18.5	07.6
6	107°38.3	258°13.4	S11°22.3	234°54.5	S19°43.4	300°11.0	N06°26.2	83°21.1	N07°07.6
7	122°40.8	273°13.0	23.5	249°55.1	43.8	315°13.0	26.1	98°23.8	07.5
8	137°43.3	288°12.5	24.7	264°55.8	44.3	330°15.0	25.9	113°26.4	07.4
9	152°45.7	303°12.0	·· 25.8	279°56.4	·· 44.7	345°17.0	·· 25.7	128°29.1	·· 07.4
10	167°48.2	318°11.5	27.0	294°57.1	45.1	0°19.0	25.5	143°31.7	07.3
11	182°50.6	333°11.1	28.2	309°57.7	45.6	15°21.0	25.3	158°34.4	07.2
12	197°53.1	348°10.6	S11°29.3	324°58.4	S19°46.0	30°23.0	N06°25.1	173°37.0	N07°07.1
13	212°55.6	3°10.1	30.5	339°59.0	46.5	45°25.0	24.9	188°39.7	07.1
14	227°58.0	18°09.6	31.6	354°59.7	46.9	60°27.0	24.7	203°42.3	07.0
15	243°00.5	33°09.1	·· 32.8	10°00.3	·· 47.4	75°29.0	·· 24.5	218°45.0	·· 06.9
16	258°03.0	48°08.7	34.0	25°01.0	47.8	90°31.0	24.3	233°47.6	06.8
17	273°05.4	63°08.2	35.1	40°01.7	48.3	105°33.0	24.1	248°50.3	06.8
18	288°07.9	78°07.7	S11°36.3	55°02.3	S19°48.7	120°35.0	N06°24.0	263°52.9	N07°06.7
19	303°10.4	93°07.2	37.4	70°03.0	49.1	135°36.9	23.8	278°55.5	06.6
20	318°12.8	108°06.7	38.6	85°03.6	49.6	150°38.9	23.6	293°58.2	06.6
21	333°15.3	123°06.3	·· 39.7	100°04.3	·· 50.0	165°40.9	·· 23.4	309°00.8	·· 06.5
22	348°17.7	138°05.8	40.9	115°04.9	50.5	180°42.9	23.2	324°03.5	06.4
23	3°20.2	153°05.3	42.1	130°05.6	50.9	195°44.9	23.0	339°06.1	06.3
Mer.pass.	22:47	ν -0.5′	d 1.2′	m -3.88	ν 0.7′	d 0.4′	m 1.36	ν 2.0′	d 0.2′ m -1.74	ν 2.6′	d 0.1′ m 0.15

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°25.1	89°22.7
Acamar	315°09.7	-40°11.3
Menkar	314°03.5	4°12.1
Mirfak	308°24.6	49°57.5
Aldebaran	290°36.8	16°33.9
Rigel	281°01.6	-8°10.0
Capella	280°18.3	46°01.4
Bellatrix	278°20.3	6°22.6
Elnath	277°58.9	28°37.8
Alnilam	275°35.3	-1°10.9
Betelgeuse	270°49.6	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.2	-16°45.1
Adhara	255°04.1	-29°00.3
Procyon	244°48.5	5°09.3
Pollux	243°14.6	27°57.4
Avior	234°14.0	-59°35.6
Suhail	222°44.9	-43°32.5
Miaplacidus	221°38.2	-69°49.6
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.9	61°35.9
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.1
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.5
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.5
Hadar	148°33.4	-60°30.5
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.7	-60°57.1
Kochab	137°21.0	74°02.6
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.7	-69°04.8
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.5
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°29.6	-34°22.3
Vega	80°31.7	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.0	-56°38.8
Deneb	49°24.1	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 07 Thu	SHA	Mer.pass
Venus	153°13.3	12:46
Mars	128°53.3	14:22
Jupiter	192°58.2	10:05
Saturn	335°33.1	00:36

Oct 08 Fri	SHA	Mer.pass
Venus	152°03.1	12:47
Mars	128°10.2	14:21
Jupiter	192°46.8	10:02
Saturn	335°37.4	00:32

Oct 09 Sat	SHA	Mer.pass
Venus	150°52.7	12:47
Mars	127°27.0	14:20
Jupiter	192°35.5	09:59
Saturn	335°41.7	00:28

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0783 sec ΔT = TT-UT1 = +69.2623 sec

2027 October 07 to Oct. 09 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°59.5	S05°19.9	96°25.8	10.3′	S25°49.5	4.3′	54.7′
1	197°59.6	20.8	110°55.1	10.3′	25°45.2	4.3′	54.7′
2	212°59.8	21.8	125°24.4	10.4′	25°40.9	4.5′	54.7′
3	228°00.0	·· 22.7	139°53.8	10.5′	25°36.4	4.6′	54.7′
4	243°00.2	23.7	154°23.3	10.5′	25°31.8	4.7′	54.7′
5	258°00.4	24.6	168°52.8	10.6′	25°27.1	4.8′	54.6′
6	273°00.5	S05°25.6	183°22.4	10.7′	S25°22.3	5.0′	54.6′
7	288°00.7	26.6	197°52.0	10.7′	25°17.3	5.0′	54.6′
8	303°00.9	27.5	212°21.7	10.8′	25°12.3	5.2′	54.6′
9	318°01.1	·· 28.5	226°51.5	10.9′	25°07.1	5.3′	54.6′
10	333°01.3	29.4	241°21.4	10.9′	25°01.8	5.4′	54.6′
11	348°01.5	30.4	255°51.3	11.0′	24°56.4	5.6′	54.5′
12	3°01.6	S05°31.3	270°21.3	11.1′	S24°50.8	5.6′	54.5′
13	18°01.8	32.3	284°51.3	11.1′	24°45.2	5.7′	54.5′
14	33°02.0	33.3	299°21.5	11.2′	24°39.5	5.9′	54.5′
15	48°02.2	·· 34.2	313°51.6	11.3′	24°33.6	6.0′	54.5′
16	63°02.4	35.2	328°21.9	11.3′	24°27.6	6.1′	54.5′
17	78°02.5	36.1	342°52.2	11.4′	24°21.5	6.2′	54.4′
18	93°02.7	S05°37.1	357°22.6	11.5′	S24°15.3	6.3′	54.4′
19	108°02.9	38.0	11°53.1	11.5′	24°09.0	6.4′	54.4′
20	123°03.1	39.0	26°23.6	11.6′	24°02.6	6.5′	54.4′
21	138°03.2	·· 39.9	40°54.2	11.7′	23°56.1	6.6′	54.4′
22	153°03.4	40.9	55°24.9	11.7′	23°49.5	6.8′	54.4′
23	168°03.6	41.9	69°55.6	11.8′	23°42.7	6.8′	54.4′
	SD = 16.0′	d = 1.0′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°03.8	S05°42.8	84°26.4	11.9′	S23°35.9	7.0′	54.4′
1	198°04.0	43.8	98°57.2	11.9′	23°28.9	7.0′	54.3′
2	213°04.1	44.7	113°28.2	12.0′	23°21.9	7.2′	54.3′
3	228°04.3	·· 45.7	127°59.2	12.1′	23°14.7	7.2′	54.3′
4	243°04.5	46.6	142°30.3	12.1′	23°07.5	7.4′	54.3′
5	258°04.7	47.6	157°01.4	12.2′	23°00.1	7.4′	54.3′
6	273°04.9	S05°48.5	171°32.6	12.3′	S22°52.7	7.6′	54.3′
7	288°05.0	49.5	186°03.9	12.3′	22°45.1	7.6′	54.3′
8	303°05.2	50.4	200°35.2	12.4′	22°37.5	7.7′	54.3′
9	318°05.4	·· 51.4	215°06.6	12.5′	22°29.8	7.9′	54.3′
10	333°05.6	52.3	229°38.1	12.5′	22°21.9	7.9′	54.3′
11	348°05.7	53.3	244°09.7	12.6′	22°14.0	8.0′	54.3′
12	3°05.9	S05°54.3	258°41.3	12.7′	S22°06.0	8.2′	54.2′
13	18°06.1	55.2	273°13.0	12.7′	21°57.8	8.2′	54.2′
14	33°06.3	56.2	287°44.7	12.8′	21°49.6	8.3′	54.2′
15	48°06.4	·· 57.1	302°16.5	12.9′	21°41.3	8.4′	54.2′
16	63°06.6	58.1	316°48.4	12.9′	21°32.9	8.5′	54.2′
17	78°06.8	05°59.0	331°20.3	13.0′	21°24.4	8.6′	54.2′
18	93°07.0	S06°00.0	345°52.4	13.1′	S21°15.8	8.7′	54.2′
19	108°07.1	00.9	0°24.4	13.1′	21°07.1	8.7′	54.2′
20	123°07.3	01.9	14°56.6	13.2′	20°58.4	8.9′	54.2′
21	138°07.5	·· 02.8	29°28.8	13.3′	20°49.5	8.9′	54.2′
22	153°07.7	03.8	44°01.0	13.3′	20°40.6	9.0′	54.2′
23	168°07.8	04.7	58°33.4	13.4′	20°31.6	9.1′	54.2′
	SD = 16.0′	d = 1.0′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°08.0	S06°05.7	73°05.8	13.5′	S20°22.5	9.2′	54.2′
1	198°08.2	06.6	87°38.2	13.5′	20°13.3	9.3′	54.2′
2	213°08.4	07.6	102°10.8	13.6′	20°04.0	9.4′	54.2′
3	228°08.5	·· 08.5	116°43.3	13.6′	19°54.6	9.4′	54.2′
4	243°08.7	09.5	131°16.0	13.7′	19°45.2	9.5′	54.2′
5	258°08.9	10.4	145°48.7	13.8′	19°35.7	9.6′	54.1′
6	273°09.1	S06°11.4	160°21.5	13.8′	S19°26.1	9.7′	54.1′
7	288°09.2	12.3	174°54.3	13.9′	19°16.4	9.8′	54.1′
8	303°09.4	13.3	189°27.2	13.9′	19°06.6	9.8′	54.1′
9	318°09.6	·· 14.2	204°00.1	14.0′	18°56.8	9.9′	54.1′
10	333°09.7	15.2	218°33.1	14.1′	18°46.9	10.0′	54.1′
11	348°09.9	16.1	233°06.2	14.1′	18°36.9	10.1′	54.1′
12	3°10.1	S06°17.1	247°39.3	14.2′	S18°26.8	10.1′	54.1′
13	18°10.3	18.0	262°12.5	14.2′	18°16.7	10.2′	54.1′
14	33°10.4	19.0	276°45.7	14.3′	18°06.5	10.3′	54.1′
15	48°10.6	·· 19.9	291°19.0	14.3′	17°56.2	10.4′	54.1′
16	63°10.8	20.9	305°52.3	14.4′	17°45.8	10.4′	54.1′
17	78°10.9	21.8	320°25.7	14.5′	17°35.4	10.5′	54.1′
18	93°11.1	S06°22.8	334°59.2	14.5′	S17°24.9	10.6′	54.1′
19	108°11.3	23.7	349°32.7	14.6′	17°14.3	10.7′	54.1′
20	123°11.5	24.7	4°06.3	14.6′	17°03.6	10.7′	54.1′
21	138°11.6	·· 25.6	18°39.9	14.7′	16°52.9	10.8′	54.1′
22	153°11.8	26.6	33°13.5	14.7′	16°42.1	10.8′	54.1′
23	168°12.0	27.5	47°47.2	14.8′	16°31.3	10.9′	54.1′
	SD = 16.0′	d = 1.0′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:22	05:41	06:50	16:44	17:51	19:10
N 70°	04:30	05:41	06:43	16:51	17:52	19:03
68°	04:36	05:41	06:37	16:57	17:52	18:57
66°	04:41	05:41	06:32	17:01	17:53	18:52
64°	04:45	05:41	06:28	17:06	17:53	18:48
62°	04:49	05:40	06:25	17:09	17:54	18:45
60°	04:52	05:40	06:22	17:12	17:54	18:42
N 58°	04:54	05:40	06:19	17:15	17:54	18:40
56°	04:56	05:39	06:16	17:18	17:55	18:38
54°	04:58	05:39	06:14	17:20	17:55	18:36
52°	04:59	05:38	06:12	17:22	17:56	18:35
50°	05:01	05:38	06:10	17:24	17:56	18:34
45°	05:03	05:37	06:06	17:28	17:58	18:31
N 40°	05:04	05:36	06:03	17:32	17:59	18:30
35°	05:05	05:35	06:00	17:35	18:00	18:29
30°	05:06	05:33	05:57	17:38	18:01	18:29
20°	05:05	05:31	05:53	17:42	18:04	18:30
N 10°	05:03	05:27	05:48	17:47	18:08	18:32
0°	04:59	05:24	05:44	17:51	18:12	18:36
S 10°	04:54	05:19	05:40	17:55	18:16	18:41
20°	04:48	05:13	05:36	18:00	18:22	18:48
30°	04:38	05:06	05:30	18:05	18:29	18:58
35°	04:32	05:02	05:27	18:09	18:34	19:04
40°	04:24	04:56	05:24	18:12	18:40	19:12
45°	04:14	04:50	05:20	18:16	18:46	19:22
S 50°	04:02	04:42	05:15	18:22	18:55	19:35
52°	03:56	04:38	05:12	18:24	18:59	19:41
54°	03:49	04:33	05:10	18:27	19:03	19:48
56°	03:41	04:29	05:07	18:29	19:08	19:56
58°	03:33	04:23	05:04	18:33	19:14	20:05
S 60°	03:22	04:17	05:00	18:36	19:20	20:15

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	18:39	▬	▬	21:07
N 70°	▬	▬	17:41	▬	▬	22:03
68°	▬	17:58	17:06	▬	20:12	22:37
66°	▬	17:03	16:41	▬	21:06	23:01
64°	16:44	16:30	16:22	19:46	21:38	23:19
62°	16:03	16:06	16:06	20:26	22:02	23:34
60°	15:36	15:46	15:52	20:54	22:21	23:47
N 58°	15:14	15:30	15:41	21:15	22:36	23:58
56°	14:56	15:16	15:30	21:32	22:50	·· ··
54°	14:41	15:05	15:21	21:47	23:01	·· ··
52°	14:28	14:54	15:13	22:00	23:11	·· ··
50°	14:16	14:44	15:06	22:11	23:20	·· ··
45°	13:52	14:25	14:51	22:34	23:39	·· ··
N 40°	13:33	14:08	14:38	22:53	23:54	·· ··
35°	13:17	13:55	14:27	23:08	·· ··	00:07
30°	13:03	13:43	14:17	23:22	·· ··	00:18
20°	12:39	13:22	14:01	23:45	·· ··	00:37
N 10°	12:18	13:04	13:46	·· ··	00:04	00:54
0°	11:59	12:47	13:33	·· ··	00:23	01:09
S 10°	11:40	12:30	13:19	·· ··	00:41	01:25
20°	11:19	12:12	13:04	00:15	01:00	01:41
30°	10:55	11:51	12:47	00:40	01:22	02:00
35°	10:40	11:39	12:37	00:55	01:35	02:10
40°	10:24	11:25	12:26	01:12	01:50	02:23
45°	10:04	11:08	12:13	01:32	02:08	02:37
S 50°	09:39	10:47	11:56	01:57	02:30	02:55
52°	09:27	10:37	11:48	02:10	02:40	03:03
54°	09:13	10:26	11:40	02:24	02:52	03:12
56°	08:57	10:13	11:30	02:40	03:05	03:22
58°	08:38	09:58	11:19	02:59	03:21	03:34
S 60°	08:14	09:40	11:06	03:24	03:39	03:48

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 45-64%
07	11:58	12:07	11:48	18:11	05:46	
08	12:15	12:24	11:48	18:58	06:35	
09	12:32	12:40	11:47	19:43	07:21	



No IERS EOP prediction data available

October 10, 11, 12 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	18°22.7	168°04.8	S11°43.2	145°06.2	S19°51.4	210°46.9	N06°22.8	354°08.8	N07°06.3
1	33°25.1	183°04.3	44.4	160°06.9	51.8	225°48.9	22.6	9°11.4	06.2
2	48°27.6	198°03.9	45.5	175°07.5	52.2	240°50.9	22.4	24°14.1	06.1
3	63°30.1	213°03.4	·· 46.7	190°08.2	·· 52.7	255°52.9	·· 22.2	39°16.7	·· 06.0
4	78°32.5	228°02.9	47.8	205°08.8	53.1	270°54.9	22.0	54°19.4	06.0
5	93°35.0	243°02.4	49.0	220°09.5	53.6	285°56.9	21.9	69°22.0	05.9
6	108°37.5	258°01.9	S11°50.1	235°10.1	S19°54.0	300°58.9	N06°21.7	84°24.7	N07°05.8
7	123°39.9	273°01.4	51.3	250°10.8	54.4	316°00.9	21.5	99°27.3	05.8
8	138°42.4	288°00.9	52.4	265°11.4	54.9	331°02.9	21.3	114°30.0	05.7
9	153°44.9	303°00.5	·· 53.6	280°12.1	·· 55.3	346°04.9	·· 21.1	129°32.6	·· 05.6
10	168°47.3	318°00.0	54.7	295°12.7	55.7	1°06.9	20.9	144°35.3	05.5
11	183°49.8	332°59.5	55.9	310°13.4	56.2	16°08.9	20.7	159°37.9	05.5
12	198°52.2	347°59.0	S11°57.0	325°14.0	S19°56.6	31°10.9	N06°20.5	174°40.5	N07°05.4
13	213°54.7	2°58.5	58.2	340°14.6	57.1	46°12.9	20.3	189°43.2	05.3
14	228°57.2	17°58.0	11°59.3	355°15.3	57.5	61°14.9	20.1	204°45.8	05.2
15	243°59.6	32°57.5	12°00.5	10°15.9	·· 57.9	76°16.9	·· 20.0	219°48.5	·· 05.2
16	259°02.1	47°57.0	01.6	25°16.6	58.4	91°18.9	19.8	234°51.1	05.1
17	274°04.6	62°56.6	02.8	40°17.2	58.8	106°20.9	19.6	249°53.8	05.0
18	289°07.0	77°56.1	S12°03.9	55°17.9	S19°59.2	121°22.9	N06°19.4	264°56.4	N07°05.0
19	304°09.5	92°55.6	05.1	70°18.5	19°59.7	136°24.9	19.2	279°59.1	04.9
20	319°12.0	107°55.1	06.2	85°19.2	20°00.1	151°26.9	19.0	295°01.7	04.8
21	334°14.4	122°54.6	·· 07.4	100°19.8	·· 00.6	166°28.9	·· 18.8	310°04.4	·· 04.7
22	349°16.9	137°54.1	08.5	115°20.5	01.0	181°30.9	18.6	325°07.0	04.7
23	4°19.4	152°53.6	09.6	130°21.1	01.4	196°32.9	18.4	340°09.7	04.6
Mer.pass. 22:43		ν -0.5′ d 1.2′		m -3.88	ν 0.7′ d 0.4′		m 1.36	ν 2.0′ d 0.2′	m -1.74	ν 2.6′ d 0.1′	m 0.14

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	19°21.8	167°53.1	S12°10.8	145°21.7	S20°01.9	211°34.9	N06°18.2	355°12.3	N07°04.5
1	34°24.3	182°52.6	11.9	160°22.4	02.3	226°36.9	18.1	10°15.0	04.4
2	49°26.7	197°52.1	13.1	175°23.0	02.7	241°38.9	17.9	25°17.6	04.4
3	64°29.2	212°51.6	·· 14.2	190°23.7	·· 03.2	256°40.9	·· 17.7	40°20.3	·· 04.3
4	79°31.7	227°51.2	15.4	205°24.3	03.6	271°42.9	17.5	55°22.9	04.2
5	94°34.1	242°50.7	16.5	220°25.0	04.0	286°44.9	17.3	70°25.6	04.2
6	109°36.6	257°50.2	S12°17.6	235°25.6	S20°04.5	301°46.9	N06°17.1	85°28.2	N07°04.1
7	124°39.1	272°49.7	18.8	250°26.2	04.9	316°48.8	16.9	100°30.9	04.0
8	139°41.5	287°49.2	19.9	265°26.9	05.3	331°50.8	16.7	115°33.5	03.9
9	154°44.0	302°48.7	·· 21.1	280°27.5	·· 05.8	346°52.8	·· 16.5	130°36.1	·· 03.9
10	169°46.5	317°48.2	22.2	295°28.2	06.2	1°54.8	16.3	145°38.8	03.8
11	184°48.9	332°47.7	23.3	310°28.8	06.6	16°56.8	16.2	160°41.4	03.7
12	199°51.4	347°47.2	S12°24.5	325°29.4	S20°07.0	31°58.8	N06°16.0	175°44.1	N07°03.6
13	214°53.8	2°46.7	25.6	340°30.1	07.5	47°00.8	15.8	190°46.7	03.6
14	229°56.3	17°46.2	26.7	355°30.7	07.9	62°02.8	15.6	205°49.4	03.5
15	244°58.8	32°45.7	·· 27.9	10°31.4	·· 08.3	77°04.8	·· 15.4	220°52.0	·· 03.4
16	260°01.2	47°45.2	29.0	25°32.0	08.8	92°06.8	15.2	235°54.7	03.4
17	275°03.7	62°44.7	30.2	40°32.6	09.2	107°08.8	15.0	250°57.3	03.3
18	290°06.2	77°44.2	S12°31.3	55°33.3	S20°09.6	122°10.8	N06°14.8	266°00.0	N07°03.2
19	305°08.6	92°43.7	32.4	70°33.9	10.1	137°12.8	14.6	281°02.6	03.1
20	320°11.1	107°43.2	33.6	85°34.6	10.5	152°14.8	14.5	296°05.3	03.1
21	335°13.6	122°42.7	·· 34.7	100°35.2	·· 10.9	167°16.8	·· 14.3	311°07.9	·· 03.0
22	350°16.0	137°42.2	35.8	115°35.8	11.3	182°18.8	14.1	326°10.6	02.9
23	5°18.5	152°41.7	36.9	130°36.5	11.8	197°20.8	13.9	341°13.2	02.8
Mer.pass. 22:39		ν -0.5′ d 1.1′		m -3.88	ν 0.6′ d 0.4′		m 1.36	ν 2.0′ d 0.2′	m -1.74	ν 2.6′ d 0.1′	m 0.14

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	20°21.0	167°41.2	S12°38.1	145°37.1	S20°12.2	212°22.8	N06°13.7	356°15.9	N07°02.8
1	35°23.4	182°40.7	39.2	160°37.7	12.6	227°24.8	13.5	11°18.5	02.7
2	50°25.9	197°40.2	40.3	175°38.4	13.1	242°26.8	13.3	26°21.2	02.6
3	65°28.3	212°39.7	·· 41.5	190°39.0	·· 13.5	257°28.8	·· 13.1	41°23.8	·· 02.6
4	80°30.8	227°39.2	42.6	205°39.6	13.9	272°30.8	12.9	56°26.5	02.5
5	95°33.3	242°38.7	43.7	220°40.3	14.3	287°32.8	12.8	71°29.1	02.4
6	110°35.7	257°38.2	S12°44.9	235°40.9	S20°14.8	302°34.8	N06°12.6	86°31.8	N07°02.3
7	125°38.2	272°37.7	46.0	250°41.5	15.2	317°36.8	12.4	101°34.4	02.3
8	140°40.7	287°37.2	47.1	265°42.2	15.6	332°38.8	12.2	116°37.1	02.2
9	155°43.1	302°36.7	·· 48.2	280°42.8	·· 16.0	347°40.8	·· 12.0	131°39.7	·· 02.1
10	170°45.6	317°36.2	49.4	295°43.5	16.5	2°42.8	11.8	146°42.4	02.0
11	185°48.1	332°35.6	50.5	310°44.1	16.9	17°44.8	11.6	161°45.0	02.0
12	200°50.5	347°35.1	S12°51.6	325°44.7	S20°17.3	32°46.9	N06°11.4	176°47.7	N07°01.9
13	215°53.0	2°34.6	52.7	340°45.3	17.7	47°48.9	11.2	191°50.3	01.8
14	230°55.4	17°34.1	53.9	355°46.0	18.2	62°50.9	11.1	206°53.0	01.8
15	245°57.9	32°33.6	·· 55.0	10°46.6	·· 18.6	77°52.9	·· 10.9	221°55.6	·· 01.7
16	261°00.4	47°33.1	56.1	25°47.2	19.0	92°54.9	10.7	236°58.2	01.6
17	276°02.8	62°32.6	57.2	40°47.9	19.4	107°56.9	10.5	252°00.9	01.5
18	291°05.3	77°32.1	S12°58.4	55°48.5	S20°19.9	122°58.9	N06°10.3	267°03.5	N07°01.5
19	306°07.8	92°31.6	12°59.5	70°49.1	20.3	138°00.9	10.1	282°06.2	01.4
20	321°10.2	107°31.1	13°00.6	85°49.8	20.7	153°02.9	09.9	297°08.8	01.3
21	336°12.7	122°30.6	·· 01.7	100°50.4	·· 21.1	168°04.9	·· 09.7	312°11.5	·· 01.2
22	351°15.2	137°30.0	02.8	115°51.0	21.5	183°06.9	09.6	327°14.1	01.2
23	6°17.6	152°29.5	04.0	130°51.7	22.0	198°08.9	09.4	342°16.8	01.1
Mer.pass. 22:35		ν -0.5′ d 1.1′		m -3.88	ν 0.6′ d 0.4′		m 1.36	ν 2.0′ d 0.2′	m -1.74	ν 2.6′ d 0.1′	m 0.13

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°24.2	89°22.7
Acamar	315°09.7	-40°11.4
Menkar	314°03.5	4°12.1
Mirfak	308°24.6	49°57.5
Aldebaran	290°36.8	16°33.9
Rigel	281°01.5	-8°10.0
Capella	280°18.3	46°01.4
Bellatrix	278°20.3	6°22.6
Elnath	277°58.8	28°37.8
Alnilam	275°35.3	-1°10.9
Betelgeuse	270°49.5	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.2	-16°45.1
Adhara	255°04.1	-29°00.3
Procyon	244°48.5	5°09.3
Pollux	243°14.6	27°57.4
Avior	234°14.0	-59°35.6
Suhail	222°44.8	-43°32.5
Miaplacidus	221°38.2	-69°49.6
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.9	61°35.9
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.1
Gacrux	171°49.7	-57°16.1
Alioth	166°11.6	55°48.5
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.5
Hadar	148°33.4	-60°30.4
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.4
Rigil Kent.	139°37.8	-60°57.1
Kochab	137°21.0	74°02.5
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.7	-69°04.8
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.5
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°29.6	-34°22.3
Vega	80°31.8	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.0	-56°38.8
Deneb	49°24.1	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 10 Sun	SHA	Mer.pass
Venus	149°42.1	12:48
Mars	126°43.5	14:19
Jupiter	192°24.3	09:56
Saturn	335°46.1	00:23

Oct 11 Mon	SHA	Mer.pass
Venus	148°31.3	12:49
Mars	125°59.9	14:18
Jupiter	192°13.0	09:52
Saturn	335°50.5	00:19

Oct 12 Tue	SHA	Mer.pass
Venus	147°20.2	12:50
Mars	125°16.2	14:17
Jupiter	192°01.9	09:49
Saturn	335°54.9	00:15

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0789 sec ΔT = TT-UT1 = +69.2629 sec

2027 October 10 to Oct. 12 UT

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°12.1	S06°28.5	62°21.0	14.8′	S16°20.4	11.0′	54.1′
1	198°12.3	29.4	76°54.8	14.9′	16°09.4	11.1′	54.1′
2	213°12.5	30.4	91°28.7	14.9′	15°58.3	11.1′	54.1′
3	228°12.6	·· 31.3	106°02.6	15.0′	15°47.2	11.2′	54.1′
4	243°12.8	32.3	120°36.5	15.0′	15°36.0	11.2′	54.2′
5	258°13.0	33.2	135°10.5	15.0′	15°24.8	11.3′	54.2′
6	273°13.1	S06°34.2	149°44.6	15.1′	S15°13.5	11.4′	54.2′
7	288°13.3	35.1	164°18.6	15.1′	15°02.1	11.4′	54.2′
8	303°13.5	36.0	178°52.8	15.2′	14°50.7	11.5′	54.2′
9	318°13.7	·· 37.0	193°26.9	15.2′	14°39.2	11.6′	54.2′
10	333°13.8	37.9	208°01.2	15.3′	14°27.6	11.6′	54.2′
11	348°14.0	38.9	222°35.4	15.3′	14°16.0	11.6′	54.2′
12	3°14.2	S06°39.8	237°09.7	15.3′	S14°04.4	11.7′	54.2′
13	18°14.3	40.8	251°44.1	15.4′	13°52.7	11.8′	54.2′
14	33°14.5	41.7	266°18.4	15.4′	13°40.9	11.9′	54.2′
15	48°14.7	·· 42.7	280°52.9	15.5′	13°29.0	11.9′	54.2′
16	63°14.8	43.6	295°27.3	15.5′	13°17.1	11.9′	54.2′
17	78°15.0	44.6	310°01.8	15.5′	13°05.2	12.0′	54.2′
18	93°15.2	S06°45.5	324°36.3	15.6′	S12°53.2	12.1′	54.2′
19	108°15.3	46.4	339°10.9	15.6′	12°41.1	12.1′	54.2′
20	123°15.5	47.4	353°45.5	15.6′	12°29.0	12.1′	54.2′
21	138°15.7	·· 48.3	8°20.1	15.7′	12°16.9	12.2′	54.2′
22	153°15.8	49.3	22°54.8	15.7′	12°04.7	12.3′	54.3′
23	168°16.0	50.2	37°29.5	15.7′	11°52.4	12.3′	54.3′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°16.1	S06°51.2	52°04.2	15.8′	S11°40.1	12.3′	54.3′
1	198°16.3	52.1	66°39.0	15.8′	11°27.8	12.4′	54.3′
2	213°16.5	53.1	81°13.7	15.8′	11°15.4	12.5′	54.3′
3	228°16.6	·· 54.0	95°48.6	15.8′	11°02.9	12.5′	54.3′
4	243°16.8	54.9	110°23.4	15.9′	10°50.4	12.5′	54.3′
5	258°17.0	55.9	124°58.3	15.9′	10°37.9	12.6′	54.3′
6	273°17.1	S06°56.8	139°33.2	15.9′	S10°25.3	12.7′	54.3′
7	288°17.3	57.8	154°08.1	15.9′	10°12.6	12.6′	54.3′
8	303°17.5	58.7	168°43.0	16.0′	10°00.0	12.8′	54.3′
9	318°17.6	06°59.7	183°18.0	16.0′	09°47.2	12.7′	54.4′
10	333°17.8	07°00.6	197°53.0	16.0′	09°34.5	12.8′	54.4′
11	348°17.9	01.5	212°28.0	16.0′	09°21.7	12.9′	54.4′
12	3°18.1	S07°02.5	227°03.0	16.0′	S09°08.8	12.9′	54.4′
13	18°18.3	03.4	241°38.0	16.1′	08°55.9	12.9′	54.4′
14	33°18.4	04.4	256°13.1	16.1′	08°43.0	13.0′	54.4′
15	48°18.6	·· 05.3	270°48.2	16.1′	08°30.0	13.0′	54.4′
16	63°18.8	06.3	285°23.3	16.1′	08°17.0	13.0′	54.4′
17	78°18.9	07.2	299°58.4	16.1′	08°04.0	13.1′	54.4′
18	93°19.1	S07°08.1	314°33.5	16.1′	S07°50.9	13.1′	54.5′
19	108°19.2	09.1	329°08.7	16.2′	07°37.8	13.2′	54.5′
20	123°19.4	10.0	343°43.8	16.2′	07°24.6	13.1′	54.5′
21	138°19.6	·· 11.0	358°19.0	16.2′	07°11.5	13.3′	54.5′
22	153°19.7	11.9	12°54.2	16.2′	06°58.2	13.2′	54.5′
23	168°19.9	12.8	27°29.4	16.2′	06°45.0	13.3′	54.5′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°20.0	S07°13.8	42°04.6	16.2′	S06°31.7	13.3′	54.5′
1	198°20.2	14.7	56°39.8	16.2′	06°18.4	13.4′	54.5′
2	213°20.4	15.7	71°15.0	16.2′	06°05.0	13.4′	54.6′
3	228°20.5	·· 16.6	85°50.2	16.2′	05°51.6	13.4′	54.6′
4	243°20.7	17.5	100°25.5	16.2′	05°38.2	13.4′	54.6′
5	258°20.8	18.5	115°00.7	16.2′	05°24.8	13.5′	54.6′
6	273°21.0	S07°19.4	129°35.9	16.2′	S05°11.3	13.5′	54.6′
7	288°21.2	20.4	144°11.2	16.2′	04°57.8	13.5′	54.6′
8	303°21.3	21.3	158°46.4	16.2′	04°44.3	13.5′	54.6′
9	318°21.5	·· 22.2	173°21.6	16.2′	04°30.8	13.6′	54.7′
10	333°21.6	23.2	187°56.9	16.2′	04°17.2	13.6′	54.7′
11	348°21.8	24.1	202°32.1	16.2′	04°03.6	13.6′	54.7′
12	3°21.9	S07°25.0	217°07.3	16.2′	S03°50.0	13.6′	54.7′
13	18°22.1	26.0	231°42.6	16.2′	03°36.4	13.7′	54.7′
14	33°22.3	26.9	246°17.8	16.2′	03°22.7	13.7′	54.7′
15	48°22.4	·· 27.9	260°53.0	16.2′	03°09.0	13.7′	54.8′
16	63°22.6	28.8	275°28.2	16.2′	02°55.3	13.7′	54.8′
17	78°22.7	29.7	290°03.4	16.2′	02°41.6	13.8′	54.8′
18	93°22.9	S07°30.7	304°38.6	16.2′	S02°27.8	13.7′	54.8′
19	108°23.0	31.6	319°13.8	16.2′	02°14.1	13.8′	54.8′
20	123°23.2	32.5	333°49.0	16.2′	02°00.3	13.8′	54.8′
21	138°23.4	·· 33.5	348°24.2	16.2′	01°46.5	13.8′	54.9′
22	153°23.5	34.4	2°59.3	16.1′	01°32.7	13.9′	54.9′
23	168°23.7	35.4	17°34.5	16.1′	01°18.8	13.8′	54.9′
	SD = 16.0′	d = 0.9′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:36	05:55	07:04	16:28	17:37	18:55
N 70°	04:42	05:53	06:55	16:37	17:39	18:49
68°	04:47	05:52	06:48	16:44	17:40	18:44
66°	04:51	05:50	06:42	16:50	17:42	18:41
64°	04:54	05:49	06:37	16:55	17:43	18:38
62°	04:57	05:48	06:33	17:00	17:44	18:35
60°	04:59	05:47	06:29	17:04	17:45	18:33
N 58°	05:01	05:46	06:25	17:07	17:46	18:32
56°	05:02	05:45	06:22	17:10	17:47	18:30
54°	05:03	05:44	06:20	17:13	17:48	18:29
52°	05:04	05:43	06:17	17:15	17:49	18:28
50°	05:05	05:43	06:15	17:18	17:50	18:27
45°	05:07	05:41	06:10	17:23	17:52	18:26
N 40°	05:07	05:39	06:06	17:27	17:54	18:25
35°	05:08	05:37	06:02	17:31	17:56	18:25
30°	05:07	05:35	05:59	17:34	17:58	18:26
20°	05:06	05:31	05:53	17:40	18:02	18:28
N 10°	05:03	05:27	05:48	17:45	18:06	18:31
0°	04:59	05:23	05:44	17:50	18:11	18:35
S 10°	04:53	05:17	05:39	17:55	18:16	18:41
20°	04:45	05:11	05:33	18:01	18:23	18:49
30°	04:34	05:03	05:27	18:07	18:31	19:00
35°	04:27	04:58	05:23	18:11	18:37	19:07
40°	04:19	04:51	05:19	18:15	18:43	19:16
45°	04:08	04:44	05:14	18:20	18:50	19:27
S 50°	03:55	04:35	05:08	18:26	19:00	19:40
52°	03:48	04:31	05:06	18:29	19:04	19:47
54°	03:41	04:26	05:03	18:32	19:09	19:55
56°	03:32	04:20	04:59	18:36	19:15	20:03
58°	03:23	04:14	04:56	18:39	19:21	20:13
S 60°	03:11	04:07	04:51	18:44	19:28	20:25

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	17:24	16:45	16:15	23:52	·· ··	01:57
N 70°	17:00	16:33	16:11	·· ··	00:13	02:06
68°	16:42	16:24	16:08	·· ··	00:30	02:14
66°	16:27	16:16	16:05	·· ··	00:43	02:20
64°	16:15	16:09	16:03	·· ··	00:54	02:25
62°	16:05	16:03	16:01	·· ··	01:03	02:30
60°	15:56	15:58	15:59	·· ··	01:11	02:33
N 58°	15:48	15:53	15:58	·· ··	01:18	02:37
56°	15:41	15:49	15:56	00:07	01:24	02:40
54°	15:35	15:45	15:55	00:15	01:29	02:43
52°	15:29	15:42	15:54	00:23	01:34	02:45
50°	15:24	15:39	15:53	00:30	01:39	02:47
45°	15:13	15:32	15:50	00:44	01:48	02:52
N 40°	15:03	15:27	15:48	00:55	01:56	02:56
35°	14:56	15:22	15:47	01:05	02:03	03:00
30°	14:49	15:17	15:45	01:14	02:09	03:03
20°	14:36	15:10	15:42	01:29	02:19	03:08
N 10°	14:26	15:03	15:40	01:42	02:27	03:12
0°	14:16	14:57	15:38	01:54	02:36	03:17
S 10°	14:05	14:51	15:36	02:05	02:44	03:21
20°	13:55	14:44	15:33	02:18	02:52	03:25
30°	13:42	14:37	15:31	02:32	03:02	03:30
35°	13:35	14:32	15:29	02:41	03:08	03:33
40°	13:27	14:27	15:27	02:50	03:14	03:36
45°	13:17	14:21	15:25	03:01	03:22	03:40
S 50°	13:05	14:14	15:23	03:14	03:30	03:45
52°	13:00	14:11	15:22	03:20	03:34	03:47
54°	12:54	14:07	15:21	03:27	03:39	03:49
56°	12:47	14:03	15:19	03:34	03:44	03:51
58°	12:40	13:59	15:18	03:43	03:49	03:54
S 60°	12:31	13:54	15:16	03:52	03:55	03:57

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 10-12 73-88%
10	12:49	12:57	11:47	20:26	08:05	
11	13:05	13:12	11:47	21:07	08:46	
12	13:20	13:28	11:47	21:48	09:27	



October 13, 14, 15 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	21°20.1	167°29.0	S13°05.1	145°52.3	S20°22.4	213°10.9	N06°09.2	357°19.4	N07°01.0
1	36°22.6	182°28.5	06.2	160°52.9	22.8	228°12.9	09.0	12°22.1	01.0
2	51°25.0	197°28.0	07.3	175°53.5	23.2	243°14.9	08.8	27°24.7	00.9
3	66°27.5	212°27.5	·· 08.4	190°54.2	·· 23.6	258°16.9	·· 08.6	42°27.4	·· 00.8
4	81°29.9	227°27.0	09.5	205°54.8	24.1	273°18.9	08.4	57°30.0	00.7
5	96°32.4	242°26.5	10.7	220°55.4	24.5	288°20.9	08.2	72°32.7	00.7
6	111°34.9	257°25.9	S13°11.8	235°56.1	S20°24.9	303°22.9	N06°08.0	87°35.3	N07°00.6
7	126°37.3	272°25.4	12.9	250°56.7	25.3	318°24.9	07.9	102°38.0	00.5
8	141°39.8	287°24.9	14.0	265°57.3	25.7	333°26.9	07.7	117°40.6	00.4
9	156°42.3	302°24.4	·· 15.1	280°57.9	·· 26.2	348°28.9	·· 07.5	132°43.3	·· 00.4
10	171°44.7	317°23.9	16.2	295°58.6	26.6	3°30.9	07.3	147°45.9	00.3
11	186°47.2	332°23.4	17.3	310°59.2	27.0	18°32.9	07.1	162°48.6	00.2
12	201°49.7	347°22.8	S13°18.5	325°59.8	S20°27.4	33°34.9	N06°06.9	177°51.2	N07°00.2
13	216°52.1	2°22.3	19.6	341°00.4	27.8	48°36.9	06.7	192°53.9	00.1
14	231°54.6	17°21.8	20.7	356°01.1	28.2	63°38.9	06.5	207°56.5	07°00.0
15	246°57.0	32°21.3	·· 21.8	11°01.7	·· 28.7	78°40.9	·· 06.4	222°59.2	06°59.9
16	261°59.5	47°20.8	22.9	26°02.3	29.1	93°42.9	06.2	238°01.8	59.9
17	277°02.0	62°20.3	24.0	41°02.9	29.5	108°44.9	06.0	253°04.5	59.8
18	292°04.4	77°19.7	S13°25.1	56°03.6	S20°29.9	123°46.9	N06°05.8	268°07.1	N06°59.7
19	307°06.9	92°19.2	26.2	71°04.2	30.3	138°48.9	05.6	283°09.8	59.6
20	322°09.4	107°18.7	27.3	86°04.8	30.7	153°50.9	05.4	298°12.4	59.6
21	337°11.8	122°18.2	·· 28.4	101°05.4	·· 31.2	168°52.9	·· 05.2	313°15.1	·· 59.5
22	352°14.3	137°17.6	29.5	116°06.1	31.6	183°55.0	05.0	328°17.7	59.4
23	7°16.8	152°17.1	30.7	131°06.7	32.0	198°57.0	04.9	343°20.4	59.4
Mer.pass. 22:31		ν -0.5′	d 1.1′	m -3.88	ν 0.6′	d 0.4′	m 1.36	ν 2.0′	d 0.2′ m -1.74	ν 2.6′	d 0.1′ m 0.12

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	22°19.2	167°16.6	S13°31.8	146°07.3	S20°32.4	213°59.0	N06°04.7	358°23.0	N06°59.3
1	37°21.7	182°16.1	32.9	161°07.9	32.8	229°01.0	04.5	13°25.7	59.2
2	52°24.2	197°15.6	34.0	176°08.5	33.2	244°03.0	04.3	28°28.3	59.1
3	67°26.6	212°15.0	·· 35.1	191°09.2	·· 33.6	259°05.0	·· 04.1	43°31.0	·· 59.1
4	82°29.1	227°14.5	36.2	206°09.8	34.0	274°07.0	03.9	58°33.6	59.0
5	97°31.5	242°14.0	37.3	221°10.4	34.5	289°09.0	03.7	73°36.3	58.9
6	112°34.0	257°13.5	S13°38.4	236°11.0	S20°34.9	304°11.0	N06°03.5	88°38.9	N06°58.8
7	127°36.5	272°12.9	39.5	251°11.7	35.3	319°13.0	03.4	103°41.6	58.8
8	142°38.9	287°12.4	40.6	266°12.3	35.7	334°15.0	03.2	118°44.2	58.7
9	157°41.4	302°11.9	·· 41.7	281°12.9	·· 36.1	349°17.0	·· 03.0	133°46.9	·· 58.6
10	172°43.9	317°11.4	42.8	296°13.5	36.5	4°19.0	02.8	148°49.5	58.6
11	187°46.3	332°10.8	43.9	311°14.1	36.9	19°21.0	02.6	163°52.2	58.5
12	202°48.8	347°10.3	S13°45.0	326°14.7	S20°37.3	34°23.0	N06°02.4	178°54.8	N06°58.4
13	217°51.3	2°09.8	46.1	341°15.4	37.7	49°25.0	02.2	193°57.5	58.3
14	232°53.7	17°09.2	47.2	356°16.0	38.2	64°27.0	02.1	209°00.1	58.3
15	247°56.2	32°08.7	·· 48.3	11°16.6	·· 38.6	79°29.0	·· 01.9	224°02.8	·· 58.2
16	262°58.6	47°08.2	49.4	26°17.2	39.0	94°31.0	01.7	239°05.4	58.1
17	278°01.1	62°07.6	50.5	41°17.8	39.4	109°33.1	01.5	254°08.1	58.0
18	293°03.6	77°07.1	S13°51.6	56°18.5	S20°39.8	124°35.1	N06°01.3	269°10.7	N06°58.0
19	308°06.0	92°06.6	52.7	71°19.1	40.2	139°37.1	01.1	284°13.4	57.9
20	323°08.5	107°06.1	53.7	86°19.7	40.6	154°39.1	00.9	299°16.0	57.8
21	338°11.0	122°05.5	·· 54.8	101°20.3	·· 41.0	169°41.1	·· 00.7	314°18.7	·· 57.7
22	353°13.4	137°05.0	55.9	116°20.9	41.4	184°43.1	00.6	329°21.3	57.7
23	8°15.9	152°04.5	57.0	131°21.5	41.8	199°45.1	00.4	344°24.0	57.6
Mer.pass. 22:27		ν -0.5′	d 1.1′	m -3.88	ν 0.6′	d 0.4′	m 1.36	ν 2.0′	d 0.2′ m -1.75	ν 2.6′	d 0.1′ m 0.11

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	23°18.4	167°03.9	S13°58.1	146°22.2	S20°42.2	214°47.1	N06°00.2	359°26.6	N06°57.5
1	38°20.8	182°03.4	13°59.2	161°22.8	42.6	229°49.1	06°00.0	14°29.3	57.5
2	53°23.3	197°02.9	14°00.3	176°23.4	43.1	244°51.1	05°59.8	29°31.9	57.4
3	68°25.8	212°02.3	·· 01.4	191°24.0	·· 43.5	259°53.1	·· 59.6	44°34.6	·· 57.3
4	83°28.2	227°01.8	02.5	206°24.6	43.9	274°55.1	59.4	59°37.2	57.2
5	98°30.7	242°01.2	03.6	221°25.2	44.3	289°57.1	59.3	74°39.9	57.2
6	113°33.1	257°00.7	S14°04.7	236°25.8	S20°44.7	304°59.1	N05°59.1	89°42.5	N06°57.1
7	128°35.6	272°00.2	05.7	251°26.4	45.1	320°01.2	58.9	104°45.2	57.0
8	143°38.1	286°59.6	06.8	266°27.1	45.5	335°03.2	58.7	119°47.8	56.9
9	158°40.5	301°59.1	·· 07.9	281°27.7	·· 45.9	350°05.2	·· 58.5	134°50.5	·· 56.9
10	173°43.0	316°58.6	09.0	296°28.3	46.3	5°07.2	58.3	149°53.1	56.8
11	188°45.5	331°58.0	10.1	311°28.9	46.7	20°09.2	58.1	164°55.8	56.7
12	203°47.9	346°57.5	S14°11.2	326°29.5	S20°47.1	35°11.2	N05°58.0	179°58.4	N06°56.7
13	218°50.4	1°56.9	12.3	341°30.1	47.5	50°13.2	57.8	195°01.1	56.6
14	233°52.9	16°56.4	13.3	356°30.7	47.9	65°15.2	57.6	210°03.7	56.5
15	248°55.3	31°55.9	·· 14.4	11°31.3	·· 48.3	80°17.2	·· 57.4	225°06.4	·· 56.4
16	263°57.8	46°55.3	15.5	26°32.0	48.7	95°19.2	57.2	240°09.0	56.4
17	279°00.3	61°54.8	16.6	41°32.6	49.1	110°21.2	57.0	255°11.7	56.3
18	294°02.7	76°54.2	S14°17.7	56°33.2	S20°49.5	125°23.2	N05°56.8	270°14.3	N06°56.2
19	309°05.2	91°53.7	18.7	71°33.8	49.9	140°25.3	56.7	285°17.0	56.1
20	324°07.6	106°53.1	19.8	86°34.4	50.3	155°27.3	56.5	300°19.6	56.1
21	339°10.1	121°52.6	·· 20.9	101°35.0	·· 50.7	170°29.3	·· 56.3	315°22.3	·· 56.0
22	354°12.6	136°52.1	22.0	116°35.6	51.1	185°31.3	56.1	330°24.9	55.9
23	9°15.0	151°51.5	23.1	131°36.2	51.5	200°33.3	55.9	345°27.6	55.9
Mer.pass. 22:23		ν -0.5′	d 1.1′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.6′	d 0.1′ m 0.11	ν 2.0′	d 0.2′ m -1.75

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°23.4	89°22.7
Acamar	315°09.7	-40°11.4
Menkar	314°03.5	4°12.1
Mirfak	308°24.6	49°57.6
Aldebaran	290°36.8	16°33.9
Rigel	281°01.5	-8°10.0
Capella	280°18.3	46°01.4
Bellatrix	278°20.3	6°22.6
Elnath	277°58.8	28°37.8
Alnilam	275°35.3	-1°10.9
Betelgeuse	270°49.5	7°24.8
Canopus	263°51.2	-52°42.3
Sirius	258°24.2	-16°45.1
Adhara	255°04.0	-29°00.4
Procyon	244°48.5	5°09.3
Pollux	243°14.6	27°57.4
Avior	234°13.9	-59°35.6
Suhail	222°44.8	-43°32.4
Miaplacidus	221°38.2	-69°49.6
Alphard	217°45.7	-8°46.7
Regulus	207°32.3	11°49.9
Dubhe	193°38.9	61°35.9
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.1
Gacrux	171°49.6	-57°16.1
Alioth	166°11.6	55°48.5
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.5
Hadar	148°33.4	-60°30.4
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.8	-60°57.1
Kochab	137°21.0	74°02.5
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.1	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.8	-69°04.8
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°29.6	-34°22.3
Vega	80°31.8	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.1	-56°38.8
Deneb	49°24.1	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 13 Wed	SHA	Mer.pass
Venus	146°08.9	12:51
Mars	124°32.2	14:16
Jupiter	191°50.8	09:46
Saturn	335°59.4	00:11

Oct 14 Thu	SHA	Mer.pass
Venus	144°57.4	12:51
Mars	123°48.1	14:15
Jupiter	191°39.7	09:43
Saturn	336°03.8	00:06

Oct 15 Fri	SHA	Mer.pass
Venus	143°45.6	12:52
Mars	123°03.8	14:14
Jupiter	191°28.7	09:40
Saturn	336°08.3	00:02

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0795 sec ΔT = TT-UT1 = +69.2635 sec

2027 October 13 to Oct. 15 UT

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°23.8	S07°36.3	32°09.6	16.1′	S01°05.0	13.9′	54.9′
1	198°24.0	37.2	46°44.7	16.1′	00°51.1	13.8′	54.9′
2	213°24.1	38.2	61°19.8	16.1′	00°37.3	13.9′	54.9′
3	228°24.3	·· 39.1	75°54.9	16.1′	00°23.4	13.9′	55.0′
4	243°24.4	40.0	90°29.9	16.0′	S00°09.5	13.9′	55.0′
5	258°24.6	41.0	105°05.0	16.0′	N00°04.4	13.9′	55.0′
6	273°24.7	S07°41.9	119°40.0	16.0′	N00°18.3	13.9′	55.0′
7	288°24.9	42.8	134°15.0	16.0′	00°32.2	14.0′	55.0′
8	303°25.0	43.8	148°50.0	16.0′	00°46.2	13.9′	55.1′
9	318°25.2	·· 44.7	163°24.9	15.9′	01°00.1	14.0′	55.1′
10	333°25.4	45.6	177°59.9	15.9′	01°14.1	13.9′	55.1′
11	348°25.5	46.6	192°34.8	15.9′	01°28.0	14.0′	55.1′
12	3°25.7	S07°47.5	207°09.6	15.8′	N01°42.0	13.9′	55.1′
13	18°25.8	48.4	221°44.5	15.8′	01°55.9	14.0′	55.1′
14	33°26.0	49.4	236°19.3	15.8′	02°09.9	13.9′	55.2′
15	48°26.1	·· 50.3	250°54.1	15.8′	02°23.8	14.0′	55.2′
16	63°26.3	51.2	265°28.9	15.7′	02°37.8	13.9′	55.2′
17	78°26.4	52.2	280°03.6	15.7′	02°51.7	14.0′	55.2′
18	93°26.6	S07°53.1	294°38.3	15.7′	N03°05.7	14.0′	55.2′
19	108°26.7	54.0	309°13.0	15.6′	03°19.7	13.9′	55.3′
20	123°26.9	55.0	323°47.6	15.6′	03°33.6	14.0′	55.3′
21	138°27.0	·· 55.9	338°22.2	15.6′	03°47.6	13.9′	55.3′
22	153°27.2	56.8	352°56.7	15.5′	04°01.5	14.0′	55.3′
23	168°27.3	57.8	7°31.2	15.5′	04°15.5	13.9′	55.3′
	SD = 16.0′	d = 0.9′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°27.5	S07°58.7	22°05.7	15.4′	N04°29.4	13.9′	55.4′
1	198°27.6	07°59.6	36°40.2	15.4′	04°43.3	13.9′	55.4′
2	213°27.8	08°00.6	51°14.6	15.4′	04°57.2	14.0′	55.4′
3	228°27.9	·· 01.5	65°48.9	15.3′	05°11.2	13.9′	55.4′
4	243°28.1	02.4	80°23.2	15.3′	05°25.1	13.8′	55.4′
5	258°28.2	03.3	94°57.5	15.2′	05°38.9	13.9′	55.5′
6	273°28.4	S08°04.3	109°31.7	15.2′	N05°52.8	13.9′	55.5′
7	288°28.5	05.2	124°05.9	15.1′	06°06.7	13.8′	55.5′
8	303°28.7	06.1	138°40.0	15.1′	06°20.5	13.9′	55.5′
9	318°28.8	·· 07.1	153°14.1	15.0′	06°34.4	13.8′	55.5′
10	333°28.9	08.0	167°48.2	15.0′	06°48.2	13.8′	55.6′
11	348°29.1	08.9	182°22.1	14.9′	07°02.0	13.8′	55.6′
12	3°29.2	S08°09.9	196°56.1	14.9′	N07°15.8	13.7′	55.6′
13	18°29.4	10.8	211°30.0	14.8′	07°29.5	13.8′	55.6′
14	33°29.5	11.7	226°03.8	14.8′	07°43.3	13.7′	55.7′
15	48°29.7	·· 12.6	240°37.6	14.7′	07°57.0	13.7′	55.7′
16	63°29.8	13.6	255°11.3	14.7′	08°10.7	13.7′	55.7′
17	78°30.0	14.5	269°45.0	14.6′	08°24.4	13.6′	55.7′
18	93°30.1	S08°15.4	284°18.6	14.6′	N08°38.0	13.6′	55.7′
19	108°30.3	16.3	298°52.1	14.5′	08°51.6	13.6′	55.8′
20	123°30.4	17.3	313°25.6	14.4′	09°05.2	13.6′	55.8′
21	138°30.5	·· 18.2	327°59.1	14.4′	09°18.8	13.6′	55.8′
22	153°30.7	19.1	342°32.4	14.3′	09°32.4	13.5′	55.8′
23	168°30.8	20.1	357°05.7	14.2′	09°45.9	13.5′	55.8′
	SD = 16.0′	d = 0.9′	SD = 15.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°31.0	S08°21.0	11°39.0	14.2′	N09°59.4	13.4′	55.9′
1	198°31.1	21.9	26°12.2	14.1′	10°12.8	13.4′	55.9′
2	213°31.3	22.8	40°45.3	14.1′	10°26.2	13.4′	55.9′
3	228°31.4	·· 23.8	55°18.3	14.0′	10°39.6	13.3′	55.9′
4	243°31.6	24.7	69°51.3	13.9′	10°52.9	13.3′	56.0′
5	258°31.7	25.6	84°24.3	13.9′	11°06.2	13.3′	56.0′
6	273°31.8	S08°26.5	98°57.1	13.8′	N11°19.5	13.2′	56.0′
7	288°32.0	27.5	113°29.9	13.7′	11°32.7	13.2′	56.0′
8	303°32.1	28.4	128°02.6	13.6′	11°45.9	13.2′	56.0′
9	318°32.3	·· 29.3	142°35.2	13.6′	11°59.1	13.1′	56.1′
10	333°32.4	30.2	157°07.8	13.5′	12°12.2	13.0′	56.1′
11	348°32.5	31.2	171°40.3	13.4′	12°25.2	13.1′	56.1′
12	3°32.7	S08°32.1	186°12.7	13.4′	N12°38.3	12.9′	56.1′
13	18°32.8	33.0	200°45.1	13.3′	12°51.2	13.0′	56.1′
14	33°33.0	33.9	215°17.4	13.2′	13°04.2	12.8′	56.2′
15	48°33.1	·· 34.9	229°49.6	13.1′	13°17.0	12.8′	56.2′
16	63°33.2	35.8	244°21.7	13.0′	13°29.8	12.8′	56.2′
17	78°33.4	36.7	258°53.7	13.0′	13°42.6	12.7′	56.2′
18	93°33.5	S08°37.6	273°25.7	12.9′	N13°55.3	12.7′	56.3′
19	108°33.7	38.5	287°57.6	12.8′	14°08.0	12.6′	56.3′
20	123°33.8	39.5	302°29.4	12.7′	14°20.6	12.6′	56.3′
21	138°33.9	·· 40.4	317°01.1	12.6′	14°33.2	12.5′	56.3′
22	153°34.1	41.3	331°32.8	12.6′	14°45.7	12.4′	56.3′
23	168°34.2	42.2	346°04.3	12.5′	14°58.1	12.4′	56.4′
	SD = 16.0′	d = 0.9′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:50	06:08	07:18	16:12	17:22	18:40
N 70°	04:54	06:05	07:07	16:23	17:25	18:36
68°	04:58	06:02	06:59	16:32	17:28	18:32
66°	05:00	06:00	06:52	16:39	17:31	18:30
64°	05:03	05:58	06:46	16:45	17:33	18:28
62°	05:04	05:56	06:41	16:50	17:35	18:26
60°	05:06	05:54	06:36	16:55	17:37	18:25
N 58°	05:07	05:52	06:32	16:59	17:38	18:24
56°	05:08	05:51	06:29	17:03	17:40	18:23
54°	05:09	05:50	06:25	17:06	17:41	18:22
52°	05:09	05:48	06:22	17:09	17:43	18:22
50°	05:10	05:47	06:20	17:12	17:44	18:21
45°	05:10	05:44	06:14	17:17	17:47	18:21
N 40°	05:10	05:42	06:09	17:22	17:50	18:21
35°	05:10	05:39	06:05	17:27	17:52	18:22
30°	05:09	05:37	06:01	17:31	17:55	18:23
20°	05:07	05:32	05:54	17:37	18:00	18:25
N 10°	05:03	05:27	05:48	17:44	18:05	18:29
0°	04:58	05:22	05:43	17:49	18:10	18:34
S 10°	04:51	05:16	05:37	17:55	18:17	18:41
20°	04:42	05:08	05:31	18:02	18:24	18:50
30°	04:30	04:59	05:23	18:09	18:33	19:02
35°	04:23	04:53	05:19	18:13	18:39	19:10
40°	04:14	04:47	05:14	18:18	18:46	19:19
45°	04:02	04:39	05:09	18:24	18:55	19:31
S 50°	03:47	04:28	05:02	18:31	19:05	19:46
52°	03:40	04:24	04:59	18:34	19:10	19:53
54°	03:32	04:18	04:55	18:38	19:15	20:02
56°	03:23	04:12	04:52	18:42	19:21	20:11
58°	03:12	04:05	04:47	18:46	19:28	20:22
S 60°	03:00	03:58	04:42	18:51	19:36	20:35

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	15:47	15:17	14:37	03:54	05:54	08:06
N 70°	15:50	15:28	15:01	03:55	05:45	07:45
68°	15:53	15:37	15:19	03:55	05:38	07:28
66°	15:55	15:45	15:34	03:55	05:33	07:15
64°	15:57	15:52	15:46	03:56	05:28	07:04
62°	15:59	15:57	15:56	03:56	05:24	06:55
60°	16:01	16:02	16:05	03:56	05:20	06:47
N 58°	16:02	16:07	16:13	03:56	05:17	06:40
56°	16:03	16:11	16:20	03:56	05:14	06:34
54°	16:04	16:14	16:26	03:56	05:11	06:29
52°	16:05	16:18	16:32	03:56	05:09	06:24
50°	16:06	16:21	16:37	03:56	05:07	06:20
45°	16:08	16:27	16:48	03:57	05:02	06:10
N 40°	16:10	16:33	16:58	03:57	04:59	06:02
35°	16:11	16:37	17:06	03:57	04:55	05:56
30°	16:13	16:42	17:13	03:57	04:52	05:50
20°	16:15	16:49	17:25	03:57	04:48	05:40
N 10°	16:17	16:55	17:36	03:57	04:43	05:31
0°	16:19	17:01	17:46	03:58	04:39	05:23
S 10°	16:21	17:08	17:57	03:58	04:35	05:14
20°	16:23	17:14	18:08	03:58	04:31	05:06
30°	16:26	17:22	18:21	03:58	04:26	04:56
35°	16:27	17:26	18:28	03:58	04:23	04:50
40°	16:29	17:31	18:37	03:58	04:20	04:44
45°	16:31	17:37	18:47	03:58	04:16	04:36
S 50°	16:33	17:44	18:59	03:58	04:12	04:27
52°	16:34	17:48	19:04	03:58	04:10	04:23
54°	16:35	17:51	19:11	03:58	04:08	04:19
56°	16:36	17:55	19:18	03:58	04:05	04:14
58°	16:38	18:00	19:26	03:58	04:03	04:08
S 60°	16:39	18:05	19:35	03:58	04:00	04:02

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 13-15 93-99%
13	13:35	13:43	11:46	22:29	10:08	
14	13:50	13:57	11:46	23:12	10:50	
15	14:04	14:11	11:46	23:58	11:34	

October 16, 17, 18 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	24°17.5	166°51.0	S14°24.1	146°36.8	S20°51.9	215°35.3	N05°55.7	0°30.2	N06°55.8
1	39°20.0	181°50.4	25.2	161°37.4	52.3	230°37.3	55.5	15°32.9	55.7
2	54°22.4	196°49.9	26.3	176°38.0	52.7	245°39.3	55.4	30°35.5	55.6
3	69°24.9	211°49.3	·· 27.4	191°38.7	·· 53.1	260°41.3	·· 55.2	45°38.2	·· 55.6
4	84°27.4	226°48.8	28.4	206°39.3	53.5	275°43.3	55.0	60°40.8	55.5
5	99°29.8	241°48.2	29.5	221°39.9	53.9	290°45.3	54.8	75°43.5	55.4
6	114°32.3	256°47.7	S14°30.6	236°40.5	S20°54.3	305°47.4	N05°54.6	90°46.1	N06°55.3
7	129°34.7	271°47.1	31.7	251°41.1	54.7	320°49.4	54.4	105°48.8	55.3
8	144°37.2	286°46.6	32.7	266°41.7	55.1	335°51.4	54.2	120°51.4	55.2
9	159°39.7	301°46.0	·· 33.8	281°42.3	·· 55.5	350°53.4	·· 54.1	135°54.1	·· 55.1
10	174°42.1	316°45.5	34.9	296°42.9	55.9	5°55.4	53.9	150°56.7	55.1
11	189°44.6	331°44.9	35.9	311°43.5	56.3	20°57.4	53.7	165°59.4	55.0
12	204°47.1	346°44.4	S14°37.0	326°44.1	S20°56.7	35°59.4	N05°53.5	181°02.0	N06°54.9
13	219°49.5	1°43.8	38.1	341°44.7	57.1	51°01.4	53.3	196°04.7	54.8
14	234°52.0	16°43.3	39.2	356°45.3	57.5	66°03.4	53.1	211°07.3	54.8
15	249°54.5	31°42.7	·· 40.2	11°45.9	·· 57.9	81°05.4	·· 52.9	226°10.0	·· 54.7
16	264°56.9	46°42.2	41.3	26°46.5	58.3	96°07.5	52.8	241°12.6	54.6
17	279°59.4	61°41.6	42.4	41°47.1	58.7	111°09.5	52.6	256°15.3	54.6
18	295°01.9	76°41.1	S14°43.4	56°47.7	S20°59.1	126°11.5	N05°52.4	271°17.9	N06°54.5
19	310°04.3	91°40.5	44.5	71°48.3	59.4	141°13.5	52.2	286°20.6	54.4
20	325°06.8	106°40.0	45.6	86°48.9	20°59.8	156°15.5	52.0	301°23.2	54.3
21	340°09.2	121°39.4	·· 46.6	101°49.5	21°00.2	171°17.5	·· 51.8	316°25.9	·· 54.3
22	355°11.7	136°38.9	47.7	116°50.1	00.6	186°19.5	51.7	331°28.5	54.2
23	10°14.2	151°38.3	48.7	131°50.7	01.0	201°21.5	51.5	346°31.2	54.1
Mer.pass. 22:19		ν -0.5′	d 1.1′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.75	ν 2.7′	d 0.1′ m 0.10

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	25°16.6	166°37.8	S14°49.8	146°51.3	S21°01.4	216°23.6	N05°51.3	1°33.8	N06°54.0
1	40°19.1	181°37.2	50.9	161°51.9	01.8	231°25.6	51.1	16°36.5	54.0
2	55°21.6	196°36.6	51.9	176°52.5	02.2	246°27.6	50.9	31°39.1	53.9
3	70°24.0	211°36.1	·· 53.0	191°53.1	·· 02.6	261°29.6	·· 50.7	46°41.8	·· 53.8
4	85°26.5	226°35.5	54.1	206°53.7	03.0	276°31.6	50.5	61°44.4	53.8
5	100°29.0	241°35.0	55.1	221°54.3	03.4	291°33.6	50.4	76°47.1	53.7
6	115°31.4	256°34.4	S14°56.2	236°54.9	S21°03.8	306°35.6	N05°50.2	91°49.7	N06°53.6
7	130°33.9	271°33.8	57.2	251°55.5	04.1	321°37.6	50.0	106°52.4	53.5
8	145°36.4	286°33.3	58.3	266°56.1	04.5	336°39.6	49.8	121°55.0	53.5
9	160°38.8	301°32.7	14°59.3	281°56.7	·· 04.9	351°41.7	·· 49.6	136°57.7	·· 53.4
10	175°41.3	316°32.2	15°00.4	296°57.3	05.3	6°43.7	49.4	152°00.3	53.3
11	190°43.7	331°31.6	01.5	311°57.9	05.7	21°45.7	49.3	167°03.0	53.2
12	205°46.2	346°31.0	S15°02.5	326°58.5	S21°06.1	36°47.7	N05°49.1	182°05.6	N06°53.2
13	220°48.7	1°30.5	03.6	341°59.1	06.5	51°49.7	48.9	197°08.3	53.1
14	235°51.1	16°29.9	04.6	356°59.7	06.9	66°51.7	48.7	212°10.9	53.0
15	250°53.6	31°29.3	·· 05.7	12°00.3	·· 07.3	81°53.7	·· 48.5	227°13.6	·· 53.0
16	265°56.1	46°28.8	06.7	27°00.9	07.6	96°55.8	48.3	242°16.2	52.9
17	280°58.5	61°28.2	07.8	42°01.5	08.0	111°57.8	48.2	257°18.9	52.8
18	296°01.0	76°27.7	S15°08.8	57°02.1	S21°08.4	126°59.8	N05°48.0	272°21.5	N06°52.7
19	311°03.5	91°27.1	09.9	72°02.7	08.8	142°01.8	47.8	287°24.2	52.7
20	326°05.9	106°26.5	10.9	87°03.3	09.2	157°03.8	47.6	302°26.8	52.6
21	341°08.4	121°26.0	·· 12.0	102°03.9	·· 09.6	172°05.8	·· 47.4	317°29.5	·· 52.5
22	356°10.8	136°25.4	13.0	117°04.5	10.0	187°07.8	47.2	332°32.1	52.4
23	11°13.3	151°24.8	14.1	132°05.1	10.3	202°09.8	47.0	347°34.8	52.4
Mer.pass. 22:15		ν -0.6′	d 1.1′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.75	ν 2.7′	d 0.1′ m 0.09

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	26°15.8	166°24.3	S15°15.1	147°05.7	S21°10.7	217°11.9	N05°46.9	2°37.4	N06°52.3
1	41°18.2	181°23.7	16.2	162°06.3	11.1	232°13.9	46.7	17°40.1	52.2
2	56°20.7	196°23.1	17.2	177°06.9	11.5	247°15.9	46.5	32°42.8	52.2
3	71°23.2	211°22.5	·· 18.3	192°07.5	·· 11.9	262°17.9	·· 46.3	47°45.4	·· 52.1
4	86°25.6	226°22.0	19.3	207°08.0	12.3	277°19.9	46.1	62°48.1	52.0
5	101°28.1	241°21.4	20.3	222°08.6	12.7	292°21.9	45.9	77°50.7	51.9
6	116°30.6	256°20.8	S15°21.4	237°09.2	S21°13.0	307°23.9	N05°45.8	92°53.4	N06°51.9
7	131°33.0	271°20.3	22.4	252°09.8	13.4	322°26.0	45.6	107°56.0	51.8
8	146°35.5	286°19.7	23.5	267°10.4	13.8	337°28.0	45.4	122°58.7	51.7
9	161°38.0	301°19.1	·· 24.5	282°11.0	·· 14.2	352°30.0	·· 45.2	138°01.3	·· 51.7
10	176°40.4	316°18.5	25.6	297°11.6	14.6	7°32.0	45.0	153°04.0	51.6
11	191°42.9	331°18.0	26.6	312°12.2	14.9	22°34.0	44.8	168°06.6	51.5
12	206°45.3	346°17.4	S15°27.6	327°12.8	S21°15.3	37°36.0	N05°44.7	183°09.3	N06°51.4
13	221°47.8	1°16.8	28.7	342°13.4	15.7	52°38.1	44.5	198°11.9	51.4
14	236°50.3	16°16.2	29.7	357°14.0	16.1	67°40.1	44.3	213°14.6	51.3
15	251°52.7	31°15.7	·· 30.7	12°14.5	·· 16.5	82°42.1	·· 44.1	228°17.2	·· 51.2
16	266°55.2	46°15.1	31.8	27°15.1	16.8	97°44.1	43.9	243°19.9	51.1
17	281°57.7	61°14.5	32.8	42°15.7	17.2	112°46.1	43.7	258°22.5	51.1
18	297°00.1	76°13.9	S15°33.8	57°16.3	S21°17.6	127°48.1	N05°43.6	273°25.2	N06°51.0
19	312°02.6	91°13.4	34.9	72°16.9	18.0	142°50.1	43.4	288°27.8	50.9
20	327°05.1	106°12.8	35.9	87°17.5	18.4	157°52.2	43.2	303°30.5	50.9
21	342°07.5	121°12.2	·· 37.0	102°18.1	·· 18.7	172°54.2	·· 43.0	318°33.1	·· 50.8
22	357°10.0	136°11.6	38.0	117°18.7	19.1	187°56.2	42.8	333°35.8	50.7
23	12°12.5	151°11.1	39.0	132°19.3	19.5	202°58.2	42.7	348°38.4	50.6
Mer.pass. 22:11		ν -0.6′	d 1.0′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.75	ν 2.7′	d 0.1′ m 0.09

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°22.4	89°22.7
Acamar	315°09.7	-40°11.4
Menkar	314°03.5	4°12.1
Mirfak	308°24.5	49°57.6
Aldebaran	290°36.8	16°33.9
Rigel	281°01.5	-8°10.0
Capella	280°18.3	46°01.4
Bellatrix	278°20.3	6°22.6
Elnath	277°58.8	28°37.8
Alnilam	275°35.3	-1°10.9
Betelgeuse	270°49.5	7°24.8
Canopus	263°51.2	-52°42.3
Sirius	258°24.2	-16°45.1
Adhara	255°04.0	-29°00.4
Procyon	244°48.5	5°09.2
Pollux	243°14.6	27°57.4
Avior	234°13.9	-59°35.6
Suhail	222°44.8	-43°32.4
Miaplacidus	221°38.1	-69°49.6
Alphard	217°45.7	-8°46.7
Regulus	207°32.2	11°49.9
Dubhe	193°38.8	61°35.9
Denebola	182°23.0	14°25.0
Gienah	175°41.6	-17°41.7
Acrux	172°58.2	-63°15.1
Gacrux	171°49.6	-57°16.0
Alioth	166°11.6	55°48.5
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.5
Hadar	148°33.4	-60°30.4
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.8	-60°57.0
Kochab	137°21.1	74°02.5
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.8	-69°04.8
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.8	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.7	8°56.7
Peacock	53°02.1	-56°38.8
Deneb	49°24.1	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.8	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 16 Sat	SHA	Mer.pass
Venus	142°33.5	12:53
Mars	122°19.3	14:13
Jupiter	191°17.8	09:36
Saturn	336°12.7	23:54

Oct 17 Sun	SHA	Mer.pass
Venus	141°21.1	12:54
Mars	121°34.7	14:12
Jupiter	191°06.9	09:33
Saturn	336°17.2	23:50

Oct 18 Mon	SHA	Mer.pass
Venus	140°08.5	12:55
Mars	120°49.9	14:11
Jupiter	190°56.1	09:30
Saturn	336°21.7	23:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	183°34.4	S08°43.2	0°35.8	12.4′	N15°10.5	12.3′	56.4′
1	198°34.5	44.1	15°07.2	12.3′	15°22.8	12.2′	56.4′
2	213°34.6	45.0	29°38.5	12.2′	15°35.0	12.2′	56.4′
3	228°34.8	·· 45.9	44°09.7	12.1′	15°47.2	12.1′	56.4′
4	243°34.9	46.8	58°40.9	12.1′	15°59.3	12.1′	56.5′
5	258°35.0	47.8	73°11.9	12.0′	16°11.4	12.0′	56.5′
6	273°35.2	S08°48.7	87°42.9	11.9′	N16°23.4	11.9′	56.5′
7	288°35.3	49.6	102°13.8	11.8′	16°35.3	11.8′	56.5′
8	303°35.5	50.5	116°44.5	11.7′	16°47.1	11.8′	56.6′
9	318°35.6	·· 51.4	131°15.2	11.6′	16°58.9	11.7′	56.6′
10	333°35.7	52.4	145°45.8	11.5′	17°10.6	11.6′	56.6′
11	348°35.9	53.3	160°16.4	11.4′	17°22.2	11.5′	56.6′
12	3°36.0	S08°54.2	174°46.8	11.3′	N17°33.7	11.5′	56.6′
13	18°36.1	55.1	189°17.1	11.2′	17°45.2	11.4′	56.7′
14	33°36.3	56.0	203°47.4	11.2′	17°56.6	11.3′	56.7′
15	48°36.4	·· 57.0	218°17.5	11.1′	18°07.9	11.2′	56.7′
16	63°36.5	57.9	232°47.6	11.0′	18°19.1	11.2′	56.7′
17	78°36.7	58.8	247°17.5	10.9′	18°30.3	11.0′	56.7′
18	93°36.8	S08°59.7	261°47.4	10.8′	N18°41.3	11.0′	56.8′
19	108°36.9	09°00.6	276°17.2	10.7′	18°52.3	10.8′	56.8′
20	123°37.1	01.5	290°46.9	10.6′	19°03.1	10.8′	56.8′
21	138°37.2	·· 02.5	305°16.5	10.5′	19°13.9	10.7′	56.8′
22	153°37.3	03.4	319°46.0	10.4′	19°24.6	10.6′	56.9′
23	168°37.5	04.3	334°15.4	10.3′	19°35.2	10.5′	56.9′
	SD = 16.0′	d = 0.9′		SD = 15.4′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°37.6	S09°05.2	348°44.7	10.2′	N19°45.7	10.5′	56.9′
1	198°37.7	06.1	3°13.9	10.1′	19°56.2	10.3′	56.9′
2	213°37.9	07.0	17°43.0	10.0′	20°06.5	10.2′	56.9′
3	228°38.0	·· 08.0	32°12.0	9.9′	20°16.7	10.1′	57.0′
4	243°38.1	08.9	46°40.9	9.8′	20°26.8	10.0′	57.0′
5	258°38.3	09.8	61°09.7	9.7′	20°36.8	10.0′	57.0′
6	273°38.4	S09°10.7	75°38.5	9.6′	N20°46.8	9.8′	57.0′
7	288°38.5	11.6	90°07.1	9.5′	20°56.6	9.7′	57.0′
8	303°38.6	12.5	104°35.6	9.4′	21°06.3	9.6′	57.1′
9	318°38.8	·· 13.5	119°04.1	9.3′	21°15.9	9.5′	57.1′
10	333°38.9	14.4	133°32.4	9.2′	21°25.4	9.4′	57.1′
11	348°39.0	15.3	148°00.7	9.2′	21°34.8	9.2′	57.1′
12	3°39.2	S09°16.2	162°28.8	9.1′	N21°44.0	9.2′	57.1′
13	18°39.3	17.1	176°56.9	9.0′	21°53.2	9.0′	57.2′
14	33°39.4	18.0	191°24.8	8.9′	22°02.2	9.0′	57.2′
15	48°39.5	·· 18.9	205°52.7	8.8′	22°11.2	8.8′	57.2′
16	63°39.7	19.8	220°20.5	8.7′	22°20.0	8.7′	57.2′
17	78°39.8	20.8	234°48.1	8.6′	22°28.7	8.6′	57.2′
18	93°39.9	S09°21.7	249°15.7	8.5′	N22°37.3	8.4′	57.3′
19	108°40.1	22.6	263°43.2	8.4′	22°45.7	8.3′	57.3′
20	123°40.2	23.5	278°10.6	8.3′	22°54.0	8.2′	57.3′
21	138°40.3	·· 24.4	292°37.9	8.2′	23°02.2	8.1′	57.3′
22	153°40.4	25.3	307°05.1	8.1′	23°10.3	8.0′	57.3′
23	168°40.6	26.2	321°32.2	8.0′	23°18.3	7.8′	57.4′
	SD = 16.0′	d = 0.9′		SD = 15.5′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°40.7	S09°27.1	335°59.2	7.9′	N23°26.1	7.7′	57.4′
1	198°40.8	28.0	350°26.2	7.8′	23°33.8	7.6′	57.4′
2	213°40.9	29.0	4°53.0	7.7′	23°41.4	7.4′	57.4′
3	228°41.1	·· 29.9	19°19.7	7.7′	23°48.8	7.3′	57.4′
4	243°41.2	30.8	33°46.4	7.6′	23°56.1	7.2′	57.5′
5	258°41.3	31.7	48°13.0	7.5′	24°03.3	7.0′	57.5′
6	273°41.4	S09°32.6	62°39.5	7.4′	N24°10.3	6.9′	57.5′
7	288°41.6	33.5	77°05.8	7.3′	24°17.2	6.8′	57.5′
8	303°41.7	34.4	91°32.2	7.2′	24°24.0	6.6′	57.5′
9	318°41.8	·· 35.3	105°58.4	7.1′	24°30.6	6.5′	57.6′
10	333°41.9	36.2	120°24.5	7.1′	24°37.1	6.3′	57.6′
11	348°42.1	37.1	134°50.6	7.0′	24°43.4	6.2′	57.6′
12	3°42.2	S09°38.1	149°16.6	6.9′	N24°49.6	6.0′	57.6′
13	18°42.3	39.0	163°42.4	6.8′	24°55.6	5.9′	57.6′
14	33°42.4	39.9	178°08.3	6.7′	25°01.5	5.8′	57.6′
15	48°42.5	·· 40.8	192°34.0	6.7′	25°07.3	5.6′	57.7′
16	63°42.7	41.7	206°59.7	6.6′	25°12.9	5.4′	57.7′
17	78°42.8	42.6	221°25.2	6.5′	25°18.3	5.3′	57.7′
18	93°42.9	S09°43.5	235°50.7	6.4′	N25°23.6	5.2′	57.7′
19	108°43.0	44.4	250°16.2	6.4′	25°28.8	5.0′	57.7′
20	123°43.1	45.3	264°41.5	6.3′	25°33.8	4.8′	57.8′
21	138°43.3	·· 46.2	279°06.8	6.2′	25°38.6	4.7′	57.8′
22	153°43.4	47.1	293°32.0	6.1′	25°43.3	4.6′	57.8′
23	168°43.5	48.0	307°57.2	6.1′	25°47.9	4.3′	57.8′
	SD = 16.0′	d = 0.9′		SD = 15.7′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:03	06:21	07:33	15:56	17:08	18:25
N 70°	05:06	06:16	07:20	16:09	17:13	18:23
68°	05:08	06:12	07:10	16:19	17:17	18:21
66°	05:10	06:09	07:02	16:28	17:20	18:19
64°	05:11	06:06	06:55	16:35	17:23	18:18
62°	05:12	06:03	06:49	16:41	17:26	18:17
60°	05:13	06:01	06:44	16:46	17:28	18:17
N 58°	05:13	05:59	06:39	16:51	17:31	18:16
56°	05:14	05:57	06:35	16:55	17:33	18:16
54°	05:14	05:55	06:31	16:59	17:35	18:16
52°	05:14	05:53	06:28	17:02	17:36	18:15
50°	05:14	05:52	06:25	17:05	17:38	18:15
45°	05:14	05:48	06:18	17:12	17:42	18:16
N 40°	05:13	05:45	06:12	17:18	17:45	18:17
35°	05:12	05:42	06:07	17:23	17:49	18:18
30°	05:11	05:39	06:03	17:27	17:52	18:19
20°	05:07	05:33	05:55	17:35	17:57	18:23
N 10°	05:03	05:27	05:49	17:42	18:03	18:28
0°	04:57	05:21	05:42	17:49	18:10	18:34
S 10°	04:49	05:14	05:35	17:55	18:17	18:42
20°	04:40	05:06	05:28	18:03	18:25	18:51
30°	04:27	04:56	05:20	18:11	18:36	19:05
35°	04:19	04:49	05:15	18:16	18:42	19:13
40°	04:09	04:42	05:10	18:22	18:50	19:23
45°	03:56	04:33	05:03	18:28	18:59	19:36
S 50°	03:40	04:22	04:56	18:36	19:10	19:52
52°	03:33	04:17	04:52	18:40	19:16	20:00
54°	03:24	04:11	04:48	18:44	19:22	20:09
56°	03:14	04:04	04:44	18:48	19:28	20:19
58°	03:02	03:57	04:39	18:53	19:36	20:31
S 60°	02:48	03:48	04:34	18:59	19:45	20:46

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	13:09	▭	▭	11:13	▭	▭
N 70°	14:16	▭	▭	10:08	▭	▭
68°	14:53	13:40	▭	09:32	12:31	▭
66°	15:19	14:55	▭	09:07	11:17	▭
64°	15:39	15:32	15:18	08:48	10:41	12:49
62°	15:56	15:58	16:05	08:32	10:15	12:02
60°	16:10	16:19	16:36	08:19	09:55	11:32
N 58°	16:22	16:36	16:59	08:08	09:39	11:09
56°	16:33	16:51	17:18	07:58	09:25	10:51
54°	16:42	17:03	17:34	07:50	09:13	10:35
52°	16:50	17:14	17:48	07:42	09:02	10:22
50°	16:58	17:24	18:00	07:35	08:53	10:10
45°	17:14	17:45	18:25	07:21	08:33	09:46
N 40°	17:27	18:02	18:45	07:09	08:17	09:26
35°	17:38	18:16	19:02	06:59	08:04	09:10
30°	17:48	18:29	19:16	06:50	07:52	08:56
20°	18:05	18:50	19:41	06:34	07:32	08:33
N 10°	18:20	19:09	20:03	06:21	07:15	08:12
0°	18:35	19:27	20:23	06:09	06:59	07:53
S 10°	18:49	19:44	20:43	05:57	06:43	07:34
20°	19:04	20:03	21:05	05:44	06:26	07:14
30°	19:22	20:26	21:30	05:29	06:06	06:50
35°	19:32	20:39	21:45	05:20	05:55	06:36
40°	19:44	20:54	22:02	05:10	05:42	06:21
45°	19:58	21:12	22:23	04:59	05:27	06:02
S 50°	20:16	21:34	22:50	04:45	05:08	05:38
52°	20:24	21:45	23:02	04:39	04:59	05:27
54°	20:33	21:57	23:17	04:32	04:49	05:15
56°	20:44	22:11	23:35	04:24	04:38	05:00
58°	20:56	22:28	23:56	04:15	04:26	04:43
S 60°	21:10	22:48	·· ··	04:05	04:11	04:22

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 100-93%
16	14:17	14:24	11:46	–:–	12:22	
17	14:30	14:37	11:45	00:47	13:13	
18	14:43	14:49	11:45	01:40	14:08	

October 19, 20, 21 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	27°14.9	166°10.5	S15°40.0	147°19.8	S21°19.9	218°00.2	N05°42.5	3°41.1	N06°50.6
1	42°17.4	181°09.9	41.1	162°20.4	20.2	233°02.2	42.3	18°43.7	50.5
2	57°19.8	196°09.3	42.1	177°21.0	20.6	248°04.3	42.1	33°46.4	50.4
3	72°22.3	211°08.7	·· 43.1	192°21.6	·· 21.0	263°06.3	·· 41.9	48°49.0	·· 50.4
4	87°24.8	226°08.1	44.2	207°22.2	21.4	278°08.3	41.7	63°51.7	50.3
5	102°27.2	241°07.6	45.2	222°22.8	21.8	293°10.3	41.6	78°54.3	50.2
6	117°29.7	256°07.0	S15°46.2	237°23.4	S21°22.1	308°12.3	N05°41.4	93°57.0	N06°50.1
7	132°32.2	271°06.4	47.2	252°23.9	22.5	323°14.4	41.2	108°59.6	50.1
8	147°34.6	286°05.8	48.3	267°24.5	22.9	338°16.4	41.0	124°02.3	50.0
9	162°37.1	301°05.2	·· 49.3	282°25.1	·· 23.3	353°18.4	·· 40.8	139°04.9	·· 49.9
10	177°39.6	316°04.6	50.3	297°25.7	23.6	8°20.4	40.6	154°07.6	49.8
11	192°42.0	331°04.1	51.3	312°26.3	24.0	23°22.4	40.5	169°10.2	49.8
12	207°44.5	346°03.5	S15°52.4	327°26.9	S21°24.4	38°24.4	N05°40.3	184°12.9	N06°49.7
13	222°47.0	1°02.9	53.4	342°27.4	24.7	53°26.5	40.1	199°15.5	49.6
14	237°49.4	16°02.3	54.4	357°28.0	25.1	68°28.5	39.9	214°18.2	49.6
15	252°51.9	31°01.7	·· 55.4	12°28.6	·· 25.5	83°30.5	·· 39.7	229°20.8	·· 49.5
16	267°54.3	46°01.1	56.5	27°29.2	25.9	98°32.5	39.5	244°23.5	49.4
17	282°56.8	61°00.5	57.5	42°29.8	26.2	113°34.5	39.4	259°26.1	49.3
18	297°59.3	75°59.9	S15°58.5	57°30.4	S21°26.6	128°36.5	N05°39.2	274°28.8	N06°49.3
19	313°01.7	90°59.4	15°59.5	72°30.9	27.0	143°38.6	39.0	289°31.4	49.2
20	328°04.2	105°58.8	16°00.5	87°31.5	27.3	158°40.6	38.8	304°34.1	49.1
21	343°06.7	120°58.2	·· 01.5	102°32.1	·· 27.7	173°42.6	·· 38.6	319°36.7	·· 49.1
22	358°09.1	135°57.6	02.6	117°32.7	28.1	188°44.6	38.5	334°39.4	49.0
23	13°11.6	150°57.0	03.6	132°33.3	28.5	203°46.6	38.3	349°42.0	48.9
Mer.pass. 22:07		ν -0.6′	d 1.0′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.76	ν 2.7′	d 0.1′ m 0.09

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	28°14.1	165°56.4	S16°04.6	147°33.8	S21°28.8	218°48.7	N05°38.1	4°44.7	N06°48.8
1	43°16.5	180°55.8	05.6	162°34.4	29.2	233°50.7	37.9	19°47.3	48.8
2	58°19.0	195°55.2	06.6	177°35.0	29.6	248°52.7	37.7	34°50.0	48.7
3	73°21.4	210°54.6	·· 07.6	192°35.6	·· 29.9	263°54.7	·· 37.5	49°52.6	·· 48.6
4	88°23.9	225°54.0	08.6	207°36.2	30.3	278°56.7	37.4	64°55.3	48.6
5	103°26.4	240°53.4	09.6	222°36.7	30.7	293°58.8	37.2	79°57.9	48.5
6	118°28.8	255°52.8	S16°10.7	237°37.3	S21°31.0	309°00.8	N05°37.0	95°00.6	N06°48.4
7	133°31.3	270°52.2	11.7	252°37.9	31.4	324°02.8	36.8	110°03.2	48.3
8	148°33.8	285°51.6	12.7	267°38.5	31.8	339°04.8	36.6	125°05.9	48.3
9	163°36.2	300°51.0	·· 13.7	282°39.0	·· 32.1	354°06.8	·· 36.5	140°08.5	·· 48.2
10	178°38.7	315°50.4	14.7	297°39.6	32.5	9°08.9	36.3	155°11.2	48.1
11	193°41.2	330°49.9	15.7	312°40.2	32.9	24°10.9	36.1	170°13.8	48.1
12	208°43.6	345°49.3	S16°16.7	327°40.8	S21°33.2	39°12.9	N05°35.9	185°16.5	N06°48.0
13	223°46.1	0°48.7	17.7	342°41.4	33.6	54°14.9	35.7	200°19.1	47.9
14	238°48.6	15°48.1	18.7	357°41.9	34.0	69°16.9	35.6	215°21.8	47.8
15	253°51.0	30°47.5	·· 19.7	12°42.5	·· 34.3	84°19.0	·· 35.4	230°24.4	·· 47.8
16	268°53.5	45°46.9	20.7	27°43.1	34.7	99°21.0	35.2	245°27.1	47.7
17	283°55.9	60°46.3	21.7	42°43.7	35.1	114°23.0	35.0	260°29.7	47.6
18	298°58.4	75°45.7	S16°22.7	57°44.2	S21°35.4	129°25.0	N05°34.8	275°32.4	N06°47.6
19	314°00.9	90°45.0	23.7	72°44.8	35.8	144°27.0	34.7	290°35.0	47.5
20	329°03.3	105°44.4	24.7	87°45.4	36.2	159°29.1	34.5	305°37.7	47.4
21	344°05.8	120°43.8	·· 25.7	102°46.0	·· 36.5	174°31.1	·· 34.3	320°40.3	·· 47.3
22	359°08.3	135°43.2	26.7	117°46.5	36.9	189°33.1	34.1	335°43.0	47.3
23	14°10.7	150°42.6	27.7	132°47.1	37.2	204°35.1	33.9	350°45.6	47.2
Mer.pass. 22:03		ν -0.6′	d 1.0′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.76	ν 2.7′	d 0.1′ m 0.10

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	29°13.2	165°42.0	S16°28.7	147°47.7	S21°37.6	219°37.2	N05°33.7	5°48.3	N06°47.1
1	44°15.7	180°41.4	29.7	162°48.2	38.0	234°39.2	33.6	20°50.9	47.0
2	59°18.1	195°40.8	30.7	177°48.8	38.3	249°41.2	33.4	35°53.6	47.0
3	74°20.6	210°40.2	·· 31.7	192°49.4	·· 38.7	264°43.2	·· 33.2	50°56.2	·· 46.9
4	89°23.1	225°39.6	32.7	207°50.0	39.0	279°45.2	33.0	65°58.9	46.8
5	104°25.5	240°39.0	33.7	222°50.5	39.4	294°47.3	32.8	81°01.6	46.8
6	119°28.0	255°38.4	S16°34.7	237°51.1	S21°39.8	309°49.3	N05°32.7	96°04.2	N06°46.7
7	134°30.4	270°37.8	35.7	252°51.7	40.1	324°51.3	32.5	111°06.9	46.6
8	149°32.9	285°37.2	36.7	267°52.2	40.5	339°53.3	32.3	126°09.5	46.5
9	164°35.4	300°36.6	·· 37.7	282°52.8	·· 40.8	354°55.4	·· 32.1	141°12.2	·· 46.5
10	179°37.8	315°36.0	38.7	297°53.4	41.2	9°57.4	31.9	156°14.8	46.4
11	194°40.3	330°35.3	39.6	312°54.0	41.6	24°59.4	31.8	171°17.5	46.3
12	209°42.8	345°34.7	S16°40.6	327°54.5	S21°41.9	40°01.4	N05°31.6	186°20.1	N06°46.3
13	224°45.2	0°34.1	41.6	342°55.1	42.3	55°03.4	31.4	201°22.8	46.2
14	239°47.7	15°33.5	42.6	357°55.7	42.6	70°05.5	31.2	216°25.4	46.1
15	254°50.2	30°32.9	·· 43.6	12°56.2	·· 43.0	85°07.5	·· 31.0	231°28.1	·· 46.0
16	269°52.6	45°32.3	44.6	27°56.8	43.3	100°09.5	30.9	246°30.7	46.0
17	284°55.1	60°31.7	45.6	42°57.4	43.7	115°11.5	30.7	261°33.4	45.9
18	299°57.6	75°31.1	S16°46.6	57°57.9	S21°44.1	130°13.6	N05°30.5	276°36.0	N06°45.8
19	315°00.0	90°30.4	47.5	72°58.5	44.4	145°15.6	30.3	291°38.7	45.8
20	330°02.5	105°29.8	48.5	87°59.1	44.8	160°17.6	30.1	306°41.3	45.7
21	345°04.9	120°29.2	·· 49.5	102°59.6	·· 45.1	175°19.6	·· 30.0	321°44.0	·· 45.6
22	0°07.4	135°28.6	50.5	118°00.2	45.5	190°21.7	29.8	336°46.6	45.6
23	15°09.9	150°28.0	51.5	133°00.8	45.8	205°23.7	29.6	351°49.3	45.5
Mer.pass. 22:00		ν -0.6′	d 1.0′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.76	ν 2.7′	d 0.1′ m 0.10

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°21.3	89°22.7
Acamar	315°09.7	-40°11.4
Menkar	314°03.5	4°12.1
Mirfak	308°24.5	49°57.6
Aldebaran	290°36.8	16°33.9
Rigel	281°01.5	-8°10.0
Capella	280°18.2	46°01.4
Bellatrix	278°20.3	6°22.6
Elnath	277°58.8	28°37.8
Alnilam	275°35.2	-1°11.0
Betelgeuse	270°49.5	7°24.8
Canopus	263°51.2	-52°42.3
Sirius	258°24.1	-16°45.1
Adhara	255°04.0	-29°00.4
Procyon	244°48.4	5°09.2
Pollux	243°14.5	27°57.4
Avior	234°13.9	-59°35.6
Suhail	222°44.8	-43°32.4
Miaplacidus	221°38.1	-69°49.6
Alphard	217°45.7	-8°46.7
Regulus	207°32.2	11°49.9
Dubhe	193°38.8	61°35.8
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°58.1	-63°15.1
Gacrux	171°49.6	-57°16.0
Alioth	166°11.6	55°48.5
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.5
Hadar	148°33.4	-60°30.4
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.8	-60°57.0
Kochab	137°21.1	74°02.5
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.8	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.8	38°48.9
Nunki	75°45.0	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.1	-56°38.8
Deneb	49°24.1	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.5

Oct 19 Tue	SHA	Mer.pass
Venus	138°55.6	12:56
Mars	120°04.9	14:10
Jupiter	190°45.3	09:27
Saturn	336°26.2	23:41

Oct 20 Wed	SHA	Mer.pass
Venus	137°42.3	12:57
Mars	119°19.8	14:09
Jupiter	190°34.6	09:23
Saturn	336°30.6	23:37

Oct 21 Thu	SHA	Mer.pass
Venus	136°28.8	12:58
Mars	118°34.5	14:08
Jupiter	190°24.0	09:20
Saturn	336°35.1	23:33

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°43.6	S09°48.9	322°22.3	6.0′	N25°52.2	4.3′	57.8′
1	198°43.7	49.8	336°47.3	6.0′	25°56.5	4.0′	57.8′
2	213°43.9	50.7	351°12.2	5.9′	26°00.5	3.9′	57.9′
3	228°44.0	·· 51.6	5°37.1	5.8′	26°04.4	3.8′	57.9′
4	243°44.1	52.5	20°02.0	5.8′	26°08.2	3.5′	57.9′
5	258°44.2	53.5	34°26.7	5.7′	26°11.7	3.5′	57.9′
6	273°44.3	S09°54.4	48°51.4	5.7′	N26°15.2	3.2′	57.9′
7	288°44.5	55.3	63°16.1	5.6′	26°18.4	3.1′	58.0′
8	303°44.6	56.2	77°40.7	5.6′	26°21.5	2.9′	58.0′
9	318°44.7	·· 57.1	92°05.3	5.5′	26°24.4	2.8′	58.0′
10	333°44.8	58.0	106°29.8	5.5′	26°27.2	2.6′	58.0′
11	348°44.9	58.9	120°54.2	5.4′	26°29.8	2.4′	58.0′
12	3°45.0	S09°59.8	135°18.6	5.4′	N26°32.2	2.3′	58.0′
13	18°45.2	10°00.7	149°43.0	5.3′	26°34.5	2.0′	58.1′
14	33°45.3	01.6	164°07.3	5.3′	26°36.5	2.0′	58.1′
15	48°45.4	·· 02.5	178°31.6	5.2′	26°38.5	1.7′	58.1′
16	63°45.5	03.4	192°55.8	5.2′	26°40.2	1.6′	58.1′
17	78°45.6	04.3	207°20.0	5.2′	26°41.8	1.4′	58.1′
18	93°45.7	S10°05.2	221°44.2	5.1′	N26°43.2	1.2′	58.1′
19	108°45.8	06.1	236°08.3	5.1′	26°44.4	1.1′	58.2′
20	123°46.0	07.0	250°32.4	5.1′	26°45.5	0.9′	58.2′
21	138°46.1	·· 07.9	264°56.5	5.0′	26°46.4	0.7′	58.2′
22	153°46.2	08.8	279°20.5	5.0′	26°47.1	0.6′	58.2′
23	168°46.3	09.7	293°44.5	5.0′	26°47.7	0.3′	58.2′
	SD = 16.0′	d = 0.9′	SD = 15.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°46.4	S10°10.6	308°08.5	5.0′	N26°48.0	0.2′	58.2′
1	198°46.5	11.5	322°32.5	5.0′	26°48.2	0.1′	58.3′
2	213°46.6	12.4	336°56.4	4.9′	26°48.3	0.2′	58.3′
3	228°46.7	·· 13.3	351°20.4	4.9′	26°48.1	0.3′	58.3′
4	243°46.9	14.2	5°44.3	4.9′	26°47.8	0.5′	58.3′
5	258°47.0	15.1	20°08.2	4.9′	26°47.3	0.7′	58.3′
6	273°47.1	S10°16.0	34°32.1	4.9′	N26°46.6	0.8′	58.3′
7	288°47.2	16.9	48°56.0	4.9′	26°45.8	1.0′	58.3′
8	303°47.3	17.8	63°19.9	4.9′	26°44.8	1.2′	58.4′
9	318°47.4	·· 18.7	77°43.7	4.9′	26°43.6	1.4′	58.4′
10	333°47.5	19.6	92°07.6	4.9′	26°42.2	1.5′	58.4′
11	348°47.6	20.5	106°31.5	4.9′	26°40.7	1.7′	58.4′
12	3°47.7	S10°21.4	120°55.4	4.9′	N26°39.0	1.9′	58.4′
13	18°47.8	22.2	135°19.2	4.9′	26°37.1	2.1′	58.4′
14	33°48.0	23.1	149°43.1	4.9′	26°35.0	2.2′	58.4′
15	48°48.1	·· 24.0	164°07.0	4.9′	26°32.8	2.5′	58.5′
16	63°48.2	24.9	178°30.9	4.9′	26°30.3	2.5′	58.5′
17	78°48.3	25.8	192°54.8	4.9′	26°27.8	2.8′	58.5′
18	93°48.4	S10°26.7	207°18.7	4.9′	N26°25.0	2.9′	58.5′
19	108°48.5	27.6	221°42.7	5.0′	26°22.1	3.2′	58.5′
20	123°48.6	28.5	236°06.6	5.0′	26°18.9	3.2′	58.5′
21	138°48.7	·· 29.4	250°30.6	5.0′	26°15.7	3.5′	58.5′
22	153°48.8	30.3	264°54.6	5.0′	26°12.2	3.6′	58.6′
23	168°48.9	31.2	279°18.6	5.0′	26°08.6	3.8′	58.6′
	SD = 16.1′	d = 0.9′	SD = 15.9′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°49.0	S10°32.1	293°42.6	5.1′	N26°04.8	4.0′	58.6′
1	198°49.1	33.0	308°06.7	5.1′	26°00.8	4.1′	58.6′
2	213°49.2	33.9	322°30.8	5.1′	25°56.7	4.3′	58.6′
3	228°49.3	·· 34.8	336°54.9	5.2′	25°52.4	4.5′	58.6′
4	243°49.4	35.7	351°19.1	5.2′	25°47.9	4.7′	58.6′
5	258°49.5	36.5	5°43.3	5.2′	25°43.2	4.8′	58.7′
6	273°49.7	S10°37.4	20°07.5	5.3′	N25°38.4	5.0′	58.7′
7	288°49.8	38.3	34°31.8	5.3′	25°33.4	5.1′	58.7′
8	303°49.9	39.2	48°56.1	5.3′	25°28.3	5.4′	58.7′
9	318°50.0	·· 40.1	63°20.4	5.4′	25°22.9	5.4′	58.7′
10	333°50.1	41.0	77°44.8	5.4′	25°17.5	5.7′	58.7′
11	348°50.2	41.9	92°09.2	5.5′	25°11.8	5.8′	58.7′
12	3°50.3	S10°42.8	106°33.7	5.5′	N25°06.0	6.0′	58.8′
13	18°50.4	43.7	120°58.2	5.6′	25°00.0	6.1′	58.8′
14	33°50.5	44.6	135°22.8	5.6′	24°53.9	6.3′	58.8′
15	48°50.6	·· 45.4	149°47.4	5.7′	24°47.6	6.5′	58.8′
16	63°50.7	46.3	164°12.0	5.7′	24°41.1	6.6′	58.8′
17	78°50.8	47.2	178°36.8	5.8′	24°34.5	6.8′	58.8′
18	93°50.9	S10°48.1	193°01.5	5.8′	N24°27.7	6.9′	58.8′
19	108°51.0	49.0	207°26.3	5.9′	24°20.8	7.2′	58.8′
20	123°51.1	49.9	221°51.2	5.9′	24°13.6	7.2′	58.9′
21	138°51.2	·· 50.8	236°16.2	6.0′	24°06.4	7.4′	58.9′
22	153°51.3	51.7	250°41.1	6.0′	23°59.0	7.6′	58.9′
23	168°51.4	52.5	265°06.2	6.1′	23°51.4	7.7′	58.9′
	SD = 16.1′	d = 0.9′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:16	06:34	07:48	15:40	16:53	18:12
N 70°	05:17	06:28	07:33	15:55	17:00	18:10
68°	05:18	06:23	07:22	16:07	17:05	18:10
66°	05:19	06:18	07:12	16:16	17:10	18:09
64°	05:19	06:15	07:04	16:24	17:14	18:09
62°	05:20	06:11	06:57	16:31	17:17	18:09
60°	05:20	06:08	06:51	16:38	17:20	18:09
N 58°	05:20	06:05	06:46	16:43	17:23	18:09
56°	05:20	06:03	06:41	16:48	17:26	18:09
54°	05:20	06:01	06:37	16:52	17:28	18:09
52°	05:19	05:58	06:33	16:56	17:30	18:09
50°	05:19	05:56	06:29	16:59	17:32	18:10
45°	05:18	05:52	06:22	17:07	17:37	18:11
N 40°	05:16	05:48	06:15	17:14	17:41	18:13
35°	05:15	05:44	06:10	17:19	17:45	18:14
30°	05:13	05:41	06:05	17:24	17:49	18:16
20°	05:08	05:34	05:56	17:33	17:55	18:21
N 10°	05:03	05:27	05:49	17:41	18:02	18:27
0°	04:56	05:20	05:41	17:48	18:09	18:34
S 10°	04:48	05:13	05:34	17:56	18:17	18:42
20°	04:37	05:04	05:26	18:04	18:26	18:53
30°	04:23	04:52	05:17	18:13	18:38	19:07
35°	04:14	04:45	05:12	18:19	18:45	19:16
40°	04:04	04:37	05:05	18:25	18:53	19:27
45°	03:50	04:28	04:58	18:32	19:03	19:40
S 50°	03:33	04:15	04:50	18:41	19:15	19:58
52°	03:25	04:10	04:46	18:45	19:21	20:07
54°	03:15	04:03	04:41	18:50	19:28	20:16
56°	03:04	03:56	04:36	18:55	19:35	20:28
58°	02:51	03:48	04:31	19:00	19:44	20:41
S 60°	02:36	03:38	04:25	19:07	19:54	20:57

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°						
64°			18:40			15:41
62°	16:30	17:37	19:21	13:40	14:39	14:59
60°	17:11	18:17	19:49	12:59	13:59	14:31
N 58°	17:40	18:44	20:11	12:31	13:31	14:09
56°	18:02	19:06	20:28	12:09	13:09	13:51
54°	18:20	19:24	20:43	11:51	12:51	13:35
52°	18:35	19:39	20:56	11:35	12:36	13:22
50°	18:49	19:52	21:08	11:22	12:23	13:10
45°	19:16	20:19	21:31	10:55	11:56	12:46
N 40°	19:38	20:40	21:50	10:33	11:34	12:26
35°	19:56	20:58	22:06	10:15	11:16	12:10
30°	20:11	21:13	22:19	10:00	11:01	11:56
20°	20:38	21:39	22:42	09:34	10:34	11:31
N 10°	21:00	22:01	23:02	09:12	10:12	11:10
0°	21:22	22:22	23:21	08:51	09:50	10:50
S 10°	21:43	22:43	23:40	08:30	09:29	10:30
20°	22:06	23:05	23:59	08:07	09:06	10:09
30°	22:32	23:31	·· ··	07:41	08:40	09:44
35°	22:48	23:46	·· ··	07:26	08:24	09:30
40°	23:06	·· ··	00:03	07:08	08:06	09:12
45°	23:29	·· ··	00:24	06:47	07:44	08:52
S 50°	23:57	·· ··	00:51	06:20	07:16	08:26
52°	·· ··	00:10	01:04	06:07	07:02	08:13
54°	·· ··	00:26	01:18	05:52	06:46	07:59
56°	·· ··	00:45	01:36	05:34	06:28	07:42
58°	·· ··	01:08	01:56	05:13	06:05	07:22
S 60°	00:23	01:38	02:22	04:46	05:34	06:56

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 19-21 87-69%
19	14:55	15:00	11:45	02:37	15:06	
20	15:06	15:11	11:45	03:36	16:06	
21	15:16	15:21	11:45	04:36	17:06	

October 22, 23, 24 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	30°12.3	165°27.4	S16°52.4	148°01.3	S21°46.2	220°25.7	N05°29.4	6°51.9	N06°45.4
1	45°14.8	180°26.7	53.4	163°01.9	46.5	235°27.7	29.2	21°54.6	45.3
2	60°17.3	195°26.1	54.4	178°02.5	46.9	250°29.8	29.1	36°57.2	45.3
3	75°19.7	210°25.5	·· 55.4	193°03.0	·· 47.2	265°31.8	·· 28.9	51°59.9	·· 45.2
4	90°22.2	225°24.9	56.4	208°03.6	47.6	280°33.8	28.7	67°02.5	45.1
5	105°24.7	240°24.3	57.3	223°04.2	47.9	295°35.8	28.5	82°05.2	45.1
6	120°27.1	255°23.7	S16°58.3	238°04.7	S21°48.3	310°37.9	N05°28.3	97°07.8	N06°45.0
7	135°29.6	270°23.0	16°59.3	253°05.3	48.6	325°39.9	28.2	112°10.5	44.9
8	150°32.1	285°22.4	17°00.3	268°05.9	49.0	340°41.9	28.0	127°13.1	44.8
9	165°34.5	300°21.8	·· 01.2	283°06.4	·· 49.3	355°43.9	·· 27.8	142°15.8	·· 44.8
10	180°37.0	315°21.2	02.2	298°07.0	49.7	10°46.0	27.6	157°18.4	44.7
11	195°39.4	330°20.5	03.2	313°07.5	50.1	25°48.0	27.5	172°21.1	44.6
12	210°41.9	345°19.9	S17°04.1	328°08.1	S21°50.4	40°50.0	N05°27.3	187°23.7	N06°44.6
13	225°44.4	0°19.3	05.1	343°08.7	50.7	55°52.0	27.1	202°26.4	44.5
14	240°46.8	15°18.7	06.1	358°09.2	51.1	70°54.1	26.9	217°29.0	44.4
15	255°49.3	30°18.0	·· 07.1	13°09.8	·· 51.4	85°56.1	·· 26.7	232°31.7	·· 44.3
16	270°51.8	45°17.4	08.0	28°10.4	51.8	100°58.1	26.6	247°34.3	44.3
17	285°54.2	60°16.8	09.0	43°10.9	52.1	116°00.1	26.4	262°37.0	44.2
18	300°56.7	75°16.2	S17°10.0	58°11.5	S21°52.5	131°02.2	N05°26.2	277°39.6	N06°44.1
19	315°59.2	90°15.5	10.9	73°12.0	52.8	146°04.2	26.0	292°42.3	44.1
20	331°01.6	105°14.9	11.9	88°12.6	53.2	161°06.2	25.8	307°44.9	44.0
21	346°04.1	120°14.3	·· 12.8	103°13.2	·· 53.5	176°08.2	·· 25.7	322°47.6	·· 43.9
22	1°06.5	135°13.7	13.8	118°13.7	53.9	191°10.3	25.5	337°50.2	43.8
23	16°09.0	150°13.0	14.8	133°14.3	54.2	206°12.3	25.3	352°52.9	43.8
Mer.pass. 21:56		ν -0.6′	d 1.0′	m -3.88	ν 0.6′	d 0.4′	m 1.35	ν 2.0′	d 0.2′ m -1.76	ν 2.7′	d 0.1′ m 0.11

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	31°11.5	165°12.4	S17°15.7	148°14.8	S21°54.6	221°14.3	N05°25.1	7°55.5	N06°43.7
1	46°13.9	180°11.8	16.7	163°15.4	54.9	236°16.4	24.9	22°58.2	43.6
2	61°16.4	195°11.1	17.7	178°16.0	55.3	251°18.4	24.8	38°00.8	43.6
3	76°18.9	210°10.5	·· 18.6	193°16.5	·· 55.6	266°20.4	·· 24.6	53°03.5	·· 43.5
4	91°21.3	225°09.9	19.6	208°17.1	56.0	281°22.4	24.4	68°06.1	43.4
5	106°23.8	240°09.2	20.5	223°17.6	56.3	296°24.5	24.2	83°08.8	43.3
6	121°26.3	255°08.6	S17°21.5	238°18.2	S21°56.6	311°26.5	N05°24.1	98°11.4	N06°43.3
7	136°28.7	270°08.0	22.4	253°18.7	57.0	326°28.5	23.9	113°14.1	43.2
8	151°31.2	285°07.3	23.4	268°19.3	57.3	341°30.5	23.7	128°16.7	43.1
9	166°33.7	300°06.7	·· 24.4	283°19.9	·· 57.7	356°32.6	·· 23.5	143°19.4	·· 43.1
10	181°36.1	315°06.1	25.3	298°20.4	58.0	11°34.6	23.3	158°22.0	43.0
11	196°38.6	330°05.4	26.3	313°21.0	58.4	26°36.6	23.2	173°24.7	42.9
12	211°41.0	345°04.8	S17°27.2	328°21.5	S21°58.7	41°38.7	N05°23.0	188°27.3	N06°42.9
13	226°43.5	0°04.2	28.2	343°22.1	59.0	56°40.7	22.8	203°30.0	42.8
14	241°46.0	15°03.5	29.1	358°22.6	59.4	71°42.7	22.6	218°32.6	42.7
15	256°48.4	30°02.9	·· 30.1	13°23.2	21°59.7	86°44.7	·· 22.5	233°35.3	·· 42.6
16	271°50.9	45°02.2	31.0	28°23.7	22°00.1	101°46.8	22.3	248°37.9	42.6
17	286°53.4	60°01.6	32.0	43°24.3	00.4	116°48.8	22.1	263°40.6	42.5
18	301°55.8	75°01.0	S17°32.9	58°24.9	S22°00.7	131°50.8	N05°21.9	278°43.2	N06°42.4
19	316°58.3	90°00.3	33.9	73°25.4	01.1	146°52.9	21.7	293°45.9	42.4
20	332°00.8	104°59.7	34.8	88°26.0	01.4	161°54.9	21.6	308°48.5	42.3
21	347°03.2	119°59.0	·· 35.8	103°26.5	·· 01.8	176°56.9	·· 21.4	323°51.2	·· 42.2
22	2°05.7	134°58.4	36.7	118°27.1	02.1	191°58.9	21.2	338°53.8	42.1
23	17°08.2	149°57.8	37.6	133°27.6	02.4	207°01.0	21.0	353°56.5	42.1
Mer.pass. 21:52		ν -0.6′	d 1.0′	m -3.88	ν 0.6′	d 0.3′	m 1.35	ν 2.0′	d 0.2′ m -1.77	ν 2.6′	d 0.1′ m 0.12

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	32°10.6	164°57.1	S17°38.6	148°28.2	S22°02.8	222°03.0	N05°20.9	8°59.1	N06°42.0
1	47°13.1	179°56.5	39.5	163°28.7	03.1	237°05.0	20.7	24°01.8	41.9
2	62°15.5	194°55.8	40.5	178°29.3	03.4	252°07.1	20.5	39°04.4	41.9
3	77°18.0	209°55.2	·· 41.4	193°29.8	·· 03.8	267°09.1	·· 20.3	54°07.0	·· 41.8
4	92°20.5	224°54.5	42.3	208°30.4	04.1	282°11.1	20.1	69°09.7	41.7
5	107°22.9	239°53.9	43.3	223°30.9	04.4	297°13.2	20.0	84°12.3	41.7
6	122°25.4	254°53.3	S17°44.2	238°31.5	S22°04.8	312°15.2	N05°19.8	99°15.0	N06°41.6
7	137°27.9	269°52.6	45.2	253°32.0	05.1	327°17.2	19.6	114°17.6	41.5
8	152°30.3	284°52.0	46.1	268°32.6	05.5	342°19.3	19.4	129°20.3	41.4
9	167°32.8	299°51.3	·· 47.0	283°33.1	·· 05.8	357°21.3	·· 19.3	144°22.9	·· 41.4
10	182°35.3	314°50.7	48.0	298°33.7	06.1	12°23.3	19.1	159°25.6	41.3
11	197°37.7	329°50.0	48.9	313°34.2	06.5	27°25.3	18.9	174°28.2	41.2
12	212°40.2	344°49.4	S17°49.8	328°34.8	S22°06.8	42°27.4	N05°18.7	189°30.9	N06°41.2
13	227°42.6	359°48.7	50.8	343°35.3	07.1	57°29.4	18.6	204°33.5	41.1
14	242°45.1	14°48.1	51.7	358°35.9	07.5	72°31.4	18.4	219°36.2	41.0
15	257°47.6	29°47.4	·· 52.6	13°36.4	·· 07.8	87°33.5	·· 18.2	234°38.8	·· 41.0
16	272°50.0	44°46.8	53.6	28°37.0	08.1	102°35.5	18.0	249°41.5	40.9
17	287°52.5	59°46.1	54.5	43°37.5	08.5	117°37.5	17.9	264°44.1	40.8
18	302°55.0	74°45.5	S17°55.4	58°38.1	S22°08.8	132°39.6	N05°17.7	279°46.8	N06°40.7
19	317°57.4	89°44.8	56.4	73°38.6	09.1	147°41.6	17.5	294°49.4	40.7
20	332°59.9	104°44.2	57.3	88°39.2	09.4	162°43.6	17.3	309°52.1	40.6
21	348°02.4	119°43.5	·· 58.2	103°39.7	·· 09.8	177°45.7	·· 17.1	324°54.7	·· 40.5
22	3°04.8	134°42.8	17°59.1	118°40.3	10.1	192°47.7	17.0	339°57.4	40.5
23	18°07.3	149°42.2	18°00.1	133°40.8	10.4	207°49.7	16.8	355°00.0	40.4
Mer.pass. 21:48		ν -0.6′	d 0.9′	m -3.88	ν 0.6′	d 0.3′	m 1.34	ν 2.0′	d 0.2′ m -1.77	ν 2.6′	d 0.1′ m 0.13

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°20.4	89°22.7
Acamar	315°09.7	-40°11.4
Menkar	314°03.4	4°12.1
Mirfak	308°24.5	49°57.6
Aldebaran	290°36.7	16°33.9
Rigel	281°01.5	-8°10.0
Capella	280°18.2	46°01.4
Bellatrix	278°20.2	6°22.6
Elnath	277°58.8	28°37.8
Alnilam	275°35.2	-1°11.0
Betelgeuse	270°49.4	7°24.8
Canopus	263°51.2	-52°42.3
Sirius	258°24.1	-16°45.1
Adhara	255°04.0	-29°00.4
Procyon	244°48.4	5°09.2
Pollux	243°14.5	27°57.4
Avior	234°13.8	-59°35.6
Suhail	222°44.7	-43°32.4
Miaplacidus	221°38.0	-69°49.6
Alphard	217°45.6	-8°46.7
Regulus	207°32.2	11°49.8
Dubhe	193°38.8	61°35.8
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°58.1	-63°15.1
Gacrux	171°49.6	-57°16.0
Alioth	166°11.6	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.5
Hadar	148°33.4	-60°30.4
Menkent	147°55.3	-36°30.4
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.8	-60°57.0
Kochab	137°21.1	74°02.5
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.8	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.6	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.8	38°48.9
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.1	-56°38.8
Deneb	49°24.2	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.6

Oct 22 Fri	SHA	Mer.pass
Venus	135°15.0	12:59
Mars	117°49.0	14:07
Jupiter	190°13.4	09:17
Saturn	336°39.6	23:28

Oct 23 Sat	SHA	Mer.pass
Venus	134°00.9	13:00
Mars	117°03.4	14:06
Jupiter	190°02.8	09:14
Saturn	336°44.0	23:24

Oct 24 Sun	SHA	Mer.pass
Venus	132°46.5	13:01
Mars	116°17.6	14:06
Jupiter	189°52.4	09:11
Saturn	336°48.5	23:20

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0815 sec ΔT = TT-UT1 = +69.2655 sec

2027 October 22 to Oct. 24 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°51.5	S10°53.4	279°31.3	6.2′	N23°43.7	7.9′	58.9′
1	198°51.6	54.3	293°56.5	6.2′	23°35.8	8.0′	58.9′
2	213°51.7	55.2	308°21.7	6.3′	23°27.8	8.2′	58.9′
3	228°51.8	·· 56.1	322°47.0	6.4′	23°19.6	8.3′	58.9′
4	243°51.9	57.0	337°12.3	6.4′	23°11.3	8.5′	58.9′
5	258°52.0	57.9	351°37.8	6.5′	23°02.8	8.6′	59.0′
6	273°52.1	S10°58.7	6°03.3	6.6′	N22°54.2	8.7′	59.0′
7	288°52.2	10°59.6	20°28.8	6.6′	22°45.5	9.0′	59.0′
8	303°52.3	11°00.5	34°54.4	6.7′	22°36.5	9.0′	59.0′
9	318°52.3	·· 01.4	49°20.1	6.8′	22°27.5	9.2′	59.0′
10	333°52.4	02.3	63°45.9	6.8′	22°18.3	9.3′	59.0′
11	348°52.5	03.2	78°11.7	6.9′	22°09.0	9.5′	59.0′
12	3°52.6	S11°04.0	92°37.6	7.0′	N21°59.5	9.6′	59.0′
13	18°52.7	04.9	107°03.5	7.0′	21°49.9	9.8′	59.0′
14	33°52.8	05.8	121°29.6	7.1′	21°40.1	9.8′	59.1′
15	48°52.9	·· 06.7	135°55.7	7.2′	21°30.3	10.1′	59.1′
16	63°53.0	07.6	150°21.8	7.2′	21°20.2	10.1′	59.1′
17	78°53.1	08.5	164°48.1	7.3′	21°10.1	10.3′	59.1′
18	93°53.2	S11°09.3	179°14.4	7.4′	N20°59.8	10.4′	59.1′
19	108°53.3	10.2	193°40.8	7.5′	20°49.4	10.5′	59.1′
20	123°53.4	11.1	208°07.2	7.5′	20°38.9	10.7′	59.1′
21	138°53.5	·· 12.0	222°33.7	7.6′	20°28.2	10.8′	59.1′
22	153°53.6	12.9	237°00.3	7.7′	20°17.4	10.9′	59.1′
23	168°53.7	13.7	251°27.0	7.7′	20°06.5	11.1′	59.1′
	SD = 16.1′	d = 0.9′	SD = 16.1′				

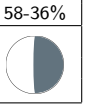
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°53.8	S11°14.6	265°53.8	7.8′	N19°55.4	11.1′	59.1′
1	198°53.8	15.5	280°20.6	7.9′	19°44.3	11.3′	59.2′
2	213°53.9	16.4	294°47.5	8.0′	19°33.0	11.4′	59.2′
3	228°54.0	·· 17.3	309°14.4	8.0′	19°21.6	11.5′	59.2′
4	243°54.1	18.1	323°41.5	8.1′	19°10.1	11.7′	59.2′
5	258°54.2	19.0	338°08.6	8.2′	18°58.4	11.7′	59.2′
6	273°54.3	S11°19.9	352°35.7	8.2′	N18°46.7	11.9′	59.2′
7	288°54.4	20.8	7°03.0	8.3′	18°34.8	12.0′	59.2′
8	303°54.5	21.6	21°30.3	8.4′	18°22.8	12.1′	59.2′
9	318°54.6	·· 22.5	35°57.7	8.5′	18°10.7	12.2′	59.2′
10	333°54.6	23.4	50°25.2	8.5′	17°58.5	12.3′	59.2′
11	348°54.7	24.3	64°52.7	8.6′	17°46.2	12.4′	59.2′
12	3°54.8	S11°25.2	79°20.3	8.7′	N17°33.8	12.5′	59.2′
13	18°54.9	26.0	93°48.0	8.7′	17°21.3	12.6′	59.3′
14	33°55.0	26.9	108°15.7	8.8′	17°08.7	12.8′	59.3′
15	48°55.1	·· 27.8	122°43.5	8.9′	16°55.9	12.8′	59.3′
16	63°55.2	28.7	137°11.4	9.0′	16°43.1	12.9′	59.3′
17	78°55.3	29.5	151°39.4	9.0′	16°30.2	13.0′	59.3′
18	93°55.3	S11°30.4	166°07.4	9.1′	N16°17.2	13.1′	59.3′
19	108°55.4	31.3	180°35.5	9.2′	16°04.1	13.3′	59.3′
20	123°55.5	32.2	195°03.7	9.2′	15°50.8	13.3′	59.3′
21	138°55.6	·· 33.0	209°31.9	9.3′	15°37.5	13.4′	59.3′
22	153°55.7	33.9	224°00.2	9.4′	15°24.1	13.4′	59.3′
23	168°55.8	34.8	238°28.5	9.4′	15°10.7	13.6′	59.3′
	SD = 16.1′	d = 0.9′	SD = 16.1′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°55.9	S11°35.6	252°56.9	9.5′	N14°57.1	13.7′	59.3′
1	198°55.9	36.5	267°25.4	9.5′	14°43.4	13.7′	59.3′
2	213°56.0	37.4	281°54.0	9.6′	14°29.7	13.9′	59.3′
3	228°56.1	·· 38.3	296°22.6	9.7′	14°15.8	13.9′	59.3′
4	243°56.2	39.1	310°51.2	9.7′	14°01.9	14.0′	59.3′
5	258°56.3	40.0	325°20.0	9.8′	13°47.9	14.0′	59.4′
6	273°56.4	S11°40.9	339°48.8	9.9′	N13°33.9	14.2′	59.4′
7	288°56.4	41.7	354°17.6	9.9′	13°19.7	14.2′	59.4′
8	303°56.5	42.6	8°46.5	10.0′	13°05.5	14.3′	59.4′
9	318°56.6	·· 43.5	23°15.5	10.0′	12°51.2	14.4′	59.4′
10	333°56.7	44.4	37°44.5	10.1′	12°36.8	14.4′	59.4′
11	348°56.8	45.2	52°13.6	10.1′	12°22.4	14.5′	59.4′
12	3°56.8	S11°46.1	66°42.8	10.2′	N12°07.9	14.6′	59.4′
13	18°56.9	47.0	81°11.9	10.2′	11°53.3	14.7′	59.4′
14	33°57.0	47.8	95°41.2	10.3′	11°38.6	14.7′	59.4′
15	48°57.1	·· 48.7	110°10.5	10.4′	11°23.9	14.8′	59.4′
16	63°57.2	49.6	124°39.9	10.4′	11°09.1	14.8′	59.4′
17	78°57.2	50.4	139°09.3	10.5′	10°54.3	14.9′	59.4′
18	93°57.3	S11°51.3	153°38.7	10.5′	N10°39.4	15.0′	59.4′
19	108°57.4	52.2	168°08.2	10.6′	10°24.4	15.0′	59.4′
20	123°57.5	53.0	182°37.8	10.6′	10°09.4	15.1′	59.4′
21	138°57.5	·· 53.9	197°07.4	10.6′	09°54.3	15.1′	59.4′
22	153°57.6	54.8	211°37.0	10.7′	09°39.2	15.2′	59.4′
23	168°57.7	55.6	226°06.7	10.7′	09°24.0	15.3′	59.4′
	SD = 16.1′	d = 0.9′	SD = 16.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:28	06:48	08:04	15:23	16:39	17:58
N 70°	05:28	06:40	07:47	15:41	16:47	17:58
68°	05:28	06:33	07:33	15:54	16:54	17:59
66°	05:28	06:28	07:22	16:05	16:59	17:59
64°	05:28	06:23	07:13	16:14	17:04	18:00
62°	05:27	06:19	07:05	16:22	17:09	18:00
60°	05:27	06:15	06:59	16:29	17:12	18:01
N 58°	05:26	06:12	06:53	16:35	17:16	18:01
56°	05:26	06:09	06:47	16:41	17:19	18:02
54°	05:25	06:06	06:43	16:45	17:22	18:03
52°	05:24	06:04	06:38	16:50	17:24	18:04
50°	05:23	06:01	06:34	16:54	17:27	18:04
45°	05:22	05:56	06:26	17:02	17:32	18:06
N 40°	05:19	05:51	06:19	17:10	17:37	18:09
35°	05:17	05:47	06:12	17:16	17:41	18:11
30°	05:15	05:43	06:07	17:21	17:46	18:14
20°	05:09	05:35	05:57	17:31	17:53	18:19
N 10°	05:03	05:28	05:49	17:40	18:01	18:26
0°	04:55	05:20	05:41	17:48	18:09	18:33
S 10°	04:46	05:11	05:33	17:56	18:17	18:43
20°	04:35	05:01	05:24	18:05	18:28	18:54
30°	04:20	04:49	05:14	18:15	18:40	19:09
35°	04:10	04:42	05:08	18:21	18:48	19:19
40°	03:59	04:33	05:01	18:28	18:57	19:31
45°	03:45	04:22	04:53	18:36	19:07	19:45
S 50°	03:26	04:09	04:44	18:46	19:21	20:04
52°	03:17	04:03	04:39	18:51	19:27	20:13
54°	03:07	03:56	04:34	18:56	19:34	20:24
56°	02:55	03:48	04:29	19:01	19:43	20:36
58°	02:40	03:39	04:23	19:07	19:52	20:51
S 60°	02:23	03:28	04:16	19:14	20:02	21:09

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▭	21:09	·· ··	▭	17:11	16:08
N 70°	▭	21:49	·· ··	▭	16:29	15:51
68°	19:33	22:16	·· ··	16:50	16:01	15:37
66°	20:21	22:36	·· ··	16:01	15:39	15:25
64°	20:52	22:52	·· ··	15:29	15:22	15:15
62°	21:14	23:05	·· ··	15:06	15:07	15:07
60°	21:32	23:17	·· ··	14:47	14:55	15:00
N 58°	21:48	23:26	·· ··	14:31	14:44	14:53
56°	22:00	23:35	·· ··	14:17	14:35	14:48
54°	22:12	23:42	·· ··	14:05	14:27	14:42
52°	22:21	23:49	·· ··	13:55	14:19	14:38
50°	22:30	23:55	·· ··	13:46	14:12	14:34
45°	22:49	·· ··	00:08	13:26	13:58	14:24
N 40°	23:04	·· ··	00:18	13:10	13:46	14:17
35°	23:16	·· ··	00:27	12:56	13:35	14:10
30°	23:27	·· ··	00:35	12:44	13:26	14:04
20°	23:46	·· ··	00:49	12:23	13:11	13:54
N 10°	·· ··	00:03	01:00	12:05	12:57	13:44
0°	·· ··	00:18	01:11	11:48	12:44	13:36
S 10°	·· ··	00:33	01:22	11:31	12:30	13:27
20°	·· ··	00:49	01:34	11:13	12:16	13:18
30°	00:22	01:07	01:47	10:52	12:00	13:07
35°	00:36	01:18	01:55	10:39	11:50	13:01
40°	00:51	01:30	02:03	10:25	11:39	12:53
45°	01:09	01:45	02:13	10:07	11:26	12:45
S 50°	01:32	02:02	02:26	09:46	11:10	12:35
52°	01:42	02:10	02:31	09:36	11:03	12:30
54°	01:55	02:19	02:37	09:24	10:54	12:25
56°	02:08	02:30	02:44	09:11	10:45	12:19
58°	02:25	02:41	02:52	08:55	10:34	12:12
S 60°	02:44	02:55	03:00	08:36	10:21	12:05

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 22-24 58-36%
22	15:26	15:31	11:44	05:35	18:03	
23	15:35	15:39	11:44	06:31	18:58	
24	15:43	15:47	11:44	07:24	19:49	



October 25, 26, 27 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	33°09.8	164°41.5	S18°01.0	148°41.3	S22°10.8	222°51.8	N05°16.6	10°02.7	N06°40.3
1	48°12.2	179°40.9	01.9	163°41.9	11.1	237°53.8	16.4	25°05.3	40.2
2	63°14.7	194°40.2	02.8	178°42.4	11.4	252°55.8	16.3	40°08.0	40.2
3	78°17.1	209°39.6	·· 03.7	193°43.0	·· 11.7	267°57.9	·· 16.1	55°10.6	·· 40.1
4	93°19.6	224°38.9	04.7	208°43.5	12.1	282°59.9	15.9	70°13.3	40.0
5	108°22.1	239°38.2	05.6	223°44.1	12.4	298°01.9	15.7	85°15.9	40.0
6	123°24.5	254°37.6	S18°06.5	238°44.6	S22°12.7	313°04.0	N05°15.6	100°18.6	N06°39.9
7	138°27.0	269°36.9	07.4	253°45.2	13.1	328°06.0	15.4	115°21.2	39.8
8	153°29.5	284°36.3	08.3	268°45.7	13.4	343°08.0	15.2	130°23.9	39.8
9	168°31.9	299°35.6	·· 09.3	283°46.2	·· 13.7	358°10.1	·· 15.0	145°26.5	·· 39.7
10	183°34.4	314°34.9	10.2	298°46.8	14.0	13°12.1	14.9	160°29.2	39.6
11	198°36.9	329°34.3	11.1	313°47.3	14.4	28°14.1	14.7	175°31.8	39.6
12	213°39.3	344°33.6	S18°12.0	328°47.9	S22°14.7	43°16.2	N05°14.5	190°34.5	N06°39.5
13	228°41.8	359°33.0	12.9	343°48.4	15.0	58°18.2	14.3	205°37.1	39.4
14	243°44.3	14°32.3	13.8	358°49.0	15.3	73°20.2	14.2	220°39.8	39.3
15	258°46.7	29°31.6	·· 14.7	13°49.5	·· 15.7	88°22.3	·· 14.0	235°42.4	·· 39.3
16	273°49.2	44°31.0	15.6	28°50.0	16.0	103°24.3	13.8	250°45.1	39.2
17	288°51.6	59°30.3	16.6	43°50.6	16.3	118°26.3	13.6	265°47.7	39.1
18	303°54.1	74°29.6	S18°17.5	58°51.1	S22°16.6	133°28.4	N05°13.5	280°50.4	N06°39.1
19	318°56.6	89°29.0	18.4	73°51.7	17.0	148°30.4	13.3	295°53.0	39.0
20	333°59.0	104°28.3	19.3	88°52.2	17.3	163°32.4	13.1	310°55.7	38.9
21	349°01.5	119°27.6	·· 20.2	103°52.7	·· 17.6	178°34.5	·· 12.9	325°58.3	·· 38.9
22	4°04.0	134°27.0	21.1	118°53.3	17.9	193°36.5	12.8	341°00.9	38.8
23	19°06.4	149°26.3	22.0	133°53.8	18.2	208°38.5	12.6	356°03.6	38.7
Mer.pass. 21:44		ν -0.7′	d 0.9′	m -3.88	ν 0.5′	d 0.3′	m 1.34	ν 2.0′	d 0.2′ m -1.77	ν 2.6′	d 0.1′ m 0.14

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	34°08.9	164°25.6	S18°22.9	148°54.4	S22°18.6	223°40.6	N05°12.4	11°06.2	N06°38.6
1	49°11.4	179°25.0	23.8	163°54.9	18.9	238°42.6	12.2	26°08.9	38.6
2	64°13.8	194°24.3	24.7	178°55.4	19.2	253°44.6	12.1	41°11.5	38.5
3	79°16.3	209°23.6	·· 25.6	193°56.0	·· 19.5	268°46.7	·· 11.9	56°14.2	·· 38.4
4	94°18.7	224°23.0	26.5	208°56.5	19.8	283°48.7	11.7	71°16.8	38.4
5	109°21.2	239°22.3	27.4	223°57.0	20.2	298°50.8	11.5	86°19.5	38.3
6	124°23.7	254°21.6	S18°28.3	238°57.6	S22°20.5	313°52.8	N05°11.4	101°22.1	N06°38.2
7	139°26.1	269°20.9	29.2	253°58.1	20.8	328°54.8	11.2	116°24.8	38.2
8	154°28.6	284°20.3	30.1	268°58.7	21.1	343°56.9	11.0	131°27.4	38.1
9	169°31.1	299°19.6	·· 31.0	283°59.2	·· 21.4	358°58.9	·· 10.8	146°30.1	·· 38.0
10	184°33.5	314°18.9	31.9	298°59.7	21.7	14°00.9	10.7	161°32.7	38.0
11	199°36.0	329°18.2	32.8	314°00.3	22.1	29°03.0	10.5	176°35.4	37.9
12	214°38.5	344°17.6	S18°33.7	329°00.8	S22°22.4	44°05.0	N05°10.3	191°38.0	N06°37.8
13	229°40.9	359°16.9	34.6	344°01.3	22.7	59°07.1	10.1	206°40.7	37.7
14	244°43.4	14°16.2	35.5	359°01.9	23.0	74°09.1	10.0	221°43.3	37.7
15	259°45.9	29°15.5	·· 36.4	14°02.4	·· 23.3	89°11.1	·· 09.8	236°46.0	·· 37.6
16	274°48.3	44°14.9	37.2	29°02.9	23.6	104°13.2	09.6	251°48.6	37.5
17	289°50.8	59°14.2	38.1	44°03.5	24.0	119°15.2	09.4	266°51.3	37.5
18	304°53.2	74°13.5	S18°39.0	59°04.0	S22°24.3	134°17.2	N05°09.3	281°53.9	N06°37.4
19	319°55.7	89°12.8	39.9	74°04.5	24.6	149°19.3	09.1	296°56.6	37.3
20	334°58.2	104°12.1	40.8	89°05.1	24.9	164°21.3	08.9	311°59.2	37.3
21	350°00.6	119°11.5	·· 41.7	104°05.6	·· 25.2	179°23.4	·· 08.7	327°01.8	·· 37.2
22	5°03.1	134°10.8	42.6	119°06.1	25.5	194°25.4	08.6	342°04.5	37.1
23	20°05.6	149°10.1	43.5	134°06.7	25.8	209°27.4	08.4	357°07.1	37.1
Mer.pass. 21:40		ν -0.7′	d 0.9′	m -3.88	ν 0.5′	d 0.3′	m 1.34	ν 2.0′	d 0.2′ m -1.78	ν 2.6′	d 0.1′ m 0.14

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	35°08.0	164°09.4	S18°44.3	149°07.2	S22°26.1	224°29.5	N05°08.2	12°09.8	N06°37.0
1	50°10.5	179°08.7	45.2	164°07.7	26.5	239°31.5	08.0	27°12.4	36.9
2	65°13.0	194°08.1	46.1	179°08.3	26.8	254°33.5	07.9	42°15.1	36.8
3	80°15.4	209°07.4	·· 47.0	194°08.8	·· 27.1	269°35.6	·· 07.7	57°17.7	·· 36.8
4	95°17.9	224°06.7	47.9	209°09.3	27.4	284°37.6	07.5	72°20.4	36.7
5	110°20.3	239°06.0	48.7	224°09.9	27.7	299°39.7	07.4	87°23.0	36.6
6	125°22.8	254°05.3	S18°49.6	239°10.4	S22°28.0	314°41.7	N05°07.2	102°25.7	N06°36.6
7	140°25.3	269°04.6	50.5	254°10.9	28.3	329°43.7	07.0	117°28.3	36.5
8	155°27.7	284°04.0	51.4	269°11.4	28.6	344°45.8	06.8	132°31.0	36.4
9	170°30.2	299°03.3	·· 52.3	284°12.0	·· 28.9	359°47.8	·· 06.7	147°33.6	·· 36.4
10	185°32.7	314°02.6	53.1	299°12.5	29.3	14°49.9	06.5	162°36.3	36.3
11	200°35.1	329°01.9	54.0	314°13.0	29.6	29°51.9	06.3	177°38.9	36.2
12	215°37.6	344°01.2	S18°54.9	329°13.6	S22°29.9	44°53.9	N05°06.1	192°41.6	N06°36.2
13	230°40.1	359°00.5	55.7	344°14.1	30.2	59°56.0	06.0	207°44.2	36.1
14	245°42.5	13°59.8	56.6	359°14.6	30.5	74°58.0	05.8	222°46.9	36.0
15	260°45.0	28°59.1	·· 57.5	14°15.1	·· 30.8	90°00.1	·· 05.6	237°49.5	·· 35.9
16	275°47.5	43°58.4	58.4	29°15.7	31.1	105°02.1	05.4	252°52.1	35.9
17	290°49.9	58°57.8	18°59.2	44°16.2	31.4	120°04.1	05.3	267°54.8	35.8
18	305°52.4	73°57.1	S19°00.1	59°16.7	S22°31.7	135°06.2	N05°05.1	282°57.4	N06°35.7
19	320°54.8	88°56.4	01.0	74°17.3	32.0	150°08.2	04.9	298°00.1	35.7
20	335°57.3	103°55.7	01.8	89°17.8	32.3	165°10.3	04.8	313°02.7	35.6
21	350°59.8	118°55.0	·· 02.7	104°18.3	·· 32.6	180°12.3	·· 04.6	328°05.4	·· 35.5
22	6°02.2	133°54.3	03.6	119°18.8	32.9	195°14.3	04.4	343°08.0	35.5
23	21°04.7	148°53.6	04.4	134°19.4	33.2	210°16.4	04.2	358°10.7	35.4
Mer.pass. 21:36		ν -0.7′	d 0.9′	m -3.88	ν 0.5′	d 0.3′	m 1.34	ν 2.0′	d 0.2′ m -1.78	ν 2.6′	d 0.1′ m 0.15

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.5	-42°09.2
Schedar	349°27.8	56°41.6
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.6
Hamal	327°48.3	23°35.8
Polaris	312°19.8	89°22.8
Acamar	315°09.6	-40°11.4
Menkar	314°03.4	4°12.1
Mirfak	308°24.5	49°57.6
Aldebaran	290°36.7	16°34.0
Rigel	281°01.4	-8°10.0
Capella	280°18.2	46°01.4
Bellatrix	278°20.2	6°22.6
Elnath	277°58.7	28°37.8
Alnilam	275°35.2	-1°11.0
Betelgeuse	270°49.4	7°24.8
Canopus	263°51.1	-52°42.3
Sirius	258°24.1	-16°45.1
Adhara	255°03.9	-29°00.4
Procyon	244°48.4	5°09.2
Pollux	243°14.5	27°57.4
Avior	234°13.8	-59°35.6
Suhail	222°44.7	-43°32.4
Miaplacidus	221°38.0	-69°49.6
Alphard	217°45.6	-8°46.7
Regulus	207°32.2	11°49.8
Dubhe	193°38.7	61°35.8
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°58.1	-63°15.1
Gacrux	171°49.6	-57°16.0
Alioth	166°11.6	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.4
Hadar	148°33.4	-60°30.4
Menkent	147°55.3	-36°30.3
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.8	-60°57.0
Kochab	137°21.1	74°02.4
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.7	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.9
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.2	-56°38.8
Deneb	49°24.2	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.6

Oct 25 Mon	SHA	Mer.pass
Venus	131°31.8	13:02
Mars	115°31.6	14:05
Jupiter	189°42.0	09:07
Saturn	336°52.9	23:16

Oct 26 Tue	SHA	Mer.pass
Venus	130°16.7	13:03
Mars	114°45.5	14:04
Jupiter	189°31.7	09:04
Saturn	336°57.4	23:11

Oct 27 Wed	SHA	Mer.pass
Venus	129°01.4	13:04
Mars	113°59.2	14:03
Jupiter	189°21.4	09:01
Saturn	337°01.8	23:07

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0821 sec ΔT = TT-UT1 = +69.2661 sec

2027 October 25 to Oct. 27 UT

h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.8	S11°56.5	240°36.4	10.8′	N09°08.7	15.2′	59.4′
1	198°57.9	57.4	255°06.2	10.8′	08°53.5	15.4′	59.4′
2	213°57.9	58.2	269°36.0	10.9′	08°38.1	15.4′	59.4′
3	228°58.0	11°59.1	284°05.9	10.9′	08°22.7	15.4′	59.4′
4	243°58.1	12°00.0	298°35.8	10.9′	08°07.3	15.5′	59.4′
5	258°58.2	00.8	313°05.7	11.0′	07°51.8	15.5′	59.4′
6	273°58.2	S12°01.7	327°35.7	11.0′	N07°36.3	15.5′	59.4′
7	288°58.3	02.5	342°05.7	11.1′	07°20.8	15.6′	59.4′
8	303°58.4	03.4	356°35.8	11.1′	07°05.2	15.7′	59.4′
9	318°58.5	·· 04.3	11°05.9	11.1′	06°49.5	15.6′	59.4′
10	333°58.5	05.1	25°36.0	11.2′	06°33.9	15.8′	59.4′
11	348°58.6	06.0	40°06.1	11.2′	06°18.1	15.7′	59.4′
12	3°58.7	S12°06.9	54°36.3	11.2′	N06°02.4	15.8′	59.4′
13	18°58.7	07.7	69°06.5	11.2′	05°46.6	15.8′	59.4′
14	33°58.8	08.6	83°36.8	11.3′	05°30.8	15.8′	59.4′
15	48°58.9	·· 09.4	98°07.1	11.3′	05°15.0	15.9′	59.4′
16	63°59.0	10.3	112°37.4	11.3′	04°59.1	15.8′	59.4′
17	78°59.0	11.2	127°07.7	11.3′	04°43.3	15.9′	59.4′
18	93°59.1	S12°12.0	141°38.0	11.4′	N04°27.4	16.0′	59.4′
19	108°59.2	12.9	156°08.4	11.4′	04°11.4	15.9′	59.4′
20	123°59.2	13.7	170°38.8	11.4′	03°55.5	16.0′	59.4′
21	138°59.3	·· 14.6	185°09.2	11.4′	03°39.5	16.0′	59.4′
22	153°59.4	15.4	199°39.7	11.5′	03°23.5	16.0′	59.4′
23	168°59.5	16.3	214°10.1	11.5′	03°07.5	16.0′	59.4′
	SD = 16.1′	d = 0.9′	SD = 16.2′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.5	S12°17.2	228°40.6	11.5′	N02°51.5	16.0′	59.4′
1	198°59.6	18.0	243°11.1	11.5′	02°35.5	16.1′	59.4′
2	213°59.7	18.9	257°41.6	11.5′	02°19.4	16.0′	59.4′
3	228°59.7	·· 19.7	272°12.1	11.5′	02°03.4	16.1′	59.4′
4	243°59.8	20.6	286°42.6	11.5′	01°47.3	16.1′	59.4′
5	258°59.9	21.4	301°13.2	11.6′	01°31.2	16.1′	59.3′
6	273°59.9	S12°22.3	315°43.7	11.6′	N01°15.1	16.0′	59.3′
7	289°00.0	23.2	330°14.3	11.6′	00°59.1	16.1′	59.3′
8	304°00.1	24.0	344°44.9	11.6′	00°43.0	16.1′	59.3′
9	319°00.1	·· 24.9	359°15.5	11.6′	00°26.9	16.1′	59.3′
10	334°00.2	25.7	13°46.1	11.6′	N00°10.8	16.1′	59.3′
11	349°00.3	26.6	28°16.7	11.6′	S00°05.3	16.1′	59.3′
12	4°00.3	S12°27.4	42°47.3	11.6′	S00°21.4	16.0′	59.3′
13	19°00.4	28.3	57°17.9	11.6′	00°37.4	16.1′	59.3′
14	34°00.4	29.1	71°48.5	11.6′	00°53.5	16.1′	59.3′
15	49°00.5	·· 30.0	86°19.1	11.6′	01°09.6	16.0′	59.3′
16	64°00.6	30.8	100°49.7	11.6′	01°25.6	16.1′	59.3′
17	79°00.6	31.7	115°20.3	11.6′	01°41.7	16.0′	59.3′
18	94°00.7	S12°32.5	129°50.9	11.6′	S01°57.7	16.0′	59.3′
19	109°00.8	33.4	144°21.5	11.6′	02°13.7	16.0′	59.2′
20	124°00.8	34.2	158°52.1	11.6′	02°29.7	16.0′	59.2′
21	139°00.9	·· 35.1	173°22.7	11.6′	02°45.7	16.0′	59.2′
22	154°01.0	35.9	187°53.3	11.6′	03°01.7	15.9′	59.2′
23	169°01.0	36.8	202°23.9	11.6′	03°17.6	15.9′	59.2′
	SD = 16.1′	d = 0.9′	SD = 16.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.1	S12°37.6	216°54.5	11.6′	S03°33.5	15.9′	59.2′
1	199°01.1	38.5	231°25.0	11.6′	03°49.4	15.9′	59.2′
2	214°01.2	39.3	245°55.6	11.5′	04°05.3	15.8′	59.2′
3	229°01.3	·· 40.2	260°26.1	11.5′	04°21.1	15.9′	59.2′
4	244°01.3	41.0	274°56.6	11.5′	04°37.0	15.8′	59.2′
5	259°01.4	41.9	289°27.2	11.5′	04°52.8	15.7′	59.1′
6	274°01.4	S12°42.7	303°57.7	11.5′	S05°08.5	15.7′	59.1′
7	289°01.5	43.6	318°28.1	11.5′	05°24.2	15.7′	59.1′
8	304°01.6	44.4	332°58.6	11.4′	05°39.9	15.7′	59.1′
9	319°01.6	·· 45.3	347°29.0	11.4′	05°55.6	15.6′	59.1′
10	334°01.7	46.1	1°59.5	11.4′	06°11.2	15.6′	59.1′
11	349°01.7	47.0	16°29.9	11.4′	06°26.8	15.6′	59.1′
12	4°01.8	S12°47.8	31°00.3	11.4′	S06°42.4	15.5′	59.1′
13	19°01.8	48.7	45°30.6	11.3′	06°57.9	15.4′	59.0′
14	34°01.9	49.5	60°01.0	11.3′	07°13.3	15.4′	59.0′
15	49°02.0	·· 50.3	74°31.3	11.3′	07°28.7	15.4′	59.0′
16	64°02.0	51.2	89°01.6	11.3′	07°44.1	15.3′	59.0′
17	79°02.1	52.0	103°31.9	11.2′	07°59.4	15.3′	59.0′
18	94°02.1	S12°52.9	118°02.1	11.2′	S08°14.7	15.2′	59.0′
19	109°02.2	53.7	132°32.3	11.2′	08°29.9	15.2′	59.0′
20	124°02.2	54.6	147°02.5	11.2′	08°45.1	15.1′	58.9′
21	139°02.3	·· 55.4	161°32.7	11.1′	09°00.2	15.1′	58.9′
22	154°02.3	56.2	176°02.8	11.1′	09°15.3	15.0′	58.9′
23	169°02.4	57.1	190°32.9	11.1′	09°30.3	14.9′	58.9′
	SD = 16.1′	d = 0.8′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:41	07:01	08:20	15:06	16:25	17:45
N 70°	05:39	06:52	08:00	15:26	16:35	17:47
68°	05:38	06:44	07:45	15:41	16:43	17:48
66°	05:37	06:37	07:33	15:54	16:49	17:49
64°	05:36	06:32	07:22	16:04	16:55	17:51
62°	05:35	06:27	07:14	16:13	17:00	17:52
60°	05:33	06:22	07:06	16:21	17:05	17:53
N 58°	05:32	06:18	06:59	16:28	17:09	17:54
56°	05:31	06:15	06:54	16:33	17:12	17:56
54°	05:30	06:12	06:48	16:39	17:16	17:57
52°	05:29	06:09	06:44	16:44	17:19	17:58
50°	05:28	06:06	06:39	16:48	17:21	17:59
45°	05:25	06:00	06:30	16:58	17:28	18:02
N 40°	05:22	05:54	06:22	17:05	17:33	18:05
35°	05:20	05:49	06:15	17:12	17:38	18:08
30°	05:17	05:45	06:09	17:18	17:43	18:11
20°	05:10	05:36	05:59	17:29	17:52	18:17
N 10°	05:03	05:28	05:49	17:38	18:00	18:25
0°	04:55	05:19	05:41	17:47	18:09	18:33
S 10°	04:45	05:10	05:32	17:56	18:18	18:43
20°	04:33	04:59	05:22	18:06	18:29	18:56
30°	04:17	04:46	05:11	18:17	18:42	19:12
35°	04:06	04:38	05:04	18:24	18:51	19:22
40°	03:54	04:29	04:57	18:32	19:00	19:35
45°	03:39	04:17	04:48	18:40	19:12	19:50
S 50°	03:19	04:03	04:38	18:51	19:26	20:11
52°	03:09	03:56	04:33	18:56	19:33	20:21
54°	02:58	03:48	04:28	19:01	19:41	20:32
56°	02:45	03:40	04:22	19:08	19:50	20:45
58°	02:29	03:30	04:15	19:14	20:00	21:02
S 60°	02:10	03:19	04:08	19:22	20:12	21:21

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	00:01	02:25	04:44	15:30	14:59	14:25
N 70°	00:16	02:28	04:36	15:24	15:00	14:36
68°	00:28	02:30	04:30	15:18	15:02	14:45
66°	00:37	02:32	04:25	15:14	15:03	14:52
64°	00:45	02:34	04:21	15:10	15:04	14:58
62°	00:52	02:35	04:18	15:06	15:05	15:03
60°	00:58	02:37	04:15	15:03	15:05	15:08
N 58°	01:03	02:38	04:12	15:00	15:06	15:12
56°	01:08	02:39	04:09	14:58	15:07	15:16
54°	01:12	02:40	04:07	14:56	15:07	15:19
52°	01:15	02:41	04:05	14:53	15:08	15:22
50°	01:19	02:41	04:03	14:52	15:08	15:25
45°	01:26	02:43	04:00	14:48	15:09	15:31
N 40°	01:32	02:44	03:56	14:44	15:10	15:36
35°	01:37	02:46	03:54	14:41	15:11	15:41
30°	01:41	02:47	03:51	14:38	15:12	15:45
20°	01:49	02:48	03:47	14:34	15:13	15:52
N 10°	01:56	02:50	03:44	14:30	15:14	15:58
0°	02:02	02:52	03:40	14:26	15:15	16:03
S 10°	02:09	02:53	03:37	14:22	15:15	16:09
20°	02:15	02:55	03:33	14:18	15:16	16:15
30°	02:23	02:57	03:30	14:13	15:17	16:22
35°	02:27	02:58	03:27	14:10	15:18	16:26
40°	02:32	02:59	03:25	14:06	15:19	16:31
45°	02:38	03:00	03:22	14:03	15:19	16:36
S 50°	02:45	03:02	03:19	13:58	15:20	16:43
52°	02:48	03:03	03:17	13:56	15:21	16:45
54°	02:51	03:04	03:15	13:54	15:21	16:49
56°	02:55	03:05	03:14	13:51	15:22	16:52
58°	02:59	03:06	03:11	13:48	15:22	16:56
S 60°	03:04	03:07	03:09	13:45	15:23	17:01

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 25-8%
25	15:51	15:55	11:44	08:14	20:39	
26	15:58	16:01	11:44	09:03	21:27	
27	16:04	16:07	11:44	09:52	22:16	



October 28, 29, 30 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	36°07.2	163°52.9	S19°05.3	149°19.9	S22°33.5	225°18.4	N05°04.1	13°13.3	N06°35.3
1	51°09.6	178°52.2	06.1	164°20.4	33.8	240°20.5	03.9	28°16.0	35.3
2	66°12.1	193°51.5	07.0	179°20.9	34.1	255°22.5	03.7	43°18.6	35.2
3	81°14.6	208°50.8	·· 07.9	194°21.5	·· 34.4	270°24.6	·· 03.5	58°21.3	·· 35.1
4	96°17.0	223°50.1	08.7	209°22.0	34.7	285°26.6	03.4	73°23.9	35.1
5	111°19.5	238°49.4	09.6	224°22.5	35.0	300°28.6	03.2	88°26.6	35.0
6	126°21.9	253°48.7	S19°10.4	239°23.0	S22°35.3	315°30.7	N05°03.0	103°29.2	N06°34.9
7	141°24.4	268°48.0	11.3	254°23.6	35.6	330°32.7	02.9	118°31.8	34.9
8	156°26.9	283°47.3	12.2	269°24.1	35.9	345°34.8	02.7	133°34.5	34.8
9	171°29.3	298°46.6	·· 13.0	284°24.6	·· 36.2	0°36.8	·· 02.5	148°37.1	·· 34.7
10	186°31.8	313°45.9	13.9	299°25.1	36.5	15°38.9	02.3	163°39.8	34.6
11	201°34.3	328°45.2	14.7	314°25.6	36.8	30°40.9	02.2	178°42.4	34.6
12	216°36.7	343°44.5	S19°15.6	329°26.2	S22°37.1	45°42.9	N05°02.0	193°45.1	N06°34.5
13	231°39.2	358°43.8	16.4	344°26.7	37.4	60°45.0	01.8	208°47.7	34.4
14	246°41.7	13°43.1	17.3	359°27.2	37.7	75°47.0	01.7	223°50.4	34.4
15	261°44.1	28°42.4	·· 18.1	14°27.7	·· 38.0	90°49.1	·· 01.5	238°53.0	·· 34.3
16	276°46.6	43°41.7	19.0	29°28.3	38.3	105°51.1	01.3	253°55.7	34.2
17	291°49.1	58°41.0	19.8	44°28.8	38.6	120°53.2	01.1	268°58.3	34.2
18	306°51.5	73°40.3	S19°20.7	59°29.3	S22°38.9	135°55.2	N05°01.0	284°00.9	N06°34.1
19	321°54.0	88°39.6	21.5	74°29.8	39.2	150°57.2	00.8	299°03.6	34.0
20	336°56.4	103°38.9	22.4	89°30.3	39.5	165°59.3	00.6	314°06.2	34.0
21	351°58.9	118°38.2	·· 23.2	104°30.9	·· 39.8	181°01.3	·· 00.5	329°08.9	·· 33.9
22	7°01.4	133°37.5	24.0	119°31.4	40.1	196°03.4	00.3	344°11.5	33.8
23	22°03.8	148°36.8	24.9	134°31.9	40.4	211°05.4	00.1	359°14.2	33.8
Mer.pass. 21:32		ν -0.7′	d 0.9′	ν 0.5′	d 0.3′	ν 2.0′	d 0.2′	ν 2.6′	d 0.1′
		m -3.88		m 1.34		m -1.78		m 0.15	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	37°06.3	163°36.1	S19°25.7	149°32.4	S22°40.7	226°07.5	N04°59.9	14°16.8	N06°33.7
1	52°08.8	178°35.4	26.6	164°32.9	41.0	241°09.5	59.8	29°19.5	33.6
2	67°11.2	193°34.7	27.4	179°33.5	41.3	256°11.6	59.6	44°22.1	33.6
3	82°13.7	208°33.9	·· 28.2	194°34.0	·· 41.6	271°13.6	·· 59.4	59°24.8	·· 33.5
4	97°16.2	223°33.2	29.1	209°34.5	41.9	286°15.6	59.3	74°27.4	33.4
5	112°18.6	238°32.5	29.9	224°35.0	42.2	301°17.7	59.1	89°30.0	33.4
6	127°21.1	253°31.8	S19°30.8	239°35.5	S22°42.5	316°19.7	N04°58.9	104°32.7	N06°33.3
7	142°23.6	268°31.1	31.6	254°36.0	42.8	331°21.8	58.7	119°35.3	33.2
8	157°26.0	283°30.4	32.4	269°36.6	43.1	346°23.8	58.6	134°38.0	33.2
9	172°28.5	298°29.7	·· 33.3	284°37.1	·· 43.3	1°25.9	·· 58.4	149°40.6	·· 33.1
10	187°30.9	313°29.0	34.1	299°37.6	43.6	16°27.9	58.2	164°43.3	33.0
11	202°33.4	328°28.3	34.9	314°38.1	43.9	31°30.0	58.1	179°45.9	33.0
12	217°35.9	343°27.5	S19°35.7	329°38.6	S22°44.2	46°32.0	N04°57.9	194°48.6	N06°32.9
13	232°38.3	358°26.8	36.6	344°39.1	44.5	61°34.1	57.7	209°51.2	32.8
14	247°40.8	13°26.1	37.4	359°39.7	44.8	76°36.1	57.6	224°53.9	32.7
15	262°43.3	28°25.4	·· 38.2	14°40.2	·· 45.1	91°38.2	·· 57.4	239°56.5	·· 32.7
16	277°45.7	43°24.7	39.1	29°40.7	45.4	106°40.2	57.2	254°59.1	32.6
17	292°48.2	58°24.0	39.9	44°41.2	45.7	121°42.2	57.0	270°01.8	32.5
18	307°50.7	73°23.2	S19°40.7	59°41.7	S22°45.9	136°44.3	N04°56.9	285°04.4	N06°32.5
19	322°53.1	88°22.5	41.5	74°42.2	46.2	151°46.3	56.7	300°07.1	32.4
20	337°55.6	103°21.8	42.4	89°42.7	46.5	166°48.4	56.5	315°09.7	32.3
21	352°58.0	118°21.1	·· 43.2	104°43.3	·· 46.8	181°50.4	·· 56.4	330°12.4	·· 32.3
22	8°00.5	133°20.4	44.0	119°43.8	47.1	196°52.5	56.2	345°15.0	32.2
23	23°03.0	148°19.6	44.8	134°44.3	47.4	211°54.5	56.0	0°17.7	32.1
Mer.pass. 21:28		ν -0.7′	d 0.8′	ν 0.5′	d 0.3′	ν 2.0′	d 0.2′	ν 2.6′	d 0.1′
		m -3.88		m 1.34		m -1.78		m 0.16	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	38°05.4	163°18.9	S19°45.6	149°44.8	S22°47.7	226°56.6	N04°55.9	15°20.3	N06°32.1
1	53°07.9	178°18.2	46.5	164°45.3	48.0	241°58.6	55.7	30°22.9	32.0
2	68°10.4	193°17.5	47.3	179°45.8	48.2	257°00.7	55.5	45°25.6	31.9
3	83°12.8	208°16.8	·· 48.1	194°46.3	·· 48.5	272°02.7	·· 55.3	60°28.2	·· 31.9
4	98°15.3	223°16.0	48.9	209°46.8	48.8	287°04.8	55.2	75°30.9	31.8
5	113°17.8	238°15.3	49.7	224°47.3	49.1	302°06.8	55.0	90°33.5	31.7
6	128°20.2	253°14.6	S19°50.5	239°47.9	S22°49.4	317°08.9	N04°54.8	105°36.2	N06°31.7
7	143°22.7	268°13.9	51.3	254°48.4	49.7	332°10.9	54.7	120°38.8	31.6
8	158°25.2	283°13.1	52.2	269°48.9	49.9	347°13.0	54.5	135°41.5	31.5
9	173°27.6	298°12.4	·· 53.0	284°49.4	·· 50.2	2°15.0	·· 54.3	150°44.1	·· 31.5
10	188°30.1	313°11.7	53.8	299°49.9	50.5	17°17.1	54.2	165°46.7	31.4
11	203°32.5	328°11.0	54.6	314°50.4	50.8	32°19.1	54.0	180°49.4	31.3
12	218°35.0	343°10.2	S19°55.4	329°50.9	S22°51.1	47°21.2	N04°53.8	195°52.0	N06°31.3
13	233°37.5	358°09.5	56.2	344°51.4	51.3	62°23.2	53.6	210°54.7	31.2
14	248°39.9	13°08.8	57.0	359°51.9	51.6	77°25.3	53.5	225°57.3	31.1
15	263°42.4	28°08.1	·· 57.8	14°52.4	·· 51.9	92°27.3	·· 53.3	241°00.0	·· 31.1
16	278°44.9	43°07.3	58.6	29°53.0	52.2	107°29.4	53.1	256°02.6	31.0
17	293°47.3	58°06.6	19°59.4	44°53.5	52.5	122°31.4	53.0	271°05.2	30.9
18	308°49.8	73°05.9	S20°00.2	59°54.0	S22°52.7	137°33.5	N04°52.8	286°07.9	N06°30.9
19	323°52.3	88°05.1	01.0	74°54.5	53.0	152°35.5	52.6	301°10.5	30.8
20	338°54.7	103°04.4	01.8	89°55.0	53.3	167°37.6	52.5	316°13.2	30.7
21	353°57.2	118°03.7	·· 02.6	104°55.5	·· 53.6	182°39.6	·· 52.3	331°15.8	·· 30.7
22	8°59.7	133°02.9	03.4	119°56.0	53.9	197°41.7	52.1	346°18.5	30.6
23	24°02.1	148°02.2	04.2	134°56.5	54.1	212°43.7	52.0	1°21.1	30.5
Mer.pass. 21:24		ν -0.7′	d 0.8′	ν 0.5′	d 0.3′	ν 2.0′	d 0.2′	ν 2.6′	d 0.1′
		m -3.88		m 1.34		m -1.79		m 0.16	

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.2
Schedar	349°27.8	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.7
Hamal	327°48.2	23°35.8
Polaris	312°19.1	89°22.8
Acamar	315°09.6	-40°11.4
Menkar	314°03.4	4°12.1
Mirfak	308°24.5	49°57.6
Aldebaran	290°36.7	16°33.9
Rigel	281°01.4	-8°10.0
Capella	280°18.2	46°01.4
Bellatrix	278°20.2	6°22.5
Elnath	277°58.7	28°37.8
Alnilam	275°35.2	-1°11.0
Betelgeuse	270°49.4	7°24.8
Canopus	263°51.1	-52°42.3
Sirius	258°24.1	-16°45.1
Adhara	255°03.9	-29°00.4
Procyon	244°48.4	5°09.2
Pollux	243°14.5	27°57.4
Avior	234°13.8	-59°35.6
Suhail	222°44.7	-43°32.5
Miaplacidus	221°37.9	-69°49.6
Alphard	217°45.6	-8°46.7
Regulus	207°32.2	11°49.8
Dubhe	193°38.7	61°35.8
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°58.1	-63°15.1
Gacrux	171°49.6	-57°16.0
Alioth	166°11.6	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.4
Hadar	148°33.3	-60°30.4
Menkent	147°55.3	-36°30.3
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.8	-60°57.0
Kochab	137°21.1	74°02.4
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.7	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.2	-56°38.8
Deneb	49°24.2	45°23.1
Enif	33°36.4	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.6

Oct 28 Thu	SHA	Mer.pass
Venus	127°45.7	13:05
Mars	113°12.7	14:02
Jupiter	189°11.3	08:58
Saturn	337°06.2	23:03

Oct 29 Fri	SHA	Mer.pass
Venus	126°29.8	13:06
Mars	112°26.1	14:01
Jupiter	189°01.2	08:54
Saturn	337°10.5	22:59

Oct 30 Sat	SHA	Mer.pass
Venus	125°13.5	13:07
Mars	111°39.3	14:01
Jupiter	188°51.1	08:51
Saturn	337°14.9	22:55

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0828 sec ΔT = TT-UT1 = +69.2668 sec

2027 October 28 to Oct. 30 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°02.4	S12°57.9	205°03.0	11.0′	S09°45.2	14.9′	58.9′
1	199°02.5	58.8	219°33.0	11.0′	10°00.1	14.9′	58.9′
2	214°02.5	12°59.6	234°03.0	11.0′	10°15.0	14.7′	58.8′
3	229°02.6	13°00.4	248°33.0	10.9′	10°29.7	14.7′	58.8′
4	244°02.7	01.3	263°03.0	10.9′	10°44.4	14.7′	58.8′
5	259°02.7	02.1	277°32.9	10.9′	10°59.1	14.6′	58.8′
6	274°02.8	S13°03.0	292°02.7	10.8′	S11°13.7	14.5′	58.8′
7	289°02.8	03.8	306°32.6	10.8′	11°28.2	14.4′	58.8′
8	304°02.9	04.6	321°02.3	10.8′	11°42.6	14.4′	58.7′
9	319°02.9	·· 05.5	335°32.1	10.7′	11°57.0	14.3′	58.7′
10	334°03.0	06.3	350°01.8	10.7′	12°11.3	14.2′	58.7′
11	349°03.0	07.2	4°31.5	10.6′	12°25.5	14.1′	58.7′
12	4°03.1	S13°08.0	19°01.1	10.6′	S12°39.6	14.1′	58.7′
13	19°03.1	08.8	33°30.7	10.6′	12°53.7	14.0′	58.6′
14	34°03.2	09.7	48°00.3	10.5′	13°07.7	13.9′	58.6′
15	49°03.2	·· 10.5	62°29.8	10.5′	13°21.6	13.8′	58.6′
16	64°03.3	11.3	76°59.3	10.4′	13°35.4	13.8′	58.6′
17	79°03.3	12.2	91°28.7	10.4′	13°49.2	13.7′	58.6′
18	94°03.3	S13°13.0	105°58.1	10.3′	S14°02.9	13.5′	58.5′
19	109°03.4	13.8	120°27.5	10.3′	14°16.4	13.5′	58.5′
20	124°03.4	14.7	134°56.8	10.3′	14°29.9	13.5′	58.5′
21	139°03.5	·· 15.5	149°26.0	10.2′	14°43.4	13.3′	58.5′
22	154°03.5	16.3	163°55.2	10.2′	14°56.7	13.2′	58.4′
23	169°03.6	17.2	178°24.4	10.1′	15°09.9	13.1′	58.4′
	SD = 16.1′	d = 0.8′	SD = 16.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°03.6	S13°18.0	192°53.5	10.1′	S15°23.0	13.1′	58.4′
1	199°03.7	18.8	207°22.6	10.0′	15°36.1	12.9′	58.4′
2	214°03.7	19.7	221°51.7	10.0′	15°49.0	12.9′	58.4′
3	229°03.8	·· 20.5	236°20.6	9.9′	16°01.9	12.7′	58.3′
4	244°03.8	21.3	250°49.6	9.9′	16°14.6	12.7′	58.3′
5	259°03.8	22.2	265°18.5	9.8′	16°27.3	12.6′	58.3′
6	274°03.9	S13°23.0	279°47.3	9.8′	S16°39.9	12.4′	58.3′
7	289°03.9	23.8	294°16.1	9.8′	16°52.3	12.4′	58.2′
8	304°04.0	24.7	308°44.9	9.7′	17°04.7	12.2′	58.2′
9	319°04.0	·· 25.5	323°13.6	9.7′	17°16.9	12.2′	58.2′
10	334°04.1	26.3	337°42.3	9.6′	17°29.1	12.0′	58.2′
11	349°04.1	27.1	352°10.9	9.6′	17°41.1	12.0′	58.1′
12	4°04.1	S13°28.0	6°39.4	9.5′	S17°53.1	11.8′	58.1′
13	19°04.2	28.8	21°08.0	9.5′	18°04.9	11.7′	58.1′
14	34°04.2	29.6	35°36.4	9.4′	18°16.6	11.6′	58.1′
15	49°04.3	·· 30.5	50°04.9	9.4′	18°28.2	11.5′	58.1′
16	64°04.3	31.3	64°33.2	9.3′	18°39.7	11.4′	58.0′
17	79°04.3	32.1	79°01.6	9.3′	18°51.1	11.3′	58.0′
18	94°04.4	S13°32.9	93°29.8	9.2′	S19°02.4	11.1′	58.0′
19	109°04.4	33.8	107°58.1	9.2′	19°13.5	11.1′	57.9′
20	124°04.5	34.6	122°26.3	9.1′	19°24.6	10.9′	57.9′
21	139°04.5	·· 35.4	136°54.4	9.1′	19°35.5	10.8′	57.9′
22	154°04.5	36.2	151°22.5	9.1′	19°46.3	10.7′	57.9′
23	169°04.6	37.1	165°50.6	9.0′	19°57.0	10.5′	57.8′
	SD = 16.1′	d = 0.8′	SD = 15.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°04.6	S13°37.9	180°18.6	9.0′	S20°07.5	10.5′	57.8′
1	199°04.6	38.7	194°46.5	8.9′	20°18.0	10.3′	57.8′
2	214°04.7	39.5	209°14.4	8.9′	20°28.3	10.2′	57.8′
3	229°04.7	·· 40.4	223°42.3	8.8′	20°38.5	10.1′	57.7′
4	244°04.8	41.2	238°10.1	8.8′	20°48.6	9.9′	57.7′
5	259°04.8	42.0	252°37.9	8.7′	20°58.5	9.8′	57.7′
6	274°04.8	S13°42.8	267°05.7	8.7′	S21°08.3	9.7′	57.7′
7	289°04.9	43.6	281°33.4	8.7′	21°18.0	9.6′	57.6′
8	304°04.9	44.5	296°01.0	8.6′	21°27.6	9.4′	57.6′
9	319°04.9	·· 45.3	310°28.6	8.6′	21°37.0	9.3′	57.6′
10	334°05.0	46.1	324°56.2	8.5′	21°46.3	9.2′	57.5′
11	349°05.0	46.9	339°23.7	8.5′	21°55.5	9.0′	57.5′
12	4°05.0	S13°47.7	353°51.2	8.5′	S22°04.5	8.9′	57.5′
13	19°05.1	48.6	8°18.7	8.4′	22°13.4	8.8′	57.5′
14	34°05.1	49.4	22°46.1	8.4′	22°22.2	8.6′	57.4′
15	49°05.1	·· 50.2	37°13.4	8.3′	22°30.8	8.5′	57.4′
16	64°05.2	51.0	51°40.8	8.3′	22°39.3	8.3′	57.4′
17	79°05.2	51.8	66°08.1	8.3′	22°47.6	8.3′	57.4′
18	94°05.2	S13°52.6	80°35.3	8.2′	S22°55.9	8.0′	57.3′
19	109°05.3	53.5	95°02.6	8.2′	23°03.9	8.0′	57.3′
20	124°05.3	54.3	109°29.8	8.2′	23°11.9	7.8′	57.3′
21	139°05.3	·· 55.1	123°56.9	8.1′	23°19.7	7.6′	57.2′
22	154°05.3	55.9	138°24.1	8.1′	23°27.3	7.6′	57.2′
23	169°05.4	56.7	152°51.2	8.1′	23°34.9	7.3′	57.2′
	SD = 16.1′	d = 0.8′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:53	07:14	08:37	14:49	16:11	17:32
N 70°	05:50	07:03	08:15	15:11	16:23	17:35
68°	05:48	06:54	07:57	15:29	16:32	17:38
66°	05:46	06:47	07:43	15:43	16:40	17:40
64°	05:44	06:40	07:32	15:54	16:46	17:42
62°	05:42	06:34	07:22	16:04	16:52	17:44
60°	05:40	06:29	07:14	16:13	16:57	17:46
N 58°	05:39	06:25	07:06	16:20	17:02	17:48
56°	05:37	06:21	07:00	16:27	17:06	17:49
54°	05:35	06:17	06:54	16:32	17:10	17:51
52°	05:34	06:14	06:49	16:38	17:13	17:53
50°	05:33	06:11	06:44	16:43	17:16	17:54
45°	05:29	06:03	06:34	16:53	17:23	17:58
N 40°	05:26	05:57	06:25	17:02	17:30	18:01
35°	05:22	05:52	06:18	17:09	17:35	18:05
30°	05:19	05:47	06:11	17:16	17:40	18:08
20°	05:11	05:37	06:00	17:27	17:50	18:16
N 10°	05:03	05:28	05:50	17:37	17:59	18:24
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:44	05:09	05:31	17:57	18:19	18:44
20°	04:31	04:57	05:20	18:07	18:30	18:57
30°	04:13	04:43	05:08	18:20	18:45	19:15
35°	04:03	04:35	05:01	18:27	18:54	19:26
40°	03:50	04:24	04:53	18:35	19:04	19:39
45°	03:33	04:12	04:44	18:45	19:16	19:55
S 50°	03:12	03:57	04:32	18:56	19:32	20:17
52°	03:01	03:49	04:27	19:02	19:39	20:28
54°	02:49	03:41	04:21	19:07	19:48	20:40
56°	02:35	03:32	04:15	19:14	19:57	20:55
58°	02:18	03:21	04:07	19:22	20:08	21:13
S 60°	01:56	03:09	03:59	19:30	20:21	21:35

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	07:12	10:57	▬	13:42	11:46	▬
N 70°	06:51	09:29	▬	14:06	13:16	▬
68°	06:34	08:50	▬	14:25	13:56	▬
66°	06:21	08:23	10:43	14:40	14:24	13:55
64°	06:10	08:03	10:03	14:52	14:45	14:36
62°	06:01	07:47	09:35	15:02	15:02	15:04
60°	05:53	07:33	09:14	15:12	15:17	15:26
N 58°	05:46	07:22	08:57	15:20	15:29	15:44
56°	05:40	07:12	08:42	15:27	15:40	15:59
54°	05:35	07:03	08:30	15:33	15:50	16:12
52°	05:30	06:55	08:19	15:39	15:58	16:24
50°	05:26	06:48	08:09	15:44	16:06	16:34
45°	05:16	06:33	07:49	15:55	16:22	16:55
N 40°	05:08	06:21	07:32	16:05	16:36	17:12
35°	05:02	06:10	07:19	16:13	16:48	17:27
30°	04:56	06:01	07:07	16:20	16:58	17:40
20°	04:46	05:46	06:46	16:32	17:15	18:02
N 10°	04:37	05:33	06:29	16:43	17:31	18:21
0°	04:29	05:20	06:13	16:53	17:45	18:38
S 10°	04:21	05:08	05:56	17:04	17:59	18:56
20°	04:13	04:55	05:39	17:15	18:15	19:16
30°	04:03	04:40	05:20	17:27	18:33	19:38
35°	03:58	04:31	05:08	17:35	18:43	19:51
40°	03:52	04:21	04:55	17:43	18:55	20:06
45°	03:45	04:10	04:40	17:53	19:09	20:24
S 50°	03:36	03:56	04:21	18:05	19:27	20:46
52°	03:32	03:50	04:12	18:10	19:35	20:57
54°	03:28	03:43	04:02	18:17	19:44	21:09
56°	03:23	03:35	03:51	18:24	19:55	21:23
58°	03:18	03:27	03:39	18:31	20:07	21:40
S 60°	03:12	03:17	03:24	18:40	20:21	22:00

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-1 3-0%
28	16:10	16:12	11:44	10:41	23:07	
29	16:14	16:17	11:44	11:32	23:59	
30	16:18	16:20	11:44	12:26	–:–	



October 31, 01, 02 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	39°04.6	163°01.5	S20°05.0	149°57.0	S22°54.4	227°45.8	N04°51.8	16°23.8	N06°30.5
1	54°07.0	178°00.7	05.8	164°57.5	54.7	242°47.8	51.6	31°26.4	30.4
2	69°09.5	193°00.0	06.6	179°58.0	55.0	257°49.9	51.5	46°29.0	30.3
3	84°12.0	207°59.3	·· 07.4	194°58.5	·· 55.2	272°51.9	·· 51.3	61°31.7	·· 30.3
4	99°14.4	222°58.5	08.2	209°59.0	55.5	287°54.0	51.1	76°34.3	30.2
5	114°16.9	237°57.8	09.0	224°59.5	55.8	302°56.0	51.0	91°37.0	30.1
6	129°19.4	252°57.1	S20°09.8	240°00.0	S22°56.1	317°58.1	N04°50.8	106°39.6	N06°30.1
7	144°21.8	267°56.3	10.6	255°00.5	56.3	333°00.1	50.6	121°42.3	30.0
8	159°24.3	282°55.6	11.4	270°01.1	56.6	348°02.2	50.4	136°44.9	29.9
9	174°26.8	297°54.9	·· 12.2	285°01.6	·· 56.9	3°04.2	·· 50.3	151°47.5	·· 29.9
10	189°29.2	312°54.1	12.9	300°02.1	57.2	18°06.3	50.1	166°50.2	29.8
11	204°31.7	327°53.4	13.7	315°02.6	57.4	33°08.3	49.9	181°52.8	29.7
12	219°34.2	342°52.6	S20°14.5	330°03.1	S22°57.7	48°10.4	N04°49.8	196°55.5	N06°29.7
13	234°36.6	357°51.9	15.3	345°03.6	58.0	63°12.4	49.6	211°58.1	29.6
14	249°39.1	12°51.2	16.1	0°04.1	58.2	78°14.5	49.4	227°00.8	29.5
15	264°41.5	27°50.4	·· 16.9	15°04.6	·· 58.5	93°16.5	·· 49.3	242°03.4	·· 29.5
16	279°44.0	42°49.7	17.6	30°05.1	58.8	108°18.6	49.1	257°06.0	29.4
17	294°46.5	57°48.9	18.4	45°05.6	59.1	123°20.7	48.9	272°08.7	29.3
18	309°48.9	72°48.2	S20°19.2	60°06.1	S22°59.3	138°22.7	N04°48.8	287°11.3	N06°29.3
19	324°51.4	87°47.4	20.0	75°06.6	59.6	153°24.8	48.6	302°14.0	29.2
20	339°53.9	102°46.7	20.8	90°07.1	22°59.9	168°26.8	48.4	317°16.6	29.2
21	354°56.3	117°46.0	·· 21.5	105°07.6	23°00.1	183°28.9	·· 48.3	332°19.2	·· 29.1
22	9°58.8	132°45.2	22.3	120°08.1	00.4	198°30.9	48.1	347°21.9	29.0
23	25°01.3	147°44.5	23.1	135°08.6	00.7	213°33.0	47.9	2°24.5	29.0
Mer.pass. 21:20		ν -0.7′	d 0.8′	m -3.88	ν 0.5′	d 0.3′	m 1.33	ν 2.1′	d 0.2′ m -1.79	ν 2.6′	d 0.1′ m 0.17

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	40°03.7	162°43.7	S20°23.9	150°09.1	S23°00.9	228°35.0	N04°47.8	17°27.2	N06°28.9
1	55°06.2	177°43.0	24.6	165°09.6	01.2	243°37.1	47.6	32°29.8	28.8
2	70°08.6	192°42.2	25.4	180°10.1	01.5	258°39.1	47.4	47°32.5	28.8
3	85°11.1	207°41.5	·· 26.2	195°10.6	·· 01.7	273°41.2	·· 47.3	62°35.1	·· 28.7
4	100°13.6	222°40.7	26.9	210°11.1	02.0	288°43.3	47.1	77°37.7	28.6
5	115°16.0	237°40.0	27.7	225°11.6	02.3	303°45.3	46.9	92°40.4	28.6
6	130°18.5	252°39.2	S20°28.5	240°12.1	S23°02.5	318°47.4	N04°46.8	107°43.0	N06°28.5
7	145°21.0	267°38.5	29.2	255°12.6	02.8	333°49.4	46.6	122°45.7	28.4
8	160°23.4	282°37.7	30.0	270°13.1	03.1	348°51.5	46.4	137°48.3	28.4
9	175°25.9	297°37.0	·· 30.8	285°13.6	·· 03.3	3°53.5	·· 46.3	152°50.9	·· 28.3
10	190°28.4	312°36.2	31.5	300°14.1	03.6	18°55.6	46.1	167°53.6	28.2
11	205°30.8	327°35.5	32.3	315°14.6	03.9	33°57.6	45.9	182°56.2	28.2
12	220°33.3	342°34.7	S20°33.1	330°15.1	S23°04.1	48°59.7	N04°45.8	197°58.9	N06°28.1
13	235°35.8	357°34.0	33.8	345°15.6	04.4	64°01.8	45.6	213°01.5	28.0
14	250°38.2	12°33.2	34.6	0°16.1	04.6	79°03.8	45.4	228°04.2	28.0
15	265°40.7	27°32.5	·· 35.4	15°16.6	·· 04.9	94°05.9	·· 45.3	243°06.8	·· 27.9
16	280°43.1	42°31.7	36.1	30°17.1	05.2	109°07.9	45.1	258°09.4	27.8
17	295°45.6	57°31.0	36.9	45°17.5	05.4	124°10.0	44.9	273°12.1	27.8
18	310°48.1	72°30.2	S20°37.6	60°18.0	S23°05.7	139°12.0	N04°44.8	288°14.7	N06°27.7
19	325°50.5	87°29.4	38.4	75°18.5	06.0	154°14.1	44.6	303°17.4	27.6
20	340°53.0	102°28.7	39.1	90°19.0	06.2	169°16.2	44.4	318°20.0	27.6
21	355°55.5	117°27.9	·· 39.9	105°19.5	·· 06.5	184°18.2	·· 44.3	333°22.6	·· 27.5
22	10°57.9	132°27.2	40.6	120°20.0	06.7	199°20.3	44.1	348°25.3	27.5
23	26°00.4	147°26.4	41.4	135°20.5	07.0	214°22.3	43.9	3°27.9	27.4
Mer.pass. 21:16		ν -0.7′	d 0.8′	m -3.88	ν 0.5′	d 0.3′	m 1.33	ν 2.1′	d 0.2′ m -1.79	ν 2.6′	d 0.1′ m 0.17

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	41°02.9	162°25.7	S20°42.1	150°21.0	S23°07.3	229°24.4	N04°43.8	18°30.6	N06°27.3
1	56°05.3	177°24.9	42.9	165°21.5	07.5	244°26.4	43.6	33°33.2	27.3
2	71°07.8	192°24.1	43.6	180°22.0	07.8	259°28.5	43.4	48°35.8	27.2
3	86°10.3	207°23.4	·· 44.4	195°22.5	·· 08.0	274°30.6	·· 43.3	63°38.5	·· 27.1
4	101°12.7	222°22.6	45.1	210°23.0	08.3	289°32.6	43.1	78°41.1	27.1
5	116°15.2	237°21.9	45.9	225°23.5	08.5	304°34.7	42.9	93°43.8	27.0
6	131°17.6	252°21.1	S20°46.6	240°24.0	S23°08.8	319°36.7	N04°42.8	108°46.4	N06°26.9
7	146°20.1	267°20.3	47.4	255°24.5	09.0	334°38.8	42.6	123°49.0	26.9
8	161°22.6	282°19.6	48.1	270°25.0	09.3	349°40.8	42.4	138°51.7	26.8
9	176°25.0	297°18.8	·· 48.8	285°25.4	·· 09.6	4°42.9	·· 42.3	153°54.3	·· 26.7
10	191°27.5	312°18.0	49.6	300°25.9	09.8	19°45.0	42.1	168°57.0	26.7
11	206°30.0	327°17.3	50.3	315°26.4	10.1	34°47.0	42.0	183°59.6	26.6
12	221°32.4	342°16.5	S20°51.1	330°26.9	S23°10.3	49°49.1	N04°41.8	199°02.2	N06°26.5
13	236°34.9	357°15.7	51.8	345°27.4	10.6	64°51.1	41.6	214°04.9	26.5
14	251°37.4	12°15.0	52.5	0°27.9	10.8	79°53.2	41.5	229°07.5	26.4
15	266°39.8	27°14.2	·· 53.3	15°28.4	·· 11.1	94°55.3	·· 41.3	244°10.2	·· 26.4
16	281°42.3	42°13.4	54.0	30°28.9	11.3	109°57.3	41.1	259°12.8	26.3
17	296°44.8	57°12.7	54.7	45°29.4	11.6	124°59.4	41.0	274°15.4	26.2
18	311°47.2	72°11.9	S20°55.5	60°29.9	S23°11.8	140°01.4	N04°40.8	289°18.1	N06°26.2
19	326°49.7	87°11.1	56.2	75°30.4	12.1	155°03.5	40.6	304°20.7	26.1
20	341°52.1	102°10.4	56.9	90°30.8	12.3	170°05.6	40.5	319°23.4	26.0
21	356°54.6	117°09.6	·· 57.7	105°31.3	·· 12.6	185°07.6	·· 40.3	334°26.0	·· 26.0
22	11°57.1	132°08.8	58.4	120°31.8	12.8	200°09.7	40.1	349°28.6	25.9
23	26°59.5	147°08.1	59.1	135°32.3	13.1	215°11.7	40.0	4°31.3	25.8
Mer.pass. 21:12		ν -0.8′	d 0.7′	m -3.88	ν 0.5′	d 0.3′	m 1.33	ν 2.1′	d 0.2′ m -1.80	ν 2.6′	d 0.1′ m 0.18

Stars

	SHA	**Dec**
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.2
Schedar	349°27.8	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.7
Hamal	327°48.2	23°35.8
Polaris	312°18.3	89°22.8
Acamar	315°09.6	-40°11.4
Menkar	314°03.4	4°12.1
Mirfak	308°24.4	49°57.6
Aldebaran	290°36.7	16°33.9
Rigel	281°01.4	-8°10.1
Capella	280°18.1	46°01.4
Bellatrix	278°20.2	6°22.5
Elnath	277°58.7	28°37.8
Alnilam	275°35.2	-1°11.0
Betelgeuse	270°49.4	7°24.8
Canopus	263°51.1	-52°42.4
Sirius	258°24.0	-16°45.1
Adhara	255°03.9	-29°00.4
Procyon	244°48.4	5°09.2
Pollux	243°14.4	27°57.4
Avior	234°13.7	-59°35.6
Suhail	222°44.7	-43°32.5
Miaplacidus	221°37.9	-69°49.6
Alphard	217°45.6	-8°46.7
Regulus	207°32.1	11°49.8
Dubhe	193°38.7	61°35.8
Denebola	182°22.9	14°25.0
Gienah	175°41.5	-17°41.7
Acrux	172°58.1	-63°15.1
Gacrux	171°49.5	-57°16.0
Alioth	166°11.5	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.4
Hadar	148°33.3	-60°30.4
Menkent	147°55.3	-36°30.3
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.7	-60°57.0
Kochab	137°21.2	74°02.4
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.4
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.6
Eltanin	90°41.5	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.2	-56°38.8
Deneb	49°24.2	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.7	28°14.3
Markab	13°27.4	15°21.6

Oct 31 Sun	**SHA**	**Mer.pass**
Venus	123°56.9	13:09
Mars	110°52.4	14:00
Jupiter	188°41.2	08:48
Saturn	337°19.2	22:50

Nov 01 Mon	**SHA**	**Mer.pass**
Venus	122°40.0	13:10
Mars	110°05.4	13:59
Jupiter	188°31.3	08:44
Saturn	337°23.5	22:46

Nov 02 Tue	**SHA**	**Mer.pass**
Venus	121°22.8	13:11
Mars	109°18.2	13:58
Jupiter	188°21.5	08:41
Saturn	337°27.7	22:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°05.4	S13°57.5	167°18.2	8.0′	S23°42.2	7.3′	57.2′
1	199°05.4	58.4	181°45.3	8.0′	23°49.5	7.1′	57.1′
2	214°05.5	13°59.2	196°12.3	8.0′	23°56.6	6.9′	57.1′
3	229°05.5	14°00.0	210°39.3	8.0′	24°03.5	6.8′	57.1′
4	244°05.5	00.8	225°06.3	7.9′	24°10.3	6.7′	57.0′
5	259°05.5	01.6	239°33.2	7.9′	24°17.0	6.5′	57.0′
6	274°05.6	S14°02.4	254°00.1	7.9′	S24°23.5	6.4′	57.0′
7	289°05.6	03.2	268°27.0	7.9′	24°29.9	6.2′	57.0′
8	304°05.6	04.0	282°53.9	7.8′	24°36.1	6.1′	56.9′
9	319°05.7	·· 04.9	297°20.7	7.8′	24°42.2	5.9′	56.9′
10	334°05.7	05.7	311°47.5	7.8′	24°48.1	5.8′	56.9′
11	349°05.7	06.5	326°14.4	7.8′	24°53.9	5.6′	56.8′
12	4°05.7	S14°07.3	340°41.1	7.8′	S24°59.5	5.5′	56.8′
13	19°05.8	08.1	355°07.9	7.8′	25°05.0	5.4′	56.8′
14	34°05.8	08.9	9°34.7	7.8′	25°10.4	5.2′	56.7′
15	49°05.8	·· 09.7	24°01.4	7.7′	25°15.6	5.0′	56.7′
16	64°05.8	10.5	38°28.2	7.7′	25°20.6	4.9′	56.7′
17	79°05.8	11.3	52°54.9	7.7′	25°25.5	4.7′	56.7′
18	94°05.9	S14°12.1	67°21.6	7.7′	S25°30.2	4.6′	56.6′
19	109°05.9	12.9	81°48.4	7.7′	25°34.8	4.5′	56.6′
20	124°05.9	13.8	96°15.1	7.7′	25°39.3	4.2′	56.6′
21	139°05.9	·· 14.6	110°41.8	7.7′	25°43.5	4.2′	56.5′
22	154°06.0	15.4	125°08.5	7.7′	25°47.7	4.0′	56.5′
23	169°06.0	16.2	139°35.2	7.7′	25°51.7	3.8′	56.5′
	SD = 16.1′	d = 0.8′	SD = 15.6′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.0	S14°17.0	154°01.9	7.7′	S25°55.5	3.7′	56.5′
1	199°06.0	17.8	168°28.6	7.7′	25°59.2	3.5′	56.4′
2	214°06.0	18.6	182°55.3	7.7′	26°02.7	3.4′	56.4′
3	229°06.1	·· 19.4	197°22.0	7.7′	26°06.1	3.3′	56.4′
4	244°06.1	20.2	211°48.7	7.7′	26°09.4	3.1′	56.3′
5	259°06.1	21.0	226°15.4	7.7′	26°12.5	2.9′	56.3′
6	274°06.1	S14°21.8	240°42.1	7.7′	S26°15.4	2.8′	56.3′
7	289°06.1	22.6	255°08.9	7.7′	26°18.2	2.6′	56.3′
8	304°06.2	23.4	269°35.6	7.8′	26°20.8	2.5′	56.2′
9	319°06.2	·· 24.2	284°02.4	7.8′	26°23.3	2.3′	56.2′
10	334°06.2	25.0	298°29.2	7.8′	26°25.6	2.2′	56.2′
11	349°06.2	25.8	312°55.9	7.8′	26°27.8	2.0′	56.1′
12	4°06.2	S14°26.6	327°22.7	7.8′	S26°29.8	1.9′	56.1′
13	19°06.2	27.4	341°49.6	7.8′	26°31.7	1.7′	56.1′
14	34°06.3	28.2	356°16.4	7.9′	26°33.4	1.6′	56.1′
15	49°06.3	·· 29.0	10°43.3	7.9′	26°35.0	1.5′	56.0′
16	64°06.3	29.8	25°10.2	7.9′	26°36.5	1.2′	56.0′
17	79°06.3	30.6	39°37.1	7.9′	26°37.7	1.2′	56.0′
18	94°06.3	S14°31.4	54°04.0	8.0′	S26°38.9	1.0′	56.0′
19	109°06.3	32.2	68°31.0	8.0′	26°39.9	0.8′	55.9′
20	124°06.4	33.0	82°58.0	8.0′	26°40.7	0.7′	55.9′
21	139°06.4	·· 33.8	97°25.0	8.1′	26°41.4	0.5′	55.9′
22	154°06.4	34.6	111°52.0	8.1′	26°41.9	0.4′	55.8′
23	169°06.4	35.4	126°19.1	8.1′	26°42.3	0.3′	55.8′
	SD = 16.1′	d = 0.8′	SD = 15.4′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.4	S14°36.2	140°46.2	8.2′	S26°42.6	0.1′	55.8′
1	199°06.4	37.0	155°13.4	8.2′	26°42.7	0.1′	55.8′
2	214°06.4	37.8	169°40.6	8.2′	26°42.6	0.2′	55.7′
3	229°06.4	·· 38.6	184°07.8	8.3′	26°42.4	0.3′	55.7′
4	244°06.5	39.4	198°35.1	8.3′	26°42.1	0.5′	55.7′
5	259°06.5	40.2	213°02.4	8.3′	26°41.6	0.6′	55.7′
6	274°06.5	S14°40.9	227°29.7	8.4′	S26°41.0	0.8′	55.6′
7	289°06.5	41.7	241°57.1	8.4′	26°40.2	0.9′	55.6′
8	304°06.5	42.5	256°24.5	8.5′	26°39.3	1.0′	55.6′
9	319°06.5	·· 43.3	270°52.0	8.5′	26°38.3	1.2′	55.6′
10	334°06.5	44.1	285°19.5	8.6′	26°37.1	1.4′	55.5′
11	349°06.5	44.9	299°47.1	8.6′	26°35.7	1.4′	55.5′
12	4°06.5	S14°45.7	314°14.7	8.7′	S26°34.3	1.7′	55.5′
13	19°06.5	46.5	328°42.4	8.7′	26°32.6	1.7′	55.5′
14	34°06.6	47.3	343°10.1	8.8′	26°30.9	1.9′	55.4′
15	49°06.6	·· 48.1	357°37.9	8.8′	26°29.0	2.0′	55.4′
16	64°06.6	48.9	12°05.7	8.9′	26°27.0	2.2′	55.4′
17	79°06.6	49.6	26°33.6	8.9′	26°24.8	2.3′	55.4′
18	94°06.6	S14°50.4	41°01.5	9.0′	S26°22.5	2.5′	55.3′
19	109°06.6	51.2	55°29.5	9.1′	26°20.0	2.5′	55.3′
20	124°06.6	52.0	69°57.6	9.1′	26°17.5	2.7′	55.3′
21	139°06.6	·· 52.8	84°25.7	9.2′	26°14.8	2.9′	55.3′
22	154°06.6	53.6	98°53.9	9.2′	26°11.9	3.0′	55.2′
23	169°06.6	54.4	113°22.1	9.3′	26°08.9	3.1′	55.2′
	SD = 16.1′	d = 0.8′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:05	07:28	08:55	14:31	15:58	17:20
N 70°	06:01	07:15	08:29	14:57	16:11	17:24
68°	05:58	07:05	08:10	15:16	16:21	17:28
66°	05:54	06:56	07:54	15:32	16:30	17:31
64°	05:52	06:48	07:41	15:45	16:38	17:34
62°	05:49	06:42	07:31	15:55	16:44	17:37
60°	05:47	06:36	07:21	16:05	16:50	17:39
N 58°	05:45	06:31	07:13	16:13	16:55	17:41
56°	05:43	06:27	07:06	16:20	17:00	17:44
54°	05:41	06:23	07:00	16:26	17:04	17:46
52°	05:39	06:19	06:54	16:32	17:08	17:48
50°	05:37	06:15	06:49	16:37	17:11	17:49
45°	05:33	06:07	06:38	16:49	17:19	17:54
N 40°	05:29	06:01	06:29	16:58	17:26	17:58
35°	05:25	05:55	06:21	17:06	17:32	18:02
30°	05:21	05:49	06:14	17:13	17:38	18:06
20°	05:13	05:39	06:01	17:26	17:48	18:14
N 10°	05:04	05:29	05:50	17:37	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:43	05:08	05:30	17:58	18:19	18:45
20°	04:29	04:56	05:19	18:09	18:32	18:59
30°	04:10	04:40	05:06	18:22	18:47	19:17
35°	03:59	04:31	04:58	18:30	18:57	19:29
40°	03:45	04:20	04:49	18:38	19:08	19:43
45°	03:28	04:07	04:39	18:49	19:21	20:01
S 50°	03:05	03:51	04:27	19:01	19:38	20:24
52°	02:54	03:43	04:21	19:07	19:46	20:35
54°	02:41	03:34	04:15	19:14	19:55	20:49
56°	02:25	03:24	04:08	19:21	20:05	21:05
58°	02:06	03:13	04:00	19:29	20:17	21:24
S 60°	01:41	02:59	03:51	19:38	20:31	21:50

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	12:14	▬	▬	14:19	▬	▬
62°	11:22	12:55	13:49	15:11	15:34	16:33
60°	10:50	12:12	13:07	15:44	16:17	17:15
N 58°	10:27	11:43	12:38	16:08	16:46	17:44
56°	10:08	11:21	12:16	16:27	17:08	18:06
54°	09:52	11:03	11:58	16:43	17:27	18:24
52°	09:38	10:47	11:43	16:57	17:42	18:39
50°	09:26	10:34	11:29	17:10	17:56	18:52
45°	09:01	10:06	11:02	17:35	18:23	19:19
N 40°	08:41	09:45	10:40	17:55	18:45	19:41
35°	08:25	09:27	10:22	18:12	19:03	19:59
30°	08:11	09:11	10:07	18:27	19:19	20:14
20°	07:47	08:45	09:41	18:52	19:45	20:40
N 10°	07:26	08:23	09:18	19:13	20:08	21:02
0°	07:07	08:02	08:57	19:33	20:29	21:23
S 10°	06:48	07:41	08:36	19:54	20:50	21:43
20°	06:28	07:19	08:13	20:15	21:12	22:05
30°	06:04	06:53	07:47	20:40	21:39	22:31
35°	05:50	06:38	07:32	20:55	21:54	22:46
40°	05:35	06:21	07:14	21:12	22:12	23:03
45°	05:16	06:00	06:52	21:33	22:34	23:24
S 50°	04:53	05:33	06:25	21:59	23:01	23:50
52°	04:41	05:20	06:11	22:12	23:15	·· ··
54°	04:29	05:06	05:56	22:26	23:30	·· ··
56°	04:14	04:49	05:38	22:43	23:48	·· ··
58°	03:57	04:28	05:16	23:04	·· ··	00:10
S 60°	03:37	04:02	04:47	23:30	·· ··	00:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 2-4 3-13%
31	16:22	16:23	11:44	13:20	00:53	
01	16:24	16:25	11:44	14:15	01:48	
02	16:26	16:26	11:44	15:10	02:43	

November 03, 04, 05 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	42°02.0	162°07.3	S20°59.8	150°32.8	S23°13.3	230°13.8	N04°39.8	19°33.9	N06°25.8
1	57°04.5	177°06.5	21°00.6	165°33.3	13.6	245°15.9	39.7	34°36.5	25.7
2	72°06.9	192°05.8	01.3	180°33.8	13.8	260°17.9	39.5	49°39.2	25.6
3	87°09.4	207°05.0	·· 02.0	195°34.3	·· 14.1	275°20.0	·· 39.3	64°41.8	·· 25.6
4	102°11.9	222°04.2	02.7	210°34.7	14.3	290°22.1	39.2	79°44.5	25.5
5	117°14.3	237°03.4	03.5	225°35.2	14.6	305°24.1	39.0	94°47.1	25.5
6	132°16.8	252°02.7	S21°04.2	240°35.7	S23°14.8	320°26.2	N04°38.8	109°49.7	N06°25.4
7	147°19.3	267°01.9	04.9	255°36.2	15.1	335°28.2	38.7	124°52.4	25.3
8	162°21.7	282°01.1	05.6	270°36.7	15.3	350°30.3	38.5	139°55.0	25.3
9	177°24.2	297°00.3	·· 06.3	285°37.2	·· 15.6	5°32.4	·· 38.3	154°57.7	·· 25.2
10	192°26.6	311°59.6	07.1	300°37.7	15.8	20°34.4	38.2	170°00.3	25.1
11	207°29.1	326°58.8	07.8	315°38.1	16.1	35°36.5	38.0	185°02.9	25.1
12	222°31.6	341°58.0	S21°08.5	330°38.6	S23°16.3	50°38.6	N04°37.8	200°05.6	N06°25.0
13	237°34.0	356°57.2	09.2	345°39.1	16.5	65°40.6	37.7	215°08.2	24.9
14	252°36.5	11°56.5	09.9	0°39.6	16.8	80°42.7	37.5	230°10.8	24.9
15	267°39.0	26°55.7	·· 10.6	15°40.1	·· 17.0	95°44.7	·· 37.4	245°13.5	·· 24.8
16	282°41.4	41°54.9	11.3	30°40.6	17.3	110°46.8	37.2	260°16.1	24.8
17	297°43.9	56°54.1	12.0	45°41.1	17.5	125°48.9	37.0	275°18.8	24.7
18	312°46.4	71°53.3	S21°12.7	60°41.5	S23°17.8	140°50.9	N04°36.9	290°21.4	N06°24.6
19	327°48.8	86°52.6	13.5	75°42.0	18.0	155°53.0	36.7	305°24.0	24.6
20	342°51.3	101°51.8	14.2	90°42.5	18.2	170°55.1	36.5	320°26.7	24.5
21	357°53.7	116°51.0	·· 14.9	105°43.0	·· 18.5	185°57.1	·· 36.4	335°29.3	·· 24.4
22	12°56.2	131°50.2	15.6	120°43.5	18.7	200°59.2	36.2	350°32.0	24.4
23	27°58.7	146°49.4	16.3	135°44.0	19.0	216°01.3	36.1	5°34.6	24.3
Mer.pass. 21:08		ν -0.8′	d 0.7′	m -3.88	ν 0.5′	d 0.2′	m 1.33	ν 2.1′	d 0.2′ m -1.80	ν 2.6′	d 0.1′ m 0.18

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	43°01.1	161°48.6	S21°17.0	150°44.4	S23°19.2	231°03.3	N04°35.9	20°37.2	N06°24.2
1	58°03.6	176°47.9	17.7	165°44.9	19.4	246°05.4	35.7	35°39.9	24.2
2	73°06.1	191°47.1	18.4	180°45.4	19.7	261°07.4	35.6	50°42.5	24.1
3	88°08.5	206°46.3	·· 19.1	195°45.9	·· 19.9	276°09.5	·· 35.4	65°45.1	·· 24.1
4	103°11.0	221°45.5	19.8	210°46.4	20.2	291°11.6	35.2	80°47.8	24.0
5	118°13.5	236°44.7	20.5	225°46.8	20.4	306°13.6	35.1	95°50.4	23.9
6	133°15.9	251°43.9	S21°21.2	240°47.3	S23°20.6	321°15.7	N04°34.9	110°53.0	N06°23.9
7	148°18.4	266°43.1	21.9	255°47.8	20.9	336°17.8	34.8	125°55.7	23.8
8	163°20.9	281°42.4	22.6	270°48.3	21.1	351°19.8	34.6	140°58.3	23.7
9	178°23.3	296°41.6	·· 23.2	285°48.8	·· 21.3	6°21.9	·· 34.4	156°01.0	·· 23.7
10	193°25.8	311°40.8	23.9	300°49.2	21.6	21°24.0	34.3	171°03.6	23.6
11	208°28.2	326°40.0	24.6	315°49.7	21.8	36°26.0	34.1	186°06.2	23.6
12	223°30.7	341°39.2	S21°25.3	330°50.2	S23°22.0	51°28.1	N04°33.9	201°08.9	N06°23.5
13	238°33.2	356°38.4	26.0	345°50.7	22.3	66°30.2	33.8	216°11.5	23.4
14	253°35.6	11°37.6	26.7	0°51.2	22.5	81°32.2	33.6	231°14.1	23.4
15	268°38.1	26°36.8	·· 27.4	15°51.6	·· 22.7	96°34.3	·· 33.5	246°16.8	·· 23.3
16	283°40.6	41°36.0	28.1	30°52.1	23.0	111°36.4	33.3	261°19.4	23.2
17	298°43.0	56°35.3	28.7	45°52.6	23.2	126°38.4	33.1	276°22.0	23.2
18	313°45.5	71°34.5	S21°29.4	60°53.1	S23°23.4	141°40.5	N04°33.0	291°24.7	N06°23.1
19	328°48.0	86°33.7	30.1	75°53.6	23.7	156°42.6	32.8	306°27.3	23.1
20	343°50.4	101°32.9	30.8	90°54.0	23.9	171°44.6	32.7	321°30.0	23.0
21	358°52.9	116°32.1	·· 31.5	105°54.5	·· 24.1	186°46.7	·· 32.5	336°32.6	·· 22.9
22	13°55.4	131°31.3	32.2	120°55.0	24.4	201°48.8	32.3	351°35.2	22.9
23	28°57.8	146°30.5	32.8	135°55.5	24.6	216°50.8	32.2	6°37.9	22.8
Mer.pass. 21:04		ν -0.8′	d 0.7′	m -3.88	ν 0.5′	d 0.2′	m 1.33	ν 2.1′	d 0.2′ m -1.80	ν 2.6′	d 0.1′ m 0.19

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°00.3	161°29.7	S21°33.5	150°55.9	S23°24.8	231°52.9	N04°32.0	21°40.5	N06°22.7
1	59°02.7	176°28.9	34.2	165°56.4	25.1	246°55.0	31.8	36°43.1	22.7
2	74°05.2	191°28.1	34.9	180°56.9	25.3	261°57.1	31.7	51°45.8	22.6
3	89°07.7	206°27.3	·· 35.5	195°57.4	·· 25.5	276°59.1	·· 31.5	66°48.4	·· 22.6
4	104°10.1	221°26.5	36.2	210°57.8	25.7	292°01.2	31.4	81°51.0	22.5
5	119°12.6	236°25.7	36.9	225°58.3	26.0	307°03.3	31.2	96°53.7	22.4
6	134°15.1	251°24.9	S21°37.5	240°58.8	S23°26.2	322°05.3	N04°31.0	111°56.3	N06°22.4
7	149°17.5	266°24.1	38.2	255°59.3	26.4	337°07.4	30.9	126°58.9	22.3
8	164°20.0	281°23.3	38.9	270°59.7	26.7	352°09.5	30.7	142°01.6	22.2
9	179°22.5	296°22.5	·· 39.6	286°00.2	·· 26.9	7°11.5	·· 30.6	157°04.2	·· 22.2
10	194°24.9	311°21.7	40.2	301°00.7	27.1	22°13.6	30.4	172°06.9	22.1
11	209°27.4	326°20.9	40.9	316°01.2	27.3	37°15.7	30.2	187°09.5	22.1
12	224°29.9	341°20.1	S21°41.5	331°01.6	S23°27.6	52°17.7	N04°30.1	202°12.1	N06°22.0
13	239°32.3	356°19.3	42.2	346°02.1	27.8	67°19.8	29.9	217°14.8	21.9
14	254°34.8	11°18.5	42.9	1°02.6	28.0	82°21.9	29.8	232°17.4	21.9
15	269°37.2	26°17.7	·· 43.5	16°03.1	·· 28.2	97°24.0	·· 29.6	247°20.0	·· 21.8
16	284°39.7	41°16.9	44.2	31°03.5	28.5	112°26.0	29.4	262°22.7	21.8
17	299°42.2	56°16.1	44.9	46°04.0	28.7	127°28.1	29.3	277°25.3	21.7
18	314°44.6	71°15.3	S21°45.5	61°04.5	S23°28.9	142°30.2	N04°29.1	292°27.9	N06°21.6
19	329°47.1	86°14.5	46.2	76°05.0	29.1	157°32.2	29.0	307°30.6	21.6
20	344°49.6	101°13.7	46.8	91°05.4	29.3	172°34.3	28.8	322°33.2	21.5
21	359°52.0	116°12.9	·· 47.5	106°05.9	·· 29.6	187°36.4	·· 28.6	337°35.8	·· 21.4
22	14°54.5	131°12.1	48.1	121°06.4	29.8	202°38.5	28.5	352°38.5	21.4
23	29°57.0	146°11.3	48.8	136°06.8	30.0	217°40.5	28.3	7°41.1	21.3
Mer.pass. 21:01		ν -0.8′	d 0.7′	m -3.88	ν 0.5′	d 0.2′	m 1.32	ν 2.1′	d 0.2′ m -1.81	ν 2.6′	d 0.1′ m 0.19

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.8	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.7
Hamal	327°48.2	23°35.8
Polaris	312°17.6	89°22.8
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.1
Mirfak	308°24.4	49°57.6
Aldebaran	290°36.7	16°33.9
Rigel	281°01.4	-8°10.1
Capella	280°18.1	46°01.4
Bellatrix	278°20.1	6°22.5
Elnath	277°58.7	28°37.8
Alnilam	275°35.1	-1°11.0
Betelgeuse	270°49.4	7°24.8
Canopus	263°51.0	-52°42.4
Sirius	258°24.0	-16°45.1
Adhara	255°03.9	-29°00.4
Procyon	244°48.3	5°09.2
Pollux	243°14.4	27°57.4
Avior	234°13.7	-59°35.6
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.8	-69°49.6
Alphard	217°45.5	-8°46.7
Regulus	207°32.1	11°49.8
Dubhe	193°38.7	61°35.8
Denebola	182°22.9	14°24.9
Gienah	175°41.5	-17°41.7
Acrux	172°58.0	-63°15.1
Gacrux	171°49.5	-57°16.0
Alioth	166°11.5	55°48.4
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.4
Hadar	148°33.3	-60°30.3
Menkent	147°55.3	-36°30.3
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.7	-60°57.0
Kochab	137°21.2	74°02.4
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.6
Eltanin	90°41.5	51°29.4
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.2	-56°38.8
Deneb	49°24.2	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.8	28°14.3
Markab	13°27.4	15°21.6

Nov 03 Wed	SHA	Mer.pass
Venus	120°05.3	13:12
Mars	108°30.8	13:57
Jupiter	188°11.8	08:38
Saturn	337°31.9	22:38

Nov 04 Thu	SHA	Mer.pass
Venus	118°47.5	13:13
Mars	107°43.3	13:57
Jupiter	188°02.2	08:35
Saturn	337°36.1	22:34

Nov 05 Fri	SHA	Mer.pass
Venus	117°29.4	13:15
Mars	106°55.7	13:56
Jupiter	187°52.6	08:31
Saturn	337°40.2	22:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.6	S14°55.2	127°50.4	9.4′	S26°05.8	3.2′	55.2′
1	199°06.6	55.9	142°18.7	9.4′	26°02.6	3.4′	55.2′
2	214°06.6	56.7	156°47.2	9.5′	25°59.2	3.5′	55.1′
3	229°06.6	·· 57.5	171°15.6	9.5′	25°55.7	3.6′	55.1′
4	244°06.6	58.3	185°44.2	9.6′	25°52.1	3.8′	55.1′
5	259°06.6	59.1	200°12.8	9.7′	25°48.3	3.9′	55.1′
6	274°06.6	S14°59.9	214°41.5	9.7′	S25°44.4	4.0′	55.1′
7	289°06.6	15°00.6	229°10.2	9.8′	25°40.4	4.1′	55.0′
8	304°06.6	01.4	243°39.0	9.9′	25°36.3	4.3′	55.0′
9	319°06.6	·· 02.2	258°07.9	9.9′	25°32.0	4.4′	55.0′
10	334°06.6	03.0	272°36.8	10.0′	25°27.6	4.5′	55.0′
11	349°06.6	03.8	287°05.8	10.1′	25°23.1	4.6′	55.0′
12	4°06.6	S15°04.5	301°34.9	10.2′	S25°18.5	4.7′	54.9′
13	19°06.6	05.3	316°04.1	10.2′	25°13.8	4.9′	54.9′
14	34°06.6	06.1	330°33.3	10.3′	25°08.9	5.0′	54.9′
15	49°06.6	·· 06.9	345°02.6	10.4′	25°03.9	5.1′	54.9′
16	64°06.6	07.7	359°32.0	10.4′	24°58.8	5.3′	54.9′
17	79°06.6	08.4	14°01.4	10.5′	24°53.5	5.3′	54.8′
18	94°06.6	S15°09.2	28°30.9	10.6′	S24°48.2	5.5′	54.8′
19	109°06.6	10.0	43°00.5	10.7′	24°42.7	5.5′	54.8′
20	124°06.6	10.8	57°30.1	10.7′	24°37.2	5.7′	54.8′
21	139°06.6	·· 11.5	71°59.9	10.8′	24°31.5	5.8′	54.8′
22	154°06.6	12.3	86°29.7	10.9′	24°25.7	6.0′	54.7′
23	169°06.6	13.1	100°59.6	11.0′	24°19.7	6.0′	54.7′
	SD = 16.1′	d = 0.8′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.6	S15°13.9	115°29.5	11.0′	S24°13.7	6.1′	54.7′
1	199°06.6	14.6	129°59.5	11.1′	24°07.6	6.3′	54.7′
2	214°06.6	15.4	144°29.6	11.2′	24°01.3	6.3′	54.7′
3	229°06.6	·· 16.2	158°59.8	11.3′	23°55.0	6.5′	54.7′
4	244°06.6	17.0	173°30.1	11.3′	23°48.5	6.6′	54.6′
5	259°06.6	17.7	188°00.4	11.4′	23°41.9	6.7′	54.6′
6	274°06.6	S15°18.5	202°30.8	11.5′	S23°35.2	6.8′	54.6′
7	289°06.6	19.3	217°01.3	11.6′	23°28.4	6.9′	54.6′
8	304°06.6	20.1	231°31.8	11.6′	23°21.5	6.9′	54.6′
9	319°06.6	·· 20.8	246°02.4	11.7′	23°14.6	7.1′	54.6′
10	334°06.6	21.6	260°33.1	11.8′	23°07.5	7.2′	54.5′
11	349°06.6	22.4	275°03.9	11.9′	23°00.3	7.3′	54.5′
12	4°06.5	S15°23.1	289°34.8	11.9′	S22°53.0	7.4′	54.5′
13	19°06.5	23.9	304°05.7	12.0′	22°45.6	7.5′	54.5′
14	34°06.5	24.7	318°36.7	12.1′	22°38.1	7.6′	54.5′
15	49°06.5	·· 25.5	333°07.8	12.2′	22°30.5	7.7′	54.5′
16	64°06.5	26.2	347°38.9	12.2′	22°22.8	7.8′	54.5′
17	79°06.5	27.0	2°10.2	12.3′	22°15.0	7.9′	54.5′
18	94°06.5	S15°27.8	16°41.5	12.4′	S22°07.1	8.0′	54.4′
19	109°06.5	28.5	31°12.8	12.4′	21°59.1	8.1′	54.4′
20	124°06.5	29.3	45°44.3	12.5′	21°51.0	8.1′	54.4′
21	139°06.5	·· 30.1	60°15.8	12.6′	21°42.9	8.3′	54.4′
22	154°06.4	30.8	74°47.4	12.7′	21°34.6	8.3′	54.4′
23	169°06.4	31.6	89°19.1	12.7′	21°26.3	8.5′	54.4′
	SD = 16.1′	d = 0.8′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.4	S15°32.3	103°50.8	12.8′	S21°17.8	8.5′	54.4′
1	199°06.4	33.1	118°22.6	12.9′	21°09.3	8.6′	54.4′
2	214°06.4	33.9	132°54.5	13.0′	21°00.7	8.7′	54.4′
3	229°06.4	·· 34.6	147°26.5	13.0′	20°52.0	8.8′	54.3′
4	244°06.4	35.4	161°58.5	13.1′	20°43.2	8.9′	54.3′
5	259°06.4	36.2	176°30.6	13.2′	20°34.3	8.9′	54.3′
6	274°06.3	S15°36.9	191°02.8	13.2′	S20°25.4	9.1′	54.3′
7	289°06.3	37.7	205°35.0	13.3′	20°16.3	9.1′	54.3′
8	304°06.3	38.5	220°07.3	13.4′	20°07.2	9.2′	54.3′
9	319°06.3	·· 39.2	234°39.7	13.4′	19°58.0	9.3′	54.3′
10	334°06.3	40.0	249°12.2	13.5′	19°48.7	9.4′	54.3′
11	349°06.3	40.7	263°44.7	13.6′	19°39.3	9.4′	54.3′
12	4°06.3	S15°41.5	278°17.3	13.7′	S19°29.9	9.6′	54.3′
13	19°06.2	42.2	292°49.9	13.7′	19°20.3	9.6′	54.3′
14	34°06.2	43.0	307°22.7	13.8′	19°10.7	9.6′	54.2′
15	49°06.2	·· 43.8	321°55.4	13.9′	19°01.1	9.8′	54.2′
16	64°06.2	44.5	336°28.3	13.9′	18°51.3	9.8′	54.2′
17	79°06.2	45.3	351°01.2	14.0′	18°41.5	9.9′	54.2′
18	94°06.1	S15°46.0	5°34.2	14.0′	S18°31.6	10.0′	54.2′
19	109°06.1	46.8	20°07.2	14.1′	18°21.6	10.1′	54.2′
20	124°06.1	47.5	34°40.3	14.2′	18°11.5	10.1′	54.2′
21	139°06.1	·· 48.3	49°13.5	14.2′	18°01.4	10.2′	54.2′
22	154°06.1	49.1	63°46.7	14.3′	17°51.2	10.3′	54.2′
23	169°06.0	49.8	78°20.0	14.4′	17°40.9	10.3′	54.2′
	SD = 16.1′	d = 0.8′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:17	07:42	09:15	14:11	15:44	17:08
N 70°	06:12	07:27	08:44	14:41	15:59	17:14
68°	06:07	07:15	08:22	15:04	16:11	17:19
66°	06:03	07:05	08:05	15:21	16:21	17:23
64°	06:00	06:57	07:51	15:35	16:29	17:26
62°	05:56	06:50	07:39	15:47	16:36	17:30
60°	05:53	06:43	07:29	15:57	16:43	17:33
N 58°	05:51	06:38	07:20	16:06	16:49	17:35
56°	05:48	06:33	07:13	16:14	16:54	17:38
54°	05:46	06:28	07:06	16:20	16:58	17:40
52°	05:44	06:24	07:00	16:27	17:03	17:43
50°	05:41	06:20	06:54	16:32	17:07	17:45
45°	05:36	06:11	06:42	16:44	17:15	17:50
N 40°	05:32	06:04	06:32	16:55	17:23	17:55
35°	05:27	05:57	06:23	17:03	17:30	18:00
30°	05:23	05:51	06:16	17:11	17:36	18:04
20°	05:14	05:40	06:03	17:24	17:47	18:13
N 10°	05:04	05:29	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:42	05:07	05:29	17:58	18:20	18:46
20°	04:27	04:54	05:17	18:10	18:33	19:01
30°	04:08	04:38	05:03	18:24	18:50	19:20
35°	03:55	04:28	04:55	18:33	19:00	19:32
40°	03:41	04:17	04:46	18:42	19:11	19:47
45°	03:22	04:03	04:35	18:53	19:26	20:06
S 50°	02:58	03:45	04:22	19:06	19:43	20:31
52°	02:46	03:37	04:16	19:13	19:52	20:43
54°	02:32	03:27	04:09	19:20	20:01	20:57
56°	02:15	03:16	04:01	19:27	20:12	21:15
58°	01:54	03:04	03:53	19:36	20:25	21:37
S 60°	01:25	02:49	03:43	19:46	20:40	22:07

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	16:15	▬	▬	19:16
68°	▬	▬	15:28	▬	▬	20:02
66°	▬	15:24	14:57	▬	18:30	20:32
64°	14:57	14:42	14:34	17:14	19:11	20:54
62°	14:08	14:14	14:15	18:03	19:39	21:12
60°	13:37	13:52	14:00	18:34	20:00	21:26
N 58°	13:13	13:34	13:47	18:57	20:17	21:39
56°	12:54	13:19	13:35	19:16	20:32	21:49
54°	12:38	13:06	13:25	19:31	20:44	21:59
52°	12:24	12:54	13:16	19:45	20:55	22:07
50°	12:12	12:44	13:08	19:57	21:05	22:15
45°	11:47	12:23	12:51	20:21	21:26	22:30
N 40°	11:27	12:05	12:37	20:41	21:42	22:43
35°	11:10	11:51	12:25	20:57	21:56	22:54
30°	10:56	11:38	12:15	21:11	22:08	23:04
20°	10:31	11:16	11:57	21:35	22:28	23:20
N 10°	10:10	10:57	11:41	21:55	22:46	23:34
0°	09:50	10:39	11:26	22:14	23:02	23:48
S 10°	09:30	10:22	11:11	22:33	23:19	·· ··
20°	09:08	10:03	10:55	22:53	23:36	·· ··
30°	08:43	09:40	10:37	23:17	23:56	·· ··
35°	08:29	09:27	10:26	23:30	·· ··	00:08
40°	08:12	09:12	10:14	23:46	·· ··	00:21
45°	07:51	08:55	09:59	·· ··	00:04	00:36
S 50°	07:25	08:32	09:41	·· ··	00:28	00:56
52°	07:13	08:21	09:33	00:03	00:39	01:05
54°	06:59	08:09	09:23	00:18	00:51	01:15
56°	06:42	07:55	09:12	00:35	01:06	01:26
58°	06:22	07:39	09:00	00:55	01:22	01:39
S 60°	05:56	07:19	08:46	01:21	01:43	01:54

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 5-7 20-38%
03	16:26	16:27	11:44	16:02	03:36	
04	16:26	16:26	11:44	16:51	04:27	
05	16:26	16:25	11:44	17:37	05:14	

November 06, 07, 08 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°59.4	161°10.5	S21°49.4	151°07.3	S23°30.2	232°42.6	N04°28.2	22°43.7	N06°21.3
1	60°01.9	176°09.7	50.1	166°07.8	30.4	247°44.7	28.0	37°46.4	21.2
2	75°04.3	191°08.9	50.7	181°08.3	30.7	262°46.7	27.8	52°49.0	21.1
3	90°06.8	206°08.1	·· 51.4	196°08.7	·· 30.9	277°48.8	·· 27.7	67°51.6	·· 21.1
4	105°09.3	221°07.2	52.0	211°09.2	31.1	292°50.9	27.5	82°54.3	21.0
5	120°11.7	236°06.4	52.7	226°09.7	31.3	307°53.0	27.4	97°56.9	21.0
6	135°14.2	251°05.6	S21°53.3	241°10.1	S23°31.5	322°55.0	N04°27.2	112°59.5	N06°20.9
7	150°16.7	266°04.8	54.0	256°10.6	31.8	337°57.1	27.0	128°02.2	20.8
8	165°19.1	281°04.0	54.6	271°11.1	32.0	352°59.2	26.9	143°04.8	20.8
9	180°21.6	296°03.2	·· 55.2	286°11.5	·· 32.2	8°01.2	·· 26.7	158°07.4	·· 20.7
10	195°24.1	311°02.4	55.9	301°12.0	32.4	23°03.3	26.6	173°10.1	20.6
11	210°26.5	326°01.6	56.5	316°12.5	32.6	38°05.4	26.4	188°12.7	20.6
12	225°29.0	341°00.8	S21°57.2	331°12.9	S23°32.8	53°07.5	N04°26.2	203°15.3	N06°20.5
13	240°31.5	356°00.0	57.8	346°13.4	33.1	68°09.5	26.1	218°18.0	20.5
14	255°33.9	10°59.1	58.4	1°13.9	33.3	83°11.6	25.9	233°20.6	20.4
15	270°36.4	25°58.3	·· 59.1	16°14.3	·· 33.5	98°13.7	·· 25.8	248°23.2	·· 20.3
16	285°38.8	40°57.5	21°59.7	31°14.8	33.7	113°15.8	25.6	263°25.9	20.3
17	300°41.3	55°56.7	22°00.3	46°15.3	33.9	128°17.8	25.5	278°28.5	20.2
18	315°43.8	70°55.9	S22°01.0	61°15.8	S23°34.1	143°19.9	N04°25.3	293°31.1	N06°20.2
19	330°46.2	85°55.1	01.6	76°16.2	34.3	158°22.0	25.1	308°33.8	20.1
20	345°48.7	100°54.3	02.2	91°16.7	34.6	173°24.1	25.0	323°36.4	20.0
21	0°51.2	115°53.4	·· 02.9	106°17.2	·· 34.8	188°26.1	·· 24.8	338°39.0	·· 20.0
22	15°53.6	130°52.6	03.5	121°17.6	35.0	203°28.2	24.7	353°41.7	19.9
23	30°56.1	145°51.8	04.1	136°18.1	35.2	218°30.3	24.5	8°44.3	19.9
Mer.pass. 20:57		ν -0.8′	d 0.7′	m -3.88	ν 0.5′	d 0.2′	m 1.32	ν 2.1′	d 0.2′ m -1.81	ν 2.6′	d 0.1′ m 0.20

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°58.6	160°51.0	S22°04.7	151°18.5	S23°35.4	233°32.4	N04°24.3	23°46.9	N06°19.8
1	61°01.0	175°50.2	05.4	166°19.0	35.6	248°34.4	24.2	38°49.5	19.7
2	76°03.5	190°49.3	06.0	181°19.5	35.8	263°36.5	24.0	53°52.2	19.7
3	91°06.0	205°48.5	·· 06.6	196°19.9	·· 36.0	278°38.6	·· 23.9	68°54.8	·· 19.6
4	106°08.4	220°47.7	07.2	211°20.4	36.2	293°40.7	23.7	83°57.4	19.6
5	121°10.9	235°46.9	07.9	226°20.9	36.4	308°42.7	23.6	99°00.1	19.5
6	136°13.3	250°46.1	S22°08.5	241°21.3	S23°36.7	323°44.8	N04°23.4	114°02.7	N06°19.4
7	151°15.8	265°45.2	09.1	256°21.8	36.9	338°46.9	23.2	129°05.3	19.4
8	166°18.3	280°44.4	09.7	271°22.3	37.1	353°49.0	23.1	144°08.0	19.3
9	181°20.7	295°43.6	·· 10.3	286°22.7	·· 37.3	8°51.0	·· 22.9	159°10.6	·· 19.3
10	196°23.2	310°42.8	10.9	301°23.2	37.5	23°53.1	22.8	174°13.2	19.2
11	211°25.7	325°42.0	11.6	316°23.7	37.7	38°55.2	22.6	189°15.9	19.1
12	226°28.1	340°41.1	S22°12.2	331°24.1	S23°37.9	53°57.3	N04°22.5	204°18.5	N06°19.1
13	241°30.6	355°40.3	12.8	346°24.6	38.1	68°59.4	22.3	219°21.1	19.0
14	256°33.1	10°39.5	13.4	1°25.0	38.3	84°01.4	22.1	234°23.8	19.0
15	271°35.5	25°38.7	·· 14.0	16°25.5	·· 38.5	99°03.5	·· 22.0	249°26.4	·· 18.9
16	286°38.0	40°37.8	14.6	31°26.0	38.7	114°05.6	21.8	264°29.0	18.8
17	301°40.4	55°37.0	15.2	46°26.4	38.9	129°07.7	21.7	279°31.6	18.8
18	316°42.9	70°36.2	S22°15.8	61°26.9	S23°39.1	144°09.7	N04°21.5	294°34.3	N06°18.7
19	331°45.4	85°35.4	16.4	76°27.4	39.3	159°11.8	21.4	309°36.9	18.7
20	346°47.8	100°34.5	17.0	91°27.8	39.5	174°13.9	21.2	324°39.5	18.6
21	1°50.3	115°33.7	·· 17.6	106°28.3	·· 39.7	189°16.0	·· 21.0	339°42.2	·· 18.5
22	16°52.8	130°32.9	18.2	121°28.7	39.9	204°18.1	20.9	354°44.8	18.5
23	31°55.2	145°32.0	18.8	136°29.2	40.1	219°20.1	20.7	9°47.4	18.4
Mer.pass. 20:53		ν -0.8′	d 0.6′	m -3.88	ν 0.5′	d 0.2′	m 1.32	ν 2.1′	d 0.2′ m -1.82	ν 2.6′	d 0.1′ m 0.20

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°57.7	160°31.2	S22°19.4	151°29.7	S23°40.3	234°22.2	N04°20.6	24°50.1	N06°18.4
1	62°00.2	175°30.4	20.0	166°30.1	40.5	249°24.3	20.4	39°52.7	18.3
2	77°02.6	190°29.6	20.6	181°30.6	40.7	264°26.4	20.3	54°55.3	18.2
3	92°05.1	205°28.7	·· 21.2	196°31.0	·· 40.9	279°28.5	·· 20.1	69°57.9	·· 18.2
4	107°07.6	220°27.9	21.8	211°31.5	41.1	294°30.5	19.9	85°00.6	18.1
5	122°10.0	235°27.1	22.4	226°32.0	41.3	309°32.6	19.8	100°03.2	18.1
6	137°12.5	250°26.2	S22°23.0	241°32.4	S23°41.5	324°34.7	N04°19.6	115°05.8	N06°18.0
7	152°14.9	265°25.4	23.6	256°32.9	41.7	339°36.8	19.5	130°08.5	17.9
8	167°17.4	280°24.6	24.2	271°33.3	41.9	354°38.9	19.3	145°11.1	17.9
9	182°19.9	295°23.7	·· 24.8	286°33.8	·· 42.1	9°40.9	·· 19.2	160°13.7	·· 17.8
10	197°22.3	310°22.9	25.4	301°34.2	42.3	24°43.0	19.0	175°16.4	17.8
11	212°24.8	325°22.1	26.0	316°34.7	42.5	39°45.1	18.9	190°19.0	17.7
12	227°27.3	340°21.2	S22°26.5	331°35.2	S23°42.7	54°47.2	N04°18.7	205°21.6	N06°17.6
13	242°29.7	355°20.4	27.1	346°35.6	42.9	69°49.3	18.5	220°24.2	17.6
14	257°32.2	10°19.6	27.7	1°36.1	43.1	84°51.3	18.4	235°26.9	17.5
15	272°34.7	25°18.7	·· 28.3	16°36.5	·· 43.3	99°53.4	·· 18.2	250°29.5	·· 17.5
16	287°37.1	40°17.9	28.9	31°37.0	43.5	114°55.5	18.1	265°32.1	17.4
17	302°39.6	55°17.1	29.4	46°37.4	43.7	129°57.6	17.9	280°34.8	17.4
18	317°42.0	70°16.2	S22°30.0	61°37.9	S23°43.9	144°59.7	N04°17.8	295°37.4	N06°17.3
19	332°44.5	85°15.4	30.6	76°38.4	44.1	160°01.8	17.6	310°40.0	17.2
20	347°47.0	100°14.5	31.2	91°38.8	44.3	175°03.8	17.5	325°42.6	17.2
21	2°49.4	115°13.7	·· 31.8	106°39.3	·· 44.4	190°05.9	·· 17.3	340°45.3	·· 17.1
22	17°51.9	130°12.9	32.3	121°39.7	44.6	205°08.0	17.1	355°47.9	17.1
23	32°54.4	145°12.0	32.9	136°40.2	44.8	220°10.1	17.0	10°50.5	17.0
Mer.pass. 20:49		ν -0.8′	d 0.6′	m -3.88	ν 0.5′	d 0.2′	m 1.32	ν 2.1′	d 0.2′ m -1.82	ν 2.6′	d 0.1′ m 0.21

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.7
Hamal	327°48.2	23°35.8
Polaris	312°17.3	89°22.8
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.1
Mirfak	308°24.4	49°57.6
Aldebaran	290°36.6	16°33.9
Rigel	281°01.4	-8°10.1
Capella	280°18.1	46°01.4
Bellatrix	278°20.1	6°22.5
Elnath	277°58.6	28°37.8
Alnilam	275°35.1	-1°11.0
Betelgeuse	270°49.3	7°24.8
Canopus	263°51.0	-52°42.4
Sirius	258°24.0	-16°45.1
Adhara	255°03.8	-29°00.4
Procyon	244°48.3	5°09.2
Pollux	243°14.4	27°57.4
Avior	234°13.6	-59°35.6
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.7	-69°49.6
Alphard	217°45.5	-8°46.7
Regulus	207°32.1	11°49.8
Dubhe	193°38.6	61°35.7
Denebola	182°22.8	14°24.9
Gienah	175°41.5	-17°41.7
Acrux	172°58.0	-63°15.0
Gacrux	171°49.5	-57°16.0
Alioth	166°11.5	55°48.3
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.4
Hadar	148°33.3	-60°30.3
Menkent	147°55.3	-36°30.3
Arcturus	145°46.2	19°02.3
Rigil Kent.	139°37.7	-60°57.0
Kochab	137°21.2	74°02.4
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.5	51°29.3
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.3	-56°38.8
Deneb	49°24.3	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°29.9	-46°49.6
Fomalhaut	15°11.8	-29°28.4
Scheat	13°42.8	28°14.3
Markab	13°27.4	15°21.6

Nov 06 Sat	SHA	Mer.pass
Venus	116°11.1	13:16
Mars	106°07.9	13:55
Jupiter	187°43.2	08:28
Saturn	337°44.3	22:25

Nov 07 Sun	SHA	Mer.pass
Venus	114°52.4	13:17
Mars	105°20.0	13:54
Jupiter	187°33.8	08:25
Saturn	337°48.4	22:21

Nov 08 Mon	SHA	Mer.pass
Venus	113°33.5	13:19
Mars	104°32.0	13:54
Jupiter	187°24.5	08:21
Saturn	337°52.4	22:17

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0847 sec ΔT = TT-UT1 = +69.2687 sec

2027 November 06 to Nov. 08 UT

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.0	S15°50.6	92°53.4	14.4′	S17°30.6	10.4′	54.2′
1	199°06.0	51.3	107°26.8	14.5′	17°20.2	10.5′	54.2′
2	214°06.0	52.1	122°00.3	14.5′	17°09.7	10.6′	54.2′
3	229°06.0	·· 52.8	136°33.8	14.6′	16°59.1	10.6′	54.2′
4	244°05.9	53.6	151°07.4	14.6′	16°48.5	10.7′	54.2′
5	259°05.9	54.3	165°41.0	14.7′	16°37.8	10.7′	54.2′
6	274°05.9	S15°55.1	180°14.7	14.8′	S16°27.1	10.8′	54.2′
7	289°05.9	55.8	194°48.5	14.8′	16°16.3	10.9′	54.2′
8	304°05.8	56.6	209°22.3	14.9′	16°05.4	10.9′	54.2′
9	319°05.8	·· 57.3	223°56.1	14.9′	15°54.5	11.0′	54.2′
10	334°05.8	58.1	238°30.0	15.0′	15°43.5	11.1′	54.2′
11	349°05.8	58.8	253°04.0	15.0′	15°32.4	11.1′	54.2′
12	4°05.8	S15°59.6	267°38.0	15.1′	S15°21.3	11.2′	54.2′
13	19°05.7	16°00.3	282°12.1	15.1′	15°10.1	11.2′	54.2′
14	34°05.7	01.1	296°46.2	15.2′	14°58.9	11.3′	54.2′
15	49°05.7	·· 01.8	311°20.4	15.2′	14°47.6	11.4′	54.2′
16	64°05.6	02.6	325°54.6	15.3′	14°36.2	11.4′	54.2′
17	79°05.6	03.3	340°28.8	15.3′	14°24.8	11.5′	54.2′
18	94°05.6	S16°04.1	355°03.1	15.4′	S14°13.3	11.5′	54.2′
19	109°05.6	04.8	9°37.5	15.4′	14°01.8	11.6′	54.2′
20	124°05.5	05.5	24°11.9	15.4′	13°50.2	11.6′	54.2′
21	139°05.5	·· 06.3	38°46.3	15.5′	13°38.6	11.7′	54.2′
22	154°05.5	07.0	53°20.8	15.5′	13°26.9	11.8′	54.2′
23	169°05.5	07.8	67°55.3	15.6′	13°15.1	11.8′	54.2′
	SD = 16.1′	d = 0.8′	SD = 14.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°05.4	S16°08.5	82°29.9	15.6′	S13°03.3	11.8′	54.2′
1	199°05.4	09.3	97°04.5	15.6′	12°51.5	11.9′	54.2′
2	214°05.4	10.0	111°39.1	15.7′	12°39.6	12.0′	54.2′
3	229°05.3	·· 10.7	126°13.8	15.7′	12°27.6	11.9′	54.2′
4	244°05.3	11.5	140°48.5	15.8′	12°15.7	12.1′	54.2′
5	259°05.3	12.2	155°23.3	15.8′	12°03.6	12.1′	54.2′
6	274°05.2	S16°13.0	169°58.1	15.8′	S11°51.5	12.1′	54.2′
7	289°05.2	13.7	184°32.9	15.9′	11°39.4	12.2′	54.2′
8	304°05.2	14.4	199°07.8	15.9′	11°27.2	12.3′	54.2′
9	319°05.1	·· 15.2	213°42.7	15.9′	11°14.9	12.2′	54.2′
10	334°05.1	15.9	228°17.6	16.0′	11°02.7	12.4′	54.3′
11	349°05.1	16.7	242°52.5	16.0′	10°50.3	12.3′	54.3′
12	4°05.1	S16°17.4	257°27.5	16.0′	S10°38.0	12.4′	54.3′
13	19°05.0	18.1	272°02.5	16.0′	10°25.6	12.5′	54.3′
14	34°05.0	18.9	286°37.6	16.1′	10°13.1	12.5′	54.3′
15	49°04.9	·· 19.6	301°12.6	16.1′	10°00.6	12.5′	54.3′
16	64°04.9	20.3	315°47.7	16.1′	09°48.1	12.6′	54.3′
17	79°04.9	21.1	330°22.8	16.1′	09°35.5	12.6′	54.3′
18	94°04.8	S16°21.8	344°58.0	16.2′	S09°22.9	12.7′	54.3′
19	109°04.8	22.5	359°33.1	16.2′	09°10.2	12.7′	54.3′
20	124°04.8	23.3	14°08.3	16.2′	08°57.5	12.7′	54.3′
21	139°04.7	·· 24.0	28°43.5	16.2′	08°44.8	12.8′	54.3′
22	154°04.7	24.7	43°18.7	16.2′	08°32.0	12.8′	54.4′
23	169°04.7	25.5	57°54.0	16.3′	08°19.2	12.9′	54.4′
	SD = 16.1′	d = 0.7′	SD = 14.8′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°04.6	S16°26.2	72°29.3	16.3′	S08°06.3	12.9′	54.4′
1	199°04.6	26.9	87°04.5	16.3′	07°53.4	12.9′	54.4′
2	214°04.5	27.7	101°39.8	16.3′	07°40.5	12.9′	54.4′
3	229°04.5	·· 28.4	116°15.1	16.3′	07°27.6	13.0′	54.4′
4	244°04.5	29.1	130°50.4	16.3′	07°14.6	13.1′	54.4′
5	259°04.4	29.8	145°25.8	16.3′	07°01.5	13.0′	54.4′
6	274°04.4	S16°30.6	160°01.1	16.4′	S06°48.5	13.1′	54.4′
7	289°04.3	31.3	174°36.5	16.4′	06°35.4	13.1′	54.5′
8	304°04.3	32.0	189°11.8	16.4′	06°22.3	13.2′	54.5′
9	319°04.3	·· 32.8	203°47.2	16.4′	06°09.1	13.1′	54.5′
10	334°04.2	33.5	218°22.6	16.4′	05°56.0	13.2′	54.5′
11	349°04.2	34.2	232°58.0	16.4′	05°42.8	13.3′	54.5′
12	4°04.1	S16°34.9	247°33.4	16.4′	S05°29.5	13.2′	54.5′
13	19°04.1	35.7	262°08.8	16.4′	05°16.3	13.3′	54.5′
14	34°04.1	36.4	276°44.2	16.4′	05°03.0	13.3′	54.6′
15	49°04.0	·· 37.1	291°19.6	16.4′	04°49.7	13.4′	54.6′
16	64°04.0	37.8	305°55.0	16.4′	04°36.3	13.4′	54.6′
17	79°03.9	38.6	320°30.4	16.4′	04°22.9	13.4′	54.6′
18	94°03.9	S16°39.3	335°05.8	16.4′	S04°09.5	13.4′	54.6′
19	109°03.8	40.0	349°41.2	16.4′	03°56.1	13.4′	54.6′
20	124°03.8	40.7	4°16.6	16.4′	03°42.7	13.5′	54.6′
21	139°03.7	·· 41.4	18°52.0	16.4′	03°29.2	13.5′	54.7′
22	154°03.7	42.2	33°27.4	16.4′	03°15.7	13.5′	54.7′
23	169°03.7	42.9	48°02.7	16.4′	03°02.2	13.5′	54.7′
	SD = 16.1′	d = 0.7′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:29	07:56	09:36	13:50	15:30	16:57
N 70°	06:22	07:39	09:00	14:26	15:47	17:04
68°	06:16	07:26	08:35	14:51	16:01	17:10
66°	06:11	07:15	08:16	15:10	16:12	17:15
64°	06:07	07:05	08:01	15:26	16:21	17:19
62°	06:03	06:57	07:48	15:39	16:29	17:23
60°	06:00	06:50	07:37	15:50	16:36	17:26
N 58°	05:57	06:44	07:27	15:59	16:42	17:30
56°	05:54	06:38	07:19	16:07	16:48	17:33
54°	05:51	06:33	07:12	16:15	16:53	17:36
52°	05:48	06:29	07:05	16:22	16:58	17:38
50°	05:46	06:25	06:59	16:28	17:02	17:41
45°	05:40	06:15	06:46	16:41	17:12	17:47
N 40°	05:35	06:07	06:36	16:51	17:20	17:52
35°	05:30	06:00	06:26	17:01	17:27	17:57
30°	05:25	05:53	06:18	17:09	17:34	18:02
20°	05:15	05:41	06:04	17:23	17:46	18:12
N 10°	05:05	05:30	05:52	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:41	05:06	05:28	17:59	18:21	18:47
20°	04:25	04:52	05:16	18:12	18:35	19:03
30°	04:05	04:35	05:01	18:27	18:52	19:23
35°	03:52	04:25	04:52	18:35	19:03	19:36
40°	03:37	04:13	04:43	18:45	19:15	19:52
45°	03:17	03:58	04:31	18:57	19:30	20:11
S 50°	02:52	03:40	04:17	19:11	19:49	20:37
52°	02:39	03:31	04:10	19:18	19:58	20:51
54°	02:23	03:21	04:03	19:26	20:08	21:06
56°	02:05	03:09	03:55	19:34	20:20	21:26
58°	01:41	02:56	03:45	19:43	20:34	21:50
S 60°	01:07	02:39	03:35	19:54	20:50	22:26

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	15:52	15:08	14:37	21:11	23:22	·· ··
N 70°	15:22	14:53	14:30	21:39	23:35	·· ··
68°	14:59	14:40	14:24	22:00	23:45	·· ··
66°	14:41	14:30	14:20	22:17	23:54	·· ··
64°	14:27	14:21	14:16	22:30	·· ··	00:01
62°	14:15	14:14	14:12	22:41	·· ··	00:08
60°	14:04	14:07	14:09	22:51	·· ··	00:13
N 58°	13:55	14:01	14:06	22:59	·· ··	00:18
56°	13:47	13:56	14:04	23:06	·· ··	00:22
54°	13:40	13:52	14:02	23:13	·· ··	00:25
52°	13:33	13:47	14:00	23:18	·· ··	00:29
50°	13:28	13:44	13:58	23:24	·· ··	00:32
45°	13:15	13:35	13:54	23:35	·· ··	00:38
N 40°	13:04	13:28	13:50	23:44	·· ··	00:44
35°	12:55	13:22	13:47	23:52	·· ··	00:49
30°	12:47	13:17	13:45	23:59	·· ··	00:53
20°	12:34	13:08	13:40	·· ··	00:11	01:00
N 10°	12:22	13:00	13:36	·· ··	00:21	01:06
0°	12:10	12:52	13:33	·· ··	00:30	01:12
S 10°	11:59	12:44	13:29	00:01	00:40	01:17
20°	11:46	12:36	13:25	00:15	00:50	01:23
30°	11:32	12:27	13:20	00:31	01:02	01:30
35°	11:24	12:21	13:18	00:40	01:08	01:34
40°	11:15	12:15	13:15	00:50	01:16	01:39
45°	11:04	12:08	13:11	01:02	01:24	01:44
S 50°	10:50	11:59	13:07	01:17	01:35	01:50
52°	10:44	11:55	13:05	01:24	01:39	01:52
54°	10:37	11:50	13:03	01:32	01:45	01:55
56°	10:30	11:45	13:01	01:40	01:50	01:59
58°	10:21	11:40	12:58	01:50	01:57	02:02
S 60°	10:11	11:34	12:55	02:00	02:04	02:07

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 8-10 47-66%
06	16:24	16:23	11:44	18:20	05:59	
07	16:22	16:20	11:44	19:02	06:41	
08	16:18	16:17	11:44	19:42	07:22	



November 09, 10, 11 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	47°56.8	160°11.2	S22°33.5	151°40.6	S23°45.0	235°12.2	N04°16.8	25°53.1	N06°16.9
1	62°59.3	175°10.3	34.1	166°41.1	45.2	250°14.2	16.7	40°55.8	16.9
2	78°01.8	190°09.5	34.6	181°41.5	45.4	265°16.3	16.5	55°58.4	16.8
3	93°04.2	205°08.7	·· 35.2	196°42.0	·· 45.6	280°18.4	·· 16.4	71°01.0	·· 16.8
4	108°06.7	220°07.8	35.8	211°42.5	45.8	295°20.5	16.2	86°03.7	16.7
5	123°09.2	235°07.0	36.3	226°42.9	46.0	310°22.6	16.1	101°06.3	16.7
6	138°11.6	250°06.1	S22°36.9	241°43.4	S23°46.2	325°24.7	N04°15.9	116°08.9	N06°16.6
7	153°14.1	265°05.3	37.5	256°43.8	46.3	340°26.8	15.8	131°11.5	16.5
8	168°16.5	280°04.5	38.0	271°44.3	46.5	355°28.8	15.6	146°14.2	16.5
9	183°19.0	295°03.6	·· 38.6	286°44.7	·· 46.7	10°30.9	·· 15.4	161°16.8	·· 16.4
10	198°21.5	310°02.8	39.1	301°45.2	46.9	25°33.0	15.3	176°19.4	16.4
11	213°23.9	325°01.9	39.7	316°45.6	47.1	40°35.1	15.1	191°22.0	16.3
12	228°26.4	340°01.1	S22°40.3	331°46.1	S23°47.3	55°37.2	N04°15.0	206°24.7	N06°16.2
13	243°28.9	355°00.2	40.8	346°46.5	47.5	70°39.3	14.8	221°27.3	16.2
14	258°31.3	9°59.4	41.4	1°47.0	47.6	85°41.3	14.7	236°29.9	16.1
15	273°33.8	24°58.5	·· 41.9	16°47.4	·· 47.8	100°43.4	·· 14.5	251°32.6	·· 16.1
16	288°36.3	39°57.7	42.5	31°47.9	48.0	115°45.5	14.4	266°35.2	16.0
17	303°38.7	54°56.8	43.0	46°48.3	48.2	130°47.6	14.2	281°37.8	16.0
18	318°41.2	69°56.0	S22°43.6	61°48.8	S23°48.4	145°49.7	N04°14.1	296°40.4	N06°15.9
19	333°43.7	84°55.2	44.1	76°49.2	48.6	160°51.8	13.9	311°43.1	15.8
20	348°46.1	99°54.3	44.7	91°49.7	48.8	175°53.9	13.8	326°45.7	15.8
21	3°48.6	114°53.5	·· 45.2	106°50.1	·· 48.9	190°55.9	·· 13.6	341°48.3	·· 15.7
22	18°51.0	129°52.6	45.8	121°50.6	49.1	205°58.0	13.4	356°50.9	15.7
23	33°53.5	144°51.8	46.3	136°51.0	49.3	221°00.1	13.3	11°53.6	15.6
Mer.pass.	20:45	ν -0.8′	d 0.6′	m -3.88	ν 0.5′	d 0.2′	m 1.32	ν 2.1′	d 0.2′ m -1.82	ν 2.6′	d 0.1′ m 0.21

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	48°56.0	159°50.9	S22°46.9	151°51.5	S23°49.5	236°02.2	N04°13.1	26°56.2	N06°15.6
1	63°58.4	174°50.1	47.4	166°51.9	49.7	251°04.3	13.0	41°58.8	15.5
2	79°00.9	189°49.2	48.0	181°52.4	49.8	266°06.4	12.8	57°01.4	15.4
3	94°03.4	204°48.4	·· 48.5	196°52.8	·· 50.0	281°08.5	·· 12.7	72°04.1	·· 15.4
4	109°05.8	219°47.5	49.1	211°53.3	50.2	296°10.6	12.5	87°06.7	15.3
5	124°08.3	234°46.7	49.6	226°53.7	50.4	311°12.6	12.4	102°09.3	15.3
6	139°10.8	249°45.8	S22°50.1	241°54.2	S23°50.6	326°14.7	N04°12.2	117°11.9	N06°15.2
7	154°13.2	264°44.9	50.7	256°54.6	50.7	341°16.8	12.1	132°14.6	15.2
8	169°15.7	279°44.1	51.2	271°55.1	50.9	356°18.9	11.9	147°17.2	15.1
9	184°18.1	294°43.2	·· 51.7	286°55.5	·· 51.1	11°21.0	·· 11.8	162°19.8	·· 15.0
10	199°20.6	309°42.4	52.3	301°56.0	51.3	26°23.1	11.6	177°22.4	15.0
11	214°23.1	324°41.5	52.8	316°56.4	51.4	41°25.2	11.5	192°25.1	14.9
12	229°25.5	339°40.7	S22°53.3	331°56.9	S23°51.6	56°27.3	N04°11.3	207°27.7	N06°14.9
13	244°28.0	354°39.8	53.9	346°57.3	51.8	71°29.3	11.2	222°30.3	14.8
14	259°30.5	9°39.0	54.4	1°57.8	52.0	86°31.4	11.0	237°32.9	14.8
15	274°32.9	24°38.1	·· 54.9	16°58.2	·· 52.1	101°33.5	·· 10.9	252°35.6	·· 14.7
16	289°35.4	39°37.3	55.5	31°58.7	52.3	116°35.6	10.7	267°38.2	14.6
17	304°37.9	54°36.4	56.0	46°59.1	52.5	131°37.7	10.6	282°40.8	14.6
18	319°40.3	69°35.5	S22°56.5	61°59.6	S23°52.7	146°39.8	N04°10.4	297°43.4	N06°14.5
19	334°42.8	84°34.7	57.0	77°00.0	52.8	161°41.9	10.2	312°46.1	14.5
20	349°45.3	99°33.8	57.5	92°00.5	53.0	176°44.0	10.1	327°48.7	14.4
21	4°47.7	114°33.0	·· 58.1	107°00.9	·· 53.2	191°46.1	·· 09.9	342°51.3	·· 14.4
22	19°50.2	129°32.1	58.6	122°01.3	53.3	206°48.2	09.8	357°53.9	14.3
23	34°52.6	144°31.2	59.1	137°01.8	53.5	221°50.2	09.6	12°56.6	14.2
Mer.pass.	20:41	ν -0.9′	d 0.5′	m -3.88	ν 0.4′	d 0.2′	m 1.32	ν 2.1′	d 0.2′ m -1.83	ν 2.6′	d 0.1′ m 0.22

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	49°55.1	159°30.4	S22°59.6	152°02.2	S23°53.7	236°52.3	N04°09.5	27°59.2	N06°14.2
1	64°57.6	174°29.5	23°00.1	167°02.7	53.9	251°54.4	09.3	43°01.8	14.1
2	80°00.0	189°28.7	00.7	182°03.1	54.0	266°56.5	09.2	58°04.4	14.1
3	95°02.5	204°27.8	·· 01.2	197°03.6	·· 54.2	281°58.6	·· 09.0	73°07.0	·· 14.0
4	110°05.0	219°26.9	01.7	212°04.0	54.4	297°00.7	08.9	88°09.7	14.0
5	125°07.4	234°26.1	02.2	227°04.5	54.5	312°02.8	08.7	103°12.3	13.9
6	140°09.9	249°25.2	S23°02.7	242°04.9	S23°54.7	327°04.9	N04°08.6	118°14.9	N06°13.9
7	155°12.4	264°24.4	03.2	257°05.4	54.9	342°07.0	08.4	133°17.5	13.8
8	170°14.8	279°23.5	03.7	272°05.8	55.0	357°09.1	08.3	148°20.2	13.7
9	185°17.3	294°22.6	·· 04.2	287°06.2	·· 55.2	12°11.2	·· 08.1	163°22.8	·· 13.7
10	200°19.7	309°21.8	04.7	302°06.7	55.4	27°13.3	08.0	178°25.4	13.6
11	215°22.2	324°20.9	05.2	317°07.1	55.5	42°15.3	07.8	193°28.0	13.6
12	230°24.7	339°20.0	S23°05.7	332°07.6	S23°55.7	57°17.4	N04°07.7	208°30.7	N06°13.5
13	245°27.1	354°19.2	06.3	347°08.0	55.9	72°19.5	07.5	223°33.3	13.5
14	260°29.6	9°18.3	06.8	2°08.5	56.0	87°21.6	07.4	238°35.9	13.4
15	275°32.1	24°17.4	·· 07.3	17°08.9	·· 56.2	102°23.7	·· 07.2	253°38.5	·· 13.4
16	290°34.5	39°16.6	07.8	32°09.3	56.4	117°25.8	07.1	268°41.1	13.3
17	305°37.0	54°15.7	08.3	47°09.8	56.5	132°27.9	06.9	283°43.8	13.2
18	320°39.5	69°14.8	S23°08.7	62°10.2	S23°56.7	147°30.0	N04°06.8	298°46.4	N06°13.2
19	335°41.9	84°14.0	09.2	77°10.7	56.8	162°32.1	06.6	313°49.0	13.1
20	350°44.4	99°13.1	09.7	92°11.1	57.0	177°34.2	06.5	328°51.6	13.1
21	5°46.9	114°12.2	·· 10.2	107°11.5	·· 57.2	192°36.3	·· 06.3	343°54.2	·· 13.0
22	20°49.3	129°11.4	10.7	122°12.0	57.3	207°38.4	06.2	358°56.9	13.0
23	35°51.8	144°10.5	11.2	137°12.4	57.5	222°40.5	06.0	13°59.5	12.9
Mer.pass.	20:37	ν -0.9′	d 0.5′	m -3.88	ν 0.4′	d 0.2′	m 1.31	ν 2.1′	d 0.2′ m -1.83	ν 2.6′	d 0.1′ m 0.22

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.7
Hamal	327°48.2	23°35.8
Polaris	312°17.1	89°22.9
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.1
Mirfak	308°24.4	49°57.6
Aldebaran	290°36.6	16°33.9
Rigel	281°01.4	-8°10.1
Capella	280°18.1	46°01.4
Bellatrix	278°20.1	6°22.5
Elnath	277°58.6	28°37.8
Alnilam	275°35.1	-1°11.0
Betelgeuse	270°49.3	7°24.8
Canopus	263°51.0	-52°42.4
Sirius	258°24.0	-16°45.1
Adhara	255°03.8	-29°00.4
Procyon	244°48.3	5°09.2
Pollux	243°14.4	27°57.4
Avior	234°13.6	-59°35.6
Suhail	222°44.6	-43°32.5
Miaplacidus	221°37.7	-69°49.6
Alphard	217°45.5	-8°46.7
Regulus	207°32.1	11°49.8
Dubhe	193°38.6	61°35.7
Denebola	182°22.8	14°24.9
Gienah	175°41.4	-17°41.7
Acrux	172°58.0	-63°15.0
Gacrux	171°49.5	-57°16.0
Alioth	166°11.5	55°48.3
Spica	158°20.2	-11°18.3
Alkaid	152°50.7	49°10.3
Hadar	148°33.3	-60°30.3
Menkent	147°55.3	-36°30.3
Arcturus	145°46.2	19°02.2
Rigil Kent.	139°37.7	-60°56.9
Kochab	137°21.2	74°02.4
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.5	51°29.3
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.3	-56°38.8
Deneb	49°24.3	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.0	-46°49.6
Fomalhaut	15°11.8	-29°28.5
Scheat	13°42.8	28°14.3
Markab	13°27.4	15°21.6

Nov 09 Tue	SHA	Mer.pass
Venus	112°14.4	13:20
Mars	103°43.8	13:53
Jupiter	187°15.3	08:18
Saturn	337°56.3	22:13

Nov 10 Wed	SHA	Mer.pass
Venus	110°54.9	13:21
Mars	102°55.5	13:52
Jupiter	187°06.2	08:15
Saturn	338°00.2	22:08

Nov 11 Thu	SHA	Mer.pass
Venus	109°35.3	13:23
Mars	102°07.1	13:51
Jupiter	186°57.2	08:11
Saturn	338°04.1	22:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0853 sec ΔT = TT-UT1 = +69.2693 sec

2027 November 09 to Nov. 11 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°03.6	S16°43.6	62°38.1	16.4′	S02°48.7	13.5′	54.7′
1	199°03.6	44.3	77°13.5	16.4′	02°35.2	13.6′	54.7′
2	214°03.5	45.0	91°48.8	16.3′	02°21.6	13.6′	54.8′
3	229°03.5	·· 45.8	106°24.2	16.3′	02°08.0	13.6′	54.8′
4	244°03.4	46.5	120°59.5	16.3′	01°54.4	13.6′	54.8′
5	259°03.4	47.2	135°34.8	16.3′	01°40.8	13.6′	54.8′
6	274°03.3	S16°47.9	150°10.1	16.3′	S01°27.2	13.7′	54.8′
7	289°03.3	48.6	164°45.4	16.3′	01°13.5	13.6′	54.8′
8	304°03.2	49.3	179°20.7	16.3′	00°59.9	13.7′	54.9′
9	319°03.2	·· 50.1	193°55.9	16.2′	00°46.2	13.7′	54.9′
10	334°03.1	50.8	208°31.2	16.2′	00°32.5	13.7′	54.9′
11	349°03.1	51.5	223°06.4	16.2′	00°18.8	13.7′	54.9′
12	4°03.0	S16°52.2	237°41.6	16.2′	S00°05.1	13.8′	54.9′
13	19°03.0	52.9	252°16.8	16.2′	N00°08.7	13.7′	55.0′
14	34°02.9	53.6	266°51.9	16.1′	00°22.4	13.7′	55.0′
15	49°02.9	·· 54.3	281°27.0	16.1′	00°36.1	13.8′	55.0′
16	64°02.8	55.1	296°02.1	16.1′	00°49.9	13.8′	55.0′
17	79°02.8	55.8	310°37.2	16.0′	01°03.7	13.7′	55.0′
18	94°02.7	S16°56.5	325°12.3	16.0′	N01°17.4	13.8′	55.1′
19	109°02.7	57.2	339°47.3	16.0′	01°31.2	13.8′	55.1′
20	124°02.6	57.9	354°22.3	16.0′	01°45.0	13.8′	55.1′
21	139°02.6	·· 58.6	8°57.2	15.9′	01°58.8	13.8′	55.1′
22	154°02.5	16°59.3	23°32.1	15.9′	02°12.6	13.8′	55.1′
23	169°02.4	17°00.0	38°07.0	15.9′	02°26.4	13.8′	55.2′
	SD = 16.1′	d = 0.7′	SD = 14.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°02.4	S17°00.7	52°41.9	15.8′	N02°40.2	13.8′	55.2′
1	199°02.3	01.4	67°16.7	15.8′	02°54.0	13.8′	55.2′
2	214°02.3	02.1	81°51.5	15.8′	03°07.8	13.8′	55.2′
3	229°02.2	·· 02.8	96°26.3	15.7′	03°21.6	13.8′	55.3′
4	244°02.2	03.6	111°01.0	15.7′	03°35.4	13.8′	55.3′
5	259°02.1	04.3	125°35.7	15.6′	03°49.2	13.8′	55.3′
6	274°02.1	S17°05.0	140°10.3	15.6′	N04°03.0	13.8′	55.3′
7	289°02.0	05.7	154°44.9	15.5′	04°16.8	13.8′	55.4′
8	304°01.9	06.4	169°19.4	15.5′	04°30.6	13.7′	55.4′
9	319°01.9	·· 07.1	183°53.9	15.5′	04°44.3	13.8′	55.4′
10	334°01.8	07.8	198°28.4	15.4′	04°58.1	13.8′	55.4′
11	349°01.8	08.5	213°02.8	15.4′	05°11.9	13.8′	55.4′
12	4°01.7	S17°09.2	227°37.2	15.3′	N05°25.7	13.7′	55.5′
13	19°01.6	09.9	242°11.5	15.3′	05°39.4	13.8′	55.5′
14	34°01.6	10.6	256°45.7	15.2′	05°53.2	13.7′	55.5′
15	49°01.5	·· 11.3	271°19.9	15.2′	06°06.9	13.7′	55.5′
16	64°01.5	12.0	285°54.1	15.1′	06°20.6	13.7′	55.6′
17	79°01.4	12.7	300°28.2	15.1′	06°34.3	13.7′	55.6′
18	94°01.3	S17°13.4	315°02.3	15.0′	N06°48.0	13.7′	55.6′
19	109°01.3	14.1	329°36.3	14.9′	07°01.7	13.7′	55.6′
20	124°01.2	14.8	344°10.2	14.9′	07°15.4	13.6′	55.7′
21	139°01.2	·· 15.5	358°44.1	14.8′	07°29.0	13.7′	55.7′
22	154°01.1	16.2	13°17.9	14.8′	07°42.7	13.6′	55.7′
23	169°01.0	16.9	27°51.7	14.7′	07°56.3	13.6′	55.8′
	SD = 16.1′	d = 0.7′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°01.0	S17°17.6	42°25.4	14.6′	N08°09.9	13.5′	55.8′
1	199°00.9	18.3	56°59.0	14.6′	08°23.4	13.6′	55.8′
2	214°00.8	18.9	71°32.6	14.5′	08°37.0	13.5′	55.8′
3	229°00.8	·· 19.6	86°06.1	14.5′	08°50.5	13.5′	55.9′
4	244°00.7	20.3	100°39.6	14.4′	09°04.0	13.5′	55.9′
5	259°00.6	21.0	115°13.0	14.3′	09°17.5	13.5′	55.9′
6	274°00.6	S17°21.7	129°46.3	14.2′	N09°31.0	13.4′	55.9′
7	289°00.5	22.4	144°19.5	14.2′	09°44.4	13.4′	56.0′
8	304°00.4	23.1	158°52.7	14.1′	09°57.8	13.4′	56.0′
9	319°00.4	·· 23.8	173°25.8	14.0′	10°11.2	13.3′	56.0′
10	334°00.3	24.5	187°58.9	14.0′	10°24.5	13.4′	56.0′
11	349°00.2	25.2	202°31.8	13.9′	10°37.9	13.2′	56.1′
12	4°00.2	S17°25.9	217°04.7	13.8′	N10°51.1	13.3′	56.1′
13	19°00.1	26.5	231°37.5	13.7′	11°04.4	13.2′	56.1′
14	34°00.0	27.2	246°10.3	13.7′	11°17.6	13.2′	56.2′
15	49°00.0	·· 27.9	260°42.9	13.6′	11°30.8	13.1′	56.2′
16	63°59.9	28.6	275°15.5	13.5′	11°43.9	13.1′	56.2′
17	78°59.8	29.3	289°48.0	13.4′	11°57.0	13.1′	56.2′
18	93°59.8	S17°30.0	304°20.4	13.3′	N12°10.1	13.0′	56.3′
19	108°59.7	30.7	318°52.8	13.3′	12°23.1	13.0′	56.3′
20	123°59.6	31.4	333°25.0	13.2′	12°36.1	12.9′	56.3′
21	138°59.5	·· 32.0	347°57.2	13.1′	12°49.0	12.9′	56.3′
22	153°59.5	32.7	2°29.3	13.0′	13°01.9	12.8′	56.4′
23	168°59.4	33.4	17°01.3	12.9′	13°14.7	12.8′	56.4′
	SD = 16.1′	d = 0.7′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:40	08:09	10:00	13:26	15:17	16:46
N 70°	06:32	07:51	09:17	14:09	15:36	16:54
68°	06:25	07:36	08:49	14:38	15:51	17:01
66°	06:20	07:24	08:27	14:59	16:03	17:07
64°	06:15	07:14	08:10	15:17	16:13	17:12
62°	06:10	07:05	07:56	15:31	16:22	17:17
60°	06:06	06:57	07:45	15:42	16:30	17:21
N 58°	06:03	06:50	07:34	15:53	16:37	17:24
56°	05:59	06:44	07:25	16:02	16:43	17:28
54°	05:56	06:39	07:18	16:10	16:48	17:31
52°	05:53	06:34	07:10	16:17	16:53	17:34
50°	05:50	06:29	07:04	16:23	16:58	17:37
45°	05:44	06:19	06:50	16:37	17:08	17:43
N 40°	05:38	06:10	06:39	16:48	17:17	17:49
35°	05:32	06:03	06:29	16:58	17:25	17:55
30°	05:27	05:56	06:21	17:07	17:32	18:01
20°	05:16	05:43	06:06	17:22	17:45	18:11
N 10°	05:05	05:31	05:53	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:24	04:51	05:14	18:14	18:37	19:05
30°	04:02	04:33	04:59	18:29	18:55	19:26
35°	03:49	04:22	04:50	18:38	19:06	19:39
40°	03:33	04:09	04:39	18:49	19:19	19:56
45°	03:12	03:54	04:27	19:01	19:35	20:17
S 50°	02:45	03:34	04:12	19:17	19:55	20:44
52°	02:31	03:25	04:05	19:24	20:04	20:59
54°	02:14	03:14	03:57	19:32	20:15	21:16
56°	01:54	03:02	03:49	19:41	20:28	21:37
58°	01:27	02:47	03:39	19:51	20:43	22:05
S 60°	00:45	02:30	03:27	20:02	21:01	22:52

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	14:09	13:41	13:07	01:19	03:16	05:20
N 70°	14:09	13:49	13:25	01:23	03:11	05:05
68°	14:10	13:55	13:39	01:26	03:07	04:53
66°	14:10	14:00	13:50	01:29	03:04	04:43
64°	14:10	14:05	14:00	01:31	03:01	04:35
62°	14:11	14:09	14:08	01:33	02:59	04:28
60°	14:11	14:13	14:15	01:34	02:57	04:22
N 58°	14:11	14:16	14:22	01:36	02:55	04:17
56°	14:11	14:19	14:27	01:37	02:53	04:12
54°	14:11	14:21	14:33	01:38	02:52	04:08
52°	14:11	14:24	14:37	01:39	02:50	04:04
50°	14:11	14:26	14:41	01:40	02:49	04:01
45°	14:12	14:30	14:51	01:42	02:47	03:53
N 40°	14:12	14:34	14:58	01:44	02:44	03:47
35°	14:12	14:38	15:05	01:45	02:42	03:42
30°	14:12	14:41	15:11	01:46	02:41	03:37
20°	14:13	14:46	15:21	01:49	02:38	03:29
N 10°	14:13	14:51	15:30	01:50	02:35	03:22
0°	14:13	14:55	15:39	01:52	02:33	03:16
S 10°	14:14	14:59	15:47	01:54	02:31	03:09
20°	14:14	15:04	15:57	01:56	02:28	03:02
30°	14:14	15:10	16:07	01:58	02:25	02:54
35°	14:15	15:13	16:14	01:59	02:24	02:50
40°	14:15	15:17	16:21	02:00	02:22	02:45
45°	14:15	15:21	16:29	02:02	02:20	02:39
S 50°	14:16	15:26	16:39	02:03	02:17	02:32
52°	14:16	15:28	16:44	02:04	02:16	02:29
54°	14:16	15:31	16:49	02:05	02:15	02:25
56°	14:16	15:34	16:55	02:06	02:13	02:21
58°	14:17	15:37	17:01	02:07	02:12	02:17
S 60°	14:17	15:41	17:08	02:08	02:10	02:12

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 74-89%
09	16:14	16:12	11:44	20:23	08:03	
10	16:10	16:07	11:44	21:05	08:44	
11	16:04	16:01	11:44	21:50	09:27	



November 12, 13, 14 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°54.2	159°09.6	S23°11.7	152°12.9	S23°57.7	237°42.6	N04°05.9	29°02.1	N06°12.9
1	65°56.7	174°08.8	12.2	167°13.3	57.8	252°44.7	05.7	44°04.7	12.8
2	80°59.2	189°07.9	12.7	182°13.7	58.0	267°46.7	05.6	59°07.4	12.7
3	96°01.6	204°07.0	·· 13.2	197°14.2	·· 58.1	282°48.8	·· 05.4	74°10.0	·· 12.7
4	111°04.1	219°06.1	13.7	212°14.6	58.3	297°50.9	05.3	89°12.6	12.6
5	126°06.6	234°05.3	14.1	227°15.1	58.4	312°53.0	05.1	104°15.2	12.6
6	141°09.0	249°04.4	S23°14.6	242°15.5	S23°58.6	327°55.1	N04°05.0	119°17.8	N06°12.5
7	156°11.5	264°03.5	15.1	257°15.9	58.8	342°57.2	04.8	134°20.5	12.5
8	171°14.0	279°02.7	15.6	272°16.4	58.9	357°59.3	04.7	149°23.1	12.4
9	186°16.4	294°01.8	·· 16.1	287°16.8	·· 59.1	13°01.4	·· 04.5	164°25.7	·· 12.4
10	201°18.9	309°00.9	16.5	302°17.3	59.2	28°03.5	04.4	179°28.3	12.3
11	216°21.4	324°00.0	17.0	317°17.7	59.4	43°05.6	04.2	194°30.9	12.2
12	231°23.8	338°59.2	S23°17.5	332°18.1	S23°59.5	58°07.7	N04°04.1	209°33.6	N06°12.2
13	246°26.3	353°58.3	18.0	347°18.6	59.7	73°09.8	03.9	224°36.2	12.1
14	261°28.7	8°57.4	18.4	2°19.0	23°59.9	88°11.9	03.8	239°38.8	12.1
15	276°31.2	23°56.5	·· 18.9	17°19.4	24°00.0	103°14.0	·· 03.6	254°41.4	·· 12.0
16	291°33.7	38°55.7	19.4	32°19.9	00.2	118°16.1	03.5	269°44.0	12.0
17	306°36.1	53°54.8	19.9	47°20.3	00.3	133°18.2	03.3	284°46.7	11.9
18	321°38.6	68°53.9	S23°20.3	62°20.8	S24°00.5	148°20.3	N04°03.2	299°49.3	N06°11.9
19	336°41.1	83°53.0	20.8	77°21.2	00.6	163°22.4	03.0	314°51.9	11.8
20	351°43.5	98°52.2	21.3	92°21.6	00.8	178°24.5	02.9	329°54.5	11.8
21	6°46.0	113°51.3	·· 21.7	107°22.1	·· 00.9	193°26.6	·· 02.7	344°57.1	·· 11.7
22	21°48.5	128°50.4	22.2	122°22.5	01.1	208°28.7	02.6	359°59.7	11.7
23	36°50.9	143°49.5	22.6	137°22.9	01.2	223°30.8	02.5	15°02.4	11.6
Mer.pass. 20:33		ν -0.9′	d 0.5′	m -3.88	ν 0.4′	d 0.2′	m 1.31	ν 2.1′	d 0.1′ m -1.83	ν 2.6′	d 0.1′ m 0.22

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	51°53.4	158°48.6	S23°23.1	152°23.4	S24°01.4	238°32.9	N04°02.3	30°05.0	N06°11.5
1	66°55.8	173°47.8	23.6	167°23.8	01.5	253°35.0	02.2	45°07.6	11.5
2	81°58.3	188°46.9	24.0	182°24.2	01.7	268°37.1	02.0	60°10.2	11.4
3	97°00.8	203°46.0	·· 24.5	197°24.7	·· 01.8	283°39.2	·· 01.9	75°12.8	·· 11.4
4	112°03.2	218°45.1	24.9	212°25.1	02.0	298°41.3	01.7	90°15.5	11.3
5	127°05.7	233°44.3	25.4	227°25.5	02.1	313°43.4	01.6	105°18.1	11.3
6	142°08.2	248°43.4	S23°25.9	242°26.0	S24°02.3	328°45.5	N04°01.4	120°20.7	N06°11.2
7	157°10.6	263°42.5	26.3	257°26.4	02.4	343°47.6	01.3	135°23.3	11.2
8	172°13.1	278°41.6	26.8	272°26.9	02.6	358°49.7	01.1	150°25.9	11.1
9	187°15.6	293°40.7	·· 27.2	287°27.3	·· 02.7	13°51.8	·· 01.0	165°28.5	·· 11.1
10	202°18.0	308°39.8	27.7	302°27.7	02.9	28°53.9	00.8	180°31.2	11.0
11	217°20.5	323°39.0	28.1	317°28.2	03.0	43°56.0	00.7	195°33.8	11.0
12	232°23.0	338°38.1	S23°28.6	332°28.6	S24°03.1	58°58.1	N04°00.5	210°36.4	N06°10.9
13	247°25.4	353°37.2	29.0	347°29.0	03.3	74°00.2	00.4	225°39.0	10.8
14	262°27.9	8°36.3	29.4	2°29.5	03.4	89°02.3	00.2	240°41.6	10.8
15	277°30.3	23°35.4	·· 29.9	17°29.9	·· 03.6	104°04.4	04°00.1	255°44.3	·· 10.7
16	292°32.8	38°34.5	30.3	32°30.3	03.7	119°06.5	03°59.9	270°46.9	10.7
17	307°35.3	53°33.7	30.8	47°30.8	03.9	134°08.6	59.8	285°49.5	10.6
18	322°37.7	68°32.8	S23°31.2	62°31.2	S24°04.0	149°10.7	N03°59.7	300°52.1	N06°10.6
19	337°40.2	83°31.9	31.7	77°31.6	04.1	164°12.8	59.5	315°54.7	10.5
20	352°42.7	98°31.0	32.1	92°32.0	04.3	179°14.9	59.4	330°57.3	10.5
21	7°45.1	113°30.1	·· 32.5	107°32.5	·· 04.4	194°17.0	·· 59.2	346°00.0	·· 10.4
22	22°47.6	128°29.2	33.0	122°32.9	04.6	209°19.1	59.1	1°02.6	10.4
23	37°50.1	143°28.3	33.4	137°33.3	04.7	224°21.2	58.9	16°05.2	10.3
Mer.pass. 20:29		ν -0.9′	d 0.5′	m -3.88	ν 0.4′	d 0.1′	m 1.31	ν 2.1′	d 0.1′ m -1.84	ν 2.6′	d 0.1′ m 0.23

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	52°52.5	158°27.5	S23°33.8	152°33.8	S24°04.8	239°23.3	N03°58.8	31°07.8	N06°10.3
1	67°55.0	173°26.6	34.3	167°34.2	05.0	254°25.4	58.6	46°10.4	10.2
2	82°57.5	188°25.7	34.7	182°34.6	05.1	269°27.5	58.5	61°13.0	10.2
3	97°59.9	203°24.8	·· 35.1	197°35.1	·· 05.3	284°29.6	·· 58.3	76°15.6	·· 10.1
4	113°02.4	218°23.9	35.5	212°35.5	05.4	299°31.7	58.2	91°18.3	10.1
5	128°04.8	233°23.0	36.0	227°35.9	05.5	314°33.8	58.0	106°20.9	10.0
6	143°07.3	248°22.1	S23°36.4	242°36.4	S24°05.7	329°35.9	N03°57.9	121°23.5	N06°09.9
7	158°09.8	263°21.2	36.8	257°36.8	05.8	344°38.0	57.7	136°26.1	09.9
8	173°12.2	278°20.3	37.2	272°37.2	05.9	359°40.1	57.6	151°28.7	09.8
9	188°14.7	293°19.5	·· 37.7	287°37.6	·· 06.1	14°42.2	·· 57.5	166°31.3	·· 09.8
10	203°17.2	308°18.6	38.1	302°38.1	06.2	29°44.3	57.3	181°34.0	09.7
11	218°19.6	323°17.7	38.5	317°38.5	06.4	44°46.4	57.2	196°36.6	09.7
12	233°22.1	338°16.8	S23°38.9	332°38.9	S24°06.5	59°48.5	N03°57.0	211°39.2	N06°09.6
13	248°24.6	353°15.9	39.3	347°39.4	06.6	74°50.6	56.9	226°41.8	09.6
14	263°27.0	8°15.0	39.8	2°39.8	06.8	89°52.8	56.7	241°44.4	09.5
15	278°29.5	23°14.1	·· 40.2	17°40.2	·· 06.9	104°54.9	·· 56.6	256°47.0	·· 09.5
16	293°32.0	38°13.2	40.6	32°40.6	07.0	119°57.0	56.4	271°49.6	09.4
17	308°34.4	53°12.3	41.0	47°41.1	07.2	134°59.1	56.3	286°52.3	09.4
18	323°36.9	68°11.4	S23°41.4	62°41.5	S24°07.3	150°01.2	N03°56.2	301°54.9	N06°09.3
19	338°39.3	83°10.5	41.8	77°41.9	07.4	165°03.3	56.0	316°57.5	09.3
20	353°41.8	98°09.6	42.2	92°42.4	07.5	180°05.4	55.9	332°00.1	09.2
21	8°44.3	113°08.8	·· 42.6	107°42.8	·· 07.7	195°07.5	·· 55.7	347°02.7	·· 09.2
22	23°46.7	128°07.9	43.0	122°43.2	07.8	210°09.6	55.6	2°05.3	09.1
23	38°49.2	143°07.0	43.5	137°43.6	07.9	225°11.7	55.4	17°07.9	09.1
Mer.pass. 20:25		ν -0.9′	d 0.4′	m -3.88	ν 0.4′	d 0.1′	m 1.31	ν 2.1′	d 0.1′ m -1.84	ν 2.6′	d 0.1′ m 0.23

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.7
Hamal	327°48.2	23°35.8
Polaris	312°16.8	89°22.9
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.0
Mirfak	308°24.4	49°57.7
Aldebaran	290°36.6	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°18.0	46°01.4
Bellatrix	278°20.1	6°22.5
Elnath	277°58.6	28°37.8
Alnilam	275°35.1	-1°11.0
Betelgeuse	270°49.3	7°24.7
Canopus	263°51.0	-52°42.4
Sirius	258°24.0	-16°45.2
Adhara	255°03.8	-29°00.4
Procyon	244°48.3	5°09.2
Pollux	243°14.3	27°57.4
Avior	234°13.6	-59°35.6
Suhail	222°44.5	-43°32.5
Miaplacidus	221°37.6	-69°49.6
Alphard	217°45.5	-8°46.7
Regulus	207°32.1	11°49.8
Dubhe	193°38.6	61°35.7
Denebola	182°22.8	14°24.9
Gienah	175°41.4	-17°41.7
Acrux	172°57.9	-63°15.0
Gacrux	171°49.4	-57°16.0
Alioth	166°11.5	55°48.3
Spica	158°20.1	-11°18.3
Alkaid	152°50.7	49°10.3
Hadar	148°33.3	-60°30.3
Menkent	147°55.2	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.7	-60°56.9
Kochab	137°21.2	74°02.3
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°06.0	-69°04.7
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.5	51°29.3
Kaus Aust.	83°29.7	-34°22.3
Vega	80°31.9	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.8	8°56.7
Peacock	53°02.3	-56°38.8
Deneb	49°24.3	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.0	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.3
Markab	13°27.4	15°21.6

Nov 12 Fri	SHA	Mer.pass
Venus	108°15.4	13:24
Mars	101°18.6	13:51
Jupiter	186°48.3	08:08
Saturn	338°07.9	22:00

Nov 13 Sat	SHA	Mer.pass
Venus	106°55.3	13:26
Mars	100°30.0	13:50
Jupiter	186°39.5	08:05
Saturn	338°11.6	21:56

Nov 14 Sun	SHA	Mer.pass
Venus	105°34.9	13:27
Mars	99°41.2	13:49
Jupiter	186°30.8	08:01
Saturn	338°15.3	21:52

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°59.3	S17°34.1	31°33.2	12.8′	N13°27.5	12.8′	56.4′
1	198°59.3	34.8	46°05.1	12.7′	13°40.3	12.7′	56.5′
2	213°59.2	35.5	60°36.8	12.7′	13°53.0	12.6′	56.5′
3	228°59.1	·· 36.1	75°08.5	12.6′	14°05.6	12.6′	56.5′
4	243°59.0	36.8	89°40.1	12.5′	14°18.2	12.6′	56.5′
5	258°59.0	37.5	104°11.5	12.4′	14°30.8	12.4′	56.6′
6	273°58.9	S17°38.2	118°42.9	12.3′	N14°43.2	12.5′	56.6′
7	288°58.8	38.9	133°14.2	12.2′	14°55.7	12.3′	56.6′
8	303°58.7	39.5	147°45.4	12.1′	15°08.0	12.3′	56.7′
9	318°58.7	·· 40.2	162°16.5	12.0′	15°20.3	12.3′	56.7′
10	333°58.6	40.9	176°47.6	11.9′	15°32.6	12.2′	56.7′
11	348°58.5	41.6	191°18.5	11.8′	15°44.8	12.1′	56.7′
12	3°58.4	S17°42.2	205°49.3	11.7′	N15°56.9	12.1′	56.8′
13	18°58.4	42.9	220°20.0	11.6′	16°09.0	12.0′	56.8′
14	33°58.3	43.6	234°50.7	11.5′	16°21.0	11.9′	56.8′
15	48°58.2	·· 44.3	249°21.2	11.4′	16°32.9	11.8′	56.8′
16	63°58.1	44.9	263°51.6	11.3′	16°44.7	11.8′	56.9′
17	78°58.0	45.6	278°22.0	11.2′	16°56.5	11.7′	56.9′
18	93°58.0	S17°46.3	292°52.2	11.1′	N17°08.2	11.7′	56.9′
19	108°57.9	47.0	307°22.4	11.0′	17°19.9	11.5′	57.0′
20	123°57.8	47.6	321°52.4	10.9′	17°31.4	11.5′	57.0′
21	138°57.7	·· 48.3	336°22.3	10.8′	17°42.9	11.4′	57.0′
22	153°57.6	49.0	350°52.1	10.7′	17°54.3	11.4′	57.0′
23	168°57.6	49.7	5°21.9	10.6′	18°05.7	11.2′	57.1′
	SD = 16.1′	d = 0.7′	SD = 15.4′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°57.5	S17°50.3	19°51.5	10.5′	N18°16.9	11.2′	57.1′
1	198°57.4	51.0	34°21.0	10.4′	18°28.1	11.1′	57.1′
2	213°57.3	51.7	48°50.4	10.3′	18°39.2	10.9′	57.2′
3	228°57.2	·· 52.3	63°19.7	10.2′	18°50.1	11.0′	57.2′
4	243°57.2	53.0	77°48.9	10.1′	19°01.1	10.8′	57.2′
5	258°57.1	53.7	92°18.0	10.0′	19°11.9	10.7′	57.2′
6	273°57.0	S17°54.3	106°47.0	9.9′	N19°22.6	10.6′	57.3′
7	288°56.9	55.0	121°15.9	9.8′	19°33.2	10.6′	57.3′
8	303°56.8	55.7	135°44.7	9.7′	19°43.8	10.4′	57.3′
9	318°56.7	·· 56.3	150°13.4	9.6′	19°54.2	10.4′	57.3′
10	333°56.7	57.0	164°41.9	9.5′	20°04.6	10.2′	57.4′
11	348°56.6	57.7	179°10.4	9.4′	20°14.8	10.2′	57.4′
12	3°56.5	S17°58.3	193°38.7	9.2′	N20°25.0	10.0′	57.4′
13	18°56.4	59.0	208°07.0	9.1′	20°35.0	9.9′	57.4′
14	33°56.3	17°59.6	222°35.1	9.0′	20°44.9	9.9′	57.5′
15	48°56.2	18°00.3	237°03.2	8.9′	20°54.8	9.7′	57.5′
16	63°56.1	01.0	251°31.1	8.8′	21°04.5	9.6′	57.5′
17	78°56.1	01.6	265°58.9	8.7′	21°14.1	9.6′	57.6′
18	93°56.0	S18°02.3	280°26.6	8.6′	N21°23.7	9.4′	57.6′
19	108°55.9	03.0	294°54.2	8.5′	21°33.1	9.2′	57.6′
20	123°55.8	03.6	309°21.7	8.4′	21°42.3	9.2′	57.6′
21	138°55.7	·· 04.3	323°49.1	8.3′	21°51.5	9.1′	57.7′
22	153°55.6	04.9	338°16.4	8.2′	22°00.6	8.9′	57.7′
23	168°55.5	05.6	352°43.6	8.1′	22°09.5	8.8′	57.7′
	SD = 16.2′	d = 0.7′	SD = 15.6′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°55.4	S18°06.2	7°10.6	8.0′	N22°18.3	8.7′	57.7′
1	198°55.3	06.9	21°37.6	7.9′	22°27.0	8.6′	57.8′
2	213°55.2	07.6	36°04.4	7.8′	22°35.6	8.5′	57.8′
3	228°55.2	·· 08.2	50°31.2	7.7′	22°44.1	8.3′	57.8′
4	243°55.1	08.9	64°57.9	7.5′	22°52.4	8.2′	57.8′
5	258°55.0	09.5	79°24.4	7.4′	23°00.6	8.1′	57.9′
6	273°54.9	S18°10.2	93°50.8	7.3′	N23°08.7	7.9′	57.9′
7	288°54.8	10.8	108°17.2	7.2′	23°16.6	7.8′	57.9′
8	303°54.7	11.5	122°43.4	7.1′	23°24.4	7.7′	57.9′
9	318°54.6	·· 12.1	137°09.6	7.0′	23°32.1	7.5′	58.0′
10	333°54.5	12.8	151°35.6	6.9′	23°39.6	7.4′	58.0′
11	348°54.4	13.4	166°01.6	6.8′	23°47.0	7.3′	58.0′
12	3°54.3	S18°14.1	180°27.4	6.7′	N23°54.3	7.1′	58.0′
13	18°54.2	14.7	194°53.1	6.7′	24°01.4	7.0′	58.0′
14	33°54.1	15.4	209°18.8	6.6′	24°08.4	6.8′	58.1′
15	48°54.0	·· 16.0	223°44.4	6.5′	24°15.2	6.7′	58.1′
16	63°53.9	16.7	238°09.8	6.4′	24°21.9	6.6′	58.1′
17	78°53.8	17.3	252°35.2	6.3′	24°28.5	6.4′	58.1′
18	93°53.7	S18°18.0	267°00.5	6.2′	N24°34.9	6.2′	58.2′
19	108°53.7	18.6	281°25.7	6.1′	24°41.1	6.1′	58.2′
20	123°53.6	19.3	295°50.7	6.0′	24°47.2	6.0′	58.2′
21	138°53.5	·· 19.9	310°15.8	5.9′	24°53.2	5.8′	58.2′
22	153°53.4	20.6	324°40.7	5.8′	24°59.0	5.6′	58.3′
23	168°53.3	21.2	339°05.5	5.8′	25°04.6	5.5′	58.3′
	SD = 16.2′	d = 0.7′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:51	08:24	10:30	12:57	15:04	16:36
N 70°	06:42	08:03	09:35	13:52	15:25	16:45
68°	06:34	07:46	09:02	14:25	15:41	16:53
66°	06:28	07:33	08:39	14:49	15:55	17:00
64°	06:22	07:22	08:20	15:08	16:06	17:05
62°	06:17	07:12	08:05	15:23	16:15	17:11
60°	06:12	07:04	07:52	15:36	16:24	17:15
N 58°	06:08	06:56	07:41	15:46	16:31	17:19
56°	06:04	06:50	07:32	15:56	16:38	17:23
54°	06:01	06:44	07:23	16:04	16:44	17:27
52°	05:58	06:39	07:16	16:12	16:49	17:30
50°	05:55	06:34	07:09	16:19	16:54	17:33
45°	05:47	06:23	06:54	16:34	17:05	17:41
N 40°	05:41	06:14	06:42	16:46	17:14	17:47
35°	05:35	06:05	06:32	16:56	17:23	17:53
30°	05:29	05:58	06:23	17:05	17:30	17:59
20°	05:18	05:44	06:07	17:21	17:44	18:10
N 10°	05:06	05:32	05:54	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:35
S 10°	04:39	05:05	05:28	18:01	18:23	18:49
20°	04:22	04:50	05:13	18:15	18:39	19:07
30°	04:00	04:31	04:57	18:32	18:58	19:29
35°	03:46	04:20	04:48	18:41	19:09	19:43
40°	03:29	04:06	04:37	18:53	19:23	20:00
45°	03:08	03:50	04:24	19:06	19:39	20:22
S 50°	02:39	03:29	04:08	19:22	20:00	20:51
52°	02:24	03:19	04:00	19:29	20:11	21:07
54°	02:06	03:08	03:52	19:38	20:22	21:25
56°	01:43	02:55	03:43	19:47	20:36	21:48
58°	01:12	02:39	03:32	19:58	20:52	22:21
S 60°	00:09	02:20	03:20	20:10	21:11	////

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	12:13	▭	▭	07:50	▭	▭
N 70°	12:51	▭	▭	07:15	▭	▭
68°	13:17	12:39	▭	06:50	09:12	▭
66°	13:38	13:20	12:29	06:31	08:32	11:17
64°	13:54	13:48	13:39	06:15	08:05	10:07
62°	14:08	14:10	14:15	06:03	07:44	09:31
60°	14:20	14:27	14:42	05:52	07:27	09:06
N 58°	14:30	14:42	15:02	05:43	07:13	08:46
56°	14:39	14:55	15:19	05:34	07:01	08:29
54°	14:47	15:06	15:34	05:27	06:50	08:15
52°	14:54	15:16	15:47	05:21	06:41	08:03
50°	15:00	15:25	15:58	05:15	06:33	07:52
45°	15:14	15:44	16:21	05:03	06:15	07:29
N 40°	15:26	15:59	16:40	04:52	06:01	07:11
35°	15:36	16:12	16:56	04:44	05:49	06:56
30°	15:45	16:24	17:10	04:36	05:38	06:43
20°	16:00	16:44	17:33	04:23	05:20	06:21
N 10°	16:13	17:01	17:54	04:12	05:04	06:01
0°	16:26	17:17	18:13	04:01	04:50	05:43
S 10°	16:39	17:34	18:32	03:50	04:35	05:25
20°	16:52	17:51	18:53	03:39	04:20	05:06
30°	17:08	18:12	19:17	03:26	04:02	04:44
35°	17:17	18:24	19:32	03:19	03:52	04:32
40°	17:28	18:38	19:48	03:10	03:40	04:17
45°	17:40	18:54	20:08	03:01	03:27	03:59
S 50°	17:55	19:14	20:33	02:49	03:10	03:38
52°	18:03	19:24	20:45	02:43	03:02	03:28
54°	18:11	19:35	20:59	02:37	02:54	03:16
56°	18:19	19:48	21:15	02:31	02:44	03:03
58°	18:30	20:02	21:34	02:23	02:33	02:48
S 60°	18:41	20:20	21:59	02:15	02:20	02:30

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 95-100%
12	15:57	15:54	11:44	22:38	10:13	
13	15:50	15:46	11:44	23:30	11:03	
14	15:42	15:37	11:44	–:–	11:58	

November 15, 16, 17 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	53°51.7	158°06.1	S23°43.9	152°44.1	S24°08.1	240°13.8	N03°55.3	32°10.6	N06°09.0
1	68°54.1	173°05.2	44.3	167°44.5	08.2	255°15.9	55.1	47°13.2	09.0
2	83°56.6	188°04.3	44.7	182°44.9	08.3	270°18.0	55.0	62°15.8	08.9
3	98°59.1	203°03.4	·· 45.1	197°45.3	·· 08.5	285°20.1	·· 54.9	77°18.4	·· 08.9
4	114°01.5	218°02.5	45.5	212°45.8	08.6	300°22.2	54.7	92°21.0	08.8
5	129°04.0	233°01.6	45.9	227°46.2	08.7	315°24.3	54.6	107°23.6	08.8
6	144°06.4	248°00.7	S23°46.3	242°46.6	S24°08.8	330°26.5	N03°54.4	122°26.2	N06°08.7
7	159°08.9	262°59.8	46.6	257°47.0	09.0	345°28.6	54.3	137°28.8	08.6
8	174°11.4	277°58.9	47.0	272°47.5	09.1	0°30.7	54.1	152°31.5	08.6
9	189°13.8	292°58.0	·· 47.4	287°47.9	·· 09.2	15°32.8	·· 54.0	167°34.1	·· 08.5
10	204°16.3	307°57.1	47.8	302°48.3	09.3	30°34.9	53.8	182°36.7	08.5
11	219°18.8	322°56.2	48.2	317°48.7	09.5	45°37.0	53.7	197°39.3	08.4
12	234°21.2	337°55.3	S23°48.6	332°49.2	S24°09.6	60°39.1	N03°53.6	212°41.9	N06°08.4
13	249°23.7	352°54.4	49.0	347°49.6	09.7	75°41.2	53.4	227°44.5	08.3
14	264°26.2	7°53.5	49.4	2°50.0	09.8	90°43.3	53.3	242°47.1	08.3
15	279°28.6	22°52.6	·· 49.8	17°50.4	·· 10.0	105°45.4	·· 53.1	257°49.7	·· 08.2
16	294°31.1	37°51.7	50.2	32°50.9	10.1	120°47.5	53.0	272°52.4	08.2
17	309°33.6	52°50.8	50.5	47°51.3	10.2	135°49.7	52.8	287°55.0	08.1
18	324°36.0	67°49.9	S23°50.9	62°51.7	S24°10.3	150°51.8	N03°52.7	302°57.6	N06°08.1
19	339°38.5	82°49.0	51.3	77°52.1	10.4	165°53.9	52.6	318°00.2	08.0
20	354°40.9	97°48.1	51.7	92°52.6	10.6	180°56.0	52.4	333°02.8	08.0
21	9°43.4	112°47.2	·· 52.1	107°53.0	·· 10.7	195°58.1	·· 52.3	348°05.4	·· 07.9
22	24°45.9	127°46.3	52.4	122°53.4	10.8	211°00.2	52.1	3°08.0	07.9
23	39°48.3	142°45.4	52.8	137°53.8	10.9	226°02.3	52.0	18°10.6	07.8
Mer.pass. 20:21		ν -0.9′	d 0.4′	m -3.88	ν 0.4′	d 0.1′	m 1.31	ν 2.1′	d 0.1′ m -1.85	ν 2.6′	d 0.1′ m 0.24

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°50.8	157°44.5	S23°53.2	152°54.2	S24°11.0	241°04.4	N03°51.8	33°13.3	N06°07.8
1	69°53.3	172°43.6	53.6	167°54.7	11.2	256°06.5	51.7	48°15.9	07.7
2	84°55.7	187°42.7	53.9	182°55.1	11.3	271°08.7	51.6	63°18.5	07.7
3	99°58.2	202°41.8	·· 54.3	197°55.5	·· 11.4	286°10.8	·· 51.4	78°21.1	·· 07.6
4	115°00.7	217°40.9	54.7	212°55.9	11.5	301°12.9	51.3	93°23.7	07.6
5	130°03.1	232°40.0	55.0	227°56.4	11.6	316°15.0	51.1	108°26.3	07.5
6	145°05.6	247°39.1	S23°55.4	242°56.8	S24°11.7	331°17.1	N03°51.0	123°28.9	N06°07.5
7	160°08.1	262°38.2	55.8	257°57.2	11.9	346°19.2	50.8	138°31.5	07.4
8	175°10.5	277°37.2	56.1	272°57.6	12.0	1°21.3	50.7	153°34.1	07.4
9	190°13.0	292°36.3	·· 56.5	287°58.0	·· 12.1	16°23.4	·· 50.6	168°36.7	·· 07.3
10	205°15.4	307°35.4	56.9	302°58.5	12.2	31°25.5	50.4	183°39.4	07.3
11	220°17.9	322°34.5	57.2	317°58.9	12.3	46°27.7	50.3	198°42.0	07.2
12	235°20.4	337°33.6	S23°57.6	332°59.3	S24°12.4	61°29.8	N03°50.1	213°44.6	N06°07.2
13	250°22.8	352°32.7	57.9	347°59.7	12.5	76°31.9	50.0	228°47.2	07.1
14	265°25.3	7°31.8	58.3	3°00.1	12.7	91°34.0	49.8	243°49.8	07.1
15	280°27.8	22°30.9	·· 58.7	18°00.6	·· 12.8	106°36.1	·· 49.7	258°52.4	·· 07.0
16	295°30.2	37°30.0	59.0	33°01.0	12.9	121°38.2	49.6	273°55.0	07.0
17	310°32.7	52°29.1	59.4	48°01.4	13.0	136°40.3	49.4	288°57.6	06.9
18	325°35.2	67°28.2	S23°59.7	63°01.8	S24°13.1	151°42.5	N03°49.3	304°00.2	N06°06.9
19	340°37.6	82°27.3	24°00.1	78°02.2	13.2	166°44.6	49.1	319°02.8	06.8
20	355°40.1	97°26.4	00.4	93°02.7	13.3	181°46.7	49.0	334°05.4	06.8
21	10°42.6	112°25.5	·· 00.8	108°03.1	·· 13.4	196°48.8	·· 48.9	349°08.1	·· 06.7
22	25°45.0	127°24.5	01.1	123°03.5	13.5	211°50.9	48.7	4°10.7	06.7
23	40°47.5	142°23.6	01.5	138°03.9	13.6	226°53.0	48.6	19°13.3	06.6
Mer.pass. 20:17		ν -0.9′	d 0.4′	m -3.89	ν 0.4′	d 0.1′	m 1.30	ν 2.1′	d 0.1′ m -1.85	ν 2.6′	d 0.1′ m 0.24

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	55°49.9	157°22.7	S24°01.8	153°04.3	S24°13.8	241°55.1	N03°48.4	34°15.9	N06°06.6
1	70°52.4	172°21.8	02.2	168°04.8	13.9	256°57.3	48.3	49°18.5	06.5
2	85°54.9	187°20.9	02.5	183°05.2	14.0	271°59.4	48.2	64°21.1	06.5
3	100°57.3	202°20.0	·· 02.8	198°05.6	·· 14.1	287°01.5	·· 48.0	79°23.7	·· 06.4
4	115°59.8	217°19.1	03.2	213°06.0	14.2	302°03.6	47.9	94°26.3	06.4
5	131°02.3	232°18.2	03.5	228°06.4	14.3	317°05.7	47.7	109°28.9	06.3
6	146°04.7	247°17.3	S24°03.9	243°06.8	S24°14.4	332°07.8	N03°47.6	124°31.5	N06°06.3
7	161°07.2	262°16.3	04.2	258°07.3	14.5	347°10.0	47.5	139°34.1	06.3
8	176°09.7	277°15.4	04.5	273°07.7	14.6	2°12.1	47.3	154°36.7	06.2
9	191°12.1	292°14.5	·· 04.9	288°08.1	·· 14.7	17°14.2	·· 47.2	169°39.3	·· 06.2
10	206°14.6	307°13.6	05.2	303°08.5	14.8	32°16.3	47.0	184°42.0	06.1
11	221°17.1	322°12.7	05.5	318°08.9	14.9	47°18.4	46.9	199°44.6	06.1
12	236°19.5	337°11.8	S24°05.9	333°09.3	S24°15.0	62°20.5	N03°46.8	214°47.2	N06°06.0
13	251°22.0	352°10.9	06.2	348°09.8	15.1	77°22.7	46.6	229°49.8	06.0
14	266°24.4	7°10.0	06.5	3°10.2	15.2	92°24.8	46.5	244°52.4	05.9
15	281°26.9	22°09.0	·· 06.8	18°10.6	·· 15.3	107°26.9	·· 46.3	259°55.0	·· 05.9
16	296°29.4	37°08.1	07.2	33°11.0	15.4	122°29.0	46.2	274°57.6	05.8
17	311°31.8	52°07.2	07.5	48°11.4	15.5	137°31.1	46.1	290°00.2	05.8
18	326°34.3	67°06.3	S24°07.8	63°11.8	S24°15.6	152°33.2	N03°45.9	305°02.8	N06°05.7
19	341°36.8	82°05.4	08.1	78°12.2	15.7	167°35.4	45.8	320°05.4	05.7
20	356°39.2	97°04.5	08.5	93°12.7	15.8	182°37.5	45.6	335°08.0	05.6
21	11°41.7	112°03.6	·· 08.8	108°13.1	·· 15.9	197°39.6	·· 45.5	350°10.6	·· 05.6
22	26°44.2	127°02.6	09.1	123°13.5	16.0	212°41.7	45.4	5°13.2	05.5
23	41°46.6	142°01.7	09.4	138°13.9	16.1	227°43.8	45.2	20°15.8	05.5
Mer.pass. 20:13		ν -0.9′	d 0.3′	m -3.89	ν 0.4′	d 0.1′	m 1.30	ν 2.1′	d 0.1′ m -1.86	ν 2.6′	d 0.0′ m 0.25

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.3	89°22.9
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.0
Mirfak	308°24.4	49°57.7
Aldebaran	290°36.6	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°18.0	46°01.4
Bellatrix	278°20.1	6°22.5
Elnath	277°58.6	28°37.8
Alnilam	275°35.1	-1°11.0
Betelgeuse	270°49.3	7°24.7
Canopus	263°50.9	-52°42.4
Sirius	258°23.9	-16°45.2
Adhara	255°03.8	-29°00.4
Procyon	244°48.2	5°09.2
Pollux	243°14.3	27°57.4
Avior	234°13.5	-59°35.7
Suhail	222°44.5	-43°32.5
Miaplacidus	221°37.6	-69°49.6
Alphard	217°45.5	-8°46.7
Regulus	207°32.0	11°49.8
Dubhe	193°38.5	61°35.7
Denebola	182°22.8	14°24.9
Gienah	175°41.4	-17°41.7
Acrux	172°57.9	-63°15.0
Gacrux	171°49.4	-57°16.0
Alioth	166°11.4	55°48.3
Spica	158°20.1	-11°18.3
Alkaid	152°50.7	49°10.3
Hadar	148°33.2	-60°30.3
Menkent	147°55.2	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.7	-60°56.9
Kochab	137°21.2	74°02.3
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°06.0	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.3	-56°38.8
Deneb	49°24.3	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.0	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.3
Markab	13°27.5	15°21.6

Nov 15 Mon	SHA	Mer.pass
Venus	104°14.4	13:28
Mars	98°52.4	13:49
Jupiter	186°22.1	07:58
Saturn	338°18.9	21:48

Nov 16 Tue	SHA	Mer.pass
Venus	102°53.7	13:30
Mars	98°03.4	13:48
Jupiter	186°13.6	07:55
Saturn	338°22.4	21:43

Nov 17 Wed	SHA	Mer.pass
Venus	101°32.8	13:31
Mars	97°14.4	13:47
Jupiter	186°05.2	07:51
Saturn	338°25.9	21:39

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°53.2	S18°21.9	353°30.3	5.7′	N25°10.1	5.4′	58.3′
1	198°53.1	22.5	7°54.9	5.6′	25°15.5	5.2′	58.3′
2	213°53.0	23.1	22°19.5	5.5′	25°20.7	5.0′	58.3′
3	228°52.9	·· 23.8	36°44.0	5.4′	25°25.7	4.8′	58.4′
4	243°52.8	24.4	51°08.5	5.4′	25°30.5	4.7′	58.4′
5	258°52.7	25.1	65°32.8	5.3′	25°35.2	4.6′	58.4′
6	273°52.6	S18°25.7	79°57.1	5.2′	N25°39.8	4.4′	58.4′
7	288°52.5	26.3	94°21.3	5.1′	25°44.2	4.2′	58.4′
8	303°52.4	27.0	108°45.5	5.1′	25°48.4	4.0′	58.5′
9	318°52.3	·· 27.6	123°09.5	5.0′	25°52.4	3.9′	58.5′
10	333°52.2	28.3	137°33.5	4.9′	25°56.3	3.7′	58.5′
11	348°52.1	28.9	151°57.5	4.9′	26°00.0	3.5′	58.5′
12	3°51.9	S18°29.5	166°21.4	4.8′	N26°03.5	3.4′	58.5′
13	18°51.8	30.2	180°45.2	4.8′	26°06.9	3.2′	58.6′
14	33°51.7	30.8	195°08.9	4.7′	26°10.1	3.1′	58.6′
15	48°51.6	·· 31.4	209°32.6	4.6′	26°13.2	2.8′	58.6′
16	63°51.5	32.1	223°56.3	4.6′	26°16.0	2.7′	58.6′
17	78°51.4	32.7	238°19.9	4.5′	26°18.7	2.5′	58.6′
18	93°51.3	S18°33.3	252°43.4	4.5′	N26°21.2	2.3′	58.6′
19	108°51.2	34.0	267°06.9	4.4′	26°23.5	2.2′	58.7′
20	123°51.1	34.6	281°30.4	4.4′	26°25.7	2.0′	58.7′
21	138°51.0	·· 35.2	295°53.8	4.4′	26°27.7	1.8′	58.7′
22	153°50.9	35.9	310°17.1	4.3′	26°29.5	1.6′	58.7′
23	168°50.8	36.5	324°40.5	4.3′	26°31.1	1.5′	58.7′
	SD = 16.2′	d = 0.6′	SD = 15.9′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°50.7	S18°37.1	339°03.7	4.3′	N26°32.6	1.3′	58.7′
1	198°50.6	37.8	353°27.0	4.2′	26°33.9	1.1′	58.8′
2	213°50.5	38.4	7°50.2	4.2′	26°35.0	0.9′	58.8′
3	228°50.4	·· 39.0	22°13.4	4.2′	26°35.9	0.7′	58.8′
4	243°50.2	39.7	36°36.6	4.1′	26°36.6	0.6′	58.8′
5	258°50.1	40.3	50°59.7	4.1′	26°37.2	0.3′	58.8′
6	273°50.0	S18°40.9	65°22.8	4.1′	N26°37.5	0.2′	58.8′
7	288°49.9	41.5	79°45.9	4.1′	26°37.7	0.1′	58.8′
8	303°49.8	42.2	94°09.0	4.1′	26°37.8	0.2′	58.9′
9	318°49.7	·· 42.8	108°32.1	4.0′	26°37.6	0.4′	58.9′
10	333°49.6	43.4	122°55.1	4.0′	26°37.2	0.5′	58.9′
11	348°49.5	44.0	137°18.1	4.0′	26°36.7	0.7′	58.9′
12	3°49.4	S18°44.7	151°41.2	4.0′	N26°36.0	0.9′	58.9′
13	18°49.2	45.3	166°04.2	4.0′	26°35.1	1.1′	58.9′
14	33°49.1	45.9	180°27.2	4.0′	26°34.0	1.2′	58.9′
15	48°49.0	·· 46.5	194°50.2	4.0′	26°32.8	1.5′	59.0′
16	63°48.9	47.1	209°13.3	4.0′	26°31.3	1.6′	59.0′
17	78°48.8	47.8	223°36.3	4.0′	26°29.7	1.8′	59.0′
18	93°48.7	S18°48.4	237°59.3	4.0′	N26°27.9	2.0′	59.0′
19	108°48.6	49.0	252°22.4	4.1′	26°25.9	2.1′	59.0′
20	123°48.5	49.6	266°45.4	4.1′	26°23.8	2.4′	59.0′
21	138°48.3	·· 50.2	281°08.5	4.1′	26°21.4	2.5′	59.0′
22	153°48.2	50.9	295°31.6	4.1′	26°18.9	2.7′	59.0′
23	168°48.1	51.5	309°54.7	4.1′	26°16.2	2.9′	59.0′
	SD = 16.2′	d = 0.6′	SD = 16.0′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°48.0	S18°52.1	324°17.8	4.1′	N26°13.3	3.1′	59.1′
1	198°47.9	52.7	338°40.9	4.2′	26°10.2	3.2′	59.1′
2	213°47.8	53.3	353°04.1	4.2′	26°07.0	3.4′	59.1′
3	228°47.6	·· 53.9	7°27.3	4.2′	26°03.6	3.6′	59.1′
4	243°47.5	54.6	21°50.5	4.3′	26°00.0	3.8′	59.1′
5	258°47.4	55.2	36°13.8	4.3′	25°56.2	4.0′	59.1′
6	273°47.3	S18°55.8	50°37.0	4.3′	N25°52.2	4.1′	59.1′
7	288°47.2	56.4	65°00.4	4.4′	25°48.1	4.3′	59.1′
8	303°47.0	57.0	79°23.7	4.4′	25°43.8	4.5′	59.1′
9	318°46.9	·· 57.6	93°47.1	4.4′	25°39.3	4.7′	59.1′
10	333°46.8	58.2	108°10.6	4.5′	25°34.6	4.8′	59.1′
11	348°46.7	58.8	122°34.1	4.5′	25°29.8	5.0′	59.2′
12	3°46.6	S18°59.5	136°57.6	4.6′	N25°24.8	5.2′	59.2′
13	18°46.4	19°00.1	151°21.2	4.6′	25°19.6	5.3′	59.2′
14	33°46.3	00.7	165°44.8	4.7′	25°14.3	5.5′	59.2′
15	48°46.2	·· 01.3	180°08.5	4.7′	25°08.8	5.7′	59.2′
16	63°46.1	01.9	194°32.3	4.8′	25°03.1	5.9′	59.2′
17	78°46.0	02.5	208°56.0	4.8′	24°57.2	6.0′	59.2′
18	93°45.8	S19°03.1	223°19.9	4.9′	N24°51.2	6.2′	59.2′
19	108°45.7	03.7	237°43.8	5.0′	24°45.0	6.3′	59.2′
20	123°45.6	04.3	252°07.8	5.0′	24°38.7	6.6′	59.2′
21	138°45.5	·· 04.9	266°31.8	5.1′	24°32.1	6.6′	59.2′
22	153°45.3	05.5	280°55.9	5.2′	24°25.5	6.9′	59.2′
23	168°45.2	06.1	295°20.1	5.2′	24°18.6	7.0′	59.2′
	SD = 16.2′	d = 0.6′	SD = 16.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:02	08:38	11:21	12:08	14:51	16:26
N 70°	06:52	08:14	09:54	13:34	15:14	16:37
68°	06:43	07:56	09:16	14:12	15:32	16:45
66°	06:36	07:42	08:50	14:39	15:47	16:53
64°	06:29	07:30	08:30	14:59	15:59	16:59
62°	06:24	07:19	08:13	15:15	16:09	17:05
60°	06:18	07:10	08:00	15:29	16:18	17:10
N 58°	06:14	07:03	07:48	15:41	16:26	17:15
56°	06:10	06:56	07:38	15:51	16:33	17:19
54°	06:06	06:49	07:29	16:00	16:40	17:23
52°	06:02	06:43	07:21	16:08	16:45	17:27
50°	05:59	06:38	07:14	16:15	16:51	17:30
45°	05:51	06:27	06:59	16:30	17:02	17:38
N 40°	05:44	06:17	06:46	16:43	17:12	17:45
35°	05:38	06:08	06:35	16:54	17:21	17:52
30°	05:31	06:00	06:26	17:04	17:29	17:58
20°	05:19	05:46	06:09	17:20	17:43	18:10
N 10°	05:07	05:33	05:55	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:36
S 10°	04:39	05:05	05:27	18:02	18:24	18:51
20°	04:21	04:49	05:13	18:17	18:41	19:09
30°	03:58	04:29	04:56	18:34	19:00	19:32
35°	03:44	04:18	04:45	18:44	19:12	19:47
40°	03:26	04:03	04:34	18:56	19:27	20:05
45°	03:03	03:46	04:20	19:10	19:44	20:27
S 50°	02:33	03:25	04:04	19:27	20:06	20:59
52°	02:17	03:14	03:56	19:35	20:17	21:15
54°	01:57	03:02	03:47	19:44	20:29	21:35
56°	01:32	02:48	03:37	19:54	20:43	22:01
58°	00:55	02:31	03:26	20:05	21:01	22:41
S 60°	////	02:10	03:13	20:18	21:22	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°	13:07		16:15	12:42		13:52
62°	14:33	15:26	17:03	11:16	12:32	13:03
60°	15:10	16:07	17:34	10:39	11:51	12:32
N 58°	15:37	16:35	17:57	10:13	11:23	12:08
56°	15:58	16:57	18:16	09:52	11:01	11:49
54°	16:15	17:14	18:31	09:35	10:43	11:33
52°	16:30	17:30	18:45	09:21	10:28	11:19
50°	16:43	17:43	18:57	09:08	10:14	11:07
45°	17:10	18:10	19:21	08:42	09:47	10:42
N 40°	17:31	18:32	19:41	08:21	09:25	10:22
35°	17:48	18:49	19:57	08:03	09:08	10:05
30°	18:04	19:05	20:11	07:49	08:52	09:50
20°	18:29	19:31	20:35	07:23	08:26	09:25
N 10°	18:52	19:53	20:56	07:01	08:03	09:04
0°	19:13	20:14	21:15	06:41	07:42	08:44
S 10°	19:34	20:35	21:34	06:21	07:21	08:23
20°	19:56	20:58	21:55	05:59	06:58	08:01
30°	20:22	21:24	22:19	05:34	06:32	07:36
35°	20:38	21:39	22:32	05:19	06:16	07:21
40°	20:56	21:57	22:48	05:02	05:58	07:03
45°	21:18	22:18	23:07	04:42	05:36	06:42
S 50°	21:45	22:45	23:31	04:16	05:08	06:16
52°	21:59	22:58	23:42	04:04	04:55	06:03
54°	22:14	23:14	23:55	03:50	04:39	05:48
56°	22:33	23:31	·· ··	03:33	04:21	05:30
58°	22:55	23:53	·· ··	03:13	03:58	05:09
S 60°	23:24	·· ··	00:20	02:49	03:29	04:42

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 17-19 99-90%
15	15:33	15:28	11:45	00:27	12:57	
16	15:23	15:17	11:45	01:27	13:58	
17	15:12	15:06	11:45	02:29	14:59	

November 18, 19, 20 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°49.1	157°00.8	S24°09.7	153°14.3	S24°16.2	242°46.0	N03°45.1	35°18.4	N06°05.4
1	71°51.6	171°59.9	10.0	168°14.7	16.3	257°48.1	44.9	50°21.0	05.4
2	86°54.0	186°59.0	10.3	183°15.1	16.4	272°50.2	44.8	65°23.7	05.3
3	101°56.5	201°58.1	·· 10.7	198°15.6	·· 16.5	287°52.3	·· 44.7	80°26.3	·· 05.3
4	116°58.9	216°57.1	11.0	213°16.0	16.6	302°54.4	44.5	95°28.9	05.2
5	132°01.4	231°56.2	11.3	228°16.4	16.7	317°56.6	44.4	110°31.5	05.2
6	147°03.9	246°55.3	S24°11.6	243°16.8	S24°16.8	332°58.7	N03°44.3	125°34.1	N06°05.1
7	162°06.3	261°54.4	11.9	258°17.2	16.9	348°00.8	44.1	140°36.7	05.1
8	177°08.8	276°53.5	12.2	273°17.6	17.0	3°02.9	44.0	155°39.3	05.1
9	192°11.3	291°52.5	·· 12.5	288°18.0	·· 17.1	18°05.0	·· 43.8	170°41.9	·· 05.0
10	207°13.7	306°51.6	12.8	303°18.5	17.2	33°07.2	43.7	185°44.5	05.0
11	222°16.2	321°50.7	13.1	318°18.9	17.3	48°09.3	43.6	200°47.1	04.9
12	237°18.7	336°49.8	S24°13.4	333°19.3	S24°17.4	63°11.4	N03°43.4	215°49.7	N06°04.9
13	252°21.1	351°48.9	13.7	348°19.7	17.4	78°13.5	43.3	230°52.3	04.8
14	267°23.6	6°47.9	14.0	3°20.1	17.5	93°15.7	43.1	245°54.9	04.8
15	282°26.1	21°47.0	·· 14.3	18°20.5	·· 17.6	108°17.8	·· 43.0	260°57.5	·· 04.7
16	297°28.5	36°46.1	14.6	33°20.9	17.7	123°19.9	42.9	276°00.1	04.7
17	312°31.0	51°45.2	14.9	48°21.3	17.8	138°22.0	42.7	291°02.7	04.6
18	327°33.4	66°44.3	S24°15.2	63°21.7	S24°17.9	153°24.1	N03°42.6	306°05.3	N06°04.6
19	342°35.9	81°43.3	15.5	78°22.2	18.0	168°26.3	42.5	321°07.9	04.5
20	357°38.4	96°42.4	15.8	93°22.6	18.1	183°28.4	42.3	336°10.5	04.5
21	12°40.8	111°41.5	·· 16.1	108°23.0	·· 18.2	198°30.5	·· 42.2	351°13.1	·· 04.4
22	27°43.3	126°40.6	16.3	123°23.4	18.3	213°32.6	42.0	6°15.7	04.4
23	42°45.8	141°39.7	16.6	138°23.8	18.3	228°34.8	41.9	21°18.3	04.3
Mer.pass.	20:09	ν -0.9′	d 0.3′	ν 0.4′	d 0.1′	ν 2.1′	d 0.1′	ν 2.6′	d 0.0′
		m -3.89		m 1.30		m -1.86		m 0.25	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	57°48.2	156°38.7	S24°16.9	153°24.2	S24°18.4	243°36.9	N03°41.8	36°20.9	N06°04.3
1	72°50.7	171°37.8	17.2	168°24.6	18.5	258°39.0	41.6	51°23.5	04.3
2	87°53.2	186°36.9	17.5	183°25.0	18.6	273°41.1	41.5	66°26.1	04.2
3	102°55.6	201°36.0	·· 17.8	198°25.4	·· 18.7	288°43.3	·· 41.4	81°28.7	·· 04.2
4	117°58.1	216°35.0	18.0	213°25.8	18.8	303°45.4	41.2	96°31.3	04.1
5	133°00.5	231°34.1	18.3	228°26.3	18.9	318°47.5	41.1	111°34.0	04.1
6	148°03.0	246°33.2	S24°18.6	243°26.7	S24°18.9	333°49.6	N03°41.0	126°36.6	N06°04.0
7	163°05.5	261°32.3	18.9	258°27.1	19.0	348°51.8	40.8	141°39.2	04.0
8	178°07.9	276°31.3	19.2	273°27.5	19.1	3°53.9	40.7	156°41.8	03.9
9	193°10.4	291°30.4	·· 19.4	288°27.9	·· 19.2	18°56.0	·· 40.5	171°44.4	·· 03.9
10	208°12.9	306°29.5	19.7	303°28.3	19.3	33°58.1	40.4	186°47.0	03.8
11	223°15.3	321°28.6	20.0	318°28.7	19.3	49°00.3	40.3	201°49.6	03.8
12	238°17.8	336°27.6	S24°20.2	333°29.1	S24°19.4	64°02.4	N03°40.1	216°52.2	N06°03.7
13	253°20.3	351°26.7	20.5	348°29.5	19.5	79°04.5	40.0	231°54.8	03.7
14	268°22.7	6°25.8	20.8	3°29.9	19.6	94°06.6	39.9	246°57.4	03.7
15	283°25.2	21°24.9	·· 21.0	18°30.3	·· 19.7	109°08.8	·· 39.7	262°00.0	·· 03.6
16	298°27.7	36°23.9	21.3	33°30.8	19.8	124°10.9	39.6	277°02.6	03.6
17	313°30.1	51°23.0	21.6	48°31.2	19.8	139°13.0	39.5	292°05.2	03.5
18	328°32.6	66°22.1	S24°21.8	63°31.6	S24°19.9	154°15.2	N03°39.3	307°07.8	N06°03.5
19	343°35.0	81°21.2	22.1	78°32.0	20.0	169°17.3	39.2	322°10.4	03.4
20	358°37.5	96°20.2	22.4	93°32.4	20.1	184°19.4	39.1	337°13.0	03.4
21	13°40.0	111°19.3	·· 22.6	108°32.8	·· 20.1	199°21.5	·· 38.9	352°15.6	·· 03.3
22	28°42.4	126°18.4	22.9	123°33.2	20.2	214°23.7	38.8	7°18.2	03.3
23	43°44.9	141°17.4	23.1	138°33.6	20.3	229°25.8	38.6	22°20.8	03.2
Mer.pass.	20:05	ν -0.9′	d 0.3′	ν 0.4′	d 0.1′	ν 2.1′	d 0.1′	ν 2.6′	d 0.0′
		m -3.89		m 1.30		m -1.86		m 0.26	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	58°47.4	156°16.5	S24°23.4	153°34.0	S24°20.4	244°27.9	N03°38.5	37°23.4	N06°03.2
1	73°49.8	171°15.6	23.6	168°34.4	20.4	259°30.0	38.4	52°26.0	03.2
2	88°52.3	186°14.7	23.9	183°34.8	20.5	274°32.2	38.2	67°28.6	03.1
3	103°54.8	201°13.7	·· 24.1	198°35.2	·· 20.6	289°34.3	·· 38.1	82°31.2	·· 03.1
4	118°57.2	216°12.8	24.4	213°35.6	20.7	304°36.4	38.0	97°33.8	03.0
5	133°59.7	231°11.9	24.6	228°36.0	20.7	319°38.6	37.8	112°36.4	03.0
6	149°02.2	246°10.9	S24°24.9	243°36.4	S24°20.8	334°40.7	N03°37.7	127°39.0	N06°02.9
7	164°04.6	261°10.0	25.1	258°36.8	20.9	349°42.8	37.6	142°41.6	02.9
8	179°07.1	276°09.1	25.4	273°37.3	21.0	4°45.0	37.4	157°44.2	02.8
9	194°09.5	291°08.2	·· 25.6	288°37.7	·· 21.0	19°47.1	·· 37.3	172°46.8	·· 02.8
10	209°12.0	306°07.2	25.9	303°38.1	21.1	34°49.2	37.2	187°49.4	02.8
11	224°14.5	321°06.3	26.1	318°38.5	21.2	49°51.3	37.0	202°52.0	02.7
12	239°16.9	336°05.4	S24°26.3	333°38.9	S24°21.2	64°53.5	N03°36.9	217°54.6	N06°02.7
13	254°19.4	351°04.4	26.6	348°39.3	21.3	79°55.6	36.8	232°57.1	02.6
14	269°21.9	6°03.5	26.8	3°39.7	21.4	94°57.7	36.6	247°59.7	02.6
15	284°24.3	21°02.6	·· 27.1	18°40.1	·· 21.5	109°59.9	·· 36.5	263°02.3	·· 02.5
16	299°26.8	36°01.6	27.3	33°40.5	21.5	125°02.0	36.4	278°04.9	02.5
17	314°29.3	51°00.7	27.5	48°40.9	21.6	140°04.1	36.2	293°07.5	02.4
18	329°31.7	65°59.8	S24°27.8	63°41.3	S24°21.7	155°06.3	N03°36.1	308°10.1	N06°02.4
19	344°34.2	80°58.8	28.0	78°41.7	21.7	170°08.4	36.0	323°12.7	02.4
20	359°36.7	95°57.9	28.2	93°42.1	21.8	185°10.5	35.8	338°15.3	02.3
21	14°39.1	110°57.0	·· 28.4	108°42.5	·· 21.9	200°12.7	·· 35.7	353°17.9	·· 02.3
22	29°41.6	125°56.1	28.7	123°42.9	21.9	215°14.8	35.6	8°20.5	02.2
23	44°44.0	140°55.1	28.9	138°43.3	22.0	230°16.9	35.4	23°23.1	02.2
Mer.pass.	20:02	ν -0.9′	d 0.3′	ν 0.4′	d 0.1′	ν 2.1′	d 0.1′	ν 2.6′	d 0.0′
		m -3.89		m 1.29		m -1.87		m 0.26	

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.7
Diphda	348°44.7	-17°49.9
Achernar	335°18.0	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.0	89°22.9
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.6	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°18.0	46°01.5
Bellatrix	278°20.1	6°22.5
Elnath	277°58.6	28°37.8
Alnilam	275°35.1	-1°11.0
Betelgeuse	270°49.3	7°24.7
Canopus	263°50.9	-52°42.4
Sirius	258°23.9	-16°45.2
Adhara	255°03.8	-29°00.5
Procyon	244°48.2	5°09.2
Pollux	243°14.3	27°57.4
Avior	234°13.5	-59°35.7
Suhail	222°44.5	-43°32.5
Miaplacidus	221°37.5	-69°49.6
Alphard	217°45.4	-8°46.7
Regulus	207°32.0	11°49.8
Dubhe	193°38.5	61°35.7
Denebola	182°22.8	14°24.9
Gienah	175°41.4	-17°41.7
Acrux	172°57.8	-63°15.0
Gacrux	171°49.4	-57°16.0
Alioth	166°11.4	55°48.3
Spica	158°20.1	-11°18.4
Alkaid	152°50.7	49°10.3
Hadar	148°33.2	-60°30.3
Menkent	147°55.2	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.7	-60°56.9
Kochab	137°21.2	74°02.3
Zuben'ubi	136°53.8	-16°09.4
Alphecca	126°02.2	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.3	-56°38.8
Deneb	49°24.3	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.0	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.4
Markab	13°27.5	15°21.6

Nov 18 Thu	SHA	Mer.pass
Venus	100°11.7	13:33
Mars	96°25.2	13:47
Jupiter	185°56.9	07:48
Saturn	338°29.4	21:35

Nov 19 Fri	SHA	Mer.pass
Venus	98°50.5	13:34
Mars	95°36.0	13:46
Jupiter	185°48.7	07:44
Saturn	338°32.7	21:31

Nov 20 Sat	SHA	Mer.pass
Venus	97°29.2	13:36
Mars	94°46.6	13:45
Jupiter	185°40.5	07:41
Saturn	338°36.0	21:27

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0873 sec ΔT = TT-UT1 = +69.2713 sec

2027 November 18 to Nov. 20 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°45.1	S19°06.7	309°44.3	5.3′	N24°11.6	7.2′	59.2′
1	198°45.0	07.3	324°08.6	5.4′	24°04.4	7.3′	59.2′
2	213°44.8	07.9	338°32.9	5.4′	23°57.1	7.5′	59.2′
3	228°44.7	·· 08.5	352°57.4	5.5′	23°49.6	7.6′	59.3′
4	243°44.6	09.1	7°21.9	5.6′	23°42.0	7.8′	59.3′
5	258°44.5	09.7	21°46.4	5.6′	23°34.2	7.9′	59.3′
6	273°44.3	S19°10.3	36°11.1	5.7′	N23°26.3	8.1′	59.3′
7	288°44.2	10.9	50°35.8	5.8′	23°18.2	8.3′	59.3′
8	303°44.1	11.5	65°00.6	5.9′	23°09.9	8.4′	59.3′
9	318°43.9	·· 12.1	79°25.5	6.0′	23°01.5	8.5′	59.3′
10	333°43.8	12.7	93°50.4	6.0′	22°53.0	8.7′	59.3′
11	348°43.7	13.3	108°15.5	6.1′	22°44.3	8.8′	59.3′
12	3°43.6	S19°13.9	122°40.6	6.2′	N22°35.5	9.0′	59.3′
13	18°43.4	14.5	137°05.8	6.3′	22°26.5	9.1′	59.3′
14	33°43.3	15.1	151°31.0	6.4′	22°17.4	9.3′	59.3′
15	48°43.2	·· 15.7	165°56.4	6.4′	22°08.1	9.4′	59.3′
16	63°43.0	16.3	180°21.8	6.5′	21°58.7	9.5′	59.3′
17	78°42.9	16.9	194°47.3	6.6′	21°49.2	9.7′	59.3′
18	93°42.8	S19°17.5	209°12.9	6.7′	N21°39.5	9.8′	59.3′
19	108°42.6	18.1	223°38.6	6.8′	21°29.7	10.0′	59.3′
20	123°42.5	18.7	238°04.4	6.9′	21°19.7	10.1′	59.3′
21	138°42.4	·· 19.2	252°30.3	6.9′	21°09.6	10.2′	59.3′
22	153°42.2	19.8	266°56.2	7.0′	20°59.4	10.3′	59.3′
23	168°42.1	20.4	281°22.2	7.1′	20°49.1	10.5′	59.3′
	SD = 16.2′	d = 0.6′	SD = 16.2′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°42.0	S19°21.0	295°48.3	7.2′	N20°38.6	10.6′	59.3′
1	198°41.8	21.6	310°14.5	7.3′	20°28.0	10.7′	59.3′
2	213°41.7	22.2	324°40.8	7.4′	20°17.3	10.8′	59.3′
3	228°41.6	·· 22.8	339°07.2	7.5′	20°06.5	11.0′	59.3′
4	243°41.4	23.4	353°33.6	7.5′	19°55.5	11.1′	59.3′
5	258°41.3	23.9	8°00.2	7.6′	19°44.4	11.2′	59.3′
6	273°41.2	S19°24.5	22°26.8	7.7′	N19°33.2	11.3′	59.3′
7	288°41.0	25.1	36°53.5	7.8′	19°21.9	11.4′	59.3′
8	303°40.9	25.7	51°20.3	7.9′	19°10.5	11.6′	59.3′
9	318°40.7	·· 26.3	65°47.2	8.0′	18°58.9	11.6′	59.3′
10	333°40.6	26.9	80°14.2	8.1′	18°47.3	11.8′	59.3′
11	348°40.5	27.4	94°41.3	8.1′	18°35.5	11.9′	59.3′
12	3°40.3	S19°28.0	109°08.4	8.2′	N18°23.6	11.9′	59.3′
13	18°40.2	28.6	123°35.6	8.3′	18°11.7	12.1′	59.3′
14	33°40.1	29.2	138°03.0	8.4′	17°59.6	12.2′	59.3′
15	48°39.9	·· 29.8	152°30.4	8.5′	17°47.4	12.3′	59.3′
16	63°39.8	30.3	166°57.9	8.6′	17°35.1	12.4′	59.3′
17	78°39.6	30.9	181°25.4	8.7′	17°22.7	12.5′	59.3′
18	93°39.5	S19°31.5	195°53.1	8.7′	N17°10.2	12.6′	59.3′
19	108°39.3	32.1	210°20.8	8.8′	16°57.6	12.7′	59.3′
20	123°39.2	32.6	224°48.6	8.9′	16°44.9	12.8′	59.3′
21	138°39.1	·· 33.2	239°16.6	9.0′	16°32.1	12.8′	59.3′
22	153°38.9	33.8	253°44.5	9.1′	16°19.3	13.0′	59.3′
23	168°38.8	34.4	268°12.6	9.2′	16°06.3	13.1′	59.3′
	SD = 16.2′	d = 0.6′	SD = 16.2′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°38.6	S19°34.9	282°40.8	9.2′	N15°53.2	13.1′	59.2′
1	198°38.5	35.5	297°09.0	9.3′	15°40.1	13.2′	59.2′
2	213°38.4	36.1	311°37.3	9.4′	15°26.9	13.3′	59.2′
3	228°38.2	·· 36.7	326°05.7	9.5′	15°13.6	13.4′	59.2′
4	243°38.1	37.2	340°34.2	9.5′	15°00.2	13.5′	59.2′
5	258°37.9	37.8	355°02.7	9.6′	14°46.7	13.6′	59.2′
6	273°37.8	S19°38.4	9°31.3	9.7′	N14°33.1	13.6′	59.2′
7	288°37.6	38.9	24°00.0	9.8′	14°19.5	13.7′	59.2′
8	303°37.5	39.5	38°28.8	9.8′	14°05.8	13.8′	59.2′
9	318°37.3	·· 40.1	52°57.6	9.9′	13°52.0	13.9′	59.2′
10	333°37.2	40.7	67°26.6	10.0′	13°38.1	13.9′	59.2′
11	348°37.0	41.2	81°55.5	10.1′	13°24.2	14.0′	59.2′
12	3°36.9	S19°41.8	96°24.6	10.1′	N13°10.2	14.1′	59.2′
13	18°36.7	42.3	110°53.7	10.2′	12°56.1	14.1′	59.2′
14	33°36.6	42.9	125°22.9	10.3′	12°42.0	14.2′	59.2′
15	48°36.5	·· 43.5	139°52.2	10.3′	12°27.8	14.3′	59.2′
16	63°36.3	44.0	154°21.6	10.4′	12°13.5	14.3′	59.2′
17	78°36.2	44.6	168°51.0	10.5′	11°59.2	14.4′	59.2′
18	93°36.0	S19°45.2	183°20.4	10.5′	N11°44.8	14.5′	59.2′
19	108°35.9	45.7	197°50.0	10.6′	11°30.3	14.5′	59.1′
20	123°35.7	46.3	212°19.6	10.7′	11°15.8	14.6′	59.1′
21	138°35.6	·· 46.9	226°49.2	10.7′	11°01.2	14.6′	59.1′
22	153°35.4	47.4	241°19.0	10.8′	10°46.6	14.7′	59.1′
23	168°35.3	48.0	255°48.8	10.8′	10°31.9	14.7′	59.1′
	SD = 16.2′	d = 0.6′	SD = 16.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:13	08:52	▬	▬	14:38	16:17
N 70°	07:01	08:26	10:16	13:14	15:04	16:29
68°	06:51	08:06	09:31	13:59	15:23	16:38
66°	06:43	07:51	09:01	14:28	15:39	16:47
64°	06:36	07:37	08:39	14:51	15:52	16:54
62°	06:30	07:26	08:22	15:08	16:03	17:00
60°	06:24	07:17	08:07	15:23	16:13	17:06
N 58°	06:19	07:08	07:55	15:35	16:21	17:11
56°	06:15	07:01	07:44	15:46	16:29	17:15
54°	06:11	06:54	07:35	15:55	16:36	17:19
52°	06:07	06:48	07:26	16:04	16:42	17:23
50°	06:03	06:43	07:19	16:11	16:47	17:27
45°	05:55	06:30	07:03	16:28	17:00	17:36
N 40°	05:47	06:20	06:49	16:41	17:10	17:43
35°	05:40	06:11	06:38	16:52	17:19	17:50
30°	05:34	06:03	06:28	17:02	17:28	17:57
20°	05:21	05:48	06:11	17:19	17:43	18:10
N 10°	05:08	05:34	05:56	17:35	17:57	18:23
0°	04:54	05:20	05:42	17:49	18:11	18:36
S 10°	04:39	05:05	05:27	18:03	18:26	18:52
20°	04:20	04:48	05:12	18:19	18:43	19:11
30°	03:56	04:28	04:54	18:37	19:03	19:35
35°	03:41	04:15	04:44	18:47	19:16	19:50
40°	03:23	04:01	04:32	18:59	19:30	20:09
45°	02:59	03:43	04:17	19:14	19:49	20:33
S 50°	02:27	03:20	04:00	19:32	20:12	21:06
52°	02:10	03:09	03:52	19:40	20:23	21:23
54°	01:49	02:56	03:42	19:49	20:36	21:45
56°	01:20	02:41	03:32	20:00	20:51	22:14
58°	00:33	02:23	03:20	20:12	21:10	23:06
S 60°	////	02:01	03:06	20:26	21:33	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	18:18	21:31	▭	15:54	14:30
N 70°	▭	19:16	21:50	▭	14:54	14:09
68°	16:38	19:50	22:04	15:34	14:19	13:52
66°	17:54	20:14	22:16	14:18	13:53	13:39
64°	18:30	20:33	22:26	13:40	13:33	13:27
62°	18:56	20:48	22:35	13:13	13:17	13:17
60°	19:16	21:01	22:42	12:52	13:03	13:09
N 58°	19:33	21:12	22:48	12:35	12:51	13:01
56°	19:47	21:21	22:53	12:21	12:41	12:55
54°	19:59	21:29	22:58	12:08	12:32	12:49
52°	20:10	21:37	23:03	11:57	12:23	12:44
50°	20:19	21:43	23:07	11:47	12:16	12:39
45°	20:39	21:58	23:16	11:26	12:00	12:28
N 40°	20:55	22:09	23:23	11:09	11:47	12:19
35°	21:08	22:19	23:29	10:54	11:36	12:12
30°	21:20	22:28	23:34	10:42	11:26	12:05
20°	21:40	22:43	23:44	10:20	11:09	11:53
N 10°	21:57	22:56	23:52	10:01	10:54	11:43
0°	22:13	23:08	23:59	09:43	10:40	11:33
S 10°	22:29	23:20	·· ··	09:25	10:26	11:23
20°	22:47	23:33	·· ··	09:06	10:10	11:12
30°	23:06	23:48	·· ··	08:44	09:53	11:00
35°	23:18	23:56	·· ··	08:31	09:42	10:53
40°	23:31	·· ··	00:06	08:16	09:30	10:45
45°	23:46	·· ··	00:17	07:57	09:16	10:35
S 50°	·· ··	00:05	00:30	07:35	08:59	10:23
52°	·· ··	00:14	00:36	07:24	08:51	10:18
54°	·· ··	00:23	00:43	07:11	08:41	10:12
56°	00:10	00:34	00:51	06:57	08:31	10:05
58°	00:27	00:47	00:59	06:40	08:19	09:57
S 60°	00:48	01:02	01:09	06:20	08:05	09:49

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 20-22 82-62%
18	15:00	14:54	11:45	03:29	15:58	
19	14:48	14:41	11:45	04:27	16:54	
20	14:35	14:28	11:46	05:21	17:46	

November 21, 22, 23 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	59°46.5	155°54.2	S24°29.1	153°43.7	S24°22.1	245°19.1	N03°35.3	38°25.7	N06°02.1
1	74°49.0	170°53.3	29.3	168°44.1	22.1	260°21.2	35.2	53°28.3	02.1
2	89°51.4	185°52.3	29.6	183°44.5	22.2	275°23.3	35.0	68°30.9	02.0
3	104°53.9	200°51.4	·· 29.8	198°44.9	·· 22.3	290°25.5	·· 34.9	83°33.5	·· 02.0
4	119°56.4	215°50.5	30.0	213°45.3	22.3	305°27.6	34.8	98°36.1	02.0
5	134°58.8	230°49.5	30.2	228°45.7	22.4	320°29.7	34.6	113°38.7	01.9
6	150°01.3	245°48.6	S24°30.4	243°46.1	S24°22.4	335°31.9	N03°34.5	128°41.3	N06°01.9
7	165°03.8	260°47.7	30.7	258°46.5	22.5	350°34.0	34.4	143°43.9	01.8
8	180°06.2	275°46.7	30.9	273°46.9	22.6	5°36.1	34.2	158°46.5	01.8
9	195°08.7	290°45.8	·· 31.1	288°47.3	·· 22.6	20°38.3	·· 34.1	173°49.1	·· 01.7
10	210°11.1	305°44.8	31.3	303°47.7	22.7	35°40.4	34.0	188°51.7	01.7
11	225°13.6	320°43.9	31.5	318°48.1	22.7	50°42.5	33.8	203°54.3	01.7
12	240°16.1	335°43.0	S24°31.7	333°48.5	S24°22.8	65°44.7	N03°33.7	218°56.9	N06°01.6
13	255°18.5	350°42.0	31.9	348°48.9	22.9	80°46.8	33.6	233°59.5	01.6
14	270°21.0	5°41.1	32.1	3°49.3	22.9	95°48.9	33.4	249°02.1	01.5
15	285°23.5	20°40.2	·· 32.3	18°49.7	·· 23.0	110°51.1	·· 33.3	264°04.7	·· 01.5
16	300°25.9	35°39.2	32.5	33°50.1	23.0	125°53.2	33.2	279°07.2	01.4
17	315°28.4	50°38.3	32.7	48°50.5	23.1	140°55.3	33.1	294°09.8	01.4
18	330°30.9	65°37.4	S24°32.9	63°50.9	S24°23.2	155°57.5	N03°32.9	309°12.4	N06°01.4
19	345°33.3	80°36.4	33.1	78°51.3	23.2	170°59.6	32.8	324°15.0	01.3
20	0°35.8	95°35.5	33.3	93°51.7	23.3	186°01.8	32.7	339°17.6	01.3
21	15°38.3	110°34.6	·· 33.5	108°52.1	·· 23.3	201°03.9	·· 32.5	354°20.2	·· 01.2
22	30°40.7	125°33.6	33.7	123°52.5	23.4	216°06.0	32.4	9°22.8	01.2
23	45°43.2	140°32.7	33.9	138°52.9	23.4	231°08.2	32.3	24°25.4	01.1
Mer.pass. 19:58		ν -0.9′	d 0.2′	m -3.89	ν 0.4′	d 0.1′	m 1.29	ν 2.1′	d 0.1′ m -1.87	ν 2.6′	d 0.0′ m 0.27

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	60°45.6	155°31.7	S24°34.1	153°53.3	S24°23.5	246°10.3	N03°32.1	39°28.0	N06°01.1
1	75°48.1	170°30.8	34.3	168°53.7	23.5	261°12.4	32.0	54°30.6	01.1
2	90°50.6	185°29.9	34.5	183°54.1	23.6	276°14.6	31.9	69°33.2	01.0
3	105°53.0	200°28.9	·· 34.7	198°54.5	·· 23.6	291°16.7	·· 31.7	84°35.8	·· 01.0
4	120°55.5	215°28.0	34.9	213°54.9	23.7	306°18.9	31.6	99°38.4	00.9
5	135°58.0	230°27.1	35.1	228°55.3	23.7	321°21.0	31.5	114°41.0	00.9
6	151°00.4	245°26.1	S24°35.3	243°55.7	S24°23.8	336°23.1	N03°31.3	129°43.6	N06°00.8
7	166°02.9	260°25.2	35.4	258°56.1	23.8	351°25.3	31.2	144°46.2	00.8
8	181°05.4	275°24.2	35.6	273°56.5	23.9	6°27.4	31.1	159°48.7	00.8
9	196°07.8	290°23.3	·· 35.8	288°56.9	·· 23.9	21°29.6	·· 31.0	174°51.3	·· 00.7
10	211°10.3	305°22.4	36.0	303°57.3	24.0	36°31.7	30.8	189°53.9	00.7
11	226°12.8	320°21.4	36.2	318°57.7	24.0	51°33.8	30.7	204°56.5	00.6
12	241°15.2	335°20.5	S24°36.3	333°58.1	S24°24.1	66°36.0	N03°30.6	219°59.1	N06°00.6
13	256°17.7	350°19.6	36.5	348°58.5	24.1	81°38.1	30.4	235°01.7	00.6
14	271°20.1	5°18.6	36.7	3°58.9	24.2	96°40.3	30.3	250°04.3	00.5
15	286°22.6	20°17.7	·· 36.9	18°59.3	·· 24.2	111°42.4	·· 30.2	265°06.9	·· 00.5
16	301°25.1	35°16.7	37.0	33°59.7	24.3	126°44.5	30.0	280°09.5	00.4
17	316°27.5	50°15.8	37.2	49°00.1	24.3	141°46.7	29.9	295°12.1	00.4
18	331°30.0	65°14.9	S24°37.4	64°00.5	S24°24.4	156°48.8	N03°29.8	310°14.7	N06°00.3
19	346°32.5	80°13.9	37.6	79°00.9	24.4	171°51.0	29.7	325°17.3	00.3
20	1°34.9	95°13.0	37.7	94°01.3	24.5	186°53.1	29.5	340°19.8	00.3
21	16°37.4	110°12.0	·· 37.9	109°01.7	·· 24.5	201°55.2	·· 29.4	355°22.4	·· 00.2
22	31°39.9	125°11.1	38.1	124°02.1	24.6	216°57.4	29.3	10°25.0	00.2
23	46°42.3	140°10.2	38.2	139°02.5	24.6	231°59.5	29.1	25°27.6	00.1
Mer.pass. 19:54		ν -0.9′	d 0.2′	m -3.89	ν 0.4′	d 0.1′	m 1.29	ν 2.1′	d 0.1′ m -1.88	ν 2.6′	d 0.0′ m 0.27

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	61°44.8	155°09.2	S24°38.4	154°02.9	S24°24.6	247°01.7	N03°29.0	40°30.2	N06°00.1
1	76°47.2	170°08.3	38.5	169°03.3	24.7	262°03.8	28.9	55°32.8	00.1
2	91°49.7	185°07.3	38.7	184°03.7	24.7	277°05.9	28.8	70°35.4	00.0
3	106°52.2	200°06.4	·· 38.9	199°04.1	·· 24.8	292°08.1	·· 28.6	85°38.0	06°00.0
4	121°54.6	215°05.5	39.0	214°04.5	24.8	307°10.2	28.5	100°40.6	05°59.9
5	136°57.1	230°04.5	39.2	229°04.9	24.9	322°12.4	28.4	115°43.2	59.9
6	151°59.6	245°03.6	S24°39.3	244°05.3	S24°24.9	337°14.5	N03°28.2	130°45.7	N05°59.9
7	167°02.0	260°02.6	39.5	259°05.7	24.9	352°16.7	28.1	145°48.3	59.8
8	182°04.5	275°01.7	39.6	274°06.0	25.0	7°18.8	28.0	160°50.9	59.8
9	197°07.0	290°00.7	·· 39.8	289°06.4	·· 25.0	22°21.0	·· 27.9	175°53.5	·· 59.7
10	212°09.4	304°59.8	39.9	304°06.8	25.0	37°23.1	27.7	190°56.1	59.7
11	227°11.9	319°58.9	40.1	319°07.2	25.1	52°25.2	27.6	205°58.7	59.7
12	242°14.4	334°57.9	S24°40.2	334°07.6	S24°25.1	67°27.4	N03°27.5	221°01.3	N05°59.6
13	257°16.8	349°57.0	40.4	349°08.0	25.2	82°29.5	27.4	236°03.9	59.6
14	272°19.3	4°56.0	40.5	4°08.4	25.2	97°31.7	27.2	251°06.5	59.5
15	287°21.7	19°55.1	·· 40.7	19°08.8	·· 25.2	112°33.8	·· 27.1	266°09.0	·· 59.5
16	302°24.2	34°54.2	40.8	34°09.2	25.3	127°36.0	27.0	281°11.6	59.5
17	317°26.7	49°53.2	40.9	49°09.6	25.3	142°38.1	26.8	296°14.2	59.4
18	332°29.1	64°52.3	S24°41.1	64°10.0	S24°25.3	157°40.3	N03°26.7	311°16.8	N05°59.4
19	347°31.6	79°51.3	41.2	79°10.4	25.4	172°42.4	26.6	326°19.4	59.3
20	2°34.1	94°50.4	41.4	94°10.8	25.4	187°44.6	26.5	341°22.0	59.3
21	17°36.5	109°49.4	·· 41.5	109°11.2	·· 25.4	202°46.7	·· 26.3	356°24.6	·· 59.3
22	32°39.0	124°48.5	41.6	124°11.6	25.5	217°48.8	26.2	11°27.2	59.2
23	47°41.5	139°47.6	41.8	139°12.0	25.5	232°51.0	26.1	26°29.7	59.2
Mer.pass. 19:50		ν -0.9′	d 0.2′	m -3.89	ν 0.4′	d 0.0′	m 1.29	ν 2.1′	d 0.1′ m -1.88	ν 2.6′	d 0.0′ m 0.28

Stars

	SHA	**Dec**
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.7
Diphda	348°44.7	-17°50.0
Achernar	335°18.0	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.1	89°22.9
Acamar	315°09.6	-40°11.5
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.6	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°18.0	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.0
Betelgeuse	270°49.3	7°24.7
Canopus	263°50.9	-52°42.4
Sirius	258°23.9	-16°45.2
Adhara	255°03.7	-29°00.5
Procyon	244°48.2	5°09.2
Pollux	243°14.2	27°57.4
Avior	234°13.5	-59°35.7
Suhail	222°44.4	-43°32.5
Miaplacidus	221°37.5	-69°49.6
Alphard	217°45.4	-8°46.7
Regulus	207°32.0	11°49.8
Dubhe	193°38.4	61°35.7
Denebola	182°22.7	14°24.9
Gienah	175°41.4	-17°41.7
Acrux	172°57.8	-63°15.0
Gacrux	171°49.3	-57°16.0
Alioth	166°11.4	55°48.3
Spica	158°20.1	-11°18.4
Alkaid	152°50.6	49°10.3
Hadar	148°33.2	-60°30.3
Menkent	147°55.2	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.6	-60°56.9
Kochab	137°21.1	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.3
Antares	112°13.3	-26°29.6
Atria	107°05.9	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.8
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.4	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.0	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.4
Markab	13°27.5	15°21.6

Nov 21 Sun	**SHA**	**Mer.pass**
Venus	96°07.7	13:37
Mars	93°57.2	13:45
Jupiter	185°32.5	07:38
Saturn	338°39.2	21:23

Nov 22 Mon	**SHA**	**Mer.pass**
Venus	94°46.1	13:39
Mars	93°07.7	13:44
Jupiter	185°24.7	07:34
Saturn	338°42.4	21:18

Nov 23 Tue	**SHA**	**Mer.pass**
Venus	93°24.4	13:40
Mars	92°18.1	13:43
Jupiter	185°16.9	07:31
Saturn	338°45.4	21:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°35.1	S19°48.5	270°18.6	10.9′	N10°17.2	14.8′	59.1′
1	198°34.9	49.1	284°48.5	11.0′	10°02.4	14.8′	59.1′
2	213°34.8	49.6	299°18.5	11.0′	09°47.6	14.9′	59.1′
3	228°34.6	·· 50.2	313°48.5	11.1′	09°32.7	14.9′	59.1′
4	243°34.5	50.8	328°18.6	11.1′	09°17.8	15.0′	59.1′
5	258°34.3	51.3	342°48.7	11.2′	09°02.8	15.0′	59.1′
6	273°34.2	S19°51.9	357°18.9	11.2′	N08°47.8	15.1′	59.1′
7	288°34.0	52.4	11°49.1	11.3′	08°32.7	15.1′	59.1′
8	303°33.9	53.0	26°19.4	11.3′	08°17.6	15.1′	59.1′
9	318°33.7	·· 53.5	40°49.7	11.4′	08°02.5	15.2′	59.0′
10	333°33.6	54.1	55°20.1	11.4′	07°47.3	15.2′	59.0′
11	348°33.4	54.6	69°50.6	11.5′	07°32.1	15.2′	59.0′
12	3°33.3	S19°55.2	84°21.0	11.5′	N07°16.9	15.3′	59.0′
13	18°33.1	55.7	98°51.6	11.6′	07°01.6	15.3′	59.0′
14	33°32.9	56.3	113°22.1	11.6′	06°46.3	15.3′	59.0′
15	48°32.8	·· 56.8	127°52.7	11.6′	06°31.0	15.4′	59.0′
16	63°32.6	57.4	142°23.4	11.7′	06°15.6	15.4′	59.0′
17	78°32.5	57.9	156°54.1	11.7′	06°00.2	15.4′	59.0′
18	93°32.3	S19°58.5	171°24.8	11.8′	N05°44.8	15.5′	59.0′
19	108°32.2	59.0	185°55.6	11.8′	05°29.3	15.4′	59.0′
20	123°32.0	19°59.6	200°26.4	11.8′	05°13.9	15.5′	58.9′
21	138°31.8	20°00.1	214°57.2	11.9′	04°58.4	15.5′	58.9′
22	153°31.7	00.7	229°28.1	11.9′	04°42.9	15.6′	58.9′
23	168°31.5	01.2	243°59.0	11.9′	04°27.3	15.5′	58.9′
	SD = 16.2′	d = 0.6′	SD = 16.1′				

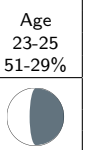
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°31.4	S20°01.8	258°29.9	12.0′	N04°11.8	15.6′	58.9′
1	198°31.2	02.3	273°00.9	12.0′	03°56.2	15.6′	58.9′
2	213°31.0	02.8	287°31.9	12.0′	03°40.6	15.6′	58.9′
3	228°30.9	·· 03.4	302°02.9	12.1′	03°25.0	15.6′	58.9′
4	243°30.7	03.9	316°34.0	12.1′	03°09.4	15.6′	58.9′
5	258°30.5	04.5	331°05.0	12.1′	02°53.8	15.6′	58.9′
6	273°30.4	S20°05.0	345°36.1	12.1′	N02°38.2	15.6′	58.9′
7	288°30.2	05.5	0°07.3	12.1′	02°22.6	15.7′	58.8′
8	303°30.1	06.1	14°38.4	12.2′	02°06.9	15.6′	58.8′
9	318°29.9	·· 06.6	29°09.6	12.2′	01°51.3	15.7′	58.8′
10	333°29.7	07.2	43°40.8	12.2′	01°35.6	15.6′	58.8′
11	348°29.6	07.7	58°12.0	12.2′	01°20.0	15.7′	58.8′
12	3°29.4	S20°08.2	72°43.2	12.2′	N01°04.3	15.6′	58.8′
13	18°29.2	08.8	87°14.4	12.2′	00°48.7	15.7′	58.8′
14	33°29.1	09.3	101°45.7	12.3′	00°33.0	15.6′	58.8′
15	48°28.9	·· 09.8	116°16.9	12.3′	00°17.4	15.7′	58.8′
16	63°28.7	10.4	130°48.2	12.3′	N00°01.7	15.6′	58.7′
17	78°28.6	10.9	145°19.5	12.3′	S00°13.9	15.6′	58.7′
18	93°28.4	S20°11.4	159°50.8	12.3′	S00°29.5	15.7′	58.7′
19	108°28.2	12.0	174°22.1	12.3′	00°45.2	15.6′	58.7′
20	123°28.1	12.5	188°53.4	12.3′	01°00.8	15.6′	58.7′
21	138°27.9	·· 13.0	203°24.7	12.3′	01°16.4	15.6′	58.7′
22	153°27.7	13.6	217°56.0	12.3′	01°32.0	15.6′	58.7′
23	168°27.6	14.1	232°27.3	12.3′	01°47.6	15.5′	58.7′
	SD = 16.2′	d = 0.5′	SD = 16.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°27.4	S20°14.6	246°58.7	12.3′	S02°03.1	15.6′	58.6′
1	198°27.2	15.1	261°30.0	12.3′	02°18.7	15.5′	58.6′
2	213°27.1	15.7	276°01.3	12.3′	02°34.2	15.5′	58.6′
3	228°26.9	·· 16.2	290°32.6	12.3′	02°49.7	15.5′	58.6′
4	243°26.7	16.7	305°04.0	12.3′	03°05.2	15.5′	58.6′
5	258°26.6	17.3	319°35.3	12.3′	03°20.7	15.5′	58.6′
6	273°26.4	S20°17.8	334°06.6	12.3′	S03°36.2	15.4′	58.6′
7	288°26.2	18.3	348°37.9	12.3′	03°51.6	15.4′	58.6′
8	303°26.0	18.8	3°09.2	12.3′	04°07.0	15.4′	58.5′
9	318°25.9	·· 19.3	17°40.5	12.3′	04°22.4	15.3′	58.5′
10	333°25.7	19.9	32°11.8	12.3′	04°37.7	15.3′	58.5′
11	348°25.5	20.4	46°43.0	12.3′	04°53.0	15.3′	58.5′
12	3°25.4	S20°20.9	61°14.3	12.2′	S05°08.3	15.3′	58.5′
13	18°25.2	21.4	75°45.5	12.2′	05°23.6	15.2′	58.5′
14	33°25.0	22.0	90°16.8	12.2′	05°38.8	15.2′	58.5′
15	48°24.8	·· 22.5	104°48.0	12.2′	05°54.0	15.2′	58.5′
16	63°24.7	23.0	119°19.2	12.2′	06°09.2	15.1′	58.4′
17	78°24.5	23.5	133°50.3	12.2′	06°24.3	15.1′	58.4′
18	93°24.3	S20°24.0	148°21.5	12.1′	S06°39.4	15.0′	58.4′
19	108°24.1	24.5	162°52.7	12.1′	06°54.4	15.0′	58.4′
20	123°24.0	25.1	177°23.8	12.1′	07°09.4	15.0′	58.4′
21	138°23.8	·· 25.6	191°54.9	12.1′	07°24.4	14.9′	58.4′
22	153°23.6	26.1	206°26.0	12.1′	07°39.3	14.9′	58.4′
23	168°23.4	26.6	220°57.0	12.0′	07°54.2	14.8′	58.3′
	SD = 16.2′	d = 0.5′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:23	09:06	▬	▬	14:25	16:08
N 70°	07:10	08:38	10:42	12:49	14:54	16:21
68°	06:59	08:16	09:46	13:46	15:15	16:32
66°	06:50	07:59	09:13	14:19	15:32	16:41
64°	06:43	07:45	08:49	14:43	15:46	16:49
62°	06:36	07:33	08:30	15:02	15:58	16:55
60°	06:30	07:23	08:14	15:17	16:08	17:01
N 58°	06:25	07:14	08:01	15:30	16:17	17:07
56°	06:20	07:06	07:50	15:42	16:25	17:12
54°	06:15	06:59	07:40	15:52	16:32	17:16
52°	06:11	06:53	07:31	16:00	16:39	17:21
50°	06:07	06:47	07:23	16:08	16:45	17:25
45°	05:58	06:34	07:06	16:25	16:58	17:34
N 40°	05:50	06:23	06:53	16:39	17:09	17:42
35°	05:43	06:14	06:41	16:51	17:18	17:49
30°	05:36	06:05	06:31	17:01	17:27	17:56
20°	05:22	05:49	06:13	17:19	17:43	18:09
N 10°	05:09	05:35	05:57	17:35	17:57	18:23
0°	04:55	05:20	05:42	17:50	18:12	18:37
S 10°	04:39	05:05	05:28	18:05	18:27	18:53
20°	04:19	04:48	05:12	18:21	18:45	19:13
30°	03:55	04:27	04:53	18:39	19:06	19:38
35°	03:39	04:14	04:42	18:50	19:19	19:54
40°	03:20	03:59	04:30	19:03	19:34	20:13
45°	02:55	03:40	04:15	19:18	19:53	20:38
S 50°	02:21	03:16	03:57	19:36	20:17	21:12
52°	02:03	03:04	03:48	19:45	20:29	21:31
54°	01:40	02:51	03:38	19:55	20:43	21:55
56°	01:08	02:35	03:27	20:06	20:59	22:28
58°	////	02:16	03:15	20:19	21:18	////
S 60°	////	01:51	03:00	20:34	21:44	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	23:55	·· ··	02:10	13:50	13:19	12:48
N 70°	·· ··	00:01	02:06	13:41	13:18	12:55
68°	·· ··	00:06	02:03	13:34	13:17	13:01
66°	·· ··	00:10	02:01	13:27	13:17	13:07
64°	·· ··	00:14	01:58	13:22	13:16	13:11
62°	·· ··	00:17	01:56	13:17	13:16	13:15
60°	·· ··	00:19	01:55	13:13	13:16	13:18
N 58°	·· ··	00:21	01:53	13:09	13:15	13:21
56°	·· ··	00:23	01:52	13:06	13:15	13:24
54°	·· ··	00:25	01:51	13:03	13:15	13:26
52°	·· ··	00:27	01:49	13:00	13:14	13:29
50°	·· ··	00:28	01:48	12:57	13:14	13:31
45°	·· ··	00:32	01:46	12:52	13:14	13:35
N 40°	·· ··	00:34	01:45	12:47	13:13	13:39
35°	·· ··	00:37	01:43	12:43	13:13	13:42
30°	·· ··	00:39	01:42	12:40	13:13	13:45
20°	·· ··	00:42	01:39	12:34	13:12	13:50
N 10°	·· ··	00:45	01:38	12:28	13:11	13:54
0°	·· ··	00:48	01:36	12:23	13:11	13:58
S 10°	00:07	00:51	01:34	12:17	13:10	14:02
20°	00:15	00:54	01:32	12:12	13:10	14:07
30°	00:24	00:58	01:30	12:05	13:09	14:12
35°	00:29	01:00	01:29	12:01	13:08	14:15
40°	00:35	01:02	01:27	11:57	13:08	14:18
45°	00:42	01:05	01:26	11:52	13:07	14:22
S 50°	00:50	01:08	01:24	11:46	13:07	14:26
52°	00:54	01:09	01:23	11:43	13:06	14:29
54°	00:58	01:11	01:22	11:40	13:06	14:31
56°	01:03	01:13	01:21	11:36	13:06	14:34
58°	01:08	01:14	01:20	11:33	13:05	14:36
S 60°	01:14	01:17	01:19	11:28	13:05	14:40

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 23-25 51-29%
21	14:20	14:13	11:46	06:11	18:35	
22	14:05	13:58	11:46	06:59	19:23	
23	13:50	13:41	11:46	07:47	20:11	



November 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°43.9	154°46.6	S24°41.9	154°12.3	S24°25.5	247°53.1	N03°26.0	41°32.3	N05°59.1
1	77°46.4	169°45.7	42.0	169°12.7	25.6	262°55.3	25.8	56°34.9	59.1
2	92°48.8	184°44.7	42.2	184°13.1	25.6	277°57.4	25.7	71°37.5	59.1
3	107°51.3	199°43.8	·· 42.3	199°13.5	·· 25.6	292°59.6	·· 25.6	86°40.1	·· 59.0
4	122°53.8	214°42.8	42.4	214°13.9	25.7	308°01.7	25.4	101°42.7	59.0
5	137°56.2	229°41.9	42.5	229°14.3	25.7	323°03.9	25.3	116°45.3	58.9
6	152°58.7	244°40.9	S24°42.7	244°14.7	S24°25.7	338°06.0	N03°25.2	131°47.9	N05°58.9
7	168°01.2	259°40.0	42.8	259°15.1	25.7	353°08.2	25.1	146°50.4	58.9
8	183°03.6	274°39.1	42.9	274°15.5	25.8	8°10.3	24.9	161°53.0	58.8
9	198°06.1	289°38.1	·· 43.0	289°15.9	·· 25.8	23°12.5	·· 24.8	176°55.6	·· 58.8
10	213°08.6	304°37.2	43.1	304°16.3	25.8	38°14.6	24.7	191°58.2	58.7
11	228°11.0	319°36.2	43.3	319°16.7	25.9	53°16.8	24.6	207°00.8	58.7
12	243°13.5	334°35.3	S24°43.4	334°17.1	S24°25.9	68°18.9	N03°24.4	222°03.4	N05°58.7
13	258°16.0	349°34.3	43.5	349°17.4	25.9	83°21.1	24.3	237°06.0	58.6
14	273°18.4	4°33.4	43.6	4°17.8	25.9	98°23.2	24.2	252°08.5	58.6
15	288°20.9	19°32.5	·· 43.7	19°18.2	·· 26.0	113°25.4	·· 24.1	267°11.1	·· 58.5
16	303°23.3	34°31.5	43.8	34°18.6	26.0	128°27.5	23.9	282°13.7	58.5
17	318°25.8	49°30.6	43.9	49°19.0	26.0	143°29.7	23.8	297°16.3	58.5
18	333°28.3	64°29.6	S24°44.0	64°19.4	S24°26.0	158°31.8	N03°23.7	312°18.9	N05°58.4
19	348°30.7	79°28.7	44.1	79°19.8	26.1	173°34.0	23.6	327°21.5	58.4
20	3°33.2	94°27.7	44.3	94°20.2	26.1	188°36.1	23.4	342°24.1	58.4
21	18°35.7	109°26.8	·· 44.4	109°20.6	·· 26.1	203°38.3	·· 23.3	357°26.6	·· 58.3
22	33°38.1	124°25.8	44.5	124°21.0	26.1	218°40.4	23.2	12°29.2	58.3
23	48°40.6	139°24.9	44.6	139°21.3	26.1	233°42.6	23.1	27°31.8	58.2
Mer.pass. 19:46		ν -0.9′	d 0.1′	m -3.89	ν 0.4′	d 0.0′	m 1.29	ν 2.1′	d 0.1′ m -1.89	ν 2.6′	d 0.0′ m 0.28

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°43.1	154°23.9	S24°44.7	154°21.7	S24°26.2	248°44.7	N03°22.9	42°34.4	N05°58.2
1	78°45.5	169°23.0	44.8	169°22.1	26.2	263°46.9	22.8	57°37.0	58.2
2	93°48.0	184°22.1	44.9	184°22.5	26.2	278°49.0	22.7	72°39.6	58.1
3	108°50.5	199°21.1	·· 45.0	199°22.9	·· 26.2	293°51.2	·· 22.6	87°42.1	·· 58.1
4	123°52.9	214°20.2	45.0	214°23.3	26.2	308°53.3	22.4	102°44.7	58.0
5	138°55.4	229°19.2	45.1	229°23.7	26.3	323°55.5	22.3	117°47.3	58.0
6	153°57.8	244°18.3	S24°45.2	244°24.1	S24°26.3	338°57.6	N03°22.2	132°49.9	N05°58.0
7	169°00.3	259°17.3	45.3	259°24.5	26.3	353°59.8	22.1	147°52.5	57.9
8	184°02.8	274°16.4	45.4	274°24.9	26.3	9°01.9	21.9	162°55.1	57.9
9	199°05.2	289°15.4	·· 45.5	289°25.2	·· 26.3	24°04.1	·· 21.8	177°57.6	·· 57.9
10	214°07.7	304°14.5	45.6	304°25.6	26.3	39°06.3	21.7	193°00.2	57.8
11	229°10.2	319°13.5	45.7	319°26.0	26.4	54°08.4	21.6	208°02.8	57.8
12	244°12.6	334°12.6	S24°45.8	334°26.4	S24°26.4	69°10.6	N03°21.4	223°05.4	N05°57.7
13	259°15.1	349°11.6	45.8	349°26.8	26.4	84°12.7	21.3	238°08.0	57.7
14	274°17.6	4°10.7	45.9	4°27.2	26.4	99°14.9	21.2	253°10.5	57.7
15	289°20.0	19°09.8	·· 46.0	19°27.6	·· 26.4	114°17.0	·· 21.1	268°13.1	·· 57.6
16	304°22.5	34°08.8	46.1	34°28.0	26.4	129°19.2	21.0	283°15.7	57.6
17	319°24.9	49°07.9	46.2	49°28.3	26.4	144°21.3	20.8	298°18.3	57.6
18	334°27.4	64°06.9	S24°46.2	64°28.7	S24°26.5	159°23.5	N03°20.7	313°20.9	N05°57.5
19	349°29.9	79°06.0	46.3	79°29.1	26.5	174°25.7	20.6	328°23.5	57.5
20	4°32.3	94°05.0	46.4	94°29.5	26.5	189°27.8	20.5	343°26.0	57.5
21	19°34.8	109°04.1	·· 46.5	109°29.9	·· 26.5	204°30.0	·· 20.3	358°28.6	·· 57.4
22	34°37.3	124°03.1	46.5	124°30.3	26.5	219°32.1	20.2	13°31.2	57.4
23	49°39.7	139°02.2	46.6	139°30.7	26.5	234°34.3	20.1	28°33.8	57.3
Mer.pass. 19:42		ν -0.9′	d 0.1′	m -3.90	ν 0.4′	d 0.0′	m 1.28	ν 2.2′	d 0.1′ m -1.89	ν 2.6′	d 0.0′ m 0.29

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	64°42.2	154°01.2	S24°46.7	154°31.1	S24°26.5	249°36.4	N03°20.0	43°36.4	N05°57.3
1	79°44.7	169°00.3	46.7	169°31.4	26.5	264°38.6	19.9	58°38.9	57.3
2	94°47.1	183°59.3	46.8	184°31.8	26.5	279°40.7	19.7	73°41.5	57.2
3	109°49.6	198°58.4	·· 46.9	199°32.2	·· 26.6	294°42.9	·· 19.6	88°44.1	·· 57.2
4	124°52.1	213°57.5	46.9	214°32.6	26.6	309°45.1	19.5	103°46.7	57.2
5	139°54.5	228°56.5	47.0	229°33.0	26.6	324°47.2	19.4	118°49.3	57.1
6	154°57.0	243°55.6	S24°47.1	244°33.4	S24°26.6	339°49.4	N03°19.2	133°51.8	N05°57.1
7	169°59.4	258°54.6	47.1	259°33.8	26.6	354°51.5	19.1	148°54.4	57.1
8	185°01.9	273°53.7	47.2	274°34.1	26.6	9°53.7	19.0	163°57.0	57.0
9	200°04.4	288°52.7	·· 47.2	289°34.5	·· 26.6	24°55.9	·· 18.9	178°59.6	·· 57.0
10	215°06.8	303°51.8	47.3	304°34.9	26.6	39°58.0	18.8	194°02.2	56.9
11	230°09.3	318°50.8	47.4	319°35.3	26.6	55°00.2	18.6	209°04.7	56.9
12	245°11.8	333°49.9	S24°47.4	334°35.7	S24°26.6	70°02.3	N03°18.5	224°07.3	N05°56.9
13	260°14.2	348°48.9	47.5	349°36.1	26.6	85°04.5	18.4	239°09.9	56.8
14	275°16.7	3°48.0	47.5	4°36.5	26.6	100°06.6	18.3	254°12.5	56.8
15	290°19.2	18°47.0	·· 47.6	19°36.8	·· 26.6	115°08.8	·· 18.1	269°15.1	·· 56.8
16	305°21.6	33°46.1	47.6	34°37.2	26.6	130°11.0	18.0	284°17.6	56.7
17	320°24.1	48°45.1	47.7	49°37.6	26.6	145°13.1	17.9	299°20.2	56.7
18	335°26.6	63°44.2	S24°47.7	64°38.0	S24°26.6	160°15.3	N03°17.8	314°22.8	N05°56.7
19	350°29.0	78°43.2	47.7	79°38.4	26.6	175°17.5	17.7	329°25.4	56.6
20	5°31.5	93°42.3	47.8	94°38.8	26.6	190°19.6	17.5	344°27.9	56.6
21	20°33.9	108°41.3	·· 47.8	109°39.2	·· 26.6	205°21.8	·· 17.4	359°30.5	·· 56.6
22	35°36.4	123°40.4	47.9	124°39.5	26.6	220°23.9	17.3	14°33.1	56.5
23	50°38.9	138°39.5	47.9	139°39.9	26.6	235°26.1	17.2	29°35.7	56.5
Mer.pass. 19:38		ν -0.9′	d 0.1′	m -3.90	ν 0.4′	d 0.0′	m 1.28	ν 2.2′	d 0.1′ m -1.90	ν 2.6′	d 0.0′ m 0.29

Stars

	SHA	Dec
Alpheratz	357°32.1	29°14.9
Ankaa	353°04.6	-42°09.3
Schedar	349°27.9	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.0	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.1	89°22.9
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.6	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°17.9	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.0
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.9	-52°42.5
Sirius	258°23.9	-16°45.2
Adhara	255°03.7	-29°00.5
Procyon	244°48.2	5°09.2
Pollux	243°14.2	27°57.4
Avior	234°13.4	-59°35.7
Suhail	222°44.4	-43°32.5
Miaplacidus	221°37.4	-69°49.6
Alphard	217°45.4	-8°46.8
Regulus	207°32.0	11°49.7
Dubhe	193°38.4	61°35.7
Denebola	182°22.7	14°24.9
Gienah	175°41.3	-17°41.7
Acrux	172°57.8	-63°15.0
Gacrux	171°49.3	-57°16.0
Alioth	166°11.4	55°48.2
Spica	158°20.1	-11°18.4
Alkaid	152°50.6	49°10.3
Hadar	148°33.2	-60°30.3
Menkent	147°55.2	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.6	-60°56.9
Kochab	137°21.1	74°02.3
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°06.0	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°29.8	-34°22.2
Vega	80°32.0	38°48.8
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.4	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.0	-46°49.7
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.3
Markab	13°27.5	15°21.6

Nov 24 Wed	SHA	Mer.pass
Venus	92°02.7	13:42
Mars	91°28.4	13:43
Jupiter	185°09.2	07:27
Saturn	338°48.4	21:10

Nov 25 Thu	SHA	Mer.pass
Venus	90°40.9	13:43
Mars	90°38.7	13:42
Jupiter	185°01.7	07:24
Saturn	338°51.3	21:06

Nov 26 Fri	SHA	Mer.pass
Venus	89°19.0	13:45
Mars	89°48.9	13:42
Jupiter	184°54.2	07:21
Saturn	338°54.2	21:02

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°23.3	S20°27.1	235°28.0	12.0′	S08°09.0	14.8′	58.3′
1	198°23.1	27.6	249°59.1	12.0′	08°23.8	14.7′	58.3′
2	213°22.9	28.1	264°30.0	12.0′	08°38.5	14.7′	58.3′
3	228°22.7	·· 28.6	279°01.0	11.9′	08°53.2	14.6′	58.3′
4	243°22.5	29.2	293°31.9	11.9′	09°07.8	14.6′	58.3′
5	258°22.4	29.7	308°02.8	11.9′	09°22.4	14.6′	58.2′
6	273°22.2	S20°30.2	322°33.7	11.8′	S09°37.0	14.4′	58.2′
7	288°22.0	30.7	337°04.5	11.8′	09°51.4	14.4′	58.2′
8	303°21.8	31.2	351°35.3	11.8′	10°05.8	14.4′	58.2′
9	318°21.6	·· 31.7	6°06.1	11.7′	10°20.2	14.3′	58.2′
10	333°21.5	32.2	20°36.8	11.7′	10°34.5	14.3′	58.2′
11	348°21.3	32.7	35°07.5	11.7′	10°48.8	14.1′	58.2′
12	3°21.1	S20°33.2	49°38.2	11.6′	S11°02.9	14.2′	58.1′
13	18°20.9	33.7	64°08.8	11.6′	11°17.1	14.0′	58.1′
14	33°20.7	34.2	78°39.4	11.6′	11°31.1	14.0′	58.1′
15	48°20.6	·· 34.7	93°09.9	11.5′	11°45.1	13.9′	58.1′
16	63°20.4	35.2	107°40.4	11.5′	11°59.0	13.9′	58.1′
17	78°20.2	35.7	122°10.9	11.4′	12°12.9	13.8′	58.1′
18	93°20.0	S20°36.2	136°41.3	11.4′	S12°26.7	13.7′	58.0′
19	108°19.8	36.7	151°11.7	11.3′	12°40.4	13.6′	58.0′
20	123°19.6	37.2	165°42.1	11.3′	12°54.0	13.6′	58.0′
21	138°19.5	·· 37.7	180°12.4	11.3′	13°07.6	13.5′	58.0′
22	153°19.3	38.2	194°42.6	11.2′	13°21.1	13.4′	58.0′
23	168°19.1	38.7	209°12.9	11.2′	13°34.5	13.4′	58.0′
	SD = 16.2′	d = 0.5′	SD = 15.9′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°18.9	S20°39.2	223°43.0	11.1′	S13°47.9	13.3′	57.9′
1	198°18.7	39.7	238°13.2	11.1′	14°01.2	13.2′	57.9′
2	213°18.5	40.2	252°43.3	11.0′	14°14.4	13.1′	57.9′
3	228°18.3	·· 40.7	267°13.3	11.0′	14°27.5	13.0′	57.9′
4	243°18.2	41.2	281°43.3	10.9′	14°40.5	13.0′	57.9′
5	258°18.0	41.7	296°13.2	10.9′	14°53.5	12.8′	57.9′
6	273°17.8	S20°42.2	310°43.1	10.8′	S15°06.3	12.8′	57.8′
7	288°17.6	42.7	325°13.0	10.8′	15°19.1	12.7′	57.8′
8	303°17.4	43.2	339°42.8	10.7′	15°31.8	12.6′	57.8′
9	318°17.2	·· 43.7	354°12.5	10.7′	15°44.4	12.5′	57.8′
10	333°17.0	44.2	8°42.2	10.6′	15°56.9	12.5′	57.8′
11	348°16.8	44.6	23°11.9	10.6′	16°09.4	12.3′	57.7′
12	3°16.7	S20°45.1	37°41.5	10.5′	S16°21.7	12.3′	57.7′
13	18°16.5	45.6	52°11.0	10.5′	16°34.0	12.1′	57.7′
14	33°16.3	46.1	66°40.5	10.4′	16°46.1	12.1′	57.7′
15	48°16.1	·· 46.6	81°10.0	10.4′	16°58.2	11.9′	57.7′
16	63°15.9	47.1	95°39.3	10.3′	17°10.1	11.9′	57.7′
17	78°15.7	47.6	110°08.7	10.3′	17°22.0	11.8′	57.6′
18	93°15.5	S20°48.1	124°38.0	10.2′	S17°33.8	11.6′	57.6′
19	108°15.3	48.5	139°07.2	10.2′	17°45.4	11.6′	57.6′
20	123°15.1	49.0	153°36.4	10.1′	17°57.0	11.5′	57.6′
21	138°14.9	·· 49.5	168°05.5	10.1′	18°08.5	11.3′	57.6′
22	153°14.7	50.0	182°34.6	10.0′	18°19.8	11.3′	57.5′
23	168°14.6	50.5	197°03.6	10.0′	18°31.1	11.1′	57.5′
	SD = 16.2′	d = 0.5′	SD = 15.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°14.4	S20°50.9	211°32.6	9.9′	S18°42.2	11.1′	57.5′
1	198°14.2	51.4	226°01.5	9.9′	18°53.3	10.9′	57.5′
2	213°14.0	51.9	240°30.4	9.8′	19°04.2	10.9′	57.5′
3	228°13.8	·· 52.4	254°59.2	9.8′	19°15.1	10.7′	57.4′
4	243°13.6	52.9	269°28.0	9.7′	19°25.8	10.6′	57.4′
5	258°13.4	53.3	283°56.7	9.7′	19°36.4	10.5′	57.4′
6	273°13.2	S20°53.8	298°25.3	9.6′	S19°46.9	10.4′	57.4′
7	288°13.0	54.3	312°53.9	9.6′	19°57.3	10.2′	57.4′
8	303°12.8	54.8	327°22.5	9.5′	20°07.5	10.2′	57.3′
9	318°12.6	·· 55.2	341°51.0	9.4′	20°17.7	10.0′	57.3′
10	333°12.4	55.7	356°19.4	9.4′	20°27.7	10.0′	57.3′
11	348°12.2	56.2	10°47.8	9.3′	20°37.7	9.8′	57.3′
12	3°12.0	S20°56.7	25°16.2	9.3′	S20°47.5	9.7′	57.3′
13	18°11.8	57.1	39°44.5	9.2′	20°57.2	9.5′	57.2′
14	33°11.6	57.6	54°12.7	9.2′	21°06.7	9.5′	57.2′
15	48°11.4	·· 58.1	68°40.9	9.1′	21°16.2	9.3′	57.2′
16	63°11.2	58.5	83°09.0	9.1′	21°25.5	9.2′	57.2′
17	78°11.0	59.0	97°37.1	9.0′	21°34.7	9.1′	57.2′
18	93°10.8	S20°59.5	112°05.2	9.0′	S21°43.8	8.9′	57.1′
19	108°10.6	21°00.0	126°33.2	8.9′	21°52.7	8.8′	57.1′
20	123°10.4	00.4	141°01.1	8.9′	22°01.5	8.7′	57.1′
21	138°10.2	·· 00.9	155°29.0	8.9′	22°10.2	8.6′	57.1′
22	153°10.0	01.4	169°56.9	8.8′	22°18.8	8.4′	57.1′
23	168°09.8	01.8	184°24.7	8.8′	22°27.2	8.3′	57.0′
	SD = 16.2′	d = 0.5′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:32	09:21	▬	▬	14:12	16:00
N 70°	07:18	08:49	11:25	12:08	14:44	16:14
68°	07:07	08:25	10:01	13:32	15:08	16:26
66°	06:57	08:07	09:24	14:09	15:26	16:36
64°	06:49	07:52	08:58	14:35	15:41	16:44
62°	06:42	07:40	08:38	14:55	15:53	16:51
60°	06:35	07:29	08:21	15:12	16:04	16:58
N 58°	06:30	07:20	08:08	15:26	16:13	17:04
56°	06:24	07:11	07:56	15:38	16:22	17:09
54°	06:20	07:04	07:45	15:48	16:29	17:14
52°	06:15	06:57	07:36	15:57	16:36	17:18
50°	06:11	06:51	07:28	16:06	16:42	17:22
45°	06:01	06:38	07:10	16:23	16:56	17:32
N 40°	05:53	06:26	06:56	16:38	17:07	17:40
35°	05:45	06:16	06:44	16:50	17:17	17:48
30°	05:38	06:07	06:33	17:00	17:26	17:56
20°	05:24	05:51	06:15	17:19	17:43	18:10
N 10°	05:10	05:36	05:58	17:35	17:58	18:24
0°	04:55	05:21	05:43	17:51	18:13	18:38
S 10°	04:39	05:05	05:28	18:06	18:29	18:55
20°	04:19	04:47	05:11	18:23	18:47	19:15
30°	03:53	04:26	04:52	18:42	19:09	19:41
35°	03:37	04:12	04:41	18:53	19:22	19:57
40°	03:17	03:57	04:28	19:06	19:38	20:17
45°	02:52	03:37	04:13	19:22	19:57	20:43
S 50°	02:16	03:12	03:54	19:41	20:22	21:19
52°	01:57	03:00	03:45	19:50	20:35	21:39
54°	01:32	02:46	03:34	20:00	20:49	22:05
56°	00:55	02:29	03:23	20:12	21:06	22:44
58°	////	02:09	03:10	20:26	21:27	////
S 60°	////	01:42	02:54	20:41	21:55	////

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	04:29	07:14	▬	12:11	11:10	▬
N 70°	04:14	06:34	▬	12:29	11:52	▬
68°	04:01	06:07	08:39	12:44	12:20	11:36
66°	03:51	05:47	07:54	12:55	12:42	12:22
64°	03:43	05:31	07:25	13:05	12:59	12:52
62°	03:36	05:18	07:02	13:14	13:14	13:15
60°	03:30	05:06	06:45	13:21	13:26	13:34
N 58°	03:24	04:57	06:30	13:28	13:37	13:49
56°	03:20	04:48	06:17	13:34	13:46	14:02
54°	03:15	04:41	06:06	13:39	13:54	14:14
52°	03:12	04:34	05:57	13:44	14:02	14:24
50°	03:08	04:28	05:48	13:48	14:08	14:33
45°	03:01	04:15	05:30	13:57	14:23	14:53
N 40°	02:55	04:05	05:15	14:05	14:35	15:08
35°	02:49	03:56	05:03	14:12	14:45	15:22
30°	02:45	03:48	04:52	14:18	14:54	15:34
20°	02:37	03:35	04:34	14:29	15:10	15:54
N 10°	02:30	03:23	04:18	14:38	15:23	16:11
0°	02:23	03:12	04:03	14:46	15:36	16:28
S 10°	02:17	03:01	03:48	14:55	15:49	16:44
20°	02:10	02:50	03:32	15:04	16:03	17:02
30°	02:03	02:37	03:15	15:15	16:19	17:23
35°	01:58	02:30	03:04	15:21	16:28	17:35
40°	01:53	02:21	02:52	15:28	16:39	17:49
45°	01:48	02:11	02:39	15:36	16:51	18:05
S 50°	01:41	02:00	02:22	15:46	17:06	18:25
52°	01:38	01:54	02:14	15:51	17:14	18:35
54°	01:34	01:48	02:05	15:56	17:22	18:46
56°	01:31	01:42	01:56	16:02	17:31	18:59
58°	01:27	01:34	01:45	16:08	17:41	19:13
S 60°	01:22	01:26	01:32	16:15	17:53	19:31

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 19-5%
24	13:33	13:24	11:47	08:35	20:59	
25	13:16	13:07	11:47	09:24	21:49	
26	12:57	12:48	11:47	10:15	22:42	

November 27, 28, 29 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	65°41.3	153°38.5	S24°47.9	154°40.3	S24°26.6	250°28.3	N03°17.1	44°38.2	N05°56.4
1	80°43.8	168°37.6	48.0	169°40.7	26.6	265°30.4	16.9	59°40.8	56.4
2	95°46.3	183°36.6	48.0	184°41.1	26.6	280°32.6	16.8	74°43.4	56.4
3	110°48.7	198°35.7	·· 48.1	199°41.5	·· 26.6	295°34.7	·· 16.7	89°46.0	·· 56.3
4	125°51.2	213°34.7	48.1	214°41.8	26.6	310°36.9	16.6	104°48.6	56.3
5	140°53.7	228°33.8	48.1	229°42.2	26.6	325°39.1	16.5	119°51.1	56.3
6	155°56.1	243°32.8	S24°48.1	244°42.6	S24°26.6	340°41.2	N03°16.3	134°53.7	N05°56.2
7	170°58.6	258°31.9	48.2	259°43.0	26.6	355°43.4	16.2	149°56.3	56.2
8	186°01.1	273°30.9	48.2	274°43.4	26.6	10°45.6	16.1	164°58.9	56.2
9	201°03.5	288°30.0	·· 48.2	289°43.8	·· 26.6	25°47.7	·· 16.0	180°01.4	·· 56.1
10	216°06.0	303°29.0	48.3	304°44.1	26.6	40°49.9	15.9	195°04.0	56.1
11	231°08.4	318°28.1	48.3	319°44.5	26.6	55°52.1	15.7	210°06.6	56.1
12	246°10.9	333°27.1	S24°48.3	334°44.9	S24°26.6	70°54.2	N03°15.6	225°09.2	N05°56.0
13	261°13.4	348°26.2	48.3	349°45.3	26.6	85°56.4	15.5	240°11.7	56.0
14	276°15.8	3°25.2	48.3	4°45.7	26.6	100°58.5	15.4	255°14.3	56.0
15	291°18.3	18°24.3	·· 48.4	19°46.1	·· 26.5	116°00.7	·· 15.3	270°16.9	·· 55.9
16	306°20.8	33°23.3	48.4	34°46.4	26.5	131°02.9	15.2	285°19.5	55.9
17	321°23.2	48°22.4	48.4	49°46.8	26.5	146°05.0	15.0	300°22.0	55.9
18	336°25.7	63°21.5	S24°48.4	64°47.2	S24°26.5	161°07.2	N03°14.9	315°24.6	N05°55.8
19	351°28.2	78°20.5	48.4	79°47.6	26.5	176°09.4	14.8	330°27.2	55.8
20	6°30.6	93°19.6	48.4	94°48.0	26.5	191°11.5	14.7	345°29.8	55.8
21	21°33.1	108°18.6	·· 48.4	109°48.4	·· 26.5	206°13.7	·· 14.6	0°32.3	·· 55.7
22	36°35.5	123°17.7	48.4	124°48.7	26.5	221°15.9	14.4	15°34.9	55.7
23	51°38.0	138°16.7	48.5	139°49.1	26.5	236°18.0	14.3	30°37.5	55.7
Mer.pass. 19:34		ν -0.9′	d 0.0′	m -3.90	ν 0.4′	d 0.0′	m 1.28	ν 2.2′	d 0.1′ m -1.90	ν 2.6′	d 0.0′ m 0.30

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	66°40.5	153°15.8	S24°48.5	154°49.5	S24°26.4	251°20.2	N03°14.2	45°40.1	N05°55.6
1	81°42.9	168°14.8	48.5	169°49.9	26.4	266°22.4	14.1	60°42.6	55.6
2	96°45.4	183°13.9	48.5	184°50.3	26.4	281°24.5	14.0	75°45.2	55.6
3	111°47.9	198°12.9	·· 48.5	199°50.7	·· 26.4	296°26.7	·· 13.9	90°47.8	·· 55.5
4	126°50.3	213°12.0	48.5	214°51.0	26.4	311°28.9	13.7	105°50.3	55.5
5	141°52.8	228°11.0	48.5	229°51.4	26.4	326°31.0	13.6	120°52.9	55.5
6	156°55.3	243°10.1	S24°48.5	244°51.8	S24°26.4	341°33.2	N03°13.5	135°55.5	N05°55.4
7	171°57.7	258°09.1	48.5	259°52.2	26.3	356°35.4	13.4	150°58.1	55.4
8	187°00.2	273°08.2	48.5	274°52.6	26.3	11°37.5	13.3	166°00.6	55.4
9	202°02.7	288°07.2	·· 48.5	289°52.9	·· 26.3	26°39.7	·· 13.2	181°03.2	·· 55.3
10	217°05.1	303°06.3	48.5	304°53.3	26.3	41°41.9	13.0	196°05.8	55.3
11	232°07.6	318°05.4	48.4	319°53.7	26.3	56°44.1	12.9	211°08.4	55.3
12	247°10.0	333°04.4	S24°48.4	334°54.1	S24°26.3	71°46.2	N03°12.8	226°10.9	N05°55.2
13	262°12.5	348°03.5	48.4	349°54.5	26.2	86°48.4	12.7	241°13.5	55.2
14	277°15.0	3°02.5	48.4	4°54.8	26.2	101°50.6	12.6	256°16.1	55.2
15	292°17.4	18°01.6	·· 48.4	19°55.2	·· 26.2	116°52.7	·· 12.4	271°18.6	·· 55.1
16	307°19.9	33°00.6	48.4	34°55.6	26.2	131°54.9	12.3	286°21.2	55.1
17	322°22.4	47°59.7	48.4	49°56.0	26.2	146°57.1	12.2	301°23.8	55.1
18	337°24.8	62°58.7	S24°48.4	64°56.4	S24°26.1	161°59.2	N03°12.1	316°26.4	N05°55.0
19	352°27.3	77°57.8	48.3	79°56.7	26.1	177°01.4	12.0	331°28.9	55.0
20	7°29.8	92°56.8	48.3	94°57.1	26.1	192°03.6	11.9	346°31.5	55.0
21	22°32.2	107°55.9	·· 48.3	109°57.5	·· 26.1	207°05.8	·· 11.8	1°34.1	·· 54.9
22	37°34.7	122°54.9	48.3	124°57.9	26.0	222°07.9	11.6	16°36.6	54.9
23	52°37.2	137°54.0	48.2	139°58.3	26.0	237°10.1	11.5	31°39.2	54.9
Mer.pass. 19:30		ν -0.9′	d 0.0′	m -3.90	ν 0.4′	d 0.0′	m 1.28	ν 2.2′	d 0.1′ m -1.91	ν 2.6′	d 0.0′ m 0.30

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	67°39.6	152°53.0	S24°48.2	154°58.6	S24°26.0	252°12.3	N03°11.4	46°41.8	N05°54.8
1	82°42.1	167°52.1	48.2	169°59.0	26.0	267°14.4	11.3	61°44.3	54.8
2	97°44.5	182°51.1	48.2	184°59.4	25.9	282°16.6	11.2	76°46.9	54.8
3	112°47.0	197°50.2	·· 48.1	199°59.8	·· 25.9	297°18.8	·· 11.1	91°49.5	·· 54.7
4	127°49.5	212°49.3	48.1	215°00.2	25.9	312°21.0	10.9	106°52.1	54.7
5	142°51.9	227°48.3	48.1	230°00.5	25.9	327°23.1	10.8	121°54.6	54.7
6	157°54.4	242°47.4	S24°48.0	245°00.9	S24°25.8	342°25.3	N03°10.7	136°57.2	N05°54.7
7	172°56.9	257°46.4	48.0	260°01.3	25.8	357°27.5	10.6	151°59.8	54.6
8	187°59.3	272°45.5	48.0	275°01.7	25.8	12°29.7	10.5	167°02.3	54.6
9	203°01.8	287°44.5	·· 47.9	290°02.1	·· 25.8	27°31.8	·· 10.4	182°04.9	·· 54.6
10	218°04.3	302°43.6	47.9	305°02.4	25.7	42°34.0	10.3	197°07.5	54.5
11	233°06.7	317°42.6	47.9	320°02.8	25.7	57°36.2	10.1	212°10.0	54.5
12	248°09.2	332°41.7	S24°47.8	335°03.2	S24°25.7	72°38.4	N03°10.0	227°12.6	N05°54.5
13	263°11.7	347°40.7	47.8	350°03.6	25.6	87°40.5	09.9	242°15.2	54.4
14	278°14.1	2°39.8	47.7	5°04.0	25.6	102°42.7	09.8	257°17.7	54.4
15	293°16.6	17°38.9	·· 47.7	20°04.3	·· 25.6	117°44.9	·· 09.7	272°20.3	·· 54.4
16	308°19.0	32°37.9	47.6	35°04.7	25.6	132°47.1	09.6	287°22.9	54.3
17	323°21.5	47°37.0	47.6	50°05.1	25.5	147°49.2	09.5	302°25.4	54.3
18	338°24.0	62°36.0	S24°47.5	65°05.5	S24°25.5	162°51.4	N03°09.3	317°28.0	N05°54.3
19	353°26.4	77°35.1	47.5	80°05.8	25.5	177°53.6	09.2	332°30.6	54.2
20	8°28.9	92°34.1	47.4	95°06.2	25.4	192°55.8	09.1	347°33.1	54.2
21	23°31.4	107°33.2	·· 47.4	110°06.6	·· 25.4	207°57.9	·· 09.0	2°35.7	·· 54.2
22	38°33.8	122°32.2	47.3	125°07.0	25.4	223°00.1	08.9	17°38.3	54.2
23	53°36.3	137°31.3	47.3	140°07.4	25.3	238°02.3	08.8	32°40.8	54.1
Mer.pass. 19:26		ν -0.9′	d 0.0′	m -3.90	ν 0.4′	d 0.0′	m 1.27	ν 2.2′	d 0.1′ m -1.91	ν 2.6′	d 0.0′ m 0.31

Stars

	SHA	Dec
Alpheratz	357°32.1	29°15.0
Ankaa	353°04.7	-42°09.3
Schedar	349°27.9	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.1	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.1	89°23.0
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.6	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°17.9	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.0
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.9	-52°42.5
Sirius	258°23.9	-16°45.2
Adhara	255°03.7	-29°00.5
Procyon	244°48.1	5°09.1
Pollux	243°14.2	27°57.3
Avior	234°13.4	-59°35.7
Suhail	222°44.4	-43°32.5
Miaplacidus	221°37.4	-69°49.6
Alphard	217°45.4	-8°46.8
Regulus	207°31.9	11°49.7
Dubhe	193°38.4	61°35.7
Denebola	182°22.7	14°24.9
Gienah	175°41.3	-17°41.7
Acrux	172°57.7	-63°15.0
Gacrux	171°49.3	-57°16.0
Alioth	166°11.3	55°48.2
Spica	158°20.1	-11°18.4
Alkaid	152°50.6	49°10.2
Hadar	148°33.1	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.6	-60°56.9
Kochab	137°21.1	74°02.2
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°05.9	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.8	-34°22.2
Vega	80°32.0	38°48.8
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.4	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.5	10°00.4
Al Na'ir	27°30.1	-46°49.7
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.4
Markab	13°27.5	15°21.6

Nov 27 Sat	SHA	Mer.pass
Venus	87°57.2	13:46
Mars	88°59.0	13:41
Jupiter	184°46.9	07:17
Saturn	338°56.9	20:58

Nov 28 Sun	SHA	Mer.pass
Venus	86°35.3	13:48
Mars	88°09.0	13:40
Jupiter	184°39.7	07:14
Saturn	338°59.6	20:54

Nov 29 Mon	SHA	Mer.pass
Venus	85°13.4	13:49
Mars	87°19.0	13:40
Jupiter	184°32.7	07:10
Saturn	339°02.2	20:50

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	183°09.6	S21°02.3	198°52.4	8.7′	S22°35.5	8.2′	57.0′
1	198°09.4	02.7	213°20.1	8.7′	22°43.7	8.1′	57.0′
2	213°09.2	03.2	227°47.8	8.6′	22°51.8	7.9′	57.0′
3	228°09.0	·· 03.7	242°15.4	8.6′	22°59.7	7.8′	56.9′
4	243°08.8	04.1	256°43.0	8.5′	23°07.5	7.6′	56.9′
5	258°08.6	04.6	271°10.6	8.5′	23°15.1	7.5′	56.9′
6	273°08.4	S21°05.1	285°38.1	8.5′	S23°22.6	7.4′	56.9′
7	288°08.2	05.5	300°05.5	8.4′	23°30.0	7.2′	56.9′
8	303°08.0	06.0	314°33.0	8.4′	23°37.2	7.1′	56.8′
9	318°07.8	·· 06.4	329°00.4	8.3′	23°44.3	7.0′	56.8′
10	333°07.6	06.9	343°27.7	8.3′	23°51.3	6.8′	56.8′
11	348°07.4	07.4	357°55.0	8.3′	23°58.1	6.7′	56.8′
12	3°07.2	S21°07.8	12°22.3	8.2′	S24°04.8	6.6′	56.8′
13	18°07.0	08.3	26°49.5	8.2′	24°11.4	6.4′	56.7′
14	33°06.8	08.7	41°16.7	8.2′	24°17.8	6.2′	56.7′
15	48°06.6	·· 09.2	55°43.9	8.1′	24°24.0	6.2′	56.7′
16	63°06.4	09.6	70°11.1	8.1′	24°30.2	5.9′	56.7′
17	78°06.2	10.1	84°38.2	8.1′	24°36.1	5.9′	56.6′
18	93°06.0	S21°10.5	99°05.3	8.1′	S24°42.0	5.7′	56.6′
19	108°05.7	11.0	113°32.3	8.0′	24°47.7	5.5′	56.6′
20	123°05.5	11.4	127°59.4	8.0′	24°53.2	5.4′	56.6′
21	138°05.3	·· 11.9	142°26.4	8.0′	24°58.6	5.3′	56.6′
22	153°05.1	12.3	156°53.4	8.0′	25°03.9	5.1′	56.5′
23	168°04.9	12.8	171°20.3	7.9′	25°09.0	5.0′	56.5′
	SD = 16.2′	d = 0.5′	SD = 15.5′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°04.7	S21°13.2	185°47.3	7.9′	S25°14.0	4.8′	56.5′
1	198°04.5	13.7	200°14.2	7.9′	25°18.8	4.7′	56.5′
2	213°04.3	14.1	214°41.1	7.9′	25°23.5	4.6′	56.4′
3	228°04.1	·· 14.6	229°08.0	7.9′	25°28.1	4.3′	56.4′
4	243°03.9	15.0	243°34.8	7.9′	25°32.4	4.3′	56.4′
5	258°03.7	15.5	258°01.7	7.8′	25°36.7	4.1′	56.4′
6	273°03.4	S21°15.9	272°28.5	7.8′	S25°40.8	3.9′	56.3′
7	288°03.2	16.3	286°55.4	7.8′	25°44.7	3.8′	56.3′
8	303°03.0	16.8	301°22.2	7.8′	25°48.5	3.7′	56.3′
9	318°02.8	·· 17.2	315°49.0	7.8′	25°52.2	3.5′	56.3′
10	333°02.6	17.7	330°15.8	7.8′	25°55.7	3.3′	56.3′
11	348°02.4	18.1	344°42.6	7.8′	25°59.0	3.2′	56.2′
12	3°02.2	S21°18.6	359°09.4	7.8′	S26°02.2	3.1′	56.2′
13	18°02.0	19.0	13°36.2	7.8′	26°05.3	2.9′	56.2′
14	33°01.8	19.4	28°03.0	7.8′	26°08.2	2.7′	56.2′
15	48°01.5	·· 19.9	42°29.8	7.8′	26°10.9	2.7′	56.1′
16	63°01.3	20.3	56°56.6	7.8′	26°13.6	2.4′	56.1′
17	78°01.1	20.7	71°23.4	7.8′	26°16.0	2.3′	56.1′
18	93°00.9	S21°21.2	85°50.2	7.8′	S26°18.3	2.2′	56.1′
19	108°00.7	21.6	100°17.0	7.8′	26°20.5	2.0′	56.1′
20	123°00.5	22.0	114°43.8	7.8′	26°22.5	1.9′	56.0′
21	138°00.3	·· 22.5	129°10.7	7.8′	26°24.4	1.7′	56.0′
22	153°00.0	22.9	143°37.5	7.9′	26°26.1	1.5′	56.0′
23	167°59.8	23.3	158°04.3	7.9′	26°27.6	1.4′	56.0′
	SD = 16.2′	d = 0.4′	SD = 15.4′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°59.6	S21°23.8	172°31.2	7.9′	S26°29.0	1.3′	55.9′
1	197°59.4	24.2	186°58.1	7.9′	26°30.3	1.1′	55.9′
2	212°59.2	24.6	201°25.0	7.9′	26°31.4	1.0′	55.9′
3	227°59.0	·· 25.1	215°51.9	7.9′	26°32.4	0.8′	55.9′
4	242°58.7	25.5	230°18.8	8.0′	26°33.2	0.7′	55.9′
5	257°58.5	25.9	244°45.8	8.0′	26°33.9	0.5′	55.8′
6	272°58.3	S21°26.3	259°12.8	8.0′	S26°34.4	0.4′	55.8′
7	287°58.1	26.8	273°39.8	8.0′	26°34.8	0.2′	55.8′
8	302°57.9	27.2	288°06.8	8.1′	26°35.0	0.1′	55.8′
9	317°57.7	·· 27.6	302°33.9	8.1′	26°35.1	0.0′	55.7′
10	332°57.4	28.0	317°01.0	8.1′	26°35.1	0.2′	55.7′
11	347°57.2	28.5	331°28.1	8.2′	26°34.9	0.4′	55.7′
12	2°57.0	S21°28.9	345°55.3	8.2′	S26°34.5	0.5′	55.7′
13	17°56.8	29.3	0°22.5	8.2′	26°34.0	0.6′	55.7′
14	32°56.6	29.7	14°49.7	8.3′	26°33.4	0.8′	55.6′
15	47°56.3	·· 30.2	29°16.9	8.3′	26°32.6	0.9′	55.6′
16	62°56.1	30.6	43°44.2	8.3′	26°31.7	1.1′	55.6′
17	77°55.9	31.0	58°11.6	8.4′	26°30.6	1.2′	55.6′
18	92°55.7	S21°31.4	72°39.0	8.4′	S26°29.4	1.4′	55.5′
19	107°55.4	31.8	87°06.4	8.5′	26°28.0	1.5′	55.5′
20	122°55.2	32.2	101°33.8	8.5′	26°26.5	1.6′	55.5′
21	137°55.0	·· 32.7	116°01.4	8.6′	26°24.9	1.8′	55.5′
22	152°54.8	33.1	130°28.9	8.6′	26°23.1	1.9′	55.5′
23	167°54.6	33.5	144°56.5	8.7′	26°21.2	2.1′	55.4′
	SD = 16.2′	d = 0.4′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:42	09:35	▬	▬	14:00	15:53
N 70°	07:27	09:00	▬	▬	14:35	16:08
68°	07:14	08:34	10:17	13:18	15:01	16:21
66°	07:04	08:15	09:35	14:00	15:20	16:31
64°	06:55	07:59	09:07	14:28	15:36	16:40
62°	06:47	07:46	08:45	14:50	15:49	16:48
60°	06:41	07:35	08:28	15:07	16:00	16:55
N 58°	06:34	07:25	08:14	15:22	16:10	17:01
56°	06:29	07:16	08:01	15:34	16:19	17:06
54°	06:24	07:09	07:50	15:45	16:27	17:12
52°	06:19	07:02	07:41	15:55	16:34	17:16
50°	06:15	06:55	07:32	16:03	16:40	17:21
45°	06:05	06:41	07:14	16:21	16:54	17:31
N 40°	05:56	06:29	06:59	16:36	17:06	17:40
35°	05:48	06:19	06:47	16:49	17:16	17:48
30°	05:40	06:10	06:36	17:00	17:26	17:55
20°	05:26	05:53	06:17	17:19	17:43	18:10
N 10°	05:11	05:37	06:00	17:36	17:58	18:24
0°	04:56	05:22	05:44	17:52	18:14	18:40
S 10°	04:39	05:06	05:28	18:07	18:30	18:57
20°	04:19	04:47	05:11	18:25	18:49	19:17
30°	03:52	04:25	04:52	18:44	19:11	19:44
35°	03:36	04:11	04:40	18:56	19:25	20:00
40°	03:15	03:55	04:27	19:10	19:41	20:21
45°	02:49	03:35	04:11	19:26	20:01	20:48
S 50°	02:11	03:09	03:51	19:45	20:27	21:26
52°	01:51	02:56	03:42	19:55	20:40	21:47
54°	01:23	02:42	03:31	20:06	20:55	22:15
56°	00:39	02:24	03:19	20:18	21:13	23:02
58°	////	02:02	03:05	20:32	21:36	////
S 60°	////	01:33	02:49	20:49	22:06	////

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	09:26	▬	▬	12:41	▬	▬
62°	08:48	10:28	11:39	13:20	13:35	14:18
60°	08:22	09:50	10:56	13:47	14:13	15:01
N 58°	08:01	09:23	10:27	14:09	14:40	15:30
56°	07:44	09:02	10:05	14:26	15:02	15:53
54°	07:29	08:45	09:47	14:41	15:19	16:11
52°	07:17	08:30	09:31	14:54	15:34	16:26
50°	07:06	08:17	09:18	15:05	15:47	16:40
45°	06:43	07:51	08:50	15:29	16:14	17:07
N 40°	06:24	07:30	08:29	15:48	16:35	17:29
35°	06:09	07:12	08:11	16:04	16:53	17:47
30°	05:56	06:57	07:55	16:18	17:08	18:02
20°	05:33	06:32	07:29	16:42	17:34	18:28
N 10°	05:14	06:10	07:06	17:02	17:56	18:51
0°	04:56	05:50	06:45	17:22	18:17	19:12
S 10°	04:38	05:30	06:24	17:41	18:38	19:32
20°	04:19	05:09	06:02	18:02	19:00	19:55
30°	03:57	04:44	05:36	18:26	19:26	20:21
35°	03:44	04:29	05:20	18:40	19:41	20:36
40°	03:29	04:12	05:03	18:56	19:59	20:54
45°	03:12	03:52	04:41	19:16	20:20	21:15
S 50°	02:50	03:27	04:14	19:40	20:47	21:42
52°	02:40	03:15	04:01	19:52	21:00	21:55
54°	02:29	03:01	03:46	20:06	21:15	22:10
56°	02:16	02:45	03:28	20:22	21:33	22:27
58°	02:00	02:26	03:06	20:41	21:55	22:48
S 60°	01:43	02:02	02:38	21:04	22:22	23:15

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 29-1 2-1%
27	12:38	12:29	11:48	11:09	23:36	
28	12:19	12:09	11:48	12:04	–:–	
29	11:58	11:48	11:48	12:58	00:31	

November 30, 01, 02 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	68°38.8	152°30.3	S24°47.2	155°07.7	S24°25.3	253°04.5	N03°08.7	47°43.4	N05°54.1
1	83°41.2	167°29.4	47.2	170°08.1	25.2	268°06.6	08.5	62°46.0	54.1
2	98°43.7	182°28.5	47.1	185°08.5	25.2	283°08.8	08.4	77°48.5	54.0
3	113°46.2	197°27.5	·· 47.1	200°08.9	·· 25.2	298°11.0	·· 08.3	92°51.1	·· 54.0
4	128°48.6	212°26.6	47.0	215°09.2	25.1	313°13.2	08.2	107°53.7	54.0
5	143°51.1	227°25.6	46.9	230°09.6	25.1	328°15.4	08.1	122°56.2	53.9
6	158°53.5	242°24.7	S24°46.9	245°10.0	S24°25.1	343°17.5	N03°08.0	137°58.8	N05°53.9
7	173°56.0	257°23.7	46.8	260°10.4	25.0	358°19.7	07.9	153°01.4	53.9
8	188°58.5	272°22.8	46.7	275°10.8	25.0	13°21.9	07.8	168°03.9	53.9
9	204°00.9	287°21.8	·· 46.7	290°11.1	·· 24.9	28°24.1	·· 07.6	183°06.5	·· 53.8
10	219°03.4	302°20.9	46.6	305°11.5	24.9	43°26.2	07.5	198°09.1	53.8
11	234°05.9	317°20.0	46.5	320°11.9	24.9	58°28.4	07.4	213°11.6	53.8
12	249°08.3	332°19.0	S24°46.4	335°12.3	S24°24.8	73°30.6	N03°07.3	228°14.2	N05°53.7
13	264°10.8	347°18.1	46.4	350°12.6	24.8	88°32.8	07.2	243°16.8	53.7
14	279°13.3	2°17.1	46.3	5°13.0	24.7	103°35.0	07.1	258°19.3	53.7
15	294°15.7	17°16.2	·· 46.2	20°13.4	·· 24.7	118°37.1	·· 07.0	273°21.9	·· 53.7
16	309°18.2	32°15.2	46.1	35°13.8	24.7	133°39.3	06.9	288°24.5	53.6
17	324°20.7	47°14.3	46.1	50°14.1	24.6	148°41.5	06.7	303°27.0	53.6
18	339°23.1	62°13.4	S24°46.0	65°14.5	S24°24.6	163°43.7	N03°06.6	318°29.6	N05°53.6
19	354°25.6	77°12.4	45.9	80°14.9	24.5	178°45.9	06.5	333°32.1	53.5
20	9°28.0	92°11.5	45.8	95°15.3	24.5	193°48.1	06.4	348°34.7	53.5
21	24°30.5	107°10.5	·· 45.7	110°15.6	·· 24.4	208°50.2	·· 06.3	3°37.3	·· 53.5
22	39°33.0	122°09.6	45.7	125°16.0	24.4	223°52.4	06.2	18°39.8	53.4
23	54°35.4	137°08.6	45.6	140°16.4	24.3	238°54.6	06.1	33°42.4	53.4
Mer.pass. 19:22		ν -0.9′	d 0.1′	m -3.90	ν 0.4′	d 0.0′	m 1.27	ν 2.2′	d 0.1′ m -1.92	ν 2.6′	d 0.0′ m 0.31

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	69°37.9	152°07.7	S24°45.5	155°16.8	S24°24.3	253°56.8	N03°06.0	48°45.0	N05°53.4
1	84°40.4	167°06.8	45.4	170°17.1	24.2	268°59.0	05.9	63°47.5	53.4
2	99°42.8	182°05.8	45.3	185°17.5	24.2	284°01.1	05.7	78°50.1	53.3
3	114°45.3	197°04.9	·· 45.2	200°17.9	·· 24.2	299°03.3	·· 05.6	93°52.7	·· 53.3
4	129°47.8	212°03.9	45.1	215°18.3	24.1	314°05.5	05.5	108°55.2	53.3
5	144°50.2	227°03.0	45.0	230°18.7	24.1	329°07.7	05.4	123°57.8	53.2
6	159°52.7	242°02.0	S24°44.9	245°19.0	S24°24.0	344°09.9	N03°05.3	139°00.3	N05°53.2
7	174°55.1	257°01.1	44.8	260°19.4	24.0	359°12.1	05.2	154°02.9	53.2
8	189°57.6	272°00.2	44.7	275°19.8	23.9	14°14.3	05.1	169°05.5	53.2
9	205°00.1	286°59.2	·· 44.6	290°20.2	·· 23.9	29°16.4	·· 05.0	184°08.0	·· 53.1
10	220°02.5	301°58.3	44.5	305°20.5	23.8	44°18.6	04.9	199°10.6	53.1
11	235°05.0	316°57.3	44.4	320°20.9	23.8	59°20.8	04.8	214°13.1	53.1
12	250°07.5	331°56.4	S24°44.3	335°21.3	S24°23.7	74°23.0	N03°04.6	229°15.7	N05°53.1
13	265°09.9	346°55.5	44.2	350°21.7	23.6	89°25.2	04.5	244°18.3	53.0
14	280°12.4	1°54.5	44.1	5°22.0	23.6	104°27.4	04.4	259°20.8	53.0
15	295°14.9	16°53.6	·· 44.0	20°22.4	·· 23.5	119°29.5	·· 04.3	274°23.4	·· 53.0
16	310°17.3	31°52.6	43.9	35°22.8	23.5	134°31.7	04.2	289°25.9	52.9
17	325°19.8	46°51.7	43.8	50°23.2	23.4	149°33.9	04.1	304°28.5	52.9
18	340°22.3	61°50.7	S24°43.7	65°23.5	S24°23.4	164°36.1	N03°04.0	319°31.1	N05°52.9
19	355°24.7	76°49.8	43.6	80°23.9	23.3	179°38.3	03.9	334°33.6	52.9
20	10°27.2	91°48.9	43.5	95°24.3	23.3	194°40.5	03.8	349°36.2	52.8
21	25°29.6	106°47.9	·· 43.3	110°24.6	·· 23.2	209°42.7	·· 03.7	4°38.7	·· 52.8
22	40°32.1	121°47.0	43.2	125°25.0	23.2	224°44.9	03.5	19°41.3	52.8
23	55°34.6	136°46.0	43.1	140°25.4	23.1	239°47.0	03.4	34°43.9	52.7
Mer.pass. 19:18		ν -0.9′	d 0.1′	m -3.91	ν 0.4′	d 0.0′	m 1.27	ν 2.2′	d 0.1′ m -1.92	ν 2.6′	d 0.0′ m 0.32

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	70°37.0	151°45.1	S24°43.0	155°25.8	S24°23.0	254°49.2	N03°03.3	49°46.4	N05°52.7
1	85°39.5	166°44.2	42.9	170°26.1	23.0	269°51.4	03.2	64°49.0	52.7
2	100°42.0	181°43.2	42.7	185°26.5	22.9	284°53.6	03.1	79°51.5	52.7
3	115°44.4	196°42.3	·· 42.6	200°26.9	·· 22.9	299°55.8	·· 03.0	94°54.1	·· 52.6
4	130°46.9	211°41.4	42.5	215°27.3	22.8	314°58.0	02.9	109°56.7	52.6
5	145°49.4	226°40.4	42.4	230°27.6	22.7	330°00.2	02.8	124°59.2	52.6
6	160°51.8	241°39.5	S24°42.2	245°28.0	S24°22.7	345°02.4	N03°02.7	140°01.8	N05°52.6
7	175°54.3	256°38.5	42.1	260°28.4	22.6	0°04.6	02.6	155°04.3	52.5
8	190°56.8	271°37.6	42.0	275°28.8	22.6	15°06.7	02.5	170°06.9	52.5
9	205°59.2	286°36.7	·· 41.9	290°29.1	·· 22.5	30°08.9	·· 02.4	185°09.4	·· 52.5
10	221°01.7	301°35.7	41.7	305°29.5	22.4	45°11.1	02.3	200°12.0	52.5
11	236°04.1	316°34.8	41.6	320°29.9	22.4	60°13.3	02.1	215°14.6	52.4
12	251°06.6	331°33.8	S24°41.5	335°30.3	S24°22.3	75°15.5	N03°02.0	230°17.1	N05°52.4
13	266°09.1	346°32.9	41.3	350°30.6	22.2	90°17.7	01.9	245°19.7	52.4
14	281°11.5	1°32.0	41.2	5°31.0	22.2	105°19.9	01.8	260°22.2	52.3
15	296°14.0	16°31.0	·· 41.0	20°31.4	·· 22.1	120°22.1	·· 01.7	275°24.8	·· 52.3
16	311°16.5	31°30.1	40.9	35°31.8	22.0	135°24.3	01.6	290°27.3	52.3
17	326°18.9	46°29.2	40.8	50°32.1	22.0	150°26.5	01.5	305°29.9	52.3
18	341°21.4	61°28.2	S24°40.6	65°32.5	S24°21.9	165°28.6	N03°01.4	320°32.5	N05°52.2
19	356°23.9	76°27.3	40.5	80°32.9	21.8	180°30.8	01.3	335°35.0	52.2
20	11°26.3	91°26.4	40.3	95°33.2	21.8	195°33.0	01.2	350°37.6	52.2
21	26°28.8	106°25.4	·· 40.2	110°33.6	·· 21.7	210°35.2	·· 01.1	5°40.1	·· 52.2
22	41°31.3	121°24.5	40.0	125°34.0	21.6	225°37.4	01.0	20°42.7	52.1
23	56°33.7	136°23.5	39.9	140°34.4	21.6	240°39.6	00.9	35°45.2	52.1
Mer.pass. 19:14		ν -0.9′	d 0.1′	m -3.91	ν 0.4′	d 0.1′	m 1.27	ν 2.2′	d 0.1′ m -1.93	ν 2.6′	d 0.0′ m 0.32

Stars

	SHA	Dec
Alpheratz	357°32.1	29°15.0
Ankaa	353°04.7	-42°09.3
Schedar	349°27.9	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.1	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.1	89°23.0
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.5	16°33.9
Rigel	281°01.3	-8°10.1
Capella	280°17.9	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.0
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.8	-52°42.5
Sirius	258°23.8	-16°45.2
Adhara	255°03.7	-29°00.5
Procyon	244°48.1	5°09.1
Pollux	243°14.2	27°57.3
Avior	234°13.3	-59°35.7
Suhail	222°44.4	-43°32.5
Miaplacidus	221°37.3	-69°49.6
Alphard	217°45.3	-8°46.8
Regulus	207°31.9	11°49.7
Dubhe	193°38.3	61°35.7
Denebola	182°22.7	14°24.8
Gienah	175°41.3	-17°41.8
Acrux	172°57.7	-63°15.0
Gacrux	171°49.2	-57°16.0
Alioth	166°11.3	55°48.2
Spica	158°20.0	-11°18.4
Alkaid	152°50.6	49°10.2
Hadar	148°33.1	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°46.1	19°02.2
Rigil Kent.	139°37.5	-60°56.9
Kochab	137°21.1	74°02.2
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°05.9	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.8	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.4	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.1	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.8	28°14.4
Markab	13°27.5	15°21.6

Nov 30 Tue	SHA	Mer.pass
Venus	83°51.6	13:51
Mars	86°29.0	13:39
Jupiter	184°25.7	07:07
Saturn	339°04.7	20:46

Dec 01 Wed	SHA	Mer.pass
Venus	82°29.8	13:52
Mars	85°38.9	13:39
Jupiter	184°18.9	07:03
Saturn	339°07.1	20:41

Dec 02 Thu	SHA	Mer.pass
Venus	81°08.1	13:54
Mars	84°48.7	13:38
Jupiter	184°12.2	07:00
Saturn	339°09.4	20:37

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°54.3	S21°33.9	159°24.2	8.7′	S26°19.1	2.2′	55.4′
1	197°54.1	34.3	173°51.9	8.8′	26°16.9	2.3′	55.4′
2	212°53.9	34.7	188°19.6	8.8′	26°14.6	2.5′	55.4′
3	227°53.7	·· 35.1	202°47.4	8.9′	26°12.1	2.6′	55.4′
4	242°53.4	35.6	217°15.3	8.9′	26°09.5	2.7′	55.3′
5	257°53.2	36.0	231°43.2	9.0′	26°06.8	2.9′	55.3′
6	272°53.0	S21°36.4	246°11.2	9.0′	S26°03.9	3.0′	55.3′
7	287°52.8	36.8	260°39.2	9.1′	26°00.9	3.2′	55.3′
8	302°52.5	37.2	275°07.3	9.1′	25°57.7	3.3′	55.2′
9	317°52.3	·· 37.6	289°35.4	9.2′	25°54.4	3.4′	55.2′
10	332°52.1	38.0	304°03.6	9.3′	25°51.0	3.5′	55.2′
11	347°51.9	38.4	318°31.9	9.3′	25°47.5	3.7′	55.2′
12	2°51.6	S21°38.8	333°00.2	9.4′	S25°43.8	3.8′	55.2′
13	17°51.4	39.2	347°28.6	9.5′	25°40.0	3.9′	55.1′
14	32°51.2	39.6	1°57.1	9.5′	25°36.1	4.1′	55.1′
15	47°51.0	·· 40.0	16°25.6	9.6′	25°32.0	4.2′	55.1′
16	62°50.7	40.4	30°54.2	9.7′	25°27.8	4.3′	55.1′
17	77°50.5	40.8	45°22.8	9.7′	25°23.5	4.4′	55.1′
18	92°50.3	S21°41.2	59°51.5	9.8′	S25°19.1	4.6′	55.1′
19	107°50.0	41.6	74°20.3	9.9′	25°14.5	4.7′	55.0′
20	122°49.8	42.0	88°49.2	9.9′	25°09.8	4.8′	55.0′
21	137°49.6	·· 42.4	103°18.1	10.0′	25°05.0	4.9′	55.0′
22	152°49.4	42.8	117°47.1	10.1′	25°00.1	5.1′	55.0′
23	167°49.1	43.2	132°16.2	10.1′	24°55.0	5.1′	55.0′
	SD = 16.2′	d = 0.4′	SD = 15.1′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°48.9	S21°43.6	146°45.3	10.2′	S24°49.9	5.3′	54.9′
1	197°48.7	44.0	161°14.5	10.3′	24°44.6	5.4′	54.9′
2	212°48.4	44.4	175°43.8	10.4′	24°39.2	5.6′	54.9′
3	227°48.2	·· 44.8	190°13.2	10.4′	24°33.6	5.6′	54.9′
4	242°48.0	45.2	204°42.6	10.5′	24°28.0	5.8′	54.9′
5	257°47.7	45.6	219°12.1	10.6′	24°22.2	5.9′	54.8′
6	272°47.5	S21°46.0	233°41.7	10.7′	S24°16.3	6.0′	54.8′
7	287°47.3	46.4	248°11.3	10.7′	24°10.3	6.1′	54.8′
8	302°47.1	46.8	262°41.0	10.8′	24°04.2	6.2′	54.8′
9	317°46.8	·· 47.2	277°10.8	10.9′	23°58.0	6.3′	54.8′
10	332°46.6	47.6	291°40.7	11.0′	23°51.7	6.4′	54.8′
11	347°46.4	48.0	306°10.7	11.0′	23°45.3	6.6′	54.7′
12	2°46.1	S21°48.3	320°40.7	11.1′	S23°38.7	6.6′	54.7′
13	17°45.9	48.7	335°10.8	11.2′	23°32.1	6.8′	54.7′
14	32°45.7	49.1	349°41.0	11.3′	23°25.3	6.8′	54.7′
15	47°45.4	·· 49.5	4°11.3	11.3′	23°18.5	7.0′	54.7′
16	62°45.2	49.9	18°41.6	11.4′	23°11.5	7.1′	54.7′
17	77°45.0	50.3	33°12.0	11.5′	23°04.4	7.2′	54.6′
18	92°44.7	S21°50.7	47°42.5	11.6′	S22°57.2	7.2′	54.6′
19	107°44.5	51.0	62°13.1	11.7′	22°50.0	7.4′	54.6′
20	122°44.2	51.4	76°43.7	11.7′	22°42.6	7.5′	54.6′
21	137°44.0	·· 51.8	91°14.5	11.8′	22°35.1	7.6′	54.6′
22	152°43.8	52.2	105°45.3	11.9′	22°27.5	7.7′	54.6′
23	167°43.5	52.6	120°16.2	12.0′	22°19.8	7.7′	54.6′
	SD = 16.2′	d = 0.4′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°43.3	S21°53.0	134°47.1	12.0′	S22°12.1	7.9′	54.5′
1	197°43.1	53.3	149°18.2	12.1′	22°04.2	8.0′	54.5′
2	212°42.8	53.7	163°49.3	12.2′	21°56.2	8.0′	54.5′
3	227°42.6	·· 54.1	178°20.5	12.3′	21°48.2	8.2′	54.5′
4	242°42.4	54.5	192°51.7	12.4′	21°40.0	8.2′	54.5′
5	257°42.1	54.8	207°23.1	12.4′	21°31.8	8.4′	54.5′
6	272°41.9	S21°55.2	221°54.5	12.5′	S21°23.4	8.4′	54.5′
7	287°41.6	55.6	236°26.0	12.6′	21°15.0	8.5′	54.4′
8	302°41.4	56.0	250°57.6	12.7′	21°06.5	8.6′	54.4′
9	317°41.2	·· 56.3	265°29.3	12.7′	20°57.9	8.7′	54.4′
10	332°40.9	56.7	280°01.0	12.8′	20°49.2	8.8′	54.4′
11	347°40.7	57.1	294°32.8	12.9′	20°40.4	8.9′	54.4′
12	2°40.4	S21°57.4	309°04.7	13.0′	S20°31.5	8.9′	54.4′
13	17°40.2	57.8	323°36.7	13.0′	20°22.6	9.0′	54.4′
14	32°40.0	58.2	338°08.7	13.1′	20°13.6	9.2′	54.4′
15	47°39.7	·· 58.6	352°40.8	13.2′	20°04.4	9.2′	54.4′
16	62°39.5	58.9	7°13.0	13.3′	19°55.2	9.2′	54.3′
17	77°39.2	59.3	21°45.2	13.3′	19°46.0	9.4′	54.3′
18	92°39.0	S21°59.7	36°17.6	13.4′	S19°36.6	9.4′	54.3′
19	107°38.8	22°00.0	50°50.0	13.5′	19°27.2	9.5′	54.3′
20	122°38.5	00.4	65°22.4	13.5′	19°17.7	9.6′	54.3′
21	137°38.3	·· 00.8	79°55.0	13.6′	19°08.1	9.7′	54.3′
22	152°38.0	01.1	94°27.6	13.7′	18°58.4	9.8′	54.3′
23	167°37.8	01.5	109°00.3	13.8′	18°48.6	9.8′	54.3′
	SD = 16.2′	d = 0.4′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:50	09:49	▬	▬	13:48	15:47
N 70°	07:34	09:10	▬	▬	14:27	16:03
68°	07:21	08:43	10:35	13:03	14:54	16:16
66°	07:10	08:22	09:46	13:51	15:15	16:27
64°	07:01	08:06	09:15	14:22	15:32	16:37
62°	06:53	07:52	08:53	14:45	15:45	16:45
60°	06:45	07:40	08:34	15:03	15:57	16:52
N 58°	06:39	07:30	08:19	15:18	16:07	16:58
56°	06:33	07:21	08:06	15:31	16:17	17:04
54°	06:28	07:13	07:55	15:42	16:25	17:10
52°	06:23	07:06	07:45	15:52	16:32	17:15
50°	06:18	06:59	07:36	16:01	16:39	17:19
45°	06:08	06:44	07:18	16:20	16:53	17:30
N 40°	05:59	06:32	07:02	16:35	17:05	17:39
35°	05:50	06:22	06:49	16:48	17:16	17:47
30°	05:42	06:12	06:38	17:00	17:26	17:55
20°	05:28	05:55	06:18	17:19	17:43	18:10
N 10°	05:13	05:39	06:01	17:36	17:59	18:25
0°	04:57	05:23	05:45	17:53	18:15	18:41
S 10°	04:40	05:06	05:29	18:09	18:32	18:58
20°	04:19	04:47	05:12	18:26	18:51	19:19
30°	03:52	04:24	04:51	18:47	19:14	19:46
35°	03:35	04:10	04:39	18:59	19:28	20:04
40°	03:14	03:54	04:26	19:13	19:45	20:25
45°	02:46	03:33	04:09	19:29	20:05	20:53
S 50°	02:07	03:06	03:49	19:50	20:32	21:32
52°	01:45	02:53	03:39	19:59	20:46	21:54
54°	01:15	02:38	03:28	20:10	21:01	22:25
56°	00:19	02:19	03:16	20:23	21:20	23:28
58°	////	01:56	03:01	20:38	21:44	////
S 60°	////	01:24	02:44	20:55	22:17	////

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	13:53	▬	▬	17:22
66°	▬	13:53	13:13	▬	15:43	18:01
64°	13:17	12:54	12:45	14:33	16:40	18:28
62°	12:10	12:21	12:24	15:39	17:14	18:48
60°	11:35	11:56	12:06	16:13	17:38	19:05
N 58°	11:10	11:36	11:52	16:38	17:57	19:19
56°	10:50	11:20	11:39	16:58	18:13	19:31
54°	10:33	11:05	11:28	17:15	18:27	19:42
52°	10:19	10:53	11:18	17:29	18:39	19:51
50°	10:06	10:42	11:10	17:42	18:49	19:59
45°	09:40	10:19	10:51	18:07	19:11	20:17
N 40°	09:19	10:01	10:36	18:27	19:29	20:31
35°	09:02	09:46	10:23	18:44	19:44	20:43
30°	08:47	09:32	10:11	18:59	19:57	20:53
20°	08:22	09:09	09:52	19:24	20:18	21:11
N 10°	08:00	08:49	09:35	19:45	20:37	21:27
0°	07:39	08:31	09:19	20:04	20:54	21:41
S 10°	07:19	08:12	09:03	20:24	21:12	21:56
20°	06:57	07:52	08:46	20:45	21:30	22:11
30°	06:31	07:29	08:26	21:09	21:52	22:28
35°	06:16	07:15	08:15	21:23	22:04	22:38
40°	05:59	06:59	08:01	21:40	22:18	22:50
45°	05:38	06:40	07:45	21:59	22:35	23:03
S 50°	05:12	06:17	07:26	22:24	22:55	23:19
52°	04:59	06:05	07:16	22:35	23:05	23:27
54°	04:44	05:52	07:06	22:49	23:16	23:35
56°	04:26	05:37	06:54	23:04	23:28	23:45
58°	04:05	05:20	06:40	23:22	23:43	23:56
S 60°	03:39	04:58	06:24	23:44	·· ··	00:00

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 2-4 4-14%
30	11:37	11:27	11:49	13:52	01:25	
01	11:16	11:04	11:49	14:43	02:18	
02	10:53	10:42	11:49	15:30	03:07	

December 03, 04, 05 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°36.2	151°22.6	S24°39.7	155°34.7	S24°21.5	255°41.8	N03°00.8	50°47.8	N05°52.1
1	86°38.6	166°21.7	39.6	170°35.1	21.4	270°44.0	00.6	65°50.3	52.1
2	101°41.1	181°20.7	39.4	185°35.5	21.4	285°46.2	00.5	80°52.9	52.0
3	116°43.6	196°19.8	·· 39.3	200°35.9	·· 21.3	300°48.4	·· 00.4	95°55.5	·· 52.0
4	131°46.0	211°18.9	39.1	215°36.2	21.2	315°50.6	00.3	110°58.0	52.0
5	146°48.5	226°17.9	39.0	230°36.6	21.2	330°52.8	00.2	126°00.6	52.0
6	161°51.0	241°17.0	S24°38.8	245°37.0	S24°21.1	345°55.0	N03°00.1	141°03.1	N05°51.9
7	176°53.4	256°16.1	38.7	260°37.3	21.0	0°57.2	03°00.0	156°05.7	51.9
8	191°55.9	271°15.1	38.5	275°37.7	20.9	15°59.4	02°59.9	171°08.2	51.9
9	206°58.4	286°14.2	·· 38.3	290°38.1	·· 20.9	31°01.6	·· 59.8	186°10.8	·· 51.9
10	222°00.8	301°13.3	38.2	305°38.5	20.8	46°03.7	59.7	201°13.3	51.8
11	237°03.3	316°12.3	38.0	320°38.8	20.7	61°05.9	59.6	216°15.9	51.8
12	252°05.8	331°11.4	S24°37.8	335°39.2	S24°20.6	76°08.1	N02°59.5	231°18.4	N05°51.8
13	267°08.2	346°10.5	37.7	350°39.6	20.6	91°10.3	59.4	246°21.0	51.8
14	282°10.7	1°09.5	37.5	5°39.9	20.5	106°12.5	59.3	261°23.6	51.7
15	297°13.1	16°08.6	·· 37.3	20°40.3	·· 20.4	121°14.7	·· 59.2	276°26.1	·· 51.7
16	312°15.6	31°07.7	37.2	35°40.7	20.3	136°16.9	59.1	291°28.7	51.7
17	327°18.1	46°06.7	37.0	50°41.1	20.3	151°19.1	59.0	306°31.2	51.7
18	342°20.5	61°05.8	S24°36.8	65°41.4	S24°20.2	166°21.3	N02°58.9	321°33.8	N05°51.6
19	357°23.0	76°04.9	36.6	80°41.8	20.1	181°23.5	58.8	336°36.3	51.6
20	12°25.5	91°03.9	36.5	95°42.2	20.0	196°25.7	58.7	351°38.9	51.6
21	27°27.9	106°03.0	·· 36.3	110°42.5	·· 19.9	211°27.9	·· 58.5	6°41.4	·· 51.6
22	42°30.4	121°02.1	36.1	125°42.9	19.9	226°30.1	58.4	21°44.0	51.5
23	57°32.9	136°01.1	35.9	140°43.3	19.8	241°32.3	58.3	36°46.5	51.5
Mer.pass.	19:10	ν -0.9′	d 0.2′	m -3.91	ν 0.4′	d 0.1′	m 1.26	ν 2.2′	d 0.1′ m -1.93	ν 2.6′	d 0.0′ m 0.33

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	72°35.3	151°00.2	S24°35.7	155°43.7	S24°19.7	256°34.5	N02°58.2	51°49.1	N05°51.5
1	87°37.8	165°59.3	35.6	170°44.0	19.6	271°36.7	58.1	66°51.6	51.5
2	102°40.2	180°58.3	35.4	185°44.4	19.5	286°38.9	58.0	81°54.2	51.5
3	117°42.7	195°57.4	·· 35.2	200°44.8	·· 19.5	301°41.1	·· 57.9	96°56.7	·· 51.4
4	132°45.2	210°56.5	35.0	215°45.2	19.4	316°43.3	57.8	111°59.3	51.4
5	147°47.6	225°55.6	34.8	230°45.5	19.3	331°45.5	57.7	127°01.8	51.4
6	162°50.1	240°54.6	S24°34.6	245°45.9	S24°19.2	346°47.7	N02°57.6	142°04.4	N05°51.4
7	177°52.6	255°53.7	34.4	260°46.3	19.1	1°49.9	57.5	157°06.9	51.3
8	192°55.0	270°52.8	34.2	275°46.6	19.0	16°52.1	57.4	172°09.5	51.3
9	207°57.5	285°51.8	·· 34.1	290°47.0	·· 19.0	31°54.3	·· 57.3	187°12.0	·· 51.3
10	223°00.0	300°50.9	33.9	305°47.4	18.9	46°56.5	57.2	202°14.6	51.3
11	238°02.4	315°50.0	33.7	320°47.7	18.8	61°58.7	57.1	217°17.1	51.2
12	253°04.9	330°49.0	S24°33.5	335°48.1	S24°18.7	77°00.9	N02°57.0	232°19.7	N05°51.2
13	268°07.4	345°48.1	33.3	350°48.5	18.6	92°03.1	56.9	247°22.2	51.2
14	283°09.8	0°47.2	33.1	5°48.9	18.5	107°05.3	56.8	262°24.8	51.2
15	298°12.3	15°46.3	·· 32.9	20°49.2	·· 18.4	122°07.5	·· 56.7	277°27.3	·· 51.2
16	313°14.7	30°45.3	32.7	35°49.6	18.3	137°09.7	56.6	292°29.9	51.1
17	328°17.2	45°44.4	32.5	50°50.0	18.3	152°11.9	56.5	307°32.4	51.1
18	343°19.7	60°43.5	S24°32.3	65°50.3	S24°18.2	167°14.1	N02°56.4	322°35.0	N05°51.1
19	358°22.1	75°42.6	32.1	80°50.7	18.1	182°16.3	56.3	337°37.5	51.1
20	13°24.6	90°41.6	31.8	95°51.1	18.0	197°18.5	56.2	352°40.1	51.0
21	28°27.1	105°40.7	·· 31.6	110°51.5	·· 17.9	212°20.7	·· 56.1	7°42.6	·· 51.0
22	43°29.5	120°39.8	31.4	125°51.8	17.8	227°22.9	56.0	22°45.2	51.0
23	58°32.0	135°38.8	31.2	140°52.2	17.7	242°25.1	55.9	37°47.7	51.0
Mer.pass.	19:07	ν -0.9′	d 0.2′	m -3.91	ν 0.4′	d 0.1′	m 1.26	ν 2.2′	d 0.1′ m -1.94	ν 2.6′	d 0.0′ m 0.33

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	73°34.5	150°37.9	S24°31.0	155°52.6	S24°17.6	257°27.3	N02°55.8	52°50.3	N05°50.9
1	88°36.9	165°37.0	30.8	170°52.9	17.5	272°29.6	55.7	67°52.8	50.9
2	103°39.4	180°36.1	30.6	185°53.3	17.4	287°31.8	55.6	82°55.4	50.9
3	118°41.9	195°35.1	·· 30.4	200°53.7	·· 17.3	302°34.0	·· 55.5	97°57.9	·· 50.9
4	133°44.3	210°34.2	30.1	215°54.0	17.3	317°36.2	55.4	113°00.4	50.9
5	148°46.8	225°33.3	29.9	230°54.4	17.2	332°38.4	55.3	128°03.0	50.8
6	163°49.2	240°32.4	S24°29.7	245°54.8	S24°17.1	347°40.6	N02°55.2	143°05.5	N05°50.8
7	178°51.7	255°31.4	29.5	260°55.2	17.0	2°42.8	55.1	158°08.1	50.8
8	193°54.2	270°30.5	29.3	275°55.5	16.9	17°45.0	55.0	173°10.6	50.8
9	208°56.6	285°29.6	·· 29.0	290°55.9	·· 16.8	32°47.2	·· 54.9	188°13.2	·· 50.8
10	223°59.1	300°28.7	28.8	305°56.3	16.7	47°49.4	54.8	203°15.7	50.7
11	239°01.6	315°27.8	28.6	320°56.6	16.6	62°51.6	54.7	218°18.3	50.7
12	254°04.0	330°26.8	S24°28.4	335°57.0	S24°16.5	77°53.8	N02°54.6	233°20.8	N05°50.7
13	269°06.5	345°25.9	28.1	350°57.4	16.4	92°56.0	54.5	248°23.4	50.7
14	284°09.0	0°25.0	27.9	5°57.7	16.3	107°58.2	54.4	263°25.9	50.6
15	299°11.4	15°24.1	·· 27.7	20°58.1	·· 16.2	123°00.4	·· 54.3	278°28.5	·· 50.6
16	314°13.9	30°23.1	27.4	35°58.5	16.1	138°02.6	54.2	293°31.0	50.6
17	329°16.3	45°22.2	27.2	50°58.9	16.0	153°04.9	54.1	308°33.5	50.6
18	344°18.8	60°21.3	S24°27.0	65°59.2	S24°15.9	168°07.1	N02°54.0	323°36.1	N05°50.6
19	359°21.3	75°20.4	26.7	80°59.6	15.8	183°09.3	53.9	338°38.6	50.5
20	14°23.7	90°19.5	26.5	96°00.0	15.7	198°11.5	53.8	353°41.2	50.5
21	29°26.2	105°18.5	·· 26.2	111°00.3	·· 15.6	213°13.7	·· 53.7	8°43.7	·· 50.5
22	44°28.7	120°17.6	26.0	126°00.7	15.5	228°15.9	53.6	23°46.3	50.5
23	59°31.1	135°16.7	25.8	141°01.1	15.4	243°18.1	53.5	38°48.8	50.5
Mer.pass.	19:03	ν -0.9′	d 0.2′	m -3.91	ν 0.4′	d 0.1′	m 1.26	ν 2.2′	d 0.1′ m -1.95	ν 2.5′	d 0.0′ m 0.34

Stars

	SHA	Dec
Alpheratz	357°32.2	29°15.0
Ankaa	353°04.7	-42°09.3
Schedar	349°28.0	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.1	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.4	89°23.0
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.1
Capella	280°17.9	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.0
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.8	-52°42.5
Sirius	258°23.8	-16°45.2
Adhara	255°03.7	-29°00.5
Procyon	244°48.1	5°09.1
Pollux	243°14.1	27°57.3
Avior	234°13.3	-59°35.7
Suhail	222°44.3	-43°32.5
Miaplacidus	221°37.3	-69°49.7
Alphard	217°45.3	-8°46.8
Regulus	207°31.9	11°49.7
Dubhe	193°38.3	61°35.6
Denebola	182°22.6	14°24.8
Gienah	175°41.3	-17°41.8
Acrux	172°57.6	-63°15.0
Gacrux	171°49.2	-57°16.0
Alioth	166°11.3	55°48.2
Spica	158°20.0	-11°18.4
Alkaid	152°50.6	49°10.2
Hadar	148°33.1	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.1
Rigil Kent.	139°37.5	-60°56.9
Kochab	137°21.1	74°02.2
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°05.9	-69°04.6
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.8	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.4	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.1	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.9	28°14.4
Markab	13°27.5	15°21.6

Dec 03 Fri	SHA	Mer.pass
Venus	79°46.4	13:55
Mars	83°58.6	13:37
Jupiter	184°05.6	06:56
Saturn	339°11.6	20:33

Dec 04 Sat	SHA	Mer.pass
Venus	78°24.9	13:57
Mars	83°08.3	13:37
Jupiter	183°59.2	06:53
Saturn	339°13.8	20:29

Dec 05 Sun	SHA	Mer.pass
Venus	77°03.5	13:58
Mars	82°18.1	13:36
Jupiter	183°52.9	06:49
Saturn	339°15.8	20:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0905 sec ΔT = TT-UT1 = +69.2745 sec

2027 December 03 to Dec. 05 UT

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°37.5	S22°01.8	123°33.1	13.8′	S18°38.8	9.9′	54.3′
1	197°37.3	02.2	138°05.9	13.9′	18°28.9	9.9′	54.3′
2	212°37.1	02.6	152°38.8	14.0′	18°19.0	10.1′	54.2′
3	227°36.8	·· 02.9	167°11.8	14.0′	18°08.9	10.1′	54.2′
4	242°36.6	03.3	181°44.8	14.1′	17°58.8	10.2′	54.2′
5	257°36.3	03.6	196°17.9	14.2′	17°48.6	10.2′	54.2′
6	272°36.1	S22°04.0	210°51.1	14.2′	S17°38.4	10.3′	54.2′
7	287°35.8	04.4	225°24.3	14.3′	17°28.1	10.4′	54.2′
8	302°35.6	04.7	239°57.6	14.4′	17°17.7	10.5′	54.2′
9	317°35.3	·· 05.1	254°31.0	14.4′	17°07.2	10.5′	54.2′
10	332°35.1	05.4	269°04.4	14.5′	16°56.7	10.6′	54.2′
11	347°34.9	05.8	283°37.9	14.6′	16°46.1	10.6′	54.2′
12	2°34.6	S22°06.1	298°11.4	14.6′	S16°35.5	10.7′	54.2′
13	17°34.4	06.5	312°45.1	14.7′	16°24.8	10.8′	54.2′
14	32°34.1	06.8	327°18.7	14.7′	16°14.0	10.8′	54.2′
15	47°33.9	·· 07.2	341°52.5	14.8′	16°03.2	10.9′	54.2′
16	62°33.6	07.5	356°26.3	14.9′	15°52.3	11.0′	54.2′
17	77°33.4	07.9	11°00.1	14.9′	15°41.3	11.0′	54.1′
18	92°33.1	S22°08.2	25°34.1	15.0′	S15°30.3	11.1′	54.1′
19	107°32.9	08.6	40°08.0	15.0′	15°19.2	11.1′	54.1′
20	122°32.6	08.9	54°42.1	15.1′	15°08.1	11.2′	54.1′
21	137°32.4	·· 09.3	69°16.2	15.1′	14°56.9	11.3′	54.1′
22	152°32.1	09.6	83°50.3	15.2′	14°45.6	11.3′	54.1′
23	167°31.9	10.0	98°24.5	15.2′	14°34.3	11.3′	54.1′
	SD = 16.2′	d = 0.4′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°31.6	S22°10.3	112°58.7	15.3′	S14°23.0	11.4′	54.1′
1	197°31.4	10.7	127°33.0	15.4′	14°11.6	11.5′	54.1′
2	212°31.1	11.0	142°07.4	15.4′	14°00.1	11.5′	54.1′
3	227°30.9	·· 11.3	156°41.8	15.5′	13°48.6	11.6′	54.1′
4	242°30.6	11.7	171°16.3	15.5′	13°37.0	11.6′	54.1′
5	257°30.4	12.0	185°50.8	15.6′	13°25.4	11.7′	54.1′
6	272°30.1	S22°12.4	200°25.3	15.6′	S13°13.7	11.7′	54.1′
7	287°29.9	12.7	214°59.9	15.6′	13°02.0	11.8′	54.1′
8	302°29.6	13.0	229°34.5	15.7′	12°50.2	11.8′	54.1′
9	317°29.4	·· 13.4	244°09.2	15.7′	12°38.4	11.8′	54.1′
10	332°29.1	13.7	258°44.0	15.8′	12°26.6	11.9′	54.1′
11	347°28.9	14.0	273°18.8	15.8′	12°14.7	12.0′	54.1′
12	2°28.6	S22°14.4	287°53.6	15.9′	S12°02.7	12.0′	54.1′
13	17°28.4	14.7	302°28.4	15.9′	11°50.7	12.0′	54.1′
14	32°28.1	15.1	317°03.3	15.9′	11°38.7	12.1′	54.1′
15	47°27.9	·· 15.4	331°38.3	16.0′	11°26.6	12.2′	54.1′
16	62°27.6	15.7	346°13.3	16.0′	11°14.4	12.1′	54.1′
17	77°27.4	16.0	0°48.3	16.1′	11°02.3	12.2′	54.1′
18	92°27.1	S22°16.4	15°23.3	16.1′	S10°50.1	12.3′	54.1′
19	107°26.9	16.7	29°58.4	16.1′	10°37.8	12.3′	54.1′
20	122°26.6	17.0	44°33.6	16.2′	10°25.5	12.3′	54.1′
21	137°26.4	·· 17.4	59°08.7	16.2′	10°13.2	12.4′	54.1′
22	152°26.1	17.7	73°43.9	16.2′	10°00.8	12.4′	54.1′
23	167°25.9	18.0	88°19.1	16.3′	09°48.4	12.5′	54.1′
	SD = 16.2′	d = 0.3′	SD = 14.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°25.6	S22°18.3	102°54.4	16.3′	S09°35.9	12.5′	54.1′
1	197°25.3	18.7	117°29.7	16.3′	09°23.4	12.5′	54.2′
2	212°25.1	19.0	132°05.0	16.3′	09°10.9	12.5′	54.2′
3	227°24.8	·· 19.3	146°40.3	16.4′	08°58.4	12.6′	54.2′
4	242°24.6	19.6	161°15.7	16.4′	08°45.8	12.7′	54.2′
5	257°24.3	20.0	175°51.1	16.4′	08°33.1	12.6′	54.2′
6	272°24.1	S22°20.3	190°26.5	16.4′	S08°20.5	12.7′	54.2′
7	287°23.8	20.6	205°02.0	16.5′	08°07.8	12.8′	54.2′
8	302°23.5	20.9	219°37.4	16.5′	07°55.0	12.7′	54.2′
9	317°23.3	·· 21.3	234°12.9	16.5′	07°42.3	12.8′	54.2′
10	332°23.0	21.6	248°48.4	16.5′	07°29.5	12.8′	54.2′
11	347°22.8	21.9	263°24.0	16.5′	07°16.7	12.9′	54.2′
12	2°22.5	S22°22.2	277°59.5	16.6′	S07°03.8	12.9′	54.2′
13	17°22.3	22.5	292°35.1	16.6′	06°50.9	12.9′	54.2′
14	32°22.0	22.8	307°10.7	16.6′	06°38.0	12.9′	54.2′
15	47°21.7	·· 23.2	321°46.3	16.6′	06°25.1	13.0′	54.3′
16	62°21.5	23.5	336°21.9	16.6′	06°12.1	13.0′	54.3′
17	77°21.2	23.8	350°57.5	16.6′	05°59.1	13.0′	54.3′
18	92°21.0	S22°24.1	5°33.2	16.6′	S05°46.1	13.0′	54.3′
19	107°20.7	24.4	20°08.8	16.7′	05°33.1	13.1′	54.3′
20	122°20.5	24.7	34°44.5	16.7′	05°20.0	13.1′	54.3′
21	137°20.2	·· 25.0	49°20.1	16.7′	05°06.9	13.1′	54.3′
22	152°19.9	25.3	63°55.8	16.7′	04°53.8	13.2′	54.3′
23	167°19.7	25.6	78°31.5	16.7′	04°40.6	13.1′	54.3′
	SD = 16.2′	d = 0.3′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:58	10:03	▬	▬	13:37	15:41
N 70°	07:41	09:20	▬	▬	14:20	15:59
68°	07:27	08:51	10:54	12:46	14:49	16:12
66°	07:16	08:29	09:56	13:43	15:10	16:24
64°	07:06	08:12	09:23	14:16	15:28	16:34
62°	06:57	07:57	08:59	14:40	15:42	16:42
60°	06:50	07:45	08:40	15:00	15:55	16:50
N 58°	06:43	07:35	08:25	15:15	16:05	16:57
56°	06:37	07:25	08:11	15:29	16:15	17:03
54°	06:31	07:17	08:00	15:40	16:23	17:08
52°	06:26	07:09	07:49	15:51	16:31	17:14
50°	06:22	07:02	07:40	16:00	16:37	17:18
45°	06:11	06:48	07:21	16:19	16:52	17:29
N 40°	06:01	06:35	07:05	16:35	17:05	17:39
35°	05:53	06:24	06:52	16:48	17:16	17:47
30°	05:45	06:14	06:40	17:00	17:26	17:55
20°	05:29	05:57	06:20	17:20	17:44	18:11
N 10°	05:14	05:40	06:03	17:37	18:00	18:26
0°	04:58	05:24	05:46	17:54	18:16	18:42
S 10°	04:40	05:07	05:30	18:10	18:33	19:00
20°	04:19	04:48	05:12	18:28	18:53	19:22
30°	03:51	04:24	04:51	18:49	19:16	19:49
35°	03:34	04:10	04:39	19:01	19:31	20:07
40°	03:12	03:53	04:25	19:16	19:48	20:29
45°	02:44	03:32	04:08	19:33	20:09	20:57
S 50°	02:03	03:04	03:47	19:54	20:37	21:38
52°	01:40	02:51	03:37	20:04	20:51	22:02
54°	01:08	02:34	03:26	20:15	21:07	22:35
56°	////	02:15	03:13	20:28	21:27	////
58°	////	01:50	02:58	20:43	21:52	////
S 60°	////	01:15	02:40	21:02	22:28	////

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	14:26	13:32	12:58	18:23	20:46	22:45
N 70°	13:46	13:12	12:48	19:03	21:04	22:52
68°	13:17	12:56	12:40	19:30	21:18	22:58
66°	12:56	12:44	12:33	19:50	21:29	23:03
64°	12:39	12:33	12:28	20:06	21:38	23:07
62°	12:25	12:24	12:23	20:19	21:46	23:10
60°	12:12	12:16	12:18	20:30	21:53	23:13
N 58°	12:02	12:09	12:15	20:40	21:59	23:16
56°	11:53	12:03	12:11	20:48	22:04	23:18
54°	11:45	11:57	12:08	20:56	22:09	23:20
52°	11:37	11:52	12:05	21:02	22:13	23:22
50°	11:31	11:48	12:03	21:08	22:17	23:24
45°	11:16	11:38	11:57	21:21	22:25	23:28
N 40°	11:05	11:30	11:52	21:32	22:32	23:31
35°	10:55	11:23	11:48	21:41	22:38	23:34
30°	10:46	11:16	11:45	21:49	22:43	23:36
20°	10:30	11:05	11:38	22:02	22:52	23:40
N 10°	10:17	10:56	11:33	22:14	22:59	23:44
0°	10:04	10:47	11:28	22:25	23:07	23:47
S 10°	09:52	10:38	11:22	22:36	23:14	23:50
20°	09:38	10:28	11:17	22:47	23:21	23:53
30°	09:22	10:17	11:10	23:00	23:30	23:57
35°	09:13	10:10	11:07	23:08	23:35	·· ··
40°	09:03	10:03	11:02	23:17	23:40	·· ··
45°	08:50	09:54	10:57	23:26	23:47	·· ··
S 50°	08:35	09:44	10:52	23:38	23:54	·· ··
52°	08:28	09:39	10:49	23:44	23:58	·· ··
54°	08:20	09:34	10:46	23:50	·· ··	00:02
56°	08:12	09:28	10:43	23:57	·· ··	00:06
58°	08:02	09:21	10:39	·· ··	00:04	00:11
S 60°	07:50	09:13	10:35	00:08	00:13	00:16

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 5-7 22-39%
03	10:30	10:18	11:50	16:15	03:53	
04	10:07	09:55	11:50	16:57	04:36	
05	09:42	09:30	11:50	17:37	05:17	

December 06, 07, 08 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	74°33.6	150°15.8	S24°25.5	156°01.4	S24°15.3	258°20.3	N02°53.4	53°51.4	N05°50.4
1	89°36.1	165°14.9	25.3	171°01.8	15.2	273°22.5	53.3	68°53.9	50.4
2	104°38.5	180°13.9	25.0	186°02.2	15.1	288°24.7	53.2	83°56.4	50.4
3	119°41.0	195°13.0	·· 24.8	201°02.6	·· 15.0	303°27.0	·· 53.1	98°59.0	·· 50.4
4	134°43.5	210°12.1	24.5	216°02.9	14.9	318°29.2	53.0	114°01.5	50.4
5	149°45.9	225°11.2	24.3	231°03.3	14.7	333°31.4	52.9	129°04.1	50.3
6	164°48.4	240°10.3	S24°24.0	246°03.7	S24°14.6	348°33.6	N02°52.8	144°06.6	N05°50.3
7	179°50.8	255°09.3	23.8	261°04.0	14.5	3°35.8	52.7	159°09.2	50.3
8	194°53.3	270°08.4	23.5	276°04.4	14.4	18°38.0	52.6	174°11.7	50.3
9	209°55.8	285°07.5	·· 23.3	291°04.8	·· 14.3	33°40.2	·· 52.5	189°14.2	·· 50.3
10	224°58.2	300°06.6	23.0	306°05.1	14.2	48°42.4	52.4	204°16.8	50.2
11	240°00.7	315°05.7	22.8	321°05.5	14.1	63°44.6	52.3	219°19.3	50.2
12	255°03.2	330°04.8	S24°22.5	336°05.9	S24°14.0	78°46.9	N02°52.2	234°21.9	N05°50.2
13	270°05.6	345°03.8	22.2	351°06.2	13.9	93°49.1	52.1	249°24.4	50.2
14	285°08.1	0°02.9	22.0	6°06.6	13.8	108°51.3	52.0	264°26.9	50.2
15	300°10.6	15°02.0	·· 21.7	21°07.0	·· 13.7	123°53.5	·· 51.9	279°29.5	·· 50.1
16	315°13.0	30°01.1	21.5	36°07.4	13.6	138°55.7	51.8	294°32.0	50.1
17	330°15.5	45°00.2	21.2	51°07.7	13.4	153°57.9	51.7	309°34.6	50.1
18	345°18.0	59°59.3	S24°20.9	66°08.1	S24°13.3	169°00.1	N02°51.6	324°37.1	N05°50.1
19	0°20.4	74°58.3	20.7	81°08.5	13.2	184°02.4	51.5	339°39.7	50.1
20	15°22.9	89°57.4	20.4	96°08.8	13.1	199°04.6	51.4	354°42.2	50.0
21	30°25.3	104°56.5	·· 20.1	111°09.2	·· 13.0	214°06.8	·· 51.3	9°44.7	·· 50.0
22	45°27.8	119°55.6	19.9	126°09.6	12.9	229°09.0	51.2	24°47.3	50.0
23	60°30.3	134°54.7	19.6	141°09.9	12.8	244°11.2	51.1	39°49.8	50.0
Mer.pass. 18:59		ν -0.9′	d 0.2′	m -3.91	ν 0.4′	d 0.1′	m 1.26	ν 2.2′	d 0.1′ m -1.95	ν 2.5′	d 0.0′ m 0.34

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	75°32.7	149°53.8	S24°19.3	156°10.3	S24°12.6	259°13.4	N02°51.0	54°52.4	N05°50.0
1	90°35.2	164°52.9	19.0	171°10.7	12.5	274°15.6	50.9	69°54.9	49.9
2	105°37.7	179°51.9	18.8	186°11.0	12.4	289°17.9	50.8	84°57.4	49.9
3	120°40.1	194°51.0	·· 18.5	201°11.4	·· 12.3	304°20.1	·· 50.7	100°00.0	·· 49.9
4	135°42.6	209°50.1	18.2	216°11.8	12.2	319°22.3	50.6	115°02.5	49.9
5	150°45.1	224°49.2	17.9	231°12.2	12.1	334°24.5	50.6	130°05.1	49.9
6	165°47.5	239°48.3	S24°17.6	246°12.5	S24°12.0	349°26.7	N02°50.5	145°07.6	N05°49.9
7	180°50.0	254°47.4	17.4	261°12.9	11.8	4°28.9	50.4	160°10.1	49.8
8	195°52.4	269°46.5	17.1	276°13.3	11.7	19°31.2	50.3	175°12.7	49.8
9	210°54.9	284°45.6	·· 16.8	291°13.6	·· 11.6	34°33.4	·· 50.2	190°15.2	·· 49.8
10	225°57.4	299°44.7	16.5	306°14.0	11.5	49°35.6	50.1	205°17.7	49.8
11	240°59.8	314°43.7	16.2	321°14.4	11.4	64°37.8	50.0	220°20.3	49.8
12	256°02.3	329°42.8	S24°15.9	336°14.7	S24°11.2	79°40.0	N02°49.9	235°22.8	N05°49.7
13	271°04.8	344°41.9	15.6	351°15.1	11.1	94°42.3	49.8	250°25.4	49.7
14	286°07.2	359°41.0	15.3	6°15.5	11.0	109°44.5	49.7	265°27.9	49.7
15	301°09.7	14°40.1	·· 15.0	21°15.8	·· 10.9	124°46.7	·· 49.6	280°30.4	·· 49.7
16	316°12.2	29°39.2	14.8	36°16.2	10.7	139°48.9	49.5	295°33.0	49.7
17	331°14.6	44°38.3	14.5	51°16.6	10.6	154°51.1	49.4	310°35.5	49.7
18	346°17.1	59°37.4	S24°14.2	66°16.9	S24°10.5	169°53.3	N02°49.3	325°38.0	N05°49.6
19	1°19.6	74°36.5	13.9	81°17.3	10.4	184°55.6	49.2	340°40.6	49.6
20	16°22.0	89°35.6	13.6	96°17.7	10.3	199°57.8	49.1	355°43.1	49.6
21	31°24.5	104°34.7	·· 13.3	111°18.0	·· 10.1	215°00.0	·· 49.0	10°45.7	·· 49.6
22	46°26.9	119°33.8	13.0	126°18.4	10.0	230°02.2	48.9	25°48.2	49.6
23	61°29.4	134°32.8	12.7	141°18.8	09.9	245°04.5	48.8	40°50.7	49.6
Mer.pass. 18:55		ν -0.9′	d 0.3′	m -3.92	ν 0.4′	d 0.1′	m 1.26	ν 2.2′	d 0.1′ m -1.96	ν 2.5′	d 0.0′ m 0.35

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	76°31.9	149°31.9	S24°12.4	156°19.2	S24°09.8	260°06.7	N02°48.8	55°53.3	N05°49.5
1	91°34.3	164°31.0	12.0	171°19.5	09.6	275°08.9	48.7	70°55.8	49.5
2	106°36.8	179°30.1	11.7	186°19.9	09.5	290°11.1	48.6	85°58.3	49.5
3	121°39.3	194°29.2	·· 11.4	201°20.3	·· 09.4	305°13.3	·· 48.5	101°00.9	·· 49.5
4	136°41.7	209°28.3	11.1	216°20.6	09.2	320°15.6	48.4	116°03.4	49.5
5	151°44.2	224°27.4	10.8	231°21.0	09.1	335°17.8	48.3	131°05.9	49.4
6	166°46.7	239°26.5	S24°10.5	246°21.4	S24°09.0	350°20.0	N02°48.2	146°08.5	N05°49.4
7	181°49.1	254°25.6	10.2	261°21.7	08.9	5°22.2	48.1	161°11.0	49.4
8	196°51.6	269°24.7	09.9	276°22.1	08.7	20°24.5	48.0	176°13.5	49.4
9	211°54.0	284°23.8	·· 09.6	291°22.5	·· 08.6	35°26.7	·· 47.9	191°16.1	·· 49.4
10	226°56.5	299°22.9	09.2	306°22.8	08.5	50°28.9	47.8	206°18.6	49.4
11	241°59.0	314°22.0	08.9	321°23.2	08.3	65°31.1	47.7	221°21.1	49.3
12	257°01.4	329°21.1	S24°08.6	336°23.6	S24°08.2	80°33.3	N02°47.6	236°23.7	N05°49.3
13	272°03.9	344°20.2	08.3	351°23.9	08.1	95°35.6	47.5	251°26.2	49.3
14	287°06.4	359°19.3	08.0	6°24.3	07.9	110°37.8	47.5	266°28.7	49.3
15	302°08.8	14°18.4	·· 07.6	21°24.7	·· 07.8	125°40.0	·· 47.4	281°31.3	·· 49.3
16	317°11.3	29°17.5	07.3	36°25.0	07.7	140°42.2	47.3	296°33.8	49.3
17	332°13.8	44°16.6	07.0	51°25.4	07.5	155°44.5	47.2	311°36.3	49.3
18	347°16.2	59°15.7	S24°06.7	66°25.8	S24°07.4	170°46.7	N02°47.1	326°38.9	N05°49.2
19	2°18.7	74°14.8	06.3	81°26.1	07.3	185°48.9	47.0	341°41.4	49.2
20	17°21.2	89°13.9	06.0	96°26.5	07.1	200°51.1	46.9	356°43.9	49.2
21	32°23.6	104°13.0	·· 05.7	111°26.9	·· 07.0	215°53.4	·· 46.8	11°46.5	·· 49.2
22	47°26.1	119°12.1	05.3	126°27.3	06.9	230°55.6	46.7	26°49.0	49.2
23	62°28.5	134°11.2	05.0	141°27.6	06.7	245°57.8	46.6	41°51.5	49.2
Mer.pass. 18:51		ν -0.9′	d 0.3′	m -3.92	ν 0.4′	d 0.1′	m 1.25	ν 2.2′	d 0.1′ m -1.96	ν 2.5′	d 0.0′ m 0.35

Stars

	SHA	Dec
Alpheratz	357°32.2	29°15.0
Ankaa	353°04.7	-42°09.4
Schedar	349°28.0	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.1	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°16.9	89°23.0
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.9	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.1
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.8	-52°42.5
Sirius	258°23.8	-16°45.3
Adhara	255°03.6	-29°00.5
Procyon	244°48.1	5°09.1
Pollux	243°14.1	27°57.3
Avior	234°13.3	-59°35.7
Suhail	222°44.3	-43°32.6
Miaplacidus	221°37.2	-69°49.7
Alphard	217°45.3	-8°46.8
Regulus	207°31.8	11°49.7
Dubhe	193°38.2	61°35.6
Denebola	182°22.6	14°24.8
Gienah	175°41.2	-17°41.8
Acrux	172°57.6	-63°15.0
Gacrux	171°49.1	-57°16.0
Alioth	166°11.2	55°48.2
Spica	158°20.0	-11°18.4
Alkaid	152°50.5	49°10.2
Hadar	148°33.0	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.1
Rigil Kent.	139°37.5	-60°56.9
Kochab	137°21.0	74°02.2
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°05.9	-69°04.5
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.8	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.4	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.1	-46°49.6
Fomalhaut	15°11.9	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.5	15°21.6

Dec 06 Mon	SHA	Mer.pass
Venus	75°42.2	14:00
Mars	81°27.8	13:36
Jupiter	183°46.7	06:46
Saturn	339°17.8	20:21

Dec 07 Tue	SHA	Mer.pass
Venus	74°21.0	14:01
Mars	80°37.6	13:35
Jupiter	183°40.7	06:42
Saturn	339°19.6	20:17

Dec 08 Wed	SHA	Mer.pass
Venus	73°00.1	14:03
Mars	79°47.3	13:34
Jupiter	183°34.8	06:39
Saturn	339°21.4	20:13

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°19.4	S22°26.0	93°07.2	16.7′	S04°27.5	13.2′	54.3′
1	197°19.2	26.3	107°42.9	16.7′	04°14.3	13.2′	54.4′
2	212°18.9	26.6	122°18.6	16.7′	04°01.1	13.2′	54.4′
3	227°18.6	·· 26.9	136°54.3	16.7′	03°47.9	13.3′	54.4′
4	242°18.4	27.2	151°30.0	16.7′	03°34.6	13.2′	54.4′
5	257°18.1	27.5	166°05.7	16.7′	03°21.4	13.3′	54.4′
6	272°17.8	S22°27.8	180°41.4	16.7′	S03°08.1	13.3′	54.4′
7	287°17.6	28.1	195°17.1	16.7′	02°54.8	13.4′	54.4′
8	302°17.3	28.4	209°52.8	16.7′	02°41.4	13.3′	54.4′
9	317°17.1	·· 28.7	224°28.5	16.7′	02°28.1	13.3′	54.5′
10	332°16.8	29.0	239°04.1	16.7′	02°14.8	13.4′	54.5′
11	347°16.5	29.3	253°39.8	16.7′	02°01.4	13.4′	54.5′
12	2°16.3	S22°29.6	268°15.5	16.7′	S01°48.0	13.4′	54.5′
13	17°16.0	29.9	282°51.1	16.7′	01°34.6	13.4′	54.5′
14	32°15.7	30.2	297°26.8	16.6′	01°21.2	13.4′	54.5′
15	47°15.5	·· 30.5	312°02.4	16.6′	01°07.8	13.5′	54.6′
16	62°15.2	30.8	326°38.1	16.6′	00°54.3	13.4′	54.6′
17	77°15.0	31.1	341°13.7	16.6′	00°40.9	13.5′	54.6′
18	92°14.7	S22°31.4	355°49.3	16.6′	S00°27.4	13.4′	54.6′
19	107°14.4	31.7	10°24.9	16.6′	00°14.0	13.5′	54.6′
20	122°14.2	32.0	25°00.4	16.5′	S00°00.5	13.5′	54.6′
21	137°13.9	·· 32.2	39°36.0	16.5′	N00°13.0	13.5′	54.7′
22	152°13.6	32.5	54°11.5	16.5′	00°26.5	13.5′	54.7′
23	167°13.4	32.8	68°47.0	16.5′	00°40.0	13.5′	54.7′
	SD = 16.2′	d = 0.3′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°13.1	S22°33.1	83°22.5	16.5′	N00°53.5	13.5′	54.7′
1	197°12.8	33.4	97°58.0	16.4′	01°07.0	13.6′	54.7′
2	212°12.6	33.7	112°33.4	16.4′	01°20.6	13.5′	54.8′
3	227°12.3	·· 34.0	127°08.8	16.4′	01°34.1	13.5′	54.8′
4	242°12.0	34.3	141°44.2	16.4′	01°47.6	13.6′	54.8′
5	257°11.8	34.6	156°19.6	16.3′	02°01.2	13.5′	54.8′
6	272°11.5	S22°34.8	170°54.9	16.3′	N02°14.7	13.5′	54.8′
7	287°11.2	35.1	185°30.2	16.3′	02°28.2	13.6′	54.9′
8	302°11.0	35.4	200°05.5	16.2′	02°41.8	13.5′	54.9′
9	317°10.7	·· 35.7	214°40.7	16.2′	02°55.3	13.6′	54.9′
10	332°10.4	36.0	229°15.9	16.2′	03°08.9	13.5′	54.9′
11	347°10.2	36.3	243°51.1	16.1′	03°22.4	13.6′	54.9′
12	2°09.9	S22°36.5	258°26.2	16.1′	N03°36.0	13.5′	55.0′
13	17°09.6	36.8	273°01.3	16.1′	03°49.5	13.5′	55.0′
14	32°09.4	37.1	287°36.4	16.0′	04°03.0	13.6′	55.0′
15	47°09.1	·· 37.4	302°11.4	16.0′	04°16.6	13.5′	55.0′
16	62°08.8	37.7	316°46.4	15.9′	04°30.1	13.5′	55.1′
17	77°08.6	37.9	331°21.3	15.9′	04°43.6	13.5′	55.1′
18	92°08.3	S22°38.2	345°56.2	15.9′	N04°57.1	13.5′	55.1′
19	107°08.0	38.5	0°31.1	15.8′	05°10.6	13.6′	55.1′
20	122°07.7	38.8	15°05.9	15.8′	05°24.2	13.4′	55.2′
21	137°07.5	·· 39.0	29°40.7	15.7′	05°37.6	13.5′	55.2′
22	152°07.2	39.3	44°15.4	15.7′	05°51.1	13.5′	55.2′
23	167°06.9	39.6	58°50.0	15.6′	06°04.6	13.5′	55.2′
	SD = 16.2′	d = 0.3′	SD = 14.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°06.7	S22°39.8	73°24.6	15.6′	N06°18.1	13.4′	55.2′
1	197°06.4	40.1	87°59.2	15.5′	06°31.5	13.5′	55.3′
2	212°06.1	40.4	102°33.7	15.5′	06°45.0	13.4′	55.3′
3	227°05.8	·· 40.7	117°08.2	15.4′	06°58.4	13.4′	55.3′
4	242°05.6	40.9	131°42.6	15.3′	07°11.8	13.4′	55.4′
5	257°05.3	41.2	146°16.9	15.3′	07°25.2	13.4′	55.4′
6	272°05.0	S22°41.5	160°51.2	15.2′	N07°38.6	13.4′	55.4′
7	287°04.8	41.7	175°25.4	15.2′	07°52.0	13.3′	55.4′
8	302°04.5	42.0	189°59.6	15.1′	08°05.3	13.3′	55.5′
9	317°04.2	·· 42.3	204°33.7	15.0′	08°18.6	13.3′	55.5′
10	332°03.9	42.5	219°07.8	15.0′	08°31.9	13.3′	55.5′
11	347°03.7	42.8	233°41.7	14.9′	08°45.2	13.3′	55.5′
12	2°03.4	S22°43.0	248°15.7	14.9′	N08°58.5	13.2′	55.6′
13	17°03.1	43.3	262°49.5	14.8′	09°11.7	13.3′	55.6′
14	32°02.9	43.6	277°23.3	14.7′	09°25.0	13.2′	55.6′
15	47°02.6	·· 43.8	291°57.0	14.6′	09°38.2	13.1′	55.7′
16	62°02.3	44.1	306°30.7	14.6′	09°51.3	13.2′	55.7′
17	77°02.0	44.3	321°04.2	14.5′	10°04.5	13.1′	55.7′
18	92°01.8	S22°44.6	335°37.7	14.4′	N10°17.6	13.1′	55.7′
19	107°01.5	44.9	350°11.2	14.4′	10°30.7	13.1′	55.8′
20	122°01.2	45.1	4°44.5	14.3′	10°43.8	13.0′	55.8′
21	137°00.9	·· 45.4	19°17.8	14.2′	10°56.8	13.0′	55.8′
22	152°00.7	45.6	33°51.0	14.1′	11°09.8	13.0′	55.9′
23	167°00.4	45.9	48°24.1	14.0′	11°22.8	12.9′	55.9′
	SD = 16.2′	d = 0.3′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:05	10:16	▬	▬	13:26	15:37
N 70°	07:47	09:29	▬	▬	14:14	15:55
68°	07:33	08:58	11:17	12:26	14:44	16:09
66°	07:21	08:35	10:06	13:36	15:07	16:21
64°	07:11	08:17	09:31	14:12	15:25	16:32
62°	07:02	08:02	09:05	14:37	15:40	16:41
60°	06:54	07:50	08:46	14:57	15:53	16:48
N 58°	06:47	07:39	08:29	15:13	16:04	16:55
56°	06:41	07:29	08:16	15:27	16:13	17:02
54°	06:35	07:21	08:04	15:39	16:22	17:07
52°	06:30	07:13	07:53	15:49	16:30	17:13
50°	06:25	07:06	07:44	15:59	16:37	17:18
45°	06:14	06:51	07:24	16:18	16:52	17:29
N 40°	06:04	06:38	07:08	16:35	17:05	17:39
35°	05:55	06:26	06:54	16:48	17:16	17:48
30°	05:47	06:16	06:43	17:00	17:26	17:56
20°	05:31	05:58	06:22	17:20	17:44	18:12
N 10°	05:15	05:42	06:04	17:38	18:01	18:27
0°	04:59	05:25	05:48	17:55	18:17	18:44
S 10°	04:41	05:08	05:31	18:12	18:35	19:02
20°	04:19	04:48	05:13	18:30	18:55	19:24
30°	03:51	04:24	04:51	18:51	19:19	19:52
35°	03:33	04:10	04:39	19:04	19:33	20:10
40°	03:11	03:52	04:25	19:18	19:51	20:32
45°	02:42	03:31	04:07	19:36	20:13	21:01
S 50°	02:00	03:03	03:46	19:57	20:41	21:43
52°	01:36	02:48	03:36	20:08	20:55	22:08
54°	01:00	02:32	03:24	20:19	21:12	22:45
56°	////	02:11	03:11	20:33	21:32	////
58°	////	01:45	02:55	20:48	21:59	////
S 60°	////	01:07	02:36	21:07	22:38	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	12:30	12:03	11:33	·· ··	00:39	02:37
N 70°	12:27	12:08	11:46	·· ··	00:38	02:26
68°	12:26	12:11	11:56	·· ··	00:37	02:18
66°	12:24	12:15	12:05	·· ··	00:36	02:11
64°	12:23	12:17	12:12	·· ··	00:35	02:05
62°	12:21	12:20	12:19	·· ··	00:34	02:00
60°	12:20	12:22	12:24	·· ··	00:34	01:56
N 58°	12:19	12:24	12:29	·· ··	00:33	01:52
56°	12:18	12:26	12:34	·· ··	00:33	01:49
54°	12:18	12:27	12:38	·· ··	00:32	01:46
52°	12:17	12:29	12:41	·· ··	00:32	01:43
50°	12:16	12:30	12:45	·· ··	00:32	01:41
45°	12:15	12:33	12:52	·· ··	00:31	01:35
N 40°	12:14	12:35	12:58	·· ··	00:30	01:31
35°	12:13	12:37	13:03	·· ··	00:30	01:27
30°	12:12	12:39	13:08	·· ··	00:29	01:24
20°	12:10	12:42	13:16	·· ··	00:28	01:18
N 10°	12:09	12:45	13:23	·· ··	00:28	01:13
0°	12:08	12:48	13:30	·· ··	00:27	01:08
S 10°	12:06	12:51	13:37	·· ··	00:26	01:03
20°	12:05	12:54	13:44	·· ··	00:25	00:58
30°	12:03	12:57	13:53	·· ··	00:24	00:52
35°	12:02	12:59	13:58	00:00	00:24	00:49
40°	12:01	13:01	14:03	00:02	00:23	00:45
45°	12:00	13:04	14:10	00:05	00:23	00:41
S 50°	11:59	13:07	14:18	00:08	00:22	00:36
52°	11:58	13:09	14:21	00:10	00:21	00:33
54°	11:58	13:10	14:25	00:12	00:21	00:31
56°	11:57	13:12	14:30	00:13	00:21	00:28
58°	11:56	13:14	14:35	00:16	00:20	00:25
S 60°	11:55	13:16	14:40	00:18	00:20	00:21

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 8-10 48-67%
06	09:18	09:05	11:51	18:17	05:57	
07	08:52	08:40	11:51	18:58	06:37	
08	08:27	08:14	11:52	19:40	07:19	

December 09, 10, 11 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°31.0	149°10.3	S24°04.7	156°28.0	S24°06.6	261°00.1	N02°46.5	56°54.1	N05°49.1
1	92°33.5	164°09.4	04.3	171°28.4	06.4	276°02.3	46.4	71°56.6	49.1
2	107°35.9	179°08.5	04.0	186°28.7	06.3	291°04.5	46.4	86°59.1	49.1
3	122°38.4	194°07.6	·· 03.7	201°29.1	·· 06.2	306°06.7	·· 46.3	102°01.7	·· 49.1
4	137°40.9	209°06.7	03.3	216°29.5	06.0	321°09.0	46.2	117°04.2	49.1
5	152°43.3	224°05.8	03.0	231°29.8	05.9	336°11.2	46.1	132°06.7	49.1
6	167°45.8	239°04.9	S24°02.6	246°30.2	S24°05.7	351°13.4	N02°46.0	147°09.3	N05°49.1
7	182°48.3	254°04.0	02.3	261°30.6	05.6	6°15.6	45.9	162°11.8	49.0
8	197°50.7	269°03.1	02.0	276°30.9	05.5	21°17.9	45.8	177°14.3	49.0
9	212°53.2	284°02.2	·· 01.6	291°31.3	·· 05.3	36°20.1	·· 45.7	192°16.8	·· 49.0
10	227°55.7	299°01.3	01.3	306°31.7	05.2	51°22.3	45.6	207°19.4	49.0
11	242°58.1	314°00.4	00.9	321°32.0	05.0	66°24.6	45.5	222°21.9	49.0
12	258°00.6	328°59.5	S24°00.6	336°32.4	S24°04.9	81°26.8	N02°45.4	237°24.4	N05°49.0
13	273°03.0	343°58.6	24°00.2	351°32.8	04.8	96°29.0	45.4	252°27.0	48.9
14	288°05.5	358°57.8	23°59.9	6°33.1	04.6	111°31.3	45.3	267°29.5	48.9
15	303°08.0	13°56.9	·· 59.5	21°33.5	·· 04.5	126°33.5	·· 45.2	282°32.0	·· 48.9
16	318°10.4	28°56.0	59.2	36°33.9	04.3	141°35.7	45.1	297°34.6	48.9
17	333°12.9	43°55.1	58.8	51°34.2	04.2	156°37.9	45.0	312°37.1	48.9
18	348°15.4	58°54.2	S23°58.4	66°34.6	S24°04.0	171°40.2	N02°44.9	327°39.6	N05°48.9
19	3°17.8	73°53.3	58.1	81°35.0	03.9	186°42.4	44.8	342°42.1	48.9
20	18°20.3	88°52.4	57.7	96°35.3	03.7	201°44.6	44.7	357°44.7	48.8
21	33°22.8	103°51.5	·· 57.4	111°35.7	·· 03.6	216°46.9	·· 44.6	12°47.2	·· 48.8
22	48°25.2	118°50.6	57.0	126°36.1	03.4	231°49.1	44.6	27°49.7	48.8
23	63°27.7	133°49.7	56.6	141°36.5	03.3	246°51.3	44.5	42°52.3	48.8
Mer.pass. 18:47		ν -0.9′ d 0.3′		m -3.92	ν 0.4′ d 0.1′		m 1.25	ν 2.2′ d 0.1′	m -1.97	ν 2.5′ d 0.0′	m 0.36

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°30.1	148°48.8	S23°56.3	156°36.8	S24°03.1	261°53.6	N02°44.4	57°54.8	N05°48.8
1	93°32.6	163°48.0	55.9	171°37.2	03.0	276°55.8	44.3	72°57.3	48.8
2	108°35.1	178°47.1	55.5	186°37.6	02.8	291°58.0	44.2	87°59.8	48.8
3	123°37.5	193°46.2	·· 55.2	201°37.9	·· 02.7	307°00.3	·· 44.1	103°02.4	·· 48.8
4	138°40.0	208°45.3	54.8	216°38.3	02.5	322°02.5	44.0	118°04.9	48.7
5	153°42.5	223°44.4	54.4	231°38.7	02.4	337°04.7	43.9	133°07.4	48.7
6	168°44.9	238°43.5	S23°54.1	246°39.0	S24°02.2	352°07.0	N02°43.8	148°09.9	N05°48.7
7	183°47.4	253°42.6	53.7	261°39.4	02.1	7°09.2	43.8	163°12.5	48.7
8	198°49.9	268°41.7	53.3	276°39.8	01.9	22°11.4	43.7	178°15.0	48.7
9	213°52.3	283°40.9	·· 52.9	291°40.1	·· 01.8	37°13.7	·· 43.6	193°17.5	·· 48.7
10	228°54.8	298°40.0	52.6	306°40.5	01.6	52°15.9	43.5	208°20.1	48.7
11	243°57.3	313°39.1	52.2	321°40.9	01.5	67°18.2	43.4	223°22.6	48.6
12	258°59.7	328°38.2	S23°51.8	336°41.2	S24°01.3	82°20.4	N02°43.3	238°25.1	N05°48.6
13	274°02.2	343°37.3	51.4	351°41.6	01.2	97°22.6	43.2	253°27.6	48.6
14	289°04.6	358°36.4	51.0	6°42.0	01.0	112°24.9	43.1	268°30.2	48.6
15	304°07.1	13°35.5	·· 50.7	21°42.3	·· 00.8	127°27.1	·· 43.1	283°32.7	·· 48.6
16	319°09.6	28°34.7	50.3	36°42.7	00.7	142°29.3	43.0	298°35.2	48.6
17	334°12.0	43°33.8	49.9	51°43.1	00.5	157°31.6	42.9	313°37.7	48.6
18	349°14.5	58°32.9	S23°49.5	66°43.4	S24°00.4	172°33.8	N02°42.8	328°40.3	N05°48.6
19	4°17.0	73°32.0	49.1	81°43.8	00.2	187°36.0	42.7	343°42.8	48.5
20	19°19.4	88°31.1	48.7	96°44.2	24°00.1	202°38.3	42.6	358°45.3	48.5
21	34°21.9	103°30.2	·· 48.3	111°44.5	23°59.9	217°40.5	·· 42.5	13°47.8	·· 48.5
22	49°24.4	118°29.4	47.9	126°44.9	59.7	232°42.8	42.5	28°50.4	48.5
23	64°26.8	133°28.5	47.6	141°45.3	59.6	247°45.0	42.4	43°52.9	48.5
Mer.pass. 18:43		ν -0.9′ d 0.4′		m -3.92	ν 0.4′ d 0.1′		m 1.25	ν 2.2′ d 0.1′	m -1.97	ν 2.5′ d 0.0′	m 0.36

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	79°29.3	148°27.6	S23°47.2	156°45.6	S23°59.4	262°47.2	N02°42.3	58°55.4	N05°48.5
1	94°31.8	163°26.7	46.8	171°46.0	59.3	277°49.5	42.2	73°57.9	48.5
2	109°34.2	178°25.8	46.4	186°46.4	59.1	292°51.7	42.1	89°00.4	48.5
3	124°36.7	193°25.0	·· 46.0	201°46.8	·· 58.9	307°54.0	·· 42.0	104°03.0	·· 48.4
4	139°39.1	208°24.1	45.6	216°47.1	58.8	322°56.2	41.9	119°05.5	48.4
5	154°41.6	223°23.2	45.2	231°47.5	58.6	337°58.4	41.9	134°08.0	48.4
6	169°44.1	238°22.3	S23°44.8	246°47.9	S23°58.5	353°00.7	N02°41.8	149°10.5	N05°48.4
7	184°46.5	253°21.4	44.4	261°48.2	58.3	8°02.9	41.7	164°13.1	48.4
8	199°49.0	268°20.6	44.0	276°48.6	58.1	23°05.2	41.6	179°15.6	48.4
9	214°51.5	283°19.7	·· 43.6	291°49.0	·· 58.0	38°07.4	·· 41.5	194°18.1	·· 48.4
10	229°53.9	298°18.8	43.2	306°49.3	57.8	53°09.6	41.4	209°20.6	48.4
11	244°56.4	313°17.9	42.7	321°49.7	57.6	68°11.9	41.3	224°23.1	48.4
12	259°58.9	328°17.1	S23°42.3	336°50.1	S23°57.5	83°14.1	N02°41.3	239°25.7	N05°48.3
13	275°01.3	343°16.2	41.9	351°50.4	57.3	98°16.4	41.2	254°28.2	48.3
14	290°03.8	358°15.3	41.5	6°50.8	57.1	113°18.6	41.1	269°30.7	48.3
15	305°06.3	13°14.4	·· 41.1	21°51.2	·· 57.0	128°20.8	·· 41.0	284°33.2	·· 48.3
16	320°08.7	28°13.6	40.7	36°51.5	56.8	143°23.1	40.9	299°35.8	48.3
17	335°11.2	43°12.7	40.3	51°51.9	56.6	158°25.3	40.8	314°38.3	48.3
18	350°13.6	58°11.8	S23°39.9	66°52.3	S23°56.5	173°27.6	N02°40.8	329°40.8	N05°48.3
19	5°16.1	73°10.9	39.4	81°52.6	56.3	188°29.8	40.7	344°43.3	48.3
20	20°18.6	88°10.1	39.0	96°53.0	56.1	203°32.1	40.6	359°45.8	48.3
21	35°21.0	103°09.2	·· 38.6	111°53.4	·· 55.9	218°34.3	·· 40.5	14°48.4	·· 48.2
22	50°23.5	118°08.3	38.2	126°53.7	55.8	233°36.6	40.4	29°50.9	48.2
23	65°26.0	133°07.5	37.8	141°54.1	55.6	248°38.8	40.3	44°53.4	48.2
Mer.pass. 18:39		ν -0.9′ d 0.4′		m -3.93	ν 0.4′ d 0.2′		m 1.25	ν 2.2′ d 0.1′	m -1.98	ν 2.5′ d 0.0′	m 0.37

Stars

	SHA	Dec
Alpheratz	357°32.2	29°15.0
Ankaa	353°04.7	-42°09.4
Schedar	349°28.0	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.1	-57°05.8
Hamal	327°48.2	23°35.8
Polaris	312°17.4	89°23.0
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.7
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.9	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.5	28°37.8
Alnilam	275°35.0	-1°11.1
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.8	-52°42.5
Sirius	258°23.8	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.1	5°09.1
Pollux	243°14.1	27°57.3
Avior	234°13.3	-59°35.8
Suhail	222°44.3	-43°32.6
Miaplacidus	221°37.2	-69°49.7
Alphard	217°45.3	-8°46.8
Regulus	207°31.8	11°49.7
Dubhe	193°38.2	61°35.6
Denebola	182°22.6	14°24.8
Gienah	175°41.2	-17°41.8
Acrux	172°57.6	-63°15.0
Gacrux	171°49.1	-57°16.0
Alioth	166°11.2	55°48.2
Spica	158°20.0	-11°18.4
Alkaid	152°50.5	49°10.2
Hadar	148°33.0	-60°30.3
Menkent	147°55.1	-36°30.3
Arcturus	145°46.0	19°02.1
Rigil Kent.	139°37.5	-60°56.9
Kochab	137°21.0	74°02.2
Zuben'ubi	136°53.7	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°05.9	-69°04.5
Sabik	102°00.4	-15°45.5
Shaula	96°07.6	-37°07.4
Rasalhague	95°56.7	12°32.5
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.8	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.5	-56°38.8
Deneb	49°24.4	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.1	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.5	15°21.5

Dec 09 Thu	SHA	Mer.pass
Venus	71°39.3	14:04
Mars	78°57.0	13:34
Jupiter	183°29.0	06:35
Saturn	339°23.1	20:09

Dec 10 Fri	SHA	Mer.pass
Venus	70°18.7	14:06
Mars	78°06.7	13:33
Jupiter	183°23.4	06:31
Saturn	339°24.6	20:05

Dec 11 Sat	SHA	Mer.pass
Venus	68°58.3	14:07
Mars	77°16.4	13:33
Jupiter	183°17.9	06:28
Saturn	339°26.1	20:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°00.1	S22°46.1	62°57.2	14.0′	N11°35.7	12.9′	55.9′
1	196°59.8	46.4	77°30.1	13.9′	11°48.6	12.9′	56.0′
2	211°59.6	46.6	92°03.0	13.8′	12°01.5	12.8′	56.0′
3	226°59.3	·· 46.9	106°35.8	13.7′	12°14.3	12.8′	56.0′
4	241°59.0	47.1	121°08.6	13.6′	12°27.1	12.7′	56.1′
5	256°58.7	47.4	135°41.2	13.6′	12°39.8	12.7′	56.1′
6	271°58.5	S22°47.6	150°13.7	13.5′	N12°52.5	12.7′	56.1′
7	286°58.2	47.9	164°46.2	13.4′	13°05.2	12.6′	56.1′
8	301°57.9	48.1	179°18.6	13.3′	13°17.8	12.6′	56.2′
9	316°57.6	·· 48.4	193°50.9	13.2′	13°30.4	12.5′	56.2′
10	331°57.3	48.6	208°23.1	13.1′	13°42.9	12.5′	56.2′
11	346°57.1	48.9	222°55.2	13.0′	13°55.4	12.5′	56.3′
12	1°56.8	S22°49.1	237°27.2	12.9′	N14°07.9	12.3′	56.3′
13	16°56.5	49.3	251°59.1	12.8′	14°20.2	12.4′	56.3′
14	31°56.2	49.6	266°30.9	12.7′	14°32.6	12.3′	56.4′
15	46°56.0	·· 49.8	281°02.7	12.6′	14°44.9	12.2′	56.4′
16	61°55.7	50.1	295°34.3	12.5′	14°57.1	12.2′	56.4′
17	76°55.4	50.3	310°05.8	12.4′	15°09.3	12.1′	56.5′
18	91°55.1	S22°50.6	324°37.3	12.3′	N15°21.4	12.1′	56.5′
19	106°54.8	50.8	339°08.6	12.2′	15°33.5	12.0′	56.5′
20	121°54.6	51.0	353°39.9	12.1′	15°45.5	12.0′	56.6′
21	136°54.3	·· 51.3	8°11.0	12.0′	15°57.5	11.9′	56.6′
22	151°54.0	51.5	22°42.0	11.9′	16°09.4	11.8′	56.6′
23	166°53.7	51.7	37°13.0	11.8′	16°21.2	11.8′	56.7′
	SD = 16.2′	d = 0.3′	SD = 15.3′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°53.4	S22°52.0	51°43.8	11.7′	N16°33.0	11.7′	56.7′
1	196°53.2	52.2	66°14.5	11.6′	16°44.7	11.6′	56.7′
2	211°52.9	52.4	80°45.1	11.5′	16°56.3	11.6′	56.8′
3	226°52.6	·· 52.7	95°15.6	11.4′	17°07.9	11.5′	56.8′
4	241°52.3	52.9	109°46.0	11.3′	17°19.4	11.4′	56.8′
5	256°52.0	53.1	124°16.3	11.2′	17°30.8	11.4′	56.9′
6	271°51.8	S22°53.4	138°46.5	11.1′	N17°42.2	11.2′	56.9′
7	286°51.5	53.6	153°16.6	11.0′	17°53.4	11.2′	56.9′
8	301°51.2	53.8	167°46.5	10.9′	18°04.6	11.2′	57.0′
9	316°50.9	·· 54.0	182°16.4	10.7′	18°15.8	11.0′	57.0′
10	331°50.6	54.3	196°46.1	10.6′	18°26.8	11.0′	57.0′
11	346°50.4	54.5	211°15.8	10.5′	18°37.8	10.9′	57.1′
12	1°50.1	S22°54.7	225°45.3	10.4′	N18°48.7	10.8′	57.1′
13	16°49.8	54.9	240°14.7	10.3′	18°59.5	10.7′	57.2′
14	31°49.5	55.2	254°44.0	10.2′	19°10.2	10.7′	57.2′
15	46°49.2	·· 55.4	269°13.1	10.1′	19°20.9	10.5′	57.2′
16	61°48.9	55.6	283°42.2	9.9′	19°31.4	10.5′	57.3′
17	76°48.7	55.8	298°11.1	9.8′	19°41.9	10.3′	57.3′
18	91°48.4	S22°56.0	312°40.0	9.7′	N19°52.2	10.3′	57.3′
19	106°48.1	56.3	327°08.7	9.6′	20°02.5	10.2′	57.4′
20	121°47.8	56.5	341°37.3	9.5′	20°12.7	10.1′	57.4′
21	136°47.5	·· 56.7	356°05.7	9.4′	20°22.8	10.0′	57.4′
22	151°47.2	56.9	10°34.1	9.2′	20°32.8	9.9′	57.5′
23	166°47.0	57.1	25°02.3	9.1′	20°42.7	9.8′	57.5′
	SD = 16.2′	d = 0.2′	SD = 15.5′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°46.7	S22°57.4	39°30.4	9.0′	N20°52.5	9.7′	57.5′
1	196°46.4	57.6	53°58.4	8.9′	21°02.2	9.5′	57.6′
2	211°46.1	57.8	68°26.3	8.8′	21°11.7	9.5′	57.6′
3	226°45.8	·· 58.0	82°54.1	8.6′	21°21.2	9.4′	57.6′
4	241°45.5	58.2	97°21.7	8.5′	21°30.6	9.3′	57.7′
5	256°45.3	58.4	111°49.2	8.4′	21°39.9	9.1′	57.7′
6	271°45.0	S22°58.6	126°16.6	8.3′	N21°49.0	9.0′	57.7′
7	286°44.7	58.8	140°43.9	8.2′	21°58.0	9.0′	57.8′
8	301°44.4	59.0	155°11.1	8.0′	22°07.0	8.8′	57.8′
9	316°44.1	·· 59.3	169°38.1	7.9′	22°15.8	8.7′	57.8′
10	331°43.8	59.5	184°05.1	7.8′	22°24.5	8.5′	57.9′
11	346°43.5	59.7	198°31.9	7.7′	22°33.0	8.5′	57.9′
12	1°43.3	S22°59.9	212°58.6	7.6′	N22°41.5	8.3′	58.0′
13	16°43.0	23°00.1	227°25.2	7.5′	22°49.8	8.2′	58.0′
14	31°42.7	00.3	241°51.6	7.3′	22°58.0	8.1′	58.0′
15	46°42.4	·· 00.5	256°18.0	7.2′	23°06.1	7.9′	58.1′
16	61°42.1	00.7	270°44.2	7.1′	23°14.0	7.9′	58.1′
17	76°41.8	00.9	285°10.3	7.0′	23°21.9	7.6′	58.1′
18	91°41.5	S23°01.1	299°36.3	6.9′	N23°29.5	7.6′	58.2′
19	106°41.3	01.3	314°02.2	6.8′	23°37.1	7.4′	58.2′
20	121°41.0	01.5	328°27.9	6.7′	23°44.5	7.3′	58.2′
21	136°40.7	·· 01.7	342°53.6	6.5′	23°51.8	7.2′	58.3′
22	151°40.4	01.9	357°19.1	6.4′	23°59.0	7.0′	58.3′
23	166°40.1	02.1	11°44.5	6.3′	24°06.0	6.8′	58.3′
	SD = 16.2′	d = 0.2′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:12	10:29	▬	▬	13:16	15:33
N 70°	07:53	09:37	▬	▬	14:08	15:52
68°	07:38	09:04	▬	▬	14:40	16:07
66°	07:25	08:41	10:15	13:30	15:04	16:20
64°	07:15	08:22	09:37	14:08	15:23	16:30
62°	07:06	08:07	09:11	14:34	15:38	16:39
60°	06:58	07:54	08:50	14:55	15:51	16:47
N 58°	06:50	07:43	08:34	15:11	16:02	16:55
56°	06:44	07:33	08:20	15:26	16:12	17:01
54°	06:38	07:24	08:07	15:38	16:21	17:07
52°	06:33	07:16	07:57	15:49	16:29	17:12
50°	06:28	07:09	07:47	15:58	16:36	17:18
45°	06:16	06:53	07:27	16:18	16:52	17:29
N 40°	06:06	06:40	07:11	16:35	17:05	17:39
35°	05:57	06:29	06:57	16:48	17:16	17:48
30°	05:49	06:18	06:45	17:00	17:27	17:57
20°	05:33	06:00	06:24	17:21	17:45	18:13
N 10°	05:17	05:43	06:06	17:39	18:02	18:28
0°	05:00	05:26	05:49	17:56	18:19	18:45
S 10°	04:42	05:09	05:32	18:14	18:37	19:04
20°	04:20	04:49	05:13	18:32	18:57	19:26
30°	03:51	04:25	04:52	18:54	19:21	19:54
35°	03:33	04:10	04:39	19:06	19:36	20:12
40°	03:11	03:52	04:24	19:21	19:54	20:35
45°	02:41	03:30	04:07	19:39	20:16	21:05
S 50°	01:58	03:01	03:45	20:01	20:45	21:48
52°	01:32	02:47	03:35	20:11	20:59	22:14
54°	00:54	02:30	03:23	20:23	21:16	22:54
56°	////	02:09	03:09	20:37	21:37	////
58°	////	01:41	02:53	20:53	22:05	////
S 60°	////	01:00	02:34	21:12	22:48	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	10:52	▭	▭	04:49	▭	▭
N 70°	11:18	10:29	▭	04:25	06:53	▭
68°	11:38	11:11	▭	04:07	06:13	▭
66°	11:54	11:40	11:14	03:53	05:45	07:59
64°	12:07	12:01	11:55	03:41	05:24	07:19
62°	12:18	12:19	12:23	03:31	05:08	06:52
60°	12:28	12:34	12:45	03:22	04:54	06:31
N 58°	12:36	12:46	13:02	03:15	04:42	06:14
56°	12:44	12:57	13:17	03:08	04:32	05:59
54°	12:50	13:07	13:30	03:02	04:23	05:47
52°	12:56	13:16	13:42	02:57	04:15	05:36
50°	13:02	13:23	13:52	02:52	04:08	05:26
45°	13:14	13:40	14:14	02:42	03:53	05:06
N 40°	13:24	13:54	14:31	02:34	03:40	04:49
35°	13:32	14:06	14:46	02:27	03:29	04:35
30°	13:40	14:16	14:58	02:20	03:20	04:24
20°	13:53	14:34	15:20	02:09	03:04	04:03
N 10°	14:04	14:49	15:40	02:00	02:51	03:45
0°	14:15	15:04	15:58	01:51	02:38	03:29
S 10°	14:26	15:19	16:16	01:42	02:25	03:12
20°	14:38	15:34	16:35	01:33	02:11	02:55
30°	14:51	15:53	16:58	01:22	01:56	02:35
35°	14:59	16:04	17:11	01:16	01:47	02:23
40°	15:08	16:16	17:26	01:09	01:37	02:10
45°	15:18	16:31	17:45	01:01	01:25	01:54
S 50°	15:31	16:49	18:08	00:51	01:10	01:35
52°	15:37	16:57	18:19	00:47	01:04	01:26
54°	15:44	17:07	18:32	00:42	00:56	01:15
56°	15:51	17:18	18:46	00:37	00:48	01:04
58°	16:00	17:30	19:03	00:31	00:39	00:51
S 60°	16:10	17:45	19:24	00:24	00:28	00:35

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 76-91%
09	08:00	07:47	11:52	20:26	08:03	
10	07:34	07:20	11:53	21:16	08:51	
11	07:07	06:53	11:53	22:11	09:43	

December 12, 13, 14 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	80°28.4	148°06.6	S23°37.3	156°54.5	S23°55.4	263°41.0	N02°40.2	59°55.9	N05°48.2
1	95°30.9	163°05.7	36.9	171°54.8	55.3	278°43.3	40.2	74°58.4	48.2
2	110°33.4	178°04.8	36.5	186°55.2	55.1	293°45.5	40.1	90°01.0	48.2
3	125°35.8	193°04.0	·· 36.1	201°55.6	·· 54.9	308°47.8	·· 40.0	105°03.5	·· 48.2
4	140°38.3	208°03.1	35.6	216°56.0	54.7	323°50.0	39.9	120°06.0	48.2
5	155°40.8	223°02.2	35.2	231°56.3	54.6	338°52.3	39.8	135°08.5	48.2
6	170°43.2	238°01.4	S23°34.8	246°56.7	S23°54.4	353°54.5	N02°39.8	150°11.0	N05°48.2
7	185°45.7	253°00.5	34.3	261°57.1	54.2	8°56.8	39.7	165°13.6	48.1
8	200°48.1	267°59.6	33.9	276°57.4	54.0	23°59.0	39.6	180°16.1	48.1
9	215°50.6	282°58.8	·· 33.5	291°57.8	·· 53.9	39°01.3	·· 39.5	195°18.6	·· 48.1
10	230°53.1	297°57.9	33.0	306°58.2	53.7	54°03.5	39.4	210°21.1	48.1
11	245°55.5	312°57.0	32.6	321°58.5	53.5	69°05.7	39.3	225°23.6	48.1
12	260°58.0	327°56.2	S23°32.2	336°58.9	S23°53.3	84°08.0	N02°39.3	240°26.1	N05°48.1
13	276°00.5	342°55.3	31.7	351°59.3	53.2	99°10.2	39.2	255°28.7	48.1
14	291°02.9	357°54.4	31.3	6°59.6	53.0	114°12.5	39.1	270°31.2	48.1
15	306°05.4	12°53.6	·· 30.8	22°00.0	·· 52.8	129°14.7	·· 39.0	285°33.7	·· 48.1
16	321°07.9	27°52.7	30.4	37°00.4	52.6	144°17.0	38.9	300°36.2	48.1
17	336°10.3	42°51.8	30.0	52°00.7	52.4	159°19.2	38.8	315°38.7	48.1
18	351°12.8	57°51.0	S23°29.5	67°01.1	S23°52.3	174°21.5	N02°38.8	330°41.2	N05°48.0
19	6°15.2	72°50.1	29.1	82°01.5	52.1	189°23.7	38.7	345°43.8	48.0
20	21°17.7	87°49.3	28.6	97°01.8	51.9	204°26.0	38.6	0°46.3	48.0
21	36°20.2	102°48.4	·· 28.2	112°02.2	·· 51.7	219°28.2	·· 38.5	15°48.8	·· 48.0
22	51°22.6	117°47.5	27.7	127°02.6	51.5	234°30.5	38.4	30°51.3	48.0
23	66°25.1	132°46.7	27.3	142°02.9	51.4	249°32.7	38.4	45°53.8	48.0
Mer.pass. 18:35		ν -0.9′	d 0.4′	m -3.93	ν 0.4′	d 0.2′	m 1.24	ν 2.2′	d 0.1′ m -1.99	ν 2.5′	d 0.0′ m 0.37

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	81°27.6	147°45.8	S23°26.8	157°03.3	S23°51.2	264°35.0	N02°38.3	60°56.3	N05°48.0
1	96°30.0	162°45.0	26.4	172°03.7	51.0	279°37.2	38.2	75°58.9	48.0
2	111°32.5	177°44.1	25.9	187°04.1	50.8	294°39.5	38.1	91°01.4	48.0
3	126°35.0	192°43.2	·· 25.4	202°04.4	·· 50.6	309°41.7	·· 38.0	106°03.9	·· 48.0
4	141°37.4	207°42.4	25.0	217°04.8	50.4	324°44.0	38.0	121°06.4	48.0
5	156°39.9	222°41.5	24.5	232°05.2	50.3	339°46.2	37.9	136°08.9	48.0
6	171°42.4	237°40.7	S23°24.1	247°05.5	S23°50.1	354°48.5	N02°37.8	151°11.4	N05°47.9
7	186°44.8	252°39.8	23.6	262°05.9	49.9	9°50.8	37.7	166°13.9	47.9
8	201°47.3	267°38.9	23.1	277°06.3	49.7	24°53.0	37.6	181°16.5	47.9
9	216°49.7	282°38.1	·· 22.7	292°06.6	·· 49.5	39°55.3	·· 37.6	196°19.0	·· 47.9
10	231°52.2	297°37.2	22.2	307°07.0	49.3	54°57.5	37.5	211°21.5	47.9
11	246°54.7	312°36.4	21.8	322°07.4	49.1	69°59.8	37.4	226°24.0	47.9
12	261°57.1	327°35.5	S23°21.3	337°07.7	S23°48.9	85°02.0	N02°37.3	241°26.5	N05°47.9
13	276°59.6	342°34.7	20.8	352°08.1	48.8	100°04.3	37.2	256°29.0	47.9
14	292°02.1	357°33.8	20.3	7°08.5	48.6	115°06.5	37.2	271°31.5	47.9
15	307°04.5	12°33.0	·· 19.9	22°08.8	·· 48.4	130°08.8	·· 37.1	286°34.1	·· 47.9
16	322°07.0	27°32.1	19.4	37°09.2	48.2	145°11.0	37.0	301°36.6	47.9
17	337°09.5	42°31.2	18.9	52°09.6	48.0	160°13.3	36.9	316°39.1	47.9
18	352°11.9	57°30.4	S23°18.5	67°10.0	S23°47.8	175°15.5	N02°36.8	331°41.6	N05°47.9
19	7°14.4	72°29.5	18.0	82°10.3	47.6	190°17.8	36.8	346°44.1	47.8
20	22°16.9	87°28.7	17.5	97°10.7	47.4	205°20.1	36.7	1°46.6	47.8
21	37°19.3	102°27.8	·· 17.0	112°11.1	·· 47.2	220°22.3	·· 36.6	16°49.1	·· 47.8
22	52°21.8	117°27.0	16.6	127°11.4	47.0	235°24.6	36.5	31°51.6	47.8
23	67°24.2	132°26.1	16.1	142°11.8	46.8	250°26.8	36.5	46°54.1	47.8
Mer.pass. 18:31		ν -0.9′	d 0.5′	m -3.93	ν 0.4′	d 0.2′	m 1.24	ν 2.3′	d 0.1′ m -1.99	ν 2.5′	d 0.0′ m 0.38

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	82°26.7	147°25.3	S23°15.6	157°12.2	S23°46.6	265°29.1	N02°36.4	61°56.7	N05°47.8
1	97°29.2	162°24.4	15.1	172°12.5	46.4	280°31.3	36.3	76°59.2	47.8
2	112°31.6	177°23.6	14.6	187°12.9	46.3	295°33.6	36.2	92°01.7	47.8
3	127°34.1	192°22.7	·· 14.1	202°13.3	·· 46.1	310°35.9	·· 36.1	107°04.2	·· 47.8
4	142°36.6	207°21.9	13.7	217°13.6	45.9	325°38.1	36.1	122°06.7	47.8
5	157°39.0	222°21.0	13.2	232°14.0	45.7	340°40.4	36.0	137°09.2	47.8
6	172°41.5	237°20.2	S23°12.7	247°14.4	S23°45.5	355°42.6	N02°35.9	152°11.7	N05°47.8
7	187°44.0	252°19.4	12.2	262°14.7	45.3	10°44.9	35.8	167°14.2	47.8
8	202°46.4	267°18.5	11.7	277°15.1	45.1	25°47.1	35.8	182°16.7	47.8
9	217°48.9	282°17.7	·· 11.2	292°15.5	·· 44.9	40°49.4	·· 35.7	197°19.3	·· 47.7
10	232°51.4	297°16.8	10.7	307°15.9	44.7	55°51.7	35.6	212°21.8	47.7
11	247°53.8	312°16.0	10.2	322°16.2	44.5	70°53.9	35.5	227°24.3	47.7
12	262°56.3	327°15.1	S23°09.7	337°16.6	S23°44.3	85°56.2	N02°35.4	242°26.8	N05°47.7
13	277°58.7	342°14.3	09.2	352°17.0	44.1	100°58.4	35.4	257°29.3	47.7
14	293°01.2	357°13.4	08.7	7°17.3	43.9	116°00.7	35.3	272°31.8	47.7
15	308°03.7	12°12.6	·· 08.2	22°17.7	·· 43.7	131°03.0	·· 35.2	287°34.3	·· 47.7
16	323°06.1	27°11.8	07.7	37°18.1	43.5	146°05.2	35.1	302°36.8	47.7
17	338°08.6	42°10.9	07.2	52°18.4	43.3	161°07.5	35.1	317°39.3	47.7
18	353°11.1	57°10.1	S23°06.7	67°18.8	S23°43.1	176°09.7	N02°35.0	332°41.8	N05°47.7
19	8°13.5	72°09.2	06.2	82°19.2	42.9	191°12.0	34.9	347°44.3	47.7
20	23°16.0	87°08.4	05.7	97°19.5	42.7	206°14.3	34.8	2°46.9	47.7
21	38°18.5	102°07.5	·· 05.2	112°19.9	·· 42.5	221°16.5	·· 34.8	17°49.4	·· 47.7
22	53°20.9	117°06.7	04.7	127°20.3	42.3	236°18.8	34.7	32°51.9	47.7
23	68°23.4	132°05.9	04.2	142°20.7	42.0	251°21.1	34.6	47°54.4	47.7
Mer.pass. 18:27		ν -0.8′	d 0.5′	m -3.93	ν 0.4′	d 0.2′	m 1.24	ν 2.3′	d 0.1′ m -2.00	ν 2.5′	d 0.0′ m 0.38

Stars

	SHA	**Dec**
Alpheratz	357°32.2	29°15.0
Ankaa	353°04.7	-42°09.4
Schedar	349°28.0	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.1	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°17.6	89°23.0
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.5
Bellatrix	278°20.0	6°22.5
Elnath	277°58.4	28°37.8
Alnilam	275°35.0	-1°11.1
Betelgeuse	270°49.2	7°24.7
Canopus	263°50.8	-52°42.6
Sirius	258°23.8	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.0	5°09.1
Pollux	243°14.1	27°57.3
Avior	234°13.2	-59°35.8
Suhail	222°44.3	-43°32.6
Miaplacidus	221°37.1	-69°49.7
Alphard	217°45.2	-8°46.8
Regulus	207°31.8	11°49.7
Dubhe	193°38.1	61°35.6
Denebola	182°22.6	14°24.8
Gienah	175°41.2	-17°41.8
Acrux	172°57.5	-63°15.0
Gacrux	171°49.1	-57°16.0
Alioth	166°11.2	55°48.2
Spica	158°19.9	-11°18.4
Alkaid	152°50.5	49°10.2
Hadar	148°32.9	-60°30.3
Menkent	147°55.0	-36°30.3
Arcturus	145°46.0	19°02.1
Rigil Kent.	139°37.4	-60°56.9
Kochab	137°21.0	74°02.2
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°02.1	26°37.2
Antares	112°13.3	-26°29.5
Atria	107°05.9	-69°04.5
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.7	12°32.4
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.2	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.5	-56°38.8
Deneb	49°24.5	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.1	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.5	15°21.5

Dec 12 Sun	**SHA**	**Mer.pass**
Venus	67°38.2	14:08
Mars	76°26.1	13:32
Jupiter	183°12.6	06:24
Saturn	339°27.5	19:57

Dec 13 Mon	**SHA**	**Mer.pass**
Venus	66°18.2	14:10
Mars	75°35.7	13:31
Jupiter	183°07.4	06:21
Saturn	339°28.8	19:53

Dec 14 Tue	**SHA**	**Mer.pass**
Venus	64°58.6	14:11
Mars	74°45.5	13:31
Jupiter	183°02.4	06:17
Saturn	339°29.9	19:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°39.8	S23°02.3	26°09.8	6.2′	N24°12.8	6.7′	58.4′
1	196°39.5	02.5	40°35.1	6.1′	24°19.5	6.6′	58.4′
2	211°39.2	02.7	55°00.1	6.0′	24°26.1	6.5′	58.4′
3	226°38.9	·· 02.9	69°25.1	5.9′	24°32.6	6.2′	58.4′
4	241°38.7	03.1	83°50.0	5.8′	24°38.8	6.2′	58.5′
5	256°38.4	03.3	98°14.8	5.7′	24°45.0	6.0′	58.5′
6	271°38.1	S23°03.4	112°39.5	5.6′	N24°51.0	5.8′	58.5′
7	286°37.8	03.6	127°04.0	5.5′	24°56.8	5.7′	58.6′
8	301°37.5	03.8	141°28.5	5.4′	25°02.5	5.5′	58.6′
9	316°37.2	·· 04.0	155°52.9	5.3′	25°08.0	5.4′	58.6′
10	331°36.9	04.2	170°17.1	5.2′	25°13.4	5.2′	58.7′
11	346°36.6	04.4	184°41.3	5.1′	25°18.6	5.0′	58.7′
12	1°36.3	S23°04.6	199°05.4	5.0′	N25°23.6	4.9′	58.7′
13	16°36.1	04.8	213°29.4	4.9′	25°28.5	4.7′	58.8′
14	31°35.8	05.0	227°53.3	4.8′	25°33.2	4.6′	58.8′
15	46°35.5	·· 05.1	242°17.1	4.7′	25°37.8	4.4′	58.8′
16	61°35.2	05.3	256°40.8	4.6′	25°42.2	4.2′	58.9′
17	76°34.9	05.5	271°04.4	4.5′	25°46.4	4.0′	58.9′
18	91°34.6	S23°05.7	285°27.9	4.5′	N25°50.4	3.9′	58.9′
19	106°34.3	05.9	299°51.4	4.4′	25°54.3	3.7′	58.9′
20	121°34.0	06.0	314°14.7	4.3′	25°58.0	3.6′	59.0′
21	136°33.7	·· 06.2	328°38.0	4.2′	26°01.6	3.4′	59.0′
22	151°33.4	06.4	343°01.3	4.1′	26°05.0	3.1′	59.0′
23	166°33.2	06.6	357°24.4	4.1′	26°08.1	3.1′	59.1′
	SD = 16.2′	d = 0.2′	SD = 15.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°32.9	S23°06.8	11°47.5	4.0′	N26°11.2	2.8′	59.1′
1	196°32.6	06.9	26°10.5	3.9′	26°14.0	2.7′	59.1′
2	211°32.3	07.1	40°33.4	3.9′	26°16.7	2.5′	59.1′
3	226°32.0	·· 07.3	54°56.2	3.8′	26°19.2	2.3′	59.2′
4	241°31.7	07.5	69°19.0	3.7′	26°21.5	2.1′	59.2′
5	256°31.4	07.6	83°41.8	3.7′	26°23.6	1.9′	59.2′
6	271°31.1	S23°07.8	98°04.5	3.6′	N26°25.5	1.8′	59.2′
7	286°30.8	08.0	112°27.1	3.6′	26°27.3	1.6′	59.3′
8	301°30.5	08.2	126°49.6	3.5′	26°28.9	1.4′	59.3′
9	316°30.2	·· 08.3	141°12.2	3.5′	26°30.3	1.2′	59.3′
10	331°29.9	08.5	155°34.6	3.4′	26°31.5	1.0′	59.3′
11	346°29.6	08.7	169°57.0	3.4′	26°32.5	0.9′	59.4′
12	1°29.3	S23°08.8	184°19.4	3.3′	N26°33.4	0.6′	59.4′
13	16°29.1	09.0	198°41.7	3.3′	26°34.0	0.5′	59.4′
14	31°28.8	09.2	213°04.0	3.3′	26°34.5	0.3′	59.4′
15	46°28.5	·· 09.3	227°26.3	3.2′	26°34.8	0.0′	59.5′
16	61°28.2	09.5	241°48.5	3.2′	26°34.8	0.1′	59.5′
17	76°27.9	09.7	256°10.7	3.2′	26°34.7	0.3′	59.5′
18	91°27.6	S23°09.8	270°32.9	3.1′	N26°34.4	0.4′	59.5′
19	106°27.3	10.0	284°55.0	3.1′	26°34.0	0.7′	59.6′
20	121°27.0	10.1	299°17.1	3.1′	26°33.3	0.9′	59.6′
21	136°26.7	·· 10.3	313°39.2	3.1′	26°32.4	1.0′	59.6′
22	151°26.4	10.5	328°01.3	3.1′	26°31.4	1.3′	59.6′
23	166°26.1	10.6	342°23.4	3.1′	26°30.1	1.4′	59.6′
	SD = 16.2′	d = 0.2′	SD = 16.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°25.8	S23°10.8	356°45.5	3.0′	N26°28.7	1.6′	59.7′
1	196°25.5	10.9	11°07.5	3.0′	26°27.1	1.8′	59.7′
2	211°25.2	11.1	25°29.6	3.0′	26°25.3	2.0′	59.7′
3	226°24.9	·· 11.3	39°51.6	3.0′	26°23.3	2.2′	59.7′
4	241°24.6	11.4	54°13.6	3.0′	26°21.1	2.4′	59.7′
5	256°24.3	11.6	68°35.7	3.0′	26°18.7	2.6′	59.7′
6	271°24.0	S23°11.7	82°57.7	3.1′	N26°16.1	2.8′	59.8′
7	286°23.8	11.9	97°19.8	3.1′	26°13.3	2.9′	59.8′
8	301°23.5	12.0	111°41.8	3.1′	26°10.4	3.2′	59.8′
9	316°23.2	·· 12.2	126°03.9	3.1′	26°07.2	3.3′	59.8′
10	331°22.9	12.3	140°26.0	3.1′	26°03.9	3.5′	59.8′
11	346°22.6	12.5	154°48.1	3.1′	26°00.4	3.7′	59.9′
12	1°22.3	S23°12.6	169°10.3	3.2′	N25°56.7	3.9′	59.9′
13	16°22.0	12.8	183°32.4	3.2′	25°52.8	4.1′	59.9′
14	31°21.7	12.9	197°54.6	3.2′	25°48.7	4.3′	59.9′
15	46°21.4	·· 13.1	212°16.8	3.2′	25°44.4	4.5′	59.9′
16	61°21.1	13.2	226°39.1	3.3′	25°39.9	4.6′	59.9′
17	76°20.8	13.4	241°01.4	3.3′	25°35.3	4.9′	59.9′
18	91°20.5	S23°13.5	255°23.7	3.4′	N25°30.4	5.0′	60.0′
19	106°20.2	13.6	269°46.0	3.4′	25°25.4	5.2′	60.0′
20	121°19.9	13.8	284°08.4	3.4′	25°20.2	5.4′	60.0′
21	136°19.6	·· 13.9	298°30.9	3.5′	25°14.8	5.5′	60.0′
22	151°19.3	14.1	312°53.4	3.5′	25°09.3	5.8′	60.0′
23	166°19.0	14.2	327°15.9	3.6′	25°03.5	5.9′	60.0′
	SD = 16.2′	d = 0.2′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:17	10:40	▬	▬	13:08	15:31
N 70°	07:57	09:43	▬	▬	14:04	15:50
68°	07:42	09:10	▬	▬	14:38	16:06
66°	07:29	08:45	10:22	13:25	15:02	16:19
64°	07:18	08:26	09:43	14:05	15:22	16:29
62°	07:09	08:11	09:15	14:32	15:37	16:39
60°	07:01	07:57	08:54	14:53	15:51	16:47
N 58°	06:54	07:46	08:37	15:11	16:02	16:54
56°	06:47	07:36	08:23	15:25	16:12	17:01
54°	06:41	07:27	08:11	15:37	16:21	17:07
52°	06:35	07:19	08:00	15:48	16:29	17:13
50°	06:30	07:12	07:50	15:58	16:36	17:18
45°	06:19	06:56	07:30	16:18	16:52	17:29
N 40°	06:08	06:42	07:13	16:35	17:06	17:40
35°	05:59	06:31	06:59	16:49	17:17	17:49
30°	05:51	06:20	06:47	17:01	17:28	17:57
20°	05:34	06:02	06:26	17:22	17:46	18:14
N 10°	05:18	05:45	06:08	17:41	18:03	18:30
0°	05:02	05:28	05:50	17:58	18:20	18:46
S 10°	04:43	05:10	05:33	18:15	18:38	19:05
20°	04:21	04:50	05:14	18:34	18:58	19:28
30°	03:52	04:25	04:52	18:56	19:23	19:56
35°	03:34	04:10	04:40	19:09	19:38	20:15
40°	03:11	03:52	04:25	19:23	19:56	20:38
45°	02:41	03:30	04:07	19:41	20:18	21:08
S 50°	01:56	03:01	03:45	20:03	20:48	21:52
52°	01:30	02:46	03:34	20:14	21:03	22:19
54°	00:48	02:28	03:22	20:26	21:20	23:02
56°	////	02:07	03:08	20:40	21:42	////
58°	////	01:38	02:52	20:57	22:11	////
S 60°	////	00:53	02:32	21:17	22:57	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	11:43	▭	13:25	09:31	▭	12:11
62°	12:34	13:09	14:32	08:40	10:14	11:03
60°	13:06	13:50	15:07	08:09	09:33	10:28
N 58°	13:30	14:18	15:33	07:45	09:05	10:02
56°	13:49	14:40	15:53	07:26	08:43	09:42
54°	14:05	14:58	16:10	07:10	08:25	09:25
52°	14:19	15:13	16:24	06:56	08:10	09:10
50°	14:32	15:26	16:37	06:44	07:57	08:57
45°	14:57	15:54	17:03	06:20	07:30	08:31
N 40°	15:17	16:15	17:23	06:00	07:08	08:10
35°	15:34	16:33	17:40	05:44	06:50	07:53
30°	15:49	16:48	17:55	05:29	06:35	07:37
20°	16:14	17:15	18:20	05:05	06:09	07:12
N 10°	16:36	17:37	18:42	04:44	05:47	06:49
0°	16:56	17:58	19:02	04:25	05:26	06:29
S 10°	17:17	18:20	19:22	04:06	05:05	06:08
20°	17:39	18:42	19:43	03:45	04:42	05:45
30°	18:04	19:09	20:08	03:21	04:16	05:19
35°	18:19	19:24	20:23	03:07	04:01	05:04
40°	18:37	19:42	20:39	02:51	03:43	04:46
45°	18:58	20:04	21:00	02:32	03:21	04:24
S 50°	19:24	20:32	21:25	02:08	02:54	03:57
52°	19:38	20:45	21:37	01:56	02:41	03:43
54°	19:53	21:01	21:51	01:43	02:26	03:28
56°	20:10	21:19	22:07	01:28	02:08	03:10
58°	20:32	21:41	22:26	01:11	01:47	02:48
S 60°	20:59	22:10	22:49	00:49	01:19	02:19

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 96-100%
12	06:39	06:25	11:54	23:11	10:40	
13	06:11	05:57	11:54	–:–	11:42	
14	05:43	05:29	11:55	00:14	12:45	

December 15, 16, 17 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	83°25.9	147°05.0	S23°03.7	157°21.0	S23°41.8	266°23.3	N02°34.5	62°56.9	N05°47.7
1	98°28.3	162°04.2	03.2	172°21.4	41.6	281°25.6	34.5	77°59.4	47.7
2	113°30.8	177°03.4	02.7	187°21.8	41.4	296°27.8	34.4	93°01.9	47.7
3	128°33.2	192°02.5	·· 02.1	202°22.1	·· 41.2	311°30.1	·· 34.3	108°04.4	·· 47.7
4	143°35.7	207°01.7	01.6	217°22.5	41.0	326°32.4	34.2	123°06.9	47.6
5	158°38.2	222°00.8	01.1	232°22.9	40.8	341°34.6	34.2	138°09.4	47.6
6	173°40.6	237°00.0	S23°00.6	247°23.2	S23°40.6	356°36.9	N02°34.1	153°11.9	N05°47.6
7	188°43.1	251°59.2	23°00.1	262°23.6	40.4	11°39.2	34.0	168°14.4	47.6
8	203°45.6	266°58.3	22°59.6	277°24.0	40.2	26°41.4	33.9	183°16.9	47.6
9	218°48.0	281°57.5	·· 59.0	292°24.4	·· 40.0	41°43.7	·· 33.9	198°19.4	·· 47.6
10	233°50.5	296°56.7	58.5	307°24.7	39.8	56°46.0	33.8	213°21.9	47.6
11	248°53.0	311°55.8	58.0	322°25.1	39.5	71°48.2	33.7	228°24.5	47.6
12	263°55.4	326°55.0	S22°57.5	337°25.5	S23°39.3	86°50.5	N02°33.6	243°27.0	N05°47.6
13	278°57.9	341°54.2	57.0	352°25.8	39.1	101°52.8	33.6	258°29.5	47.6
14	294°00.4	356°53.3	56.4	7°26.2	38.9	116°55.0	33.5	273°32.0	47.6
15	309°02.8	11°52.5	·· 55.9	22°26.6	·· 38.7	131°57.3	·· 33.4	288°34.5	·· 47.6
16	324°05.3	26°51.7	55.4	37°26.9	38.5	146°59.6	33.3	303°37.0	47.6
17	339°07.7	41°50.8	54.8	52°27.3	38.3	162°01.8	33.3	318°39.5	47.6
18	354°10.2	56°50.0	S22°54.3	67°27.7	S23°38.1	177°04.1	N02°33.2	333°42.0	N05°47.6
19	9°12.7	71°49.2	53.8	82°28.0	37.8	192°06.4	33.1	348°44.5	47.6
20	24°15.1	86°48.4	53.2	97°28.4	37.6	207°08.6	33.0	3°47.0	47.6
21	39°17.6	101°47.5	·· 52.7	112°28.8	·· 37.4	222°10.9	·· 33.0	18°49.5	·· 47.6
22	54°20.1	116°46.7	52.2	127°29.2	37.2	237°13.2	32.9	33°52.0	47.6
23	69°22.5	131°45.9	51.6	142°29.5	37.0	252°15.4	32.8	48°54.5	47.6
Mer.pass. 18:23		ν -0.8′	d 0.5′	m -3.93	ν 0.4′	d 0.2′	m 1.24	ν 2.3′	d 0.1′ m -2.00	ν 2.5′	d 0.0′ m 0.39

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	84°25.0	146°45.0	S22°51.1	157°29.9	S23°36.8	267°17.7	N02°32.8	63°57.0	N05°47.6
1	99°27.5	161°44.2	50.6	172°30.3	36.6	282°20.0	32.7	78°59.5	47.6
2	114°29.9	176°43.4	50.0	187°30.6	36.3	297°22.2	32.6	94°02.0	47.6
3	129°32.4	191°42.6	·· 49.5	202°31.0	·· 36.1	312°24.5	·· 32.5	109°04.5	·· 47.6
4	144°34.9	206°41.7	48.9	217°31.4	35.9	327°26.8	32.5	124°07.0	47.6
5	159°37.3	221°40.9	48.4	232°31.8	35.7	342°29.1	32.4	139°09.5	47.5
6	174°39.8	236°40.1	S22°47.9	247°32.1	S23°35.5	357°31.3	N02°32.3	154°12.0	N05°47.5
7	189°42.2	251°39.3	47.3	262°32.5	35.2	12°33.6	32.3	169°14.5	47.5
8	204°44.7	266°38.4	46.8	277°32.9	35.0	27°35.9	32.2	184°17.0	47.5
9	219°47.2	281°37.6	·· 46.2	292°33.2	·· 34.8	42°38.1	·· 32.1	199°19.5	·· 47.5
10	234°49.6	296°36.8	45.7	307°33.6	34.6	57°40.4	32.0	214°22.0	47.5
11	249°52.1	311°36.0	45.1	322°34.0	34.4	72°42.7	32.0	229°24.5	47.5
12	264°54.6	326°35.2	S22°44.6	337°34.3	S23°34.1	87°45.0	N02°31.9	244°27.0	N05°47.5
13	279°57.0	341°34.3	44.0	352°34.7	33.9	102°47.2	31.8	259°29.5	47.5
14	294°59.5	356°33.5	43.5	7°35.1	33.7	117°49.5	31.8	274°32.0	47.5
15	310°02.0	11°32.7	·· 42.9	22°35.5	·· 33.5	132°51.8	·· 31.7	289°34.5	·· 47.5
16	325°04.4	26°31.9	42.3	37°35.8	33.2	147°54.1	31.6	304°37.0	47.5
17	340°06.9	41°31.1	41.8	52°36.2	33.0	162°56.3	31.5	319°39.5	47.5
18	355°09.4	56°30.2	S22°41.2	67°36.6	S23°32.8	177°58.6	N02°31.5	334°42.0	N05°47.5
19	10°11.8	71°29.4	40.7	82°36.9	32.6	193°00.9	31.4	349°44.5	47.5
20	25°14.3	86°28.6	40.1	97°37.3	32.3	208°03.1	31.3	4°47.0	47.5
21	40°16.7	101°27.8	·· 39.5	112°37.7	·· 32.1	223°05.4	·· 31.3	19°49.5	·· 47.5
22	55°19.2	116°27.0	39.0	127°38.1	31.9	238°07.7	31.2	34°52.0	47.5
23	70°21.7	131°26.2	38.4	142°38.4	31.7	253°10.0	31.1	49°54.5	47.5
Mer.pass. 18:19		ν -0.8′	d 0.5′	m -3.94	ν 0.4′	d 0.2′	m 1.23	ν 2.3′	d 0.1′ m -2.01	ν 2.5′	d 0.0′ m 0.39

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	85°24.1	146°25.3	S22°37.8	157°38.8	S23°31.4	268°12.2	N02°31.0	64°57.0	N05°47.5
1	100°26.6	161°24.5	37.3	172°39.2	31.2	283°14.5	31.0	79°59.5	47.5
2	115°29.1	176°23.7	36.7	187°39.5	31.0	298°16.8	30.9	95°02.0	47.5
3	130°31.5	191°22.9	·· 36.1	202°39.9	·· 30.7	313°19.1	·· 30.8	110°04.5	·· 47.5
4	145°34.0	206°22.1	35.6	217°40.3	30.5	328°21.4	30.8	125°07.0	47.5
5	160°36.5	221°21.3	35.0	232°40.7	30.3	343°23.6	30.7	140°09.5	47.5
6	175°38.9	236°20.5	S22°34.4	247°41.0	S23°30.1	358°25.9	N02°30.6	155°12.0	N05°47.5
7	190°41.4	251°19.6	33.9	262°41.4	29.8	13°28.2	30.6	170°14.5	47.5
8	205°43.9	266°18.8	33.3	277°41.8	29.6	28°30.5	30.5	185°17.0	47.5
9	220°46.3	281°18.0	·· 32.7	292°42.1	·· 29.4	43°32.7	·· 30.4	200°19.5	·· 47.5
10	235°48.8	296°17.2	32.1	307°42.5	29.1	58°35.0	30.4	215°22.0	47.5
11	250°51.2	311°16.4	31.6	322°42.9	28.9	73°37.3	30.3	230°24.5	47.5
12	265°53.7	326°15.6	S22°31.0	337°43.3	S23°28.7	88°39.6	N02°30.2	245°27.0	N05°47.5
13	280°56.2	341°14.8	30.4	352°43.6	28.4	103°41.9	30.2	260°29.5	47.5
14	295°58.6	356°14.0	29.8	7°44.0	28.2	118°44.1	30.1	275°32.0	47.5
15	311°01.1	11°13.2	·· 29.2	22°44.4	·· 28.0	133°46.4	·· 30.0	290°34.5	·· 47.5
16	326°03.6	26°12.4	28.6	37°44.7	27.7	148°48.7	29.9	305°37.0	47.5
17	341°06.0	41°11.6	28.1	52°45.1	27.5	163°51.0	29.9	320°39.5	47.5
18	356°08.5	56°10.8	S22°27.5	67°45.5	S23°27.2	178°53.3	N02°29.8	335°42.0	N05°47.5
19	11°11.0	71°09.9	26.9	82°45.9	27.0	193°55.5	29.7	350°44.5	47.5
20	26°13.4	86°09.1	26.3	97°46.2	26.8	208°57.8	29.7	5°47.0	47.5
21	41°15.9	101°08.3	·· 25.7	112°46.6	·· 26.5	224°00.1	·· 29.6	20°49.5	·· 47.5
22	56°18.3	116°07.5	25.1	127°47.0	26.3	239°02.4	29.5	35°52.0	47.5
23	71°20.8	131°06.7	24.5	142°47.3	26.1	254°04.7	29.5	50°54.5	47.5
Mer.pass. 18:15		ν -0.8′	d 0.6′	m -3.94	ν 0.4′	d 0.2′	m 1.23	ν 2.3′	d 0.1′ m -2.02	ν 2.5′	d 0.0′ m 0.40

Stars

	SHA	Dec
Alpheratz	357°32.2	29°15.0
Ankaa	353°04.7	-42°09.4
Schedar	349°28.0	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.2	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°18.0	89°23.1
Acamar	315°09.6	-40°11.6
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.5
Bellatrix	278°19.9	6°22.5
Elnath	277°58.4	28°37.8
Alnilam	275°34.9	-1°11.1
Betelgeuse	270°49.1	7°24.7
Canopus	263°50.8	-52°42.6
Sirius	258°23.8	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.0	5°09.1
Pollux	243°14.1	27°57.3
Avior	234°13.2	-59°35.8
Suhail	222°44.2	-43°32.6
Miaplacidus	221°37.1	-69°49.7
Alphard	217°45.2	-8°46.8
Regulus	207°31.8	11°49.7
Dubhe	193°38.1	61°35.6
Denebola	182°22.5	14°24.8
Gienah	175°41.2	-17°41.8
Acrux	172°57.5	-63°15.0
Gacrux	171°49.0	-57°16.0
Alioth	166°11.1	55°48.1
Spica	158°19.9	-11°18.4
Alkaid	152°50.5	49°10.1
Hadar	148°32.9	-60°30.3
Menkent	147°55.0	-36°30.3
Arcturus	145°46.0	19°02.1
Rigil Kent.	139°37.4	-60°56.9
Kochab	137°20.9	74°02.1
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°02.1	26°37.1
Antares	112°13.2	-26°29.5
Atria	107°05.8	-69°04.5
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.4
Rasalhague	95°56.7	12°32.4
Eltanin	90°41.6	51°29.2
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.5	-56°38.8
Deneb	49°24.5	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.1	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.5	15°21.5

Dec 15 Wed	SHA	Mer.pass
Venus	63°39.2	14:12
Mars	73°55.2	13:30
Jupiter	182°57.5	06:14
Saturn	339°31.0	19:45

Dec 16 Thu	SHA	Mer.pass
Venus	62°20.0	14:14
Mars	73°04.9	13:30
Jupiter	182°52.7	06:10
Saturn	339°32.0	19:41

Dec 17 Fri	SHA	Mer.pass
Venus	61°01.2	14:15
Mars	72°14.7	13:29
Jupiter	182°48.1	06:06
Saturn	339°32.9	19:37

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0931 sec ΔT = TT-UT1 = +69.2771 sec

2027 December 15 to Dec. 17 UT

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°18.7	S23°14.3	341°38.5	3.6′	N24°57.6	6.1′	60.0′
1	196°18.4	14.5	356°01.1	3.7′	24°51.5	6.3′	60.0′
2	211°18.1	14.6	10°23.8	3.8′	24°45.2	6.5′	60.0′
3	226°17.8	·· 14.8	24°46.6	3.8′	24°38.7	6.6′	60.1′
4	241°17.5	14.9	39°09.4	3.9′	24°32.1	6.8′	60.1′
5	256°17.2	15.0	53°32.3	3.9′	24°25.3	7.0′	60.1′
6	271°16.9	S23°15.2	67°55.2	4.0′	N24°18.3	7.2′	60.1′
7	286°16.6	15.3	82°18.2	4.1′	24°11.1	7.3′	60.1′
8	301°16.3	15.4	96°41.3	4.1′	24°03.8	7.5′	60.1′
9	316°16.0	·· 15.6	111°04.4	4.2′	23°56.3	7.7′	60.1′
10	331°15.7	15.7	125°27.6	4.3′	23°48.6	7.8′	60.1′
11	346°15.4	15.8	139°50.9	4.3′	23°40.8	8.0′	60.1′
12	1°15.1	S23°16.0	154°14.2	4.4′	N23°32.8	8.1′	60.1′
13	16°14.8	16.1	168°37.6	4.5′	23°24.7	8.4′	60.1′
14	31°14.5	16.2	183°01.1	4.6′	23°16.3	8.5′	60.1′
15	46°14.2	·· 16.3	197°24.7	4.7′	23°07.8	8.6′	60.1′
16	61°13.9	16.5	211°48.4	4.7′	22°59.2	8.8′	60.1′
17	76°13.6	16.6	226°12.1	4.8′	22°50.4	9.0′	60.1′
18	91°13.3	S23°16.7	240°35.9	4.9′	N22°41.4	9.1′	60.1′
19	106°13.0	16.8	254°59.8	5.0′	22°32.3	9.2′	60.2′
20	121°12.7	17.0	269°23.8	5.1′	22°23.1	9.5′	60.2′
21	136°12.4	·· 17.1	283°47.9	5.2′	22°13.6	9.5′	60.2′
22	151°12.1	17.2	298°12.1	5.2′	22°04.1	9.8′	60.2′
23	166°11.8	17.3	312°36.3	5.3′	21°54.3	9.8′	60.2′
	SD = 16.2′	d = 0.1′	SD = 16.4′				

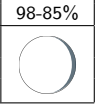
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°11.5	S23°17.4	327°00.6	5.4′	N21°44.5	10.0′	60.2′
1	196°11.2	17.6	341°25.1	5.5′	21°34.5	10.2′	60.2′
2	211°10.9	17.7	355°49.6	5.6′	21°24.3	10.3′	60.2′
3	226°10.6	·· 17.8	10°14.2	5.7′	21°14.0	10.4′	60.2′
4	241°10.3	17.9	24°38.9	5.8′	21°03.6	10.6′	60.2′
5	256°10.0	18.0	39°03.7	5.9′	20°53.0	10.7′	60.2′
6	271°09.7	S23°18.1	53°28.5	6.0′	N20°42.3	10.8′	60.2′
7	286°09.4	18.3	67°53.5	6.1′	20°31.5	11.0′	60.2′
8	301°09.1	18.4	82°18.6	6.2′	20°20.5	11.1′	60.2′
9	316°08.8	·· 18.5	96°43.8	6.3′	20°09.4	11.3′	60.2′
10	331°08.5	18.6	111°09.0	6.4′	19°58.1	11.3′	60.2′
11	346°08.2	18.7	125°34.4	6.4′	19°46.8	11.5′	60.1′
12	1°07.9	S23°18.8	139°59.8	6.5′	N19°35.3	11.6′	60.1′
13	16°07.6	18.9	154°25.4	6.6′	19°23.7	11.8′	60.1′
14	31°07.3	19.0	168°51.0	6.7′	19°11.9	11.8′	60.1′
15	46°07.0	·· 19.1	183°16.7	6.8′	19°00.1	12.0′	60.1′
16	61°06.7	19.2	197°42.6	6.9′	18°48.1	12.1′	60.1′
17	76°06.4	19.4	212°08.5	7.0′	18°36.0	12.2′	60.1′
18	91°06.1	S23°19.5	226°34.5	7.1′	N18°23.8	12.3′	60.1′
19	106°05.8	19.6	241°00.6	7.2′	18°11.5	12.4′	60.1′
20	121°05.5	19.7	255°26.9	7.3′	17°59.1	12.6′	60.1′
21	136°05.2	·· 19.8	269°53.2	7.4′	17°46.5	12.6′	60.1′
22	151°04.9	19.9	284°19.6	7.5′	17°33.9	12.8′	60.1′
23	166°04.6	20.0	298°46.1	7.6′	17°21.1	12.8′	60.1′
	SD = 16.2′	d = 0.1′	SD = 16.4′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°04.3	S23°20.1	313°12.7	7.7′	N17°08.3	13.0′	60.1′
1	196°04.0	20.2	327°39.4	7.8′	16°55.3	13.0′	60.1′
2	211°03.7	20.3	342°06.2	7.9′	16°42.3	13.1′	60.1′
3	226°03.4	·· 20.4	356°33.0	8.0′	16°29.2	13.3′	60.1′
4	241°03.1	20.5	11°00.0	8.1′	16°15.9	13.3′	60.0′
5	256°02.8	20.6	25°27.1	8.2′	16°02.6	13.5′	60.0′
6	271°02.4	S23°20.7	39°54.2	8.3′	N15°49.1	13.5′	60.0′
7	286°02.1	20.8	54°21.5	8.3′	15°35.6	13.6′	60.0′
8	301°01.8	20.9	68°48.8	8.4′	15°22.0	13.7′	60.0′
9	316°01.5	·· 20.9	83°16.3	8.5′	15°08.3	13.7′	60.0′
10	331°01.2	21.0	97°43.8	8.6′	14°54.6	13.9′	60.0′
11	346°00.9	21.1	112°11.4	8.7′	14°40.7	13.9′	60.0′
12	1°00.6	S23°21.2	126°39.1	8.8′	N14°26.8	14.0′	60.0′
13	16°00.3	21.3	141°06.9	8.9′	14°12.8	14.1′	60.0′
14	31°00.0	21.4	155°34.8	9.0′	13°58.7	14.2′	59.9′
15	45°59.7	·· 21.5	170°02.8	9.1′	13°44.5	14.2′	59.9′
16	60°59.4	21.6	184°30.8	9.1′	13°30.3	14.3′	59.9′
17	75°59.1	21.7	198°59.0	9.2′	13°16.0	14.4′	59.9′
18	90°58.8	S23°21.7	213°27.2	9.3′	N13°01.6	14.5′	59.9′
19	105°58.5	21.8	227°55.5	9.4′	12°47.1	14.5′	59.9′
20	120°58.2	21.9	242°23.9	9.5′	12°32.6	14.6′	59.9′
21	135°57.9	·· 22.0	256°52.4	9.6′	12°18.0	14.6′	59.8′
22	150°57.6	22.1	271°21.0	9.6′	12°03.4	14.7′	59.8′
23	165°57.3	22.2	285°49.6	9.7′	11°48.7	14.8′	59.8′
	SD = 16.2′	d = 0.1′	SD = 16.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:21	10:49	▬	▬	13:02	15:30
N 70°	08:01	09:49	▬	▬	14:02	15:50
68°	07:45	09:14	▬	▬	14:37	16:05
66°	07:32	08:49	10:29	13:22	15:02	16:18
64°	07:21	08:30	09:47	14:04	15:21	16:29
62°	07:12	08:14	09:19	14:32	15:37	16:39
60°	07:04	08:00	08:58	14:53	15:50	16:47
N 58°	06:56	07:49	08:41	15:10	16:02	16:55
56°	06:49	07:39	08:26	15:25	16:12	17:01
54°	06:43	07:30	08:13	15:38	16:21	17:07
52°	06:38	07:21	08:02	15:49	16:29	17:13
50°	06:32	07:14	07:52	15:58	16:37	17:18
45°	06:21	06:58	07:32	16:19	16:53	17:30
N 40°	06:10	06:45	07:15	16:36	17:06	17:40
35°	06:01	06:33	07:01	16:50	17:18	17:50
30°	05:52	06:22	06:49	17:02	17:29	17:58
20°	05:36	06:04	06:28	17:23	17:47	18:15
N 10°	05:20	05:46	06:09	17:42	18:05	18:31
0°	05:03	05:29	05:52	17:59	18:22	18:48
S 10°	04:44	05:11	05:34	18:17	18:40	19:07
20°	04:22	04:51	05:15	18:36	19:00	19:29
30°	03:53	04:26	04:53	18:58	19:25	19:58
35°	03:34	04:11	04:40	19:11	19:40	20:17
40°	03:11	03:53	04:25	19:26	19:58	20:40
45°	02:41	03:30	04:08	19:44	20:21	21:11
S 50°	01:56	03:01	03:45	20:06	20:50	21:56
52°	01:28	02:46	03:34	20:17	21:06	22:23
54°	00:44	02:28	03:22	20:29	21:23	23:08
56°	////	02:06	03:08	20:43	21:45	////
58°	////	01:37	02:51	21:00	22:15	////
S 60°	////	00:48	02:31	21:20	23:04	////

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▭	▭	18:53	▭	▭	12:57
N 70°	▭	16:20	19:18	▭	13:33	12:30
68°	▭	17:10	19:37	▭	12:42	12:09
66°	15:02	17:41	19:52	12:45	12:09	11:53
64°	15:54	18:04	20:04	11:53	11:45	11:39
62°	16:25	18:22	20:14	11:20	11:26	11:28
60°	16:49	18:37	20:23	10:56	11:10	11:18
N 58°	17:08	18:50	20:30	10:37	10:57	11:09
56°	17:24	19:01	20:37	10:20	10:45	11:01
54°	17:37	19:10	20:43	10:06	10:35	10:55
52°	17:49	19:19	20:48	09:54	10:25	10:48
50°	17:59	19:26	20:53	09:43	10:17	10:43
45°	18:21	19:43	21:03	09:21	10:00	10:30
N 40°	18:38	19:56	21:12	09:02	09:45	10:20
35°	18:53	20:07	21:19	08:47	09:33	10:12
30°	19:06	20:17	21:25	08:33	09:22	10:04
20°	19:27	20:33	21:36	08:10	09:03	09:50
N 10°	19:46	20:48	21:46	07:50	08:47	09:38
0°	20:03	21:01	21:55	07:31	08:31	09:27
S 10°	20:21	21:15	22:04	07:12	08:16	09:16
20°	20:39	21:29	22:14	06:52	07:59	09:04
30°	21:00	21:45	22:24	06:28	07:40	08:50
35°	21:13	21:55	22:30	06:14	07:28	08:42
40°	21:27	22:05	22:38	05:58	07:15	08:32
45°	21:44	22:18	22:46	05:39	06:59	08:21
S 50°	22:04	22:33	22:55	05:14	06:40	08:08
52°	22:14	22:40	23:00	05:02	06:31	08:01
54°	22:25	22:48	23:05	04:49	06:21	07:54
56°	22:37	22:57	23:10	04:33	06:09	07:46
58°	22:51	23:06	23:16	04:15	05:55	07:38
S 60°	23:08	23:18	23:23	03:52	05:39	07:27

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 17-19 98-85%
15	05:15	05:00	11:55	01:17	13:47	
16	04:46	04:32	11:55	02:17	14:46	
17	04:17	04:02	11:56	03:14	15:41	



December 18, 19, 20 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	86°23.3	146°05.9	S22°23.9	157°47.7	S23°25.8	269°06.9	N02°29.4	65°57.0	N05°47.5
1	101°25.7	161°05.1	23.3	172°48.1	25.6	284°09.2	29.3	80°59.4	47.5
2	116°28.2	176°04.3	22.7	187°48.5	25.3	299°11.5	29.3	96°01.9	47.5
3	131°30.7	191°03.5	·· 22.2	202°48.8	·· 25.1	314°13.8	·· 29.2	111°04.4	·· 47.5
4	146°33.1	206°02.7	21.6	217°49.2	24.9	329°16.1	29.1	126°06.9	47.5
5	161°35.6	221°01.9	21.0	232°49.6	24.6	344°18.3	29.1	141°09.4	47.5
6	176°38.1	236°01.1	S22°20.4	247°50.0	S23°24.4	359°20.6	N02°29.0	156°11.9	N05°47.5
7	191°40.5	251°00.3	19.8	262°50.3	24.1	14°22.9	28.9	171°14.4	47.5
8	206°43.0	265°59.5	19.2	277°50.7	23.9	29°25.2	28.9	186°16.9	47.5
9	221°45.5	280°58.7	·· 18.6	292°51.1	·· 23.6	44°27.5	·· 28.8	201°19.4	·· 47.5
10	236°47.9	295°57.9	17.9	307°51.4	23.4	59°29.8	28.7	216°21.9	47.5
11	251°50.4	310°57.1	17.3	322°51.8	23.2	74°32.1	28.7	231°24.4	47.5
12	266°52.8	325°56.3	S22°16.7	337°52.2	S23°22.9	89°34.3	N02°28.6	246°26.9	N05°47.5
13	281°55.3	340°55.5	16.1	352°52.6	22.7	104°36.6	28.5	261°29.4	47.5
14	296°57.8	355°54.7	15.5	7°52.9	22.4	119°38.9	28.5	276°31.9	47.5
15	312°00.2	10°53.9	·· 14.9	22°53.3	·· 22.2	134°41.2	·· 28.4	291°34.4	·· 47.5
16	327°02.7	25°53.2	14.3	37°53.7	21.9	149°43.5	28.4	306°36.8	47.5
17	342°05.2	40°52.4	13.7	52°54.1	21.7	164°45.8	28.3	321°39.3	47.5
18	357°07.6	55°51.6	S22°13.1	67°54.4	S23°21.4	179°48.1	N02°28.2	336°41.8	N05°47.5
19	12°10.1	70°50.8	12.5	82°54.8	21.2	194°50.3	28.2	351°44.3	47.5
20	27°12.6	85°50.0	11.8	97°55.2	20.9	209°52.6	28.1	6°46.8	47.5
21	42°15.0	100°49.2	·· 11.2	112°55.5	·· 20.7	224°54.9	·· 28.0	21°49.3	·· 47.5
22	57°17.5	115°48.4	10.6	127°55.9	20.4	239°57.2	28.0	36°51.8	47.5
23	72°20.0	130°47.6	10.0	142°56.3	20.2	254°59.5	27.9	51°54.3	47.5
Mer.pass. 18:11		ν -0.8′	d 0.6′	m -3.94	ν 0.4′	d 0.2′	m 1.23	ν 2.3′	d 0.1′ m -2.02	ν 2.5′	d 0.0′ m 0.40

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	87°22.4	145°46.8	S22°09.4	157°56.7	S23°19.9	270°01.8	N02°27.8	66°56.8	N05°47.5
1	102°24.9	160°46.0	08.8	172°57.0	19.7	285°04.1	27.8	81°59.3	47.5
2	117°27.3	175°45.2	08.1	187°57.4	19.4	300°06.4	27.7	97°01.8	47.5
3	132°29.8	190°44.5	·· 07.5	202°57.8	·· 19.2	315°08.6	·· 27.6	112°04.2	·· 47.5
4	147°32.3	205°43.7	06.9	217°58.2	18.9	330°10.9	27.6	127°06.7	47.5
5	162°34.7	220°42.9	06.3	232°58.5	18.7	345°13.2	27.5	142°09.2	47.5
6	177°37.2	235°42.1	S22°05.6	247°58.9	S23°18.4	0°15.5	N02°27.5	157°11.7	N05°47.5
7	192°39.7	250°41.3	05.0	262°59.3	18.2	15°17.8	27.4	172°14.2	47.5
8	207°42.1	265°40.5	04.4	277°59.7	17.9	30°20.1	27.3	187°16.7	47.5
9	222°44.6	280°39.7	·· 03.7	293°00.0	·· 17.7	45°22.4	·· 27.3	202°19.2	·· 47.5
10	237°47.1	295°38.9	03.1	308°00.4	17.4	60°24.7	27.2	217°21.7	47.5
11	252°49.5	310°38.2	02.5	323°00.8	17.2	75°27.0	27.1	232°24.2	47.5
12	267°52.0	325°37.4	S22°01.9	338°01.1	S23°16.9	90°29.3	N02°27.1	247°26.6	N05°47.5
13	282°54.4	340°36.6	01.2	353°01.5	16.6	105°31.5	27.0	262°29.1	47.5
14	297°56.9	355°35.8	22°00.6	8°01.9	16.4	120°33.8	26.9	277°31.6	47.5
15	312°59.4	10°35.0	21°59.9	23°02.3	·· 16.1	135°36.1	·· 26.9	292°34.1	·· 47.5
16	328°01.8	25°34.3	59.3	38°02.6	15.9	150°38.4	26.8	307°36.6	47.6
17	343°04.3	40°33.5	58.7	53°03.0	15.6	165°40.7	26.8	322°39.1	47.6
18	358°06.8	55°32.7	S21°58.0	68°03.4	S23°15.4	180°43.0	N02°26.7	337°41.6	N05°47.6
19	13°09.2	70°31.9	57.4	83°03.8	15.1	195°45.3	26.6	352°44.1	47.6
20	28°11.7	85°31.1	56.7	98°04.1	14.8	210°47.6	26.6	7°46.6	47.6
21	43°14.2	100°30.4	·· 56.1	113°04.5	·· 14.6	225°49.9	·· 26.5	22°49.0	·· 47.6
22	58°16.6	115°29.6	55.5	128°04.9	14.3	240°52.2	26.5	37°51.5	47.6
23	73°19.1	130°28.8	54.8	143°05.3	14.1	255°54.5	26.4	52°54.0	47.6
Mer.pass. 18:08		ν -0.8′	d 0.6′	m -3.94	ν 0.4′	d 0.3′	m 1.22	ν 2.3′	d 0.1′ m -2.03	ν 2.5′	d 0.0′ m 0.40

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	88°21.6	145°28.0	S21°54.2	158°05.6	S23°13.8	270°56.8	N02°26.3	67°56.5	N05°47.6
1	103°24.0	160°27.2	53.5	173°06.0	13.5	285°59.1	26.3	82°59.0	47.6
2	118°26.5	175°26.5	52.9	188°06.4	13.3	301°01.4	26.2	98°01.5	47.6
3	133°28.9	190°25.7	·· 52.2	203°06.8	·· 13.0	316°03.7	·· 26.1	113°04.0	·· 47.6
4	148°31.4	205°24.9	51.6	218°07.1	12.7	331°06.0	26.1	128°06.4	47.6
5	163°33.9	220°24.1	50.9	233°07.5	12.5	346°08.3	26.0	143°08.9	47.6
6	178°36.3	235°23.4	S21°50.3	248°07.9	S23°12.2	1°10.5	N02°26.0	158°11.4	N05°47.6
7	193°38.8	250°22.6	49.6	263°08.3	12.0	16°12.8	25.9	173°13.9	47.6
8	208°41.3	265°21.8	49.0	278°08.6	11.7	31°15.1	25.8	188°16.4	47.6
9	223°43.7	280°21.1	·· 48.3	293°09.0	·· 11.4	46°17.4	·· 25.8	203°18.9	·· 47.6
10	238°46.2	295°20.3	47.6	308°09.4	11.2	61°19.7	25.7	218°21.4	47.6
11	253°48.7	310°19.5	47.0	323°09.8	10.9	76°22.0	25.7	233°23.8	47.6
12	268°51.1	325°18.7	S21°46.3	338°10.1	S23°10.6	91°24.3	N02°25.6	248°26.3	N05°47.6
13	283°53.6	340°18.0	45.7	353°10.5	10.4	106°26.6	25.5	263°28.8	47.6
14	298°56.1	355°17.2	45.0	8°10.9	10.1	121°28.9	25.5	278°31.3	47.6
15	313°58.5	10°16.4	·· 44.3	23°11.3	·· 09.8	136°31.2	·· 25.4	293°33.8	·· 47.6
16	329°01.0	25°15.7	43.7	38°11.6	09.6	151°33.5	25.4	308°36.3	47.6
17	344°03.4	40°14.9	43.0	53°12.0	09.3	166°35.8	25.3	323°38.7	47.7
18	359°05.9	55°14.1	S21°42.4	68°12.4	S23°09.0	181°38.1	N02°25.2	338°41.2	N05°47.7
19	14°08.4	70°13.4	41.7	83°12.8	08.7	196°40.4	25.2	353°43.7	47.7
20	29°10.8	85°12.6	41.0	98°13.1	08.5	211°42.7	25.1	8°46.2	47.7
21	44°13.3	100°11.8	·· 40.3	113°13.5	·· 08.2	226°45.0	·· 25.1	23°48.7	·· 47.7
22	59°15.8	115°11.1	39.7	128°13.9	07.9	241°47.3	25.0	38°51.2	47.7
23	74°18.2	130°10.3	39.0	143°14.3	07.7	256°49.6	25.0	53°53.6	47.7
Mer.pass. 18:04		ν -0.8′	d 0.6′	m -3.95	ν 0.4′	d 0.3′	m 1.22	ν 2.3′	d 0.1′ m -2.04	ν 2.5′	d 0.0′ m 0.41

Stars

	SHA	Dec
Alpheratz	357°32.2	29°15.0
Ankaa	353°04.7	-42°09.4
Schedar	349°28.0	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.2	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°18.8	89°23.1
Acamar	315°09.6	-40°11.7
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.5
Bellatrix	278°19.9	6°22.5
Elnath	277°58.4	28°37.8
Alnilam	275°34.9	-1°11.1
Betelgeuse	270°49.1	7°24.7
Canopus	263°50.8	-52°42.6
Sirius	258°23.8	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.0	5°09.1
Pollux	243°14.0	27°57.3
Avior	234°13.2	-59°35.8
Suhail	222°44.2	-43°32.6
Miaplacidus	221°37.1	-69°49.7
Alphard	217°45.2	-8°46.8
Regulus	207°31.7	11°49.7
Dubhe	193°38.0	61°35.6
Denebola	182°22.5	14°24.8
Gienah	175°41.1	-17°41.8
Acrux	172°57.4	-63°15.0
Gacrux	171°49.0	-57°16.0
Alioth	166°11.1	55°48.1
Spica	158°19.9	-11°18.4
Alkaid	152°50.4	49°10.1
Hadar	148°32.9	-60°30.2
Menkent	147°55.0	-36°30.3
Arcturus	145°45.9	19°02.1
Rigil Kent.	139°37.3	-60°56.8
Kochab	137°20.9	74°02.1
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.2	-26°29.5
Atria	107°05.8	-69°04.5
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.7	12°32.4
Eltanin	90°41.6	51°29.1
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.7
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.7
Peacock	53°02.5	-56°38.8
Deneb	49°24.5	45°23.1
Enif	33°36.6	10°00.4
Al Na'ir	27°30.2	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.5	15°21.5

Dec 18 Sat	SHA	Mer.pass
Venus	59°42.6	14:16
Mars	71°24.4	13:28
Jupiter	182°43.7	06:03
Saturn	339°33.7	19:33

Dec 19 Sun	SHA	Mer.pass
Venus	58°24.4	14:18
Mars	70°34.2	13:28
Jupiter	182°39.4	05:59
Saturn	339°34.4	19:29

Dec 20 Mon	SHA	Mer.pass
Venus	57°06.5	14:19
Mars	69°44.1	13:27
Jupiter	182°35.2	05:55
Saturn	339°34.9	19:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0938 sec ΔT = TT-UT1 = +69.2778 sec

2027 December 18 to Dec. 20 UT

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°57.0	S23°22.2	300°18.3	9.8′	N11°33.9	14.8′	59.8′
1	195°56.7	22.3	314°47.1	9.9′	11°19.1	14.8′	59.8′
2	210°56.4	22.4	329°16.0	9.9′	11°04.3	15.0′	59.8′
3	225°56.0	·· 22.5	343°44.9	10.0′	10°49.3	14.9′	59.8′
4	240°55.7	22.6	358°14.0	10.1′	10°34.4	15.1′	59.7′
5	255°55.4	22.6	12°43.1	10.2′	10°19.3	15.0′	59.7′
6	270°55.1	S23°22.7	27°12.2	10.2′	N10°04.3	15.1′	59.7′
7	285°54.8	22.8	41°41.5	10.3′	09°49.2	15.2′	59.7′
8	300°54.5	22.9	56°10.8	10.4′	09°34.0	15.2′	59.7′
9	315°54.2	·· 22.9	70°40.2	10.5′	09°18.8	15.3′	59.7′
10	330°53.9	23.0	85°09.6	10.5′	09°03.5	15.3′	59.6′
11	345°53.6	23.1	99°39.2	10.6′	08°48.2	15.3′	59.6′
12	0°53.3	S23°23.2	114°08.7	10.7′	N08°32.9	15.3′	59.6′
13	15°53.0	23.2	128°38.4	10.7′	08°17.6	15.4′	59.6′
14	30°52.7	23.3	143°08.1	10.8′	08°02.2	15.5′	59.6′
15	45°52.4	·· 23.4	157°37.9	10.8′	07°46.7	15.4′	59.6′
16	60°52.1	23.4	172°07.7	10.9′	07°31.3	15.5′	59.5′
17	75°51.8	23.5	186°37.6	11.0′	07°15.8	15.5′	59.5′
18	90°51.5	S23°23.6	201°07.6	11.0′	N07°00.3	15.6′	59.5′
19	105°51.1	23.6	215°37.6	11.1′	06°44.7	15.6′	59.5′
20	120°50.8	23.7	230°07.7	11.1′	06°29.1	15.6′	59.5′
21	135°50.5	·· 23.8	244°37.8	11.2′	06°13.5	15.6′	59.4′
22	150°50.2	23.8	259°08.0	11.2′	05°57.9	15.6′	59.4′
23	165°49.9	23.9	273°38.2	11.3′	05°42.3	15.7′	59.4′
	SD = 16.2′	d = 0.1′	SD = 16.3′				

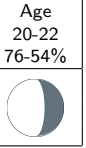
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.6	S23°23.9	288°08.5	11.3′	N05°26.6	15.6′	59.4′
1	195°49.3	24.0	302°38.9	11.4′	05°11.0	15.7′	59.4′
2	210°49.0	24.1	317°09.3	11.4′	04°55.3	15.7′	59.4′
3	225°48.7	·· 24.1	331°39.7	11.5′	04°39.6	15.7′	59.3′
4	240°48.4	24.2	346°10.2	11.5′	04°23.9	15.8′	59.3′
5	255°48.1	24.2	0°40.7	11.6′	04°08.1	15.7′	59.3′
6	270°47.8	S23°24.3	15°11.3	11.6′	N03°52.4	15.8′	59.3′
7	285°47.5	24.4	29°41.9	11.7′	03°36.6	15.7′	59.3′
8	300°47.1	24.4	44°12.6	11.7′	03°20.9	15.8′	59.2′
9	315°46.8	·· 24.5	58°43.3	11.7′	03°05.1	15.7′	59.2′
10	330°46.5	24.5	73°14.0	11.8′	02°49.4	15.8′	59.2′
11	345°46.2	24.6	87°44.8	11.8′	02°33.6	15.8′	59.2′
12	0°45.9	S23°24.6	102°15.6	11.8′	N02°17.8	15.8′	59.1′
13	15°45.6	24.7	116°46.4	11.9′	02°02.0	15.7′	59.1′
14	30°45.3	24.7	131°17.3	11.9′	01°46.3	15.8′	59.1′
15	45°45.0	·· 24.8	145°48.2	11.9′	01°30.5	15.7′	59.1′
16	60°44.7	24.8	160°19.2	12.0′	01°14.8	15.8′	59.1′
17	75°44.4	24.9	174°50.1	12.0′	00°59.0	15.7′	59.0′
18	90°44.1	S23°24.9	189°21.2	12.0′	N00°43.3	15.8′	59.0′
19	105°43.8	25.0	203°52.2	12.1′	00°27.5	15.7′	59.0′
20	120°43.4	25.0	218°23.2	12.1′	N00°11.8	15.7′	59.0′
21	135°43.1	·· 25.0	232°54.3	12.1′	S00°03.9	15.7′	59.0′
22	150°42.8	25.1	247°25.4	12.1′	00°19.6	15.7′	58.9′
23	165°42.5	25.1	261°56.6	12.1′	00°35.3	15.7′	58.9′
	SD = 16.2′	d = 0.1′	SD = 16.2′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°42.2	S23°25.2	276°27.7	12.2′	S00°51.0	15.7′	58.9′
1	195°41.9	25.2	290°58.9	12.2′	01°06.7	15.6′	58.9′
2	210°41.6	25.3	305°30.1	12.2′	01°22.3	15.7′	58.8′
3	225°41.3	·· 25.3	320°01.3	12.2′	01°38.0	15.6′	58.8′
4	240°41.0	25.3	334°32.5	12.2′	01°53.6	15.5′	58.8′
5	255°40.7	25.4	349°03.7	12.2′	02°09.1	15.6′	58.8′
6	270°40.4	S23°25.4	3°35.0	12.3′	S02°24.7	15.5′	58.8′
7	285°40.0	25.4	18°06.2	12.3′	02°40.2	15.6′	58.7′
8	300°39.7	25.5	32°37.5	12.3′	02°55.8	15.4′	58.7′
9	315°39.4	·· 25.5	47°08.8	12.3′	03°11.2	15.5′	58.7′
10	330°39.1	25.5	61°40.1	12.3′	03°26.7	15.4′	58.7′
11	345°38.8	25.6	76°11.4	12.3′	03°42.1	15.4′	58.6′
12	0°38.5	S23°25.6	90°42.7	12.3′	S03°57.5	15.4′	58.6′
13	15°38.2	25.6	105°14.0	12.3′	04°12.9	15.3′	58.6′
14	30°37.9	25.7	119°45.3	12.3′	04°28.2	15.3′	58.6′
15	45°37.6	·· 25.7	134°16.6	12.3′	04°43.5	15.3′	58.6′
16	60°37.3	25.7	148°47.9	12.3′	04°58.8	15.2′	58.5′
17	75°37.0	25.8	163°19.2	12.3′	05°14.0	15.2′	58.5′
18	90°36.6	S23°25.8	177°50.5	12.3′	S05°29.2	15.2′	58.5′
19	105°36.3	25.8	192°21.8	12.3′	05°44.4	15.1′	58.5′
20	120°36.0	25.8	206°53.1	12.3′	05°59.5	15.1′	58.4′
21	135°35.7	·· 25.9	221°24.4	12.3′	06°14.6	15.0′	58.4′
22	150°35.4	25.9	235°55.7	12.3′	06°29.6	15.0′	58.4′
23	165°35.1	25.9	250°27.0	12.3′	06°44.6	15.0′	58.4′
	SD = 16.2′	d = 0.0′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:24	10:55	▬	▬	12:59	15:30
N 70°	08:04	09:53	▬	▬	14:01	15:50
68°	07:48	09:17	▬	▬	14:36	16:06
66°	07:35	08:52	10:33	13:21	15:02	16:19
64°	07:24	08:32	09:50	14:03	15:21	16:30
62°	07:14	08:16	09:22	14:32	15:37	16:39
60°	07:06	08:03	09:01	14:53	15:51	16:48
N 58°	06:58	07:51	08:43	15:11	16:03	16:55
56°	06:52	07:41	08:28	15:26	16:13	17:02
54°	06:45	07:32	08:16	15:38	16:22	17:08
52°	06:40	07:23	08:04	15:49	16:30	17:14
50°	06:34	07:16	07:55	15:59	16:38	17:19
45°	06:23	07:00	07:34	16:20	16:54	17:31
N 40°	06:12	06:46	07:17	16:37	17:07	17:42
35°	06:03	06:35	07:03	16:51	17:19	17:51
30°	05:54	06:24	06:50	17:03	17:30	18:00
20°	05:38	06:05	06:29	17:25	17:49	18:16
N 10°	05:21	05:48	06:11	17:43	18:06	18:32
0°	05:04	05:31	05:53	18:01	18:23	18:49
S 10°	04:45	05:13	05:36	18:18	18:41	19:08
20°	04:23	04:52	05:17	18:37	19:02	19:31
30°	03:54	04:27	04:55	18:59	19:27	20:00
35°	03:35	04:12	04:42	19:12	19:42	20:19
40°	03:12	03:54	04:27	19:27	20:00	20:42
45°	02:41	03:31	04:08	19:45	20:23	21:13
S 50°	01:56	03:01	03:46	20:08	20:53	21:58
52°	01:28	02:46	03:35	20:19	21:08	22:26
54°	00:42	02:28	03:23	20:31	21:26	23:13
56°	////	02:06	03:09	20:45	21:48	////
58°	////	01:36	02:52	21:02	22:18	////
S 60°	////	00:46	02:31	21:23	23:09	////

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	21:28	23:45	·· ··	12:11	11:38	11:07
N 70°	21:37	23:44	·· ··	11:59	11:35	11:12
68°	21:44	23:43	·· ··	11:49	11:32	11:17
66°	21:50	23:42	·· ··	11:41	11:30	11:20
64°	21:55	23:41	·· ··	11:34	11:29	11:23
62°	21:59	23:41	·· ··	11:28	11:27	11:26
60°	22:03	23:40	·· ··	11:22	11:26	11:28
N 58°	22:07	23:39	·· ··	11:18	11:24	11:31
56°	22:09	23:39	·· ··	11:13	11:23	11:32
54°	22:12	23:39	·· ··	11:10	11:22	11:34
52°	22:15	23:38	·· ··	11:06	11:21	11:36
50°	22:17	23:38	·· ··	11:03	11:21	11:37
45°	22:21	23:37	·· ··	10:56	11:19	11:40
N 40°	22:25	23:37	·· ··	10:50	11:17	11:43
35°	22:29	23:36	·· ··	10:45	11:16	11:45
30°	22:32	23:36	·· ··	10:41	11:15	11:47
20°	22:37	23:35	·· ··	10:33	11:12	11:51
N 10°	22:41	23:34	·· ··	10:26	11:11	11:54
0°	22:46	23:34	·· ··	10:19	11:09	11:56
S 10°	22:50	23:33	·· ··	10:13	11:07	11:59
20°	22:54	23:33	·· ··	10:06	11:05	12:02
30°	22:59	23:32	·· ··	09:57	11:03	12:06
35°	23:02	23:32	·· ··	09:53	11:01	12:08
40°	23:06	23:32	23:57	09:47	11:00	12:10
45°	23:09	23:31	23:53	09:41	10:58	12:13
S 50°	23:14	23:31	23:47	09:33	10:56	12:16
52°	23:16	23:30	23:45	09:29	10:55	12:17
54°	23:18	23:30	23:42	09:26	10:54	12:19
56°	23:21	23:30	23:39	09:21	10:52	12:21
58°	23:24	23:30	23:36	09:16	10:51	12:23
S 60°	23:27	23:29	23:32	09:11	10:49	12:25

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 20-22 76-54%
18	03:48	03:33	11:56	04:07	16:33	
19	03:18	03:04	11:57	04:57	17:21	
20	02:49	02:34	11:57	05:45	18:09	



December 21, 22, 23 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	89°20.7	145°09.5	S21°38.3	158°14.7	S23°07.4	271°51.9	N02°24.9	68°56.1	N05°47.7
1	104°23.2	160°08.8	37.7	173°15.0	07.1	286°54.2	24.8	83°58.6	47.7
2	119°25.6	175°08.0	37.0	188°15.4	06.8	301°56.5	24.8	99°01.1	47.7
3	134°28.1	190°07.3	·· 36.3	203°15.8	·· 06.6	316°58.8	·· 24.7	114°03.6	·· 47.7
4	149°30.5	205°06.5	35.6	218°16.2	06.3	332°01.1	24.7	129°06.0	47.7
5	164°33.0	220°05.7	35.0	233°16.5	06.0	347°03.4	24.6	144°08.5	47.7
6	179°35.5	235°05.0	S21°34.3	248°16.9	S23°05.7	2°05.7	N02°24.5	159°11.0	N05°47.7
7	194°37.9	250°04.2	33.6	263°17.3	05.5	17°08.0	24.5	174°13.5	47.7
8	209°40.4	265°03.5	32.9	278°17.7	05.2	32°10.3	24.4	189°16.0	47.7
9	224°42.9	280°02.7	·· 32.2	293°18.0	·· 04.9	47°12.7	·· 24.4	204°18.4	·· 47.7
10	239°45.3	295°01.9	31.6	308°18.4	04.6	62°15.0	24.3	219°20.9	47.7
11	254°47.8	310°01.2	30.9	323°18.8	04.4	77°17.3	24.3	234°23.4	47.7
12	269°50.3	325°00.4	S21°30.2	338°19.2	S23°04.1	92°19.6	N02°24.2	249°25.9	N05°47.8
13	284°52.7	339°59.7	29.5	353°19.5	03.8	107°21.9	24.1	264°28.4	47.8
14	299°55.2	354°58.9	28.8	8°19.9	03.5	122°24.2	24.1	279°30.8	47.8
15	314°57.7	9°58.2	·· 28.1	23°20.3	·· 03.2	137°26.5	·· 24.0	294°33.3	·· 47.8
16	330°00.1	24°57.4	27.4	38°20.7	03.0	152°28.8	24.0	309°35.8	47.8
17	345°02.6	39°56.6	26.7	53°21.1	02.7	167°31.1	23.9	324°38.3	47.8
18	0°05.0	54°55.9	S21°26.0	68°21.4	S23°02.4	182°33.4	N02°23.9	339°40.8	N05°47.8
19	15°07.5	69°55.1	25.4	83°21.8	02.1	197°35.7	23.8	354°43.2	47.8
20	30°10.0	84°54.4	24.7	98°22.2	01.8	212°38.0	23.8	9°45.7	47.8
21	45°12.4	99°53.6	·· 24.0	113°22.6	·· 01.6	227°40.3	·· 23.7	24°48.2	·· 47.8
22	60°14.9	114°52.9	23.3	128°22.9	01.3	242°42.6	23.6	39°50.7	47.8
23	75°17.4	129°52.1	22.6	143°23.3	01.0	257°44.9	23.6	54°53.2	47.8
Mer.pass. 18:00		ν -0.8′	d 0.7′	m -3.95	ν 0.4′	d 0.3′	m 1.22	ν 2.3′	d 0.1′ m -2.04	ν 2.5′	d 0.0′ m 0.41

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	90°19.8	144°51.4	S21°21.9	158°23.7	S23°00.7	272°47.2	N02°23.5	69°55.6	N05°47.8
1	105°22.3	159°50.6	21.2	173°24.1	00.4	287°49.5	23.5	84°58.1	47.8
2	120°24.8	174°49.9	20.5	188°24.5	23°00.1	302°51.9	23.4	100°00.6	47.9
3	135°27.2	189°49.1	·· 19.8	203°24.8	22°59.9	317°54.2	·· 23.4	115°03.1	·· 47.9
4	150°29.7	204°48.4	19.1	218°25.2	59.6	332°56.5	23.3	130°05.5	47.9
5	165°32.2	219°47.6	18.4	233°25.6	59.3	347°58.8	23.3	145°08.0	47.9
6	180°34.6	234°46.9	S21°17.7	248°26.0	S22°59.0	3°01.1	N02°23.2	160°10.5	N05°47.9
7	195°37.1	249°46.1	17.0	263°26.3	58.7	18°03.4	23.1	175°13.0	47.9
8	210°39.5	264°45.4	16.3	278°26.7	58.4	33°05.7	23.1	190°15.4	47.9
9	225°42.0	279°44.7	·· 15.5	293°27.1	·· 58.1	48°08.0	·· 23.0	205°17.9	·· 47.9
10	240°44.5	294°43.9	14.8	308°27.5	57.9	63°10.3	23.0	220°20.4	47.9
11	255°46.9	309°43.2	14.1	323°27.9	57.6	78°12.6	22.9	235°22.9	47.9
12	270°49.4	324°42.4	S21°13.4	338°28.2	S22°57.3	93°15.0	N02°22.9	250°25.3	N05°47.9
13	285°51.9	339°41.7	12.7	353°28.6	57.0	108°17.3	22.8	265°27.8	47.9
14	300°54.3	354°40.9	12.0	8°29.0	56.7	123°19.6	22.8	280°30.3	47.9
15	315°56.8	9°40.2	·· 11.3	23°29.4	·· 56.4	138°21.9	·· 22.7	295°32.8	·· 48.0
16	330°59.3	24°39.5	10.6	38°29.8	56.1	153°24.2	22.7	310°35.3	48.0
17	346°01.7	39°38.7	09.9	53°30.1	55.8	168°26.5	22.6	325°37.7	48.0
18	1°04.2	54°38.0	S21°09.1	68°30.5	S22°55.5	183°28.8	N02°22.6	340°40.2	N05°48.0
19	16°06.6	69°37.2	08.4	83°30.9	55.2	198°31.1	22.5	355°42.7	48.0
20	31°09.1	84°36.5	07.7	98°31.3	54.9	213°33.5	22.4	10°45.1	48.0
21	46°11.6	99°35.8	·· 07.0	113°31.7	·· 54.7	228°35.8	·· 22.4	25°47.6	·· 48.0
22	61°14.0	114°35.0	06.3	128°32.0	54.4	243°38.1	22.3	40°50.1	48.0
23	76°16.5	129°34.3	05.5	143°32.4	54.1	258°40.4	22.3	55°52.6	48.0
Mer.pass. 17:56		ν -0.7′	d 0.7′	m -3.95	ν 0.4′	d 0.3′	m 1.22	ν 2.3′	d 0.1′ m -2.05	ν 2.5′	d 0.0′ m 0.42

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°19.0	144°33.6	S21°04.8	158°32.8	S22°53.8	273°42.7	N02°22.2	70°55.0	N05°48.0
1	106°21.4	159°32.8	04.1	173°33.2	53.5	288°45.0	22.2	85°57.5	48.0
2	121°23.9	174°32.1	03.4	188°33.5	53.2	303°47.3	22.1	101°00.0	48.0
3	136°26.4	189°31.4	·· 02.6	203°33.9	·· 52.9	318°49.7	·· 22.1	116°02.5	·· 48.1
4	151°28.8	204°30.6	01.9	218°34.3	52.6	333°52.0	22.0	131°04.9	48.1
5	166°31.3	219°29.9	01.2	233°34.7	52.3	348°54.3	22.0	146°07.4	48.1
6	181°33.8	234°29.2	S21°00.4	248°35.1	S22°52.0	3°56.6	N02°21.9	161°09.9	N05°48.1
7	196°36.2	249°28.4	20°59.7	263°35.4	51.7	18°58.9	21.9	176°12.4	48.1
8	211°38.7	264°27.7	59.0	278°35.8	51.4	34°01.2	21.8	191°14.8	48.1
9	226°41.1	279°27.0	·· 58.3	293°36.2	·· 51.1	49°03.6	·· 21.8	206°17.3	·· 48.1
10	241°43.6	294°26.2	57.5	308°36.6	50.8	64°05.9	21.7	221°19.8	48.1
11	256°46.1	309°25.5	56.8	323°37.0	50.5	79°08.2	21.7	236°22.2	48.1
12	271°48.5	324°24.8	S20°56.1	338°37.3	S22°50.2	94°10.5	N02°21.6	251°24.7	N05°48.1
13	286°51.0	339°24.0	55.3	353°37.7	49.9	109°12.8	21.6	266°27.2	48.2
14	301°53.5	354°23.3	54.6	8°38.1	49.6	124°15.1	21.5	281°29.7	48.2
15	316°55.9	9°22.6	·· 53.8	23°38.5	·· 49.3	139°17.5	·· 21.5	296°32.1	·· 48.2
16	331°58.4	24°21.9	53.1	38°38.9	49.0	154°19.8	21.4	311°34.6	48.2
17	347°00.9	39°21.1	52.4	53°39.3	48.7	169°22.1	21.4	326°37.1	48.2
18	2°03.3	54°20.4	S20°51.6	68°39.6	S22°48.4	184°24.4	N02°21.3	341°39.5	N05°48.2
19	17°05.8	69°19.7	50.9	83°40.0	48.1	199°26.7	21.3	356°42.0	48.2
20	32°08.3	84°19.0	50.1	98°40.4	47.8	214°29.1	21.2	11°44.5	48.2
21	47°10.7	99°18.2	·· 49.4	113°40.8	·· 47.5	229°31.4	·· 21.2	26°46.9	·· 48.2
22	62°13.2	114°17.5	48.6	128°41.2	47.2	244°33.7	21.1	41°49.4	48.2
23	77°15.6	129°16.8	47.9	143°41.5	46.9	259°36.0	21.1	56°51.9	48.3
Mer.pass. 17:52		ν -0.7′	d 0.7′	m -3.96	ν 0.4′	d 0.3′	m 1.21	ν 2.3′	d 0.1′ m -2.06	ν 2.5′	d 0.0′ m 0.42

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.9
Ankaa	353°04.8	-42°09.4
Schedar	349°28.1	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.2	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°19.6	89°23.1
Acamar	315°09.6	-40°11.7
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.5
Bellatrix	278°19.9	6°22.5
Elnath	277°58.4	28°37.8
Alnilam	275°34.9	-1°11.1
Betelgeuse	270°49.1	7°24.7
Canopus	263°50.7	-52°42.6
Sirius	258°23.8	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.0	5°09.1
Pollux	243°14.0	27°57.3
Avior	234°13.2	-59°35.8
Suhail	222°44.2	-43°32.6
Miaplacidus	221°37.0	-69°49.7
Alphard	217°45.2	-8°46.9
Regulus	207°31.7	11°49.7
Dubhe	193°38.0	61°35.6
Denebola	182°22.5	14°24.8
Gienah	175°41.1	-17°41.8
Acrux	172°57.4	-63°15.0
Gacrux	171°48.9	-57°16.0
Alioth	166°11.1	55°48.1
Spica	158°19.9	-11°18.4
Alkaid	152°50.4	49°10.1
Hadar	148°32.8	-60°30.2
Menkent	147°54.9	-36°30.3
Arcturus	145°45.9	19°02.1
Rigil Kent.	139°37.3	-60°56.8
Kochab	137°20.9	74°02.1
Zuben'ubi	136°53.6	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.2	-26°29.5
Atria	107°05.8	-69°04.5
Sabik	102°00.4	-15°45.5
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.7	12°32.4
Eltanin	90°41.6	51°29.1
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.6
Nunki	75°45.1	-26°15.7
Altair	61°57.9	8°56.6
Peacock	53°02.5	-56°38.7
Deneb	49°24.5	45°23.0
Enif	33°36.6	10°00.4
Al Na'ir	27°30.2	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.6	15°21.5

Dec 21 Tue	SHA	Mer.pass
Venus	55°48.8	14:20
Mars	68°54.0	13:27
Jupiter	182°31.2	05:52
Saturn	339°35.4	19:21

Dec 22 Wed	SHA	Mer.pass
Venus	54°31.6	14:21
Mars	68°03.9	13:26
Jupiter	182°27.4	05:48
Saturn	339°35.8	19:17

Dec 23 Thu	SHA	Mer.pass
Venus	53°14.6	14:22
Mars	67°13.8	13:25
Jupiter	182°23.7	05:44
Saturn	339°36.1	19:13

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°34.8	S23°25.9	264°58.3	12.3′	S06°59.6	14.8′	58.3′
1	195°34.5	26.0	279°29.6	12.3′	07°14.4	14.9′	58.3′
2	210°34.2	26.0	294°00.8	12.3′	07°29.3	14.8′	58.3′
3	225°33.9	·· 26.0	308°32.1	12.2′	07°44.1	14.8′	58.3′
4	240°33.5	26.0	323°03.3	12.2′	07°58.9	14.7′	58.3′
5	255°33.2	26.0	337°34.6	12.2′	08°13.6	14.6′	58.2′
6	270°32.9	S23°26.0	352°05.8	12.2′	S08°28.2	14.6′	58.2′
7	285°32.6	26.1	6°37.0	12.2′	08°42.8	14.6′	58.2′
8	300°32.3	26.1	21°08.1	12.2′	08°57.4	14.5′	58.2′
9	315°32.0	·· 26.1	35°39.3	12.1′	09°11.9	14.4′	58.1′
10	330°31.7	26.1	50°10.4	12.1′	09°26.3	14.4′	58.1′
11	345°31.4	26.1	64°41.6	12.1′	09°40.7	14.3′	58.1′
12	0°31.1	S23°26.1	79°12.7	12.1′	S09°55.0	14.2′	58.1′
13	15°30.7	26.1	93°43.7	12.1′	10°09.2	14.2′	58.0′
14	30°30.4	26.2	108°14.8	12.0′	10°23.4	14.2′	58.0′
15	45°30.1	·· 26.2	122°45.8	12.0′	10°37.6	14.1′	58.0′
16	60°29.8	26.2	137°16.8	12.0′	10°51.7	14.0′	58.0′
17	75°29.5	26.2	151°47.8	12.0′	11°05.7	13.9′	57.9′
18	90°29.2	S23°26.2	166°18.8	11.9′	S11°19.6	13.9′	57.9′
19	105°28.9	26.2	180°49.7	11.9′	11°33.5	13.8′	57.9′
20	120°28.6	26.2	195°20.6	11.9′	11°47.3	13.8′	57.9′
21	135°28.3	·· 26.2	209°51.5	11.8′	12°01.1	13.6′	57.9′
22	150°28.0	26.2	224°22.3	11.8′	12°14.7	13.6′	57.8′
23	165°27.6	26.2	238°53.1	11.8′	12°28.3	13.6′	57.8′
	SD = 16.2′	d = 0.0′	SD = 15.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°27.3	S23°26.2	253°23.9	11.7′	S12°41.9	13.4′	57.8′
1	195°27.0	26.2	267°54.6	11.7′	12°55.3	13.4′	57.8′
2	210°26.7	26.2	282°25.3	11.7′	13°08.7	13.3′	57.7′
3	225°26.4	·· 26.2	296°56.0	11.6′	13°22.0	13.3′	57.7′
4	240°26.1	26.2	311°26.7	11.6′	13°35.3	13.1′	57.7′
5	255°25.8	26.2	325°57.3	11.6′	13°48.4	13.1′	57.7′
6	270°25.5	S23°26.2	340°27.8	11.5′	S14°01.5	13.0′	57.7′
7	285°25.2	26.2	354°58.4	11.5′	14°14.5	12.9′	57.6′
8	300°24.8	26.2	9°28.9	11.5′	14°27.4	12.8′	57.6′
9	315°24.5	·· 26.2	23°59.3	11.4′	14°40.2	12.8′	57.6′
10	330°24.2	26.2	38°29.7	11.4′	14°53.0	12.7′	57.6′
11	345°23.9	26.2	53°00.1	11.3′	15°05.7	12.6′	57.5′
12	0°23.6	S23°26.2	67°30.5	11.3′	S15°18.3	12.5′	57.5′
13	15°23.3	26.2	82°00.7	11.3′	15°30.8	12.4′	57.5′
14	30°23.0	26.2	96°31.0	11.2′	15°43.2	12.3′	57.5′
15	45°22.7	·· 26.2	111°01.2	11.2′	15°55.5	12.2′	57.4′
16	60°22.4	26.2	125°31.4	11.1′	16°07.7	12.2′	57.4′
17	75°22.0	26.1	140°01.5	11.1′	16°19.9	12.1′	57.4′
18	90°21.7	S23°26.1	154°31.6	11.0′	S16°32.0	11.9′	57.4′
19	105°21.4	26.1	169°01.6	11.0′	16°43.9	11.9′	57.4′
20	120°21.1	26.1	183°31.6	10.9′	16°55.8	11.8′	57.3′
21	135°20.8	·· 26.1	198°01.6	10.9′	17°07.6	11.7′	57.3′
22	150°20.5	26.1	212°31.5	10.9′	17°19.3	11.5′	57.3′
23	165°20.2	26.1	227°01.3	10.8′	17°30.8	11.5′	57.3′
	SD = 16.3′	d = 0.0′	SD = 15.8′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°19.9	S23°26.0	241°31.1	10.8′	S17°42.3	11.4′	57.2′
1	195°19.5	26.0	256°00.9	10.7′	17°53.7	11.3′	57.2′
2	210°19.2	26.0	270°30.6	10.7′	18°05.0	11.2′	57.2′
3	225°18.9	·· 26.0	285°00.3	10.6′	18°16.2	11.1′	57.2′
4	240°18.6	26.0	299°29.9	10.6′	18°27.3	11.0′	57.2′
5	255°18.3	25.9	313°59.5	10.5′	18°38.3	10.9′	57.1′
6	270°18.0	S23°25.9	328°29.0	10.5′	S18°49.2	10.8′	57.1′
7	285°17.7	25.9	342°58.5	10.4′	19°00.0	10.6′	57.1′
8	300°17.4	25.9	357°27.9	10.4′	19°10.6	10.6′	57.1′
9	315°17.1	·· 25.8	11°57.3	10.3′	19°21.2	10.5′	57.0′
10	330°16.7	25.8	26°26.6	10.3′	19°31.7	10.3′	57.0′
11	345°16.4	25.8	40°55.9	10.2′	19°42.0	10.3′	57.0′
12	0°16.1	S23°25.8	55°25.1	10.2′	S19°52.3	10.1′	57.0′
13	15°15.8	25.7	69°54.3	10.1′	20°02.4	10.0′	57.0′
14	30°15.5	25.7	84°23.5	10.1′	20°12.4	9.9′	56.9′
15	45°15.2	·· 25.7	98°52.6	10.0′	20°22.3	9.8′	56.9′
16	60°14.9	25.7	113°21.6	10.0′	20°32.1	9.7′	56.9′
17	75°14.6	25.6	127°50.6	9.9′	20°41.8	9.6′	56.9′
18	90°14.3	S23°25.6	142°19.5	9.9′	S20°51.4	9.5′	56.9′
19	105°13.9	25.6	156°48.4	9.8′	21°00.9	9.3′	56.8′
20	120°13.6	25.5	171°17.3	9.8′	21°10.2	9.2′	56.8′
21	135°13.3	·· 25.5	185°46.1	9.8′	21°19.4	9.1′	56.8′
22	150°13.0	25.5	200°14.8	9.7′	21°28.5	9.0′	56.8′
23	165°12.7	25.4	214°43.5	9.7′	21°37.5	8.9′	56.7′
	SD = 16.3′	d = 0.0′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:26	10:58	▬	▬	12:59	15:31
N 70°	08:06	09:55	▬	▬	14:02	15:51
68°	07:50	09:19	▬	▬	14:37	16:07
66°	07:37	08:54	10:35	13:22	15:03	16:20
64°	07:26	08:34	09:52	14:04	15:23	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:08	08:05	09:02	14:55	15:52	16:49
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:53	07:43	08:30	15:27	16:14	17:04
54°	06:47	07:33	08:17	15:40	16:23	17:10
52°	06:41	07:25	08:06	15:51	16:32	17:15
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:24	07:02	07:35	16:21	16:55	17:33
N 40°	06:14	06:48	07:19	16:38	17:09	17:43
35°	06:04	06:36	07:04	16:52	17:21	17:52
30°	05:56	06:26	06:52	17:05	17:31	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:49	06:12	17:45	18:08	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
S 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:53	05:18	18:39	19:03	19:33
30°	03:55	04:28	04:56	19:01	19:28	20:02
35°	03:36	04:13	04:43	19:14	19:44	20:20
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:43	03:32	04:10	19:47	20:25	21:14
S 50°	01:57	03:03	03:47	20:10	20:54	22:00
52°	01:29	02:47	03:36	20:21	21:09	22:28
54°	00:42	02:29	03:24	20:33	21:27	23:15
56°	////	02:07	03:10	20:47	21:50	////
58°	////	01:37	02:53	21:04	22:20	////
S 60°	////	00:46	02:32	21:25	23:11	////

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	02:02	04:33	▬	10:33	09:44	▬
N 70°	01:50	04:03	06:57	10:48	10:16	09:06
68°	01:40	03:42	05:59	11:00	10:39	10:06
66°	01:32	03:25	05:25	11:10	10:57	10:40
64°	01:25	03:11	05:01	11:18	11:12	11:06
62°	01:20	03:00	04:42	11:25	11:25	11:25
60°	01:15	02:50	04:26	11:31	11:35	11:42
N 58°	01:11	02:42	04:13	11:37	11:45	11:56
56°	01:07	02:34	04:02	11:42	11:53	12:08
54°	01:03	02:28	03:52	11:46	12:00	12:18
52°	01:00	02:22	03:43	11:50	12:07	12:28
50°	00:58	02:17	03:35	11:54	12:13	12:36
45°	00:52	02:05	03:19	12:02	12:26	12:54
N 40°	00:47	01:56	03:05	12:09	12:37	13:09
35°	00:42	01:48	02:54	12:15	12:46	13:21
30°	00:39	01:41	02:44	12:20	12:54	13:32
20°	00:32	01:29	02:27	12:29	13:08	13:51
N 10°	00:27	01:19	02:12	12:37	13:21	14:07
0°	00:21	01:09	01:58	12:44	13:32	14:23
S 10°	00:16	01:00	01:45	12:51	13:44	14:38
20°	00:11	00:50	01:30	12:59	13:57	14:55
30°	00:05	00:38	01:14	13:09	14:11	15:14
35°	00:01	00:31	01:04	13:14	14:20	15:25
40°	·· ··	00:24	00:54	13:20	14:29	15:38
45°	·· ··	00:15	00:41	13:27	14:40	15:53
S 50°	·· ··	00:05	00:26	13:35	14:54	16:12
52°	·· ··	00:00	00:19	13:39	15:01	16:21
54°	23:55	·· ··	00:11	13:44	15:08	16:31
56°	23:49	·· ··	00:02	13:48	15:16	16:43
58°	23:43	23:52	·· ··	13:54	15:25	16:56
S 60°	23:36	23:41	23:49	14:00	15:35	17:11

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 23-25 43-23%
21	02:19	02:04	11:58	06:33	18:57	
22	01:49	01:34	11:58	07:21	19:45	
23	01:19	01:04	11:59	08:10	20:36	

December 24, 25, 26 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	92°18.1	144°16.1	S20°47.1	158°41.9	S22°46.6	274°38.3	N02°21.0	71°54.4	N05°48.3
1	107°20.6	159°15.4	46.4	173°42.3	46.3	289°40.7	21.0	86°56.8	48.3
2	122°23.0	174°14.6	45.6	188°42.7	46.0	304°43.0	20.9	101°59.3	48.3
3	137°25.5	189°13.9	·· 44.9	203°43.1	·· 45.7	319°45.3	·· 20.9	117°01.8	·· 48.3
4	152°28.0	204°13.2	44.1	218°43.4	45.3	334°47.6	20.8	132°04.2	48.3
5	167°30.4	219°12.5	43.4	233°43.8	45.0	349°49.9	20.8	147°06.7	48.3
6	182°32.9	234°11.8	S20°42.6	248°44.2	S22°44.7	4°52.3	N02°20.7	162°09.2	N05°48.3
7	197°35.4	249°11.0	41.9	263°44.6	44.4	19°54.6	20.7	177°11.6	48.3
8	212°37.8	264°10.3	41.1	278°45.0	44.1	34°56.9	20.6	192°14.1	48.4
9	227°40.3	279°09.6	·· 40.4	293°45.4	·· 43.8	49°59.2	·· 20.6	207°16.6	·· 48.4
10	242°42.7	294°08.9	39.6	308°45.7	43.5	65°01.6	20.5	222°19.0	48.4
11	257°45.2	309°08.2	38.8	323°46.1	43.2	80°03.9	20.5	237°21.5	48.4
12	272°47.7	324°07.5	S20°38.1	338°46.5	S22°42.9	95°06.2	N02°20.4	252°24.0	N05°48.4
13	287°50.1	339°06.7	37.3	353°46.9	42.6	110°08.5	20.4	267°26.4	48.4
14	302°52.6	354°06.0	36.6	8°47.3	42.3	125°10.9	20.3	282°28.9	48.4
15	317°55.1	9°05.3	·· 35.8	23°47.7	·· 41.9	140°13.2	·· 20.3	297°31.4	·· 48.4
16	332°57.5	24°04.6	35.0	38°48.0	41.6	155°15.5	20.2	312°33.8	48.4
17	348°00.0	39°03.9	34.3	53°48.4	41.3	170°17.8	20.2	327°36.3	48.5
18	3°02.5	54°03.2	S20°33.5	68°48.8	S22°41.0	185°20.2	N02°20.1	342°38.8	N05°48.5
19	18°04.9	69°02.5	32.7	83°49.2	40.7	200°22.5	20.1	357°41.2	48.5
20	33°07.4	84°01.8	32.0	98°49.6	40.4	215°24.8	20.0	12°43.7	48.5
21	48°09.9	99°01.1	·· 31.2	113°50.0	·· 40.1	230°27.1	·· 20.0	27°46.2	·· 48.5
22	63°12.3	114°00.3	30.4	128°50.3	39.7	245°29.5	20.0	42°48.6	48.5
23	78°14.8	128°59.6	29.7	143°50.7	39.4	260°31.8	19.9	57°51.1	48.5
Mer.pass. 17:48		ν -0.7′	d 0.7′	m -3.96	ν 0.4′	d 0.3′	m 1.21	ν 2.3′	d 0.0′ m -2.06	ν 2.5′	d 0.0′ m 0.43

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	93°17.2	143°58.9	S20°28.9	158°51.1	S22°39.1	275°34.1	N02°19.9	72°53.6	N05°48.5
1	108°19.7	158°58.2	28.1	173°51.5	38.8	290°36.5	19.8	87°56.0	48.6
2	123°22.2	173°57.5	27.3	188°51.9	38.5	305°38.8	19.8	102°58.5	48.6
3	138°24.6	188°56.8	·· 26.6	203°52.3	·· 38.2	320°41.1	·· 19.7	118°01.0	·· 48.6
4	153°27.1	203°56.1	25.8	218°52.6	37.8	335°43.4	19.7	133°03.4	48.6
5	168°29.6	218°55.4	25.0	233°53.0	37.5	350°45.8	19.6	148°05.9	48.6
6	183°32.0	233°54.7	S20°24.2	248°53.4	S22°37.2	5°48.1	N02°19.6	163°08.3	N05°48.6
7	198°34.5	248°54.0	23.5	263°53.8	36.9	20°50.4	19.5	178°10.8	48.6
8	213°37.0	263°53.3	22.7	278°54.2	36.6	35°52.8	19.5	193°13.3	48.6
9	228°39.4	278°52.6	·· 21.9	293°54.6	·· 36.2	50°55.1	·· 19.4	208°15.7	·· 48.7
10	243°41.9	293°51.9	21.1	308°54.9	35.9	65°57.4	19.4	223°18.2	48.7
11	258°44.4	308°51.2	20.3	323°55.3	35.6	80°59.8	19.4	238°20.7	48.7
12	273°46.8	323°50.5	S20°19.5	338°55.7	S22°35.3	96°02.1	N02°19.3	253°23.1	N05°48.7
13	288°49.3	338°49.8	18.8	353°56.1	35.0	111°04.4	19.3	268°25.6	48.7
14	303°51.7	353°49.1	18.0	8°56.5	34.6	126°06.8	19.2	283°28.0	48.7
15	318°54.2	8°48.4	·· 17.2	23°56.9	·· 34.3	141°09.1	·· 19.2	298°30.5	·· 48.7
16	333°56.7	23°47.7	16.4	38°57.3	34.0	156°11.4	19.1	313°33.0	48.7
17	348°59.1	38°47.0	15.6	53°57.6	33.7	171°13.8	19.1	328°35.4	48.8
18	4°01.6	53°46.3	S20°14.8	68°58.0	S22°33.3	186°16.1	N02°19.0	343°37.9	N05°48.8
19	19°04.1	68°45.6	14.0	83°58.4	33.0	201°18.4	19.0	358°40.4	48.8
20	34°06.5	83°44.9	13.2	98°58.8	32.7	216°20.8	19.0	13°42.8	48.8
21	49°09.0	98°44.2	·· 12.4	113°59.2	·· 32.4	231°23.1	·· 18.9	28°45.3	·· 48.8
22	64°11.5	113°43.5	11.7	128°59.6	32.0	246°25.4	18.9	43°47.7	48.8
23	79°13.9	128°42.8	10.9	143°59.9	31.7	261°27.8	18.8	58°50.2	48.8
Mer.pass. 17:44		ν -0.7′	d 0.8′	m -3.96	ν 0.4′	d 0.3′	m 1.21	ν 2.3′	d 0.0′ m -2.07	ν 2.5′	d 0.0′ m 0.43

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	94°16.4	143°42.1	S20°10.1	159°00.3	S22°31.4	276°30.1	N02°18.8	73°52.7	N05°48.9
1	109°18.9	158°41.4	09.3	174°00.7	31.1	291°32.4	18.7	88°55.1	48.9
2	124°21.3	173°40.8	08.5	189°01.1	30.7	306°34.8	18.7	103°57.6	48.9
3	139°23.8	188°40.1	·· 07.7	204°01.5	·· 30.4	321°37.1	·· 18.6	119°00.0	·· 48.9
4	154°26.2	203°39.4	06.9	219°01.9	30.1	336°39.4	18.6	134°02.5	48.9
5	169°28.7	218°38.7	06.1	234°02.3	29.7	351°41.8	18.6	149°05.0	48.9
6	184°31.2	233°38.0	S20°05.3	249°02.7	S22°29.4	6°44.1	N02°18.5	164°07.4	N05°48.9
7	199°33.6	248°37.3	04.5	264°03.0	29.1	21°46.4	18.5	179°09.9	49.0
8	214°36.1	263°36.6	03.7	279°03.4	28.8	36°48.8	18.4	194°12.3	49.0
9	229°38.6	278°35.9	·· 02.9	294°03.8	·· 28.4	51°51.1	·· 18.4	209°14.8	·· 49.0
10	244°41.0	293°35.2	02.0	309°04.2	28.1	66°53.5	18.3	224°17.3	49.0
11	259°43.5	308°34.6	01.2	324°04.6	27.8	81°55.8	18.3	239°19.7	49.0
12	274°46.0	323°33.9	S20°00.4	339°05.0	S22°27.4	96°58.1	N02°18.3	254°22.2	N05°49.0
13	289°48.4	338°33.2	19°59.6	354°05.4	27.1	112°00.5	18.2	269°24.6	49.1
14	304°50.9	353°32.5	58.8	9°05.7	26.8	127°02.8	18.2	284°27.1	49.1
15	319°53.4	8°31.8	·· 58.0	24°06.1	·· 26.4	142°05.1	·· 18.1	299°29.5	·· 49.1
16	334°55.8	23°31.1	57.2	39°06.5	26.1	157°07.5	18.1	314°32.0	49.1
17	349°58.3	38°30.5	56.4	54°06.9	25.8	172°09.8	18.1	329°34.5	49.1
18	5°00.7	53°29.8	S19°55.6	69°07.3	S22°25.4	187°12.2	N02°18.0	344°36.9	N05°49.1
19	20°03.2	68°29.1	54.8	84°07.7	25.1	202°14.5	18.0	359°39.4	49.1
20	35°05.7	83°28.4	53.9	99°08.1	24.8	217°16.8	17.9	14°41.8	49.2
21	50°08.1	98°27.7	·· 53.1	114°08.5	·· 24.4	232°19.2	·· 17.9	29°44.3	·· 49.2
22	65°10.6	113°27.1	52.3	129°08.8	24.1	247°21.5	17.8	44°46.7	49.2
23	80°13.1	128°26.4	51.5	144°09.2	23.8	262°23.9	17.8	59°49.2	49.2
Mer.pass. 17:40		ν -0.7′	d 0.8′	m -3.96	ν 0.4′	d 0.3′	m 1.21	ν 2.3′	d 0.0′ m -2.08	ν 2.5′	d 0.0′ m 0.44

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.9
Ankaa	353°04.8	-42°09.4
Schedar	349°28.1	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.2	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°20.3	89°23.1
Acamar	315°09.7	-40°11.7
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.5
Bellatrix	278°19.9	6°22.4
Elnath	277°58.4	28°37.8
Alnilam	275°34.9	-1°11.1
Betelgeuse	270°49.1	7°24.7
Canopus	263°50.7	-52°42.6
Sirius	258°23.7	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.0	5°09.1
Pollux	243°14.0	27°57.3
Avior	234°13.1	-59°35.8
Suhail	222°44.2	-43°32.7
Miaplacidus	221°37.0	-69°49.8
Alphard	217°45.1	-8°46.9
Regulus	207°31.7	11°49.6
Dubhe	193°38.0	61°35.6
Denebola	182°22.5	14°24.8
Gienah	175°41.1	-17°41.8
Acrux	172°57.3	-63°15.0
Gacrux	171°48.9	-57°16.0
Alioth	166°11.0	55°48.1
Spica	158°19.8	-11°18.4
Alkaid	152°50.4	49°10.1
Hadar	148°32.8	-60°30.2
Menkent	147°54.9	-36°30.3
Arcturus	145°45.9	19°02.0
Rigil Kent.	139°37.3	-60°56.8
Kochab	137°20.8	74°02.1
Zuben'ubi	136°53.5	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.2	-26°29.5
Atria	107°05.7	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.6	12°32.4
Eltanin	90°41.6	51°29.1
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.6
Nunki	75°45.1	-26°15.6
Altair	61°57.9	8°56.6
Peacock	53°02.5	-56°38.7
Deneb	49°24.5	45°23.0
Enif	33°36.6	10°00.3
Al Na'ir	27°30.2	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.6	15°21.5

Dec 24 Fri	SHA	Mer.pass
Venus	51°58.0	14:24
Mars	66°23.8	13:25
Jupiter	182°20.2	05:41
Saturn	339°36.2	19:09

Dec 25 Sat	SHA	Mer.pass
Venus	50°41.7	14:25
Mars	65°33.9	13:24
Jupiter	182°16.9	05:37
Saturn	339°36.3	19:05

Dec 26 Sun	SHA	Mer.pass
Venus	49°25.7	14:26
Mars	64°43.9	13:24
Jupiter	182°13.7	05:33
Saturn	339°36.3	19:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Fri	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	180°12.4	S23°25.4	229°12.2	9.6′	S21°46.4	8.7′	56.7′
1	195°12.1	25.3	243°40.8	9.6′	21°55.1	8.7′	56.7′
2	210°11.8	25.3	258°09.4	9.5′	22°03.8	8.5′	56.7′
3	225°11.5	·· 25.3	272°37.9	9.5′	22°12.3	8.3′	56.7′
4	240°11.1	25.2	287°06.4	9.4′	22°20.6	8.3′	56.6′
5	255°10.8	25.2	301°34.8	9.4′	22°28.9	8.1′	56.6′
6	270°10.5	S23°25.1	316°03.2	9.3′	S22°37.0	8.0′	56.6′
7	285°10.2	25.1	330°31.5	9.3′	22°45.0	7.9′	56.6′
8	300°09.9	25.1	344°59.8	9.3′	22°52.9	7.8′	56.6′
9	315°09.6	·· 25.0	359°28.1	9.2′	23°00.7	7.6′	56.5′
10	330°09.3	25.0	13°56.3	9.2′	23°08.3	7.5′	56.5′
11	345°09.0	24.9	28°24.4	9.1′	23°15.8	7.4′	56.5′
12	0°08.6	S23°24.9	42°52.6	9.1′	S23°23.2	7.2′	56.5′
13	15°08.3	24.8	57°20.6	9.0′	23°30.4	7.1′	56.4′
14	30°08.0	24.8	71°48.7	9.0′	23°37.5	7.0′	56.4′
15	45°07.7	·· 24.7	86°16.7	9.0′	23°44.5	6.8′	56.4′
16	60°07.4	24.7	100°44.6	8.9′	23°51.3	6.7′	56.4′
17	75°07.1	24.6	115°12.6	8.9′	23°58.0	6.6′	56.4′
18	90°06.8	S23°24.6	129°40.5	8.9′	S24°04.6	6.4′	56.3′
19	105°06.5	24.5	144°08.3	8.8′	24°11.0	6.3′	56.3′
20	120°06.2	24.5	158°36.1	8.8′	24°17.3	6.2′	56.3′
21	135°05.8	·· 24.4	173°03.9	8.7′	24°23.5	6.0′	56.3′
22	150°05.5	24.4	187°31.7	8.7′	24°29.5	5.9′	56.3′
23	165°05.2	24.3	201°59.4	8.7′	24°35.4	5.8′	56.2′
	SD = 16.3′	d = 0.0′		SD = 15.5′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°04.9	S23°24.3	216°27.1	8.7′	S24°41.2	5.6′	56.2′
1	195°04.6	24.2	230°54.7	8.6′	24°46.8	5.5′	56.2′
2	210°04.3	24.1	245°22.4	8.6′	24°52.3	5.4′	56.2′
3	225°04.0	·· 24.1	259°49.9	8.6′	24°57.7	5.2′	56.2′
4	240°03.7	24.0	274°17.5	8.5′	25°02.9	5.0′	56.1′
5	255°03.4	24.0	288°45.1	8.5′	25°07.9	5.0′	56.1′
6	270°03.0	S23°23.9	303°12.6	8.5′	S25°12.9	4.8′	56.1′
7	285°02.7	23.8	317°40.1	8.5′	25°17.7	4.6′	56.1′
8	300°02.4	23.8	332°07.5	8.4′	25°22.3	4.5′	56.1′
9	315°02.1	·· 23.7	346°35.0	8.4′	25°26.8	4.4′	56.0′
10	330°01.8	23.6	1°02.4	8.4′	25°31.2	4.2′	56.0′
11	345°01.5	23.6	15°29.8	8.4′	25°35.4	4.1′	56.0′
12	0°01.2	S23°23.5	29°57.2	8.4′	S25°39.5	3.9′	56.0′
13	15°00.9	23.5	44°24.6	8.4′	25°43.4	3.8′	56.0′
14	30°00.6	23.4	58°51.9	8.3′	25°47.2	3.7′	55.9′
15	45°00.3	·· 23.3	73°19.3	8.3′	25°50.9	3.5′	55.9′
16	59°59.9	23.2	87°46.6	8.3′	25°54.4	3.4′	55.9′
17	74°59.6	23.2	102°13.9	8.3′	25°57.8	3.2′	55.9′
18	89°59.3	S23°23.1	116°41.2	8.3′	S26°01.0	3.1′	55.9′
19	104°59.0	23.0	131°08.5	8.3′	26°04.1	2.9′	55.8′
20	119°58.7	23.0	145°35.8	8.3′	26°07.0	2.8′	55.8′
21	134°58.4	·· 22.9	160°03.1	8.3′	26°09.8	2.6′	55.8′
22	149°58.1	22.8	174°30.3	8.3′	26°12.4	2.5′	55.8′
23	164°57.8	22.7	188°57.6	8.3′	26°14.9	2.4′	55.8′
	SD = 16.3′	d = 0.1′		SD = 15.3′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°57.5	S23°22.7	203°24.9	8.3′	S26°17.3	2.2′	55.8′
1	194°57.1	22.6	217°52.1	8.3′	26°19.5	2.1′	55.7′
2	209°56.8	22.5	232°19.4	8.3′	26°21.6	1.9′	55.7′
3	224°56.5	·· 22.4	246°46.7	8.3′	26°23.5	1.8′	55.7′
4	239°56.2	22.3	261°13.9	8.3′	26°25.3	1.6′	55.7′
5	254°55.9	22.3	275°41.2	8.3′	26°26.9	1.5′	55.7′
6	269°55.6	S23°22.2	290°08.5	8.3′	S26°28.4	1.3′	55.6′
7	284°55.3	22.1	304°35.8	8.3′	26°29.7	1.2′	55.6′
8	299°55.0	22.0	319°03.1	8.3′	26°30.9	1.1′	55.6′
9	314°54.7	·· 21.9	333°30.4	8.3′	26°32.0	0.9′	55.6′
10	329°54.4	21.9	347°57.7	8.3′	26°32.9	0.8′	55.6′
11	344°54.0	21.8	2°25.0	8.3′	26°33.7	0.6′	55.5′
12	359°53.7	S23°21.7	16°52.4	8.4′	S26°34.3	0.5′	55.5′
13	14°53.4	21.6	31°19.7	8.4′	26°34.8	0.3′	55.5′
14	29°53.1	21.5	45°47.1	8.4′	26°35.1	0.2′	55.5′
15	44°52.8	·· 21.4	60°14.5	8.4′	26°35.3	0.0′	55.5′
16	59°52.5	21.3	74°41.9	8.4′	26°35.3	0.1′	55.5′
17	74°52.2	21.2	89°09.3	8.5′	26°35.2	0.2′	55.4′
18	89°51.9	S23°21.2	103°36.8	8.5′	S26°35.0	0.4′	55.4′
19	104°51.6	21.1	118°04.3	8.5′	26°34.6	0.5′	55.4′
20	119°51.3	21.0	132°31.8	8.5′	26°34.1	0.7′	55.4′
21	134°50.9	·· 20.9	146°59.4	8.6′	26°33.4	0.8′	55.4′
22	149°50.6	20.8	161°26.9	8.6′	26°32.6	0.9′	55.3′
23	164°50.3	20.7	175°54.5	8.6′	26°31.7	1.1′	55.3′
	SD = 16.3′	d = 0.1′		SD = 15.2′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:27	10:57	▬	▬	13:03	15:33
N 70°	08:07	09:55	▬	▬	14:05	15:53
68°	07:51	09:20	▬	▬	14:40	16:09
66°	07:38	08:55	10:35	13:25	15:05	16:22
64°	07:27	08:35	09:53	14:07	15:25	16:33
62°	07:17	08:19	09:25	14:35	15:41	16:43
60°	07:09	08:06	09:03	14:57	15:54	16:51
N 58°	07:01	07:54	08:46	15:14	16:06	16:59
56°	06:55	07:44	08:31	15:29	16:16	17:05
54°	06:48	07:35	08:18	15:41	16:25	17:12
52°	06:43	07:26	08:07	15:53	16:33	17:17
50°	06:37	07:19	07:57	16:02	16:41	17:22
45°	06:26	07:03	07:37	16:23	16:57	17:34
N 40°	06:15	06:49	07:20	16:40	17:11	17:45
35°	06:06	06:38	07:06	16:54	17:22	17:54
30°	05:57	06:27	06:53	17:07	17:33	18:03
20°	05:41	06:08	06:32	17:28	17:52	18:19
N 10°	05:24	05:51	06:14	17:46	18:09	18:35
0°	05:07	05:34	05:56	18:04	18:26	18:52
S 10°	04:48	05:16	05:39	18:21	18:44	19:11
20°	04:26	04:55	05:20	18:40	19:05	19:34
30°	03:57	04:30	04:58	19:02	19:30	20:03
35°	03:38	04:15	04:45	19:15	19:45	20:22
40°	03:15	03:57	04:30	19:30	20:03	20:45
45°	02:44	03:34	04:11	19:48	20:26	21:15
S 50°	01:59	03:04	03:49	20:11	20:55	22:01
52°	01:31	02:49	03:38	20:22	21:10	22:29
54°	00:44	02:31	03:26	20:34	21:28	23:15
56°	////	02:09	03:12	20:48	21:51	////
58°	////	01:39	02:55	21:05	22:20	////
S 60°	////	00:49	02:34	21:25	23:10	////

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	07:49	▬	▬	10:05	▬	▬
64°	06:57	09:09	▬	10:57	10:36	▬
62°	06:26	08:07	09:30	11:29	11:39	12:09
60°	06:02	07:33	08:47	11:53	12:13	12:52
N 58°	05:43	07:08	08:18	12:12	12:39	13:21
56°	05:28	06:48	07:56	12:28	12:59	13:43
54°	05:14	06:31	07:38	12:42	13:16	14:02
52°	05:03	06:17	07:22	12:54	13:30	14:17
50°	04:52	06:05	07:09	13:05	13:42	14:31
45°	04:31	05:39	06:41	13:27	14:08	14:58
N 40°	04:14	05:19	06:20	13:46	14:29	15:20
35°	03:59	05:02	06:02	14:01	14:46	15:38
30°	03:47	04:48	05:46	14:14	15:01	15:53
20°	03:25	04:23	05:20	14:37	15:26	16:19
N 10°	03:07	04:02	04:58	14:56	15:48	16:42
0°	02:50	03:43	04:37	15:15	16:09	17:03
S 10°	02:33	03:23	04:16	15:33	16:29	17:24
20°	02:14	03:02	03:54	15:53	16:51	17:47
30°	01:54	02:38	03:28	16:16	17:16	18:13
35°	01:42	02:24	03:13	16:30	17:31	18:28
40°	01:28	02:08	02:55	16:45	17:49	18:46
45°	01:11	01:49	02:34	17:04	18:10	19:07
S 50°	00:51	01:24	02:07	17:28	18:36	19:34
52°	00:42	01:13	01:54	17:39	18:49	19:48
54°	00:31	01:00	01:39	17:52	19:04	20:03
56°	00:19	00:45	01:22	18:06	19:21	20:21
58°	00:06	00:27	01:01	18:24	19:42	20:42
S 60°	·· ··	00:05	00:34	18:45	20:09	21:10

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 26-28 15-3%
24	00:50	00:35	11:59	09:02	21:29	
25	00:20	00:05	12:00	09:56	22:23	
26	00:10	00:25	12:00	10:50	23:17	

December 27, 28, 29 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	95°15.5	143°25.7	S19°50.7	159°09.6	S22°23.4	277°26.2	N02°17.8	74°51.7	N05°49.2
1	110°18.0	158°25.0	49.8	174°10.0	23.1	292°28.6	17.7	89°54.1	49.2
2	125°20.5	173°24.3	49.0	189°10.4	22.7	307°30.9	17.7	104°56.6	49.3
3	140°22.9	188°23.7	·· 48.2	204°10.8	·· 22.4	322°33.2	·· 17.6	119°59.0	·· 49.3
4	155°25.4	203°23.0	47.4	219°11.2	22.1	337°35.6	17.6	135°01.5	49.3
5	170°27.9	218°22.3	46.6	234°11.6	21.7	352°37.9	17.6	150°03.9	49.3
6	185°30.3	233°21.6	S19°45.7	249°12.0	S22°21.4	7°40.3	N02°17.5	165°06.4	N05°49.3
7	200°32.8	248°21.0	44.9	264°12.3	21.0	22°42.6	17.5	180°08.8	49.3
8	215°35.2	263°20.3	44.1	279°12.7	20.7	37°45.0	17.4	195°11.3	49.4
9	230°37.7	278°19.6	·· 43.3	294°13.1	·· 20.4	52°47.3	·· 17.4	210°13.8	·· 49.4
10	245°40.2	293°19.0	42.4	309°13.5	20.0	67°49.6	17.4	225°16.2	49.4
11	260°42.6	308°18.3	41.6	324°13.9	19.7	82°52.0	17.3	240°18.7	49.4
12	275°45.1	323°17.6	S19°40.8	339°14.3	S22°19.3	97°54.3	N02°17.3	255°21.1	N05°49.4
13	290°47.6	338°16.9	39.9	354°14.7	19.0	112°56.7	17.3	270°23.6	49.4
14	305°50.0	353°16.3	39.1	9°15.1	18.6	127°59.0	17.2	285°26.0	49.5
15	320°52.5	8°15.6	·· 38.3	24°15.5	·· 18.3	143°01.4	·· 17.2	300°28.5	·· 49.5
16	335°55.0	23°14.9	37.4	39°15.8	18.0	158°03.7	17.1	315°30.9	49.5
17	350°57.4	38°14.3	36.6	54°16.2	17.6	173°06.1	17.1	330°33.4	49.5
18	5°59.9	53°13.6	S19°35.8	69°16.6	S22°17.3	188°08.4	N02°17.1	345°35.8	N05°49.5
19	21°02.4	68°12.9	34.9	84°17.0	16.9	203°10.8	17.0	0°38.3	49.5
20	36°04.8	83°12.3	34.1	99°17.4	16.6	218°13.1	17.0	15°40.7	49.6
21	51°07.3	98°11.6	·· 33.2	114°17.8	·· 16.2	233°15.5	·· 16.9	30°43.2	·· 49.6
22	66°09.7	113°10.9	32.4	129°18.2	15.9	248°17.8	16.9	45°45.6	49.6
23	81°12.2	128°10.3	31.6	144°18.6	15.5	263°20.2	16.9	60°48.1	49.6
Mer.pass. 17:36		ν -0.7′	d 0.8′	m -3.97	ν 0.4′	d 0.3′	m 1.20	ν 2.3′	d 0.0′ m -2.08	ν 2.5′	d 0.0′ m 0.44

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	96°14.7	143°09.6	S19°30.7	159°19.0	S22°15.2	278°22.5	N02°16.8	75°50.6	N05°49.6
1	111°17.1	158°09.0	29.9	174°19.4	14.8	293°24.8	16.8	90°53.0	49.6
2	126°19.6	173°08.3	29.0	189°19.7	14.5	308°27.2	16.8	105°55.5	49.7
3	141°22.1	188°07.6	·· 28.2	204°20.1	·· 14.1	323°29.5	·· 16.7	120°57.9	·· 49.7
4	156°24.5	203°07.0	27.3	219°20.5	13.8	338°31.9	16.7	136°00.4	49.7
5	171°27.0	218°06.3	26.5	234°20.9	13.4	353°34.2	16.6	151°02.8	49.7
6	186°29.5	233°05.6	S19°25.7	249°21.3	S22°13.1	8°36.6	N02°16.6	166°05.3	N05°49.7
7	201°31.9	248°05.0	24.8	264°21.7	12.7	23°38.9	16.6	181°07.7	49.8
8	216°34.4	263°04.3	24.0	279°22.1	12.4	38°41.3	16.5	196°10.2	49.8
9	231°36.8	278°03.7	·· 23.1	294°22.5	·· 12.0	53°43.7	·· 16.5	211°12.6	·· 49.8
10	246°39.3	293°03.0	22.3	309°22.9	11.7	68°46.0	16.5	226°15.1	49.8
11	261°41.8	308°02.4	21.4	324°23.3	11.3	83°48.4	16.4	241°17.5	49.8
12	276°44.2	323°01.7	S19°20.5	339°23.7	S22°11.0	98°50.7	N02°16.4	256°20.0	N05°49.8
13	291°46.7	338°01.1	19.7	354°24.1	10.6	113°53.1	16.4	271°22.4	49.9
14	306°49.2	353°00.4	18.8	9°24.4	10.3	128°55.4	16.3	286°24.9	49.9
15	321°51.6	7°59.7	·· 18.0	24°24.8	·· 09.9	143°57.8	·· 16.3	301°27.3	·· 49.9
16	336°54.1	22°59.1	17.1	39°25.2	09.6	159°00.1	16.2	316°29.8	49.9
17	351°56.6	37°58.4	16.3	54°25.6	09.2	174°02.5	16.2	331°32.2	49.9
18	6°59.0	52°57.8	S19°15.4	69°26.0	S22°08.8	189°04.8	N02°16.2	346°34.7	N05°50.0
19	22°01.5	67°57.1	14.6	84°26.4	08.5	204°07.2	16.1	1°37.1	50.0
20	37°04.0	82°56.5	13.7	99°26.8	08.1	219°09.5	16.1	16°39.6	50.0
21	52°06.4	97°55.8	·· 12.8	114°27.2	·· 07.8	234°11.9	·· 16.1	31°42.0	·· 50.0
22	67°08.9	112°55.2	12.0	129°27.6	07.4	249°14.2	16.0	46°44.4	50.0
23	82°11.3	127°54.5	11.1	144°28.0	07.1	264°16.6	16.0	61°46.9	50.1
Mer.pass. 17:32		ν -0.7′	d 0.8′	m -3.97	ν 0.4′	d 0.3′	m 1.20	ν 2.3′	d 0.0′ m -2.09	ν 2.5′	d 0.0′ m 0.44

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	97°13.8	142°53.9	S19°10.2	159°28.4	S22°06.7	279°19.0	N02°16.0	76°49.3	N05°50.1
1	112°16.3	157°53.2	09.4	174°28.8	06.3	294°21.3	15.9	91°51.8	50.1
2	127°18.7	172°52.6	08.5	189°29.2	06.0	309°23.7	15.9	106°54.2	50.1
3	142°21.2	187°52.0	·· 07.6	204°29.6	·· 05.6	324°26.0	·· 15.9	121°56.7	·· 50.1
4	157°23.7	202°51.3	06.8	219°29.9	05.3	339°28.4	15.8	136°59.1	50.2
5	172°26.1	217°50.7	05.9	234°30.3	04.9	354°30.7	15.8	152°01.6	50.2
6	187°28.6	232°50.0	S19°05.0	249°30.7	S22°04.5	9°33.1	N02°15.8	167°04.0	N05°50.2
7	202°31.1	247°49.4	04.2	264°31.1	04.2	24°35.5	15.7	182°06.5	50.2
8	217°33.5	262°48.7	03.3	279°31.5	03.8	39°37.8	15.7	197°08.9	50.2
9	232°36.0	277°48.1	·· 02.4	294°31.9	·· 03.4	54°40.2	·· 15.7	212°11.4	·· 50.3
10	247°38.5	292°47.4	01.6	309°32.3	03.1	69°42.5	15.6	227°13.8	50.3
11	262°40.9	307°46.8	19°00.7	324°32.7	02.7	84°44.9	15.6	242°16.3	50.3
12	277°43.4	322°46.2	S18°59.8	339°33.1	S22°02.4	99°47.2	N02°15.6	257°18.7	N05°50.3
13	292°45.8	337°45.5	58.9	354°33.5	02.0	114°49.6	15.5	272°21.1	50.3
14	307°48.3	352°44.9	58.0	9°33.9	01.6	129°52.0	15.5	287°23.6	50.4
15	322°50.8	7°44.2	·· 57.2	24°34.3	·· 01.3	144°54.3	·· 15.5	302°26.0	·· 50.4
16	337°53.2	22°43.6	56.3	39°34.7	00.9	159°56.7	15.4	317°28.5	50.4
17	352°55.7	37°43.0	55.4	54°35.1	00.5	174°59.0	15.4	332°30.9	50.4
18	7°58.2	52°42.3	S18°54.5	69°35.5	S22°00.2	190°01.4	N02°15.4	347°33.4	N05°50.4
19	23°00.6	67°41.7	53.7	84°35.9	21°59.8	205°03.8	15.3	2°35.8	50.5
20	38°03.1	82°41.1	52.8	99°36.3	59.4	220°06.1	15.3	17°38.3	50.5
21	53°05.6	97°40.4	·· 51.9	114°36.7	·· 59.1	235°08.5	·· 15.3	32°40.7	·· 50.5
22	68°08.0	112°39.8	51.0	129°37.1	58.7	250°10.9	15.2	47°43.1	50.5
23	83°10.5	127°39.2	50.1	144°37.5	58.3	265°13.2	15.2	62°45.6	50.5
Mer.pass. 17:28		ν -0.6′	d 0.9′	m -3.97	ν 0.4′	d 0.4′	m 1.20	ν 2.4′	d 0.0′ m -2.10	ν 2.4′	d 0.0′ m 0.45

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.9
Ankaa	353°04.8	-42°09.4
Schedar	349°28.1	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.2	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°21.0	89°23.1
Acamar	315°09.7	-40°11.7
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.5
Bellatrix	278°19.9	6°22.4
Elnath	277°58.4	28°37.8
Alnilam	275°34.9	-1°11.1
Betelgeuse	270°49.1	7°24.7
Canopus	263°50.7	-52°42.7
Sirius	258°23.7	-16°45.3
Adhara	255°03.6	-29°00.6
Procyon	244°48.0	5°09.1
Pollux	243°14.0	27°57.3
Avior	234°13.1	-59°35.9
Suhail	222°44.1	-43°32.7
Miaplacidus	221°36.9	-69°49.8
Alphard	217°45.1	-8°46.9
Regulus	207°31.7	11°49.6
Dubhe	193°37.9	61°35.6
Denebola	182°22.4	14°24.7
Gienah	175°41.0	-17°41.8
Acrux	172°57.3	-63°15.0
Gacrux	171°48.9	-57°16.0
Alioth	166°11.0	55°48.1
Spica	158°19.8	-11°18.5
Alkaid	152°50.3	49°10.1
Hadar	148°32.7	-60°30.2
Menkent	147°54.9	-36°30.3
Arcturus	145°45.9	19°02.0
Rigil Kent.	139°37.2	-60°56.8
Kochab	137°20.8	74°02.1
Zuben'ubi	136°53.5	-16°09.4
Alphecca	126°02.0	26°37.1
Antares	112°13.2	-26°29.5
Atria	107°05.7	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.5	-37°07.3
Rasalhague	95°56.6	12°32.4
Eltanin	90°41.6	51°29.1
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.6
Nunki	75°45.1	-26°15.6
Altair	61°57.9	8°56.6
Peacock	53°02.5	-56°38.7
Deneb	49°24.5	45°23.0
Enif	33°36.6	10°00.3
Al Na'ir	27°30.2	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.6	15°21.5

Dec 27 Mon	SHA	Mer.pass
Venus	48°10.2	14:27
Mars	63°54.1	13:23
Jupiter	182°10.7	05:29
Saturn	339°36.1	18:57

Dec 28 Tue	SHA	Mer.pass
Venus	46°54.9	14:28
Mars	63°04.3	13:22
Jupiter	182°07.8	05:26
Saturn	339°35.9	18:54

Dec 29 Wed	SHA	Mer.pass
Venus	45°40.1	14:29
Mars	62°14.6	13:22
Jupiter	182°05.1	05:22
Saturn	339°35.5	18:50

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°50.0	S23°20.6	190°22.2	8.7′	S26°30.6	1.3′	55.3′
1	194°49.7	20.5	204°49.8	8.7′	26°29.3	1.3′	55.3′
2	209°49.4	20.4	219°17.5	8.7′	26°28.0	1.5′	55.3′
3	224°49.1	·· 20.3	233°45.2	8.8′	26°26.5	1.7′	55.3′
4	239°48.8	20.2	248°13.0	8.8′	26°24.8	1.8′	55.2′
5	254°48.5	20.1	262°40.8	8.8′	26°23.0	1.9′	55.2′
6	269°48.2	S23°20.0	277°08.7	8.9′	S26°21.1	2.1′	55.2′
7	284°47.9	19.9	291°36.6	8.9′	26°19.0	2.2′	55.2′
8	299°47.5	19.8	306°04.5	9.0′	26°16.8	2.3′	55.2′
9	314°47.2	·· 19.7	320°32.5	9.0′	26°14.5	2.5′	55.2′
10	329°46.9	19.6	335°00.5	9.1′	26°12.0	2.6′	55.1′
11	344°46.6	19.5	349°28.5	9.1′	26°09.4	2.7′	55.1′
12	359°46.3	S23°19.4	3°56.7	9.2′	S26°06.7	2.9′	55.1′
13	14°46.0	19.3	18°24.8	9.2′	26°03.8	3.0′	55.1′
14	29°45.7	19.2	32°53.0	9.3′	26°00.8	3.2′	55.1′
15	44°45.4	·· 19.1	47°21.3	9.3′	25°57.6	3.2′	55.1′
16	59°45.1	19.0	61°49.6	9.4′	25°54.4	3.4′	55.0′
17	74°44.8	18.8	76°18.0	9.4′	25°51.0	3.6′	55.0′
18	89°44.5	S23°18.7	90°46.4	9.5′	S25°47.4	3.6′	55.0′
19	104°44.2	18.6	105°14.8	9.5′	25°43.8	3.8′	55.0′
20	119°43.8	18.5	119°43.4	9.6′	25°40.0	4.0′	55.0′
21	134°43.5	·· 18.4	134°11.9	9.6′	25°36.0	4.0′	55.0′
22	149°43.2	18.3	148°40.6	9.7′	25°32.0	4.2′	54.9′
23	164°42.9	18.2	163°09.3	9.8′	25°27.8	4.3′	54.9′
	SD = 16.3′	d = 0.1′	SD = 15.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°42.6	S23°18.1	177°38.0	9.8′	S25°23.5	4.4′	54.9′
1	194°42.3	17.9	192°06.9	9.9′	25°19.1	4.6′	54.9′
2	209°42.0	17.8	206°35.7	9.9′	25°14.5	4.7′	54.9′
3	224°41.7	·· 17.7	221°04.7	10.0′	25°09.8	4.8′	54.9′
4	239°41.4	17.6	235°33.7	10.1′	25°05.0	4.9′	54.8′
5	254°41.1	17.5	250°02.8	10.1′	25°00.1	5.0′	54.8′
6	269°40.8	S23°17.4	264°31.9	10.2′	S24°55.1	5.2′	54.8′
7	284°40.5	17.2	279°01.1	10.3′	24°49.9	5.3′	54.8′
8	299°40.2	17.1	293°30.3	10.3′	24°44.6	5.4′	54.8′
9	314°39.8	·· 17.0	307°59.7	10.4′	24°39.2	5.5′	54.8′
10	329°39.5	16.9	322°29.1	10.5′	24°33.7	5.7′	54.8′
11	344°39.2	16.7	336°58.5	10.5′	24°28.0	5.7′	54.7′
12	359°38.9	S23°16.6	351°28.1	10.6′	S24°22.3	5.9′	54.7′
13	14°38.6	16.5	5°57.7	10.7′	24°16.4	6.0′	54.7′
14	29°38.3	16.4	20°27.3	10.7′	24°10.4	6.1′	54.7′
15	44°38.0	·· 16.2	34°57.1	10.8′	24°04.3	6.2′	54.7′
16	59°37.7	16.1	49°26.9	10.9′	23°58.1	6.3′	54.7′
17	74°37.4	16.0	63°56.8	11.0′	23°51.8	6.4′	54.7′
18	89°37.1	S23°15.8	78°26.7	11.0′	S23°45.4	6.6′	54.6′
19	104°36.8	15.7	92°56.7	11.1′	23°38.8	6.6′	54.6′
20	119°36.5	15.6	107°26.8	11.2′	23°32.2	6.8′	54.6′
21	134°36.2	·· 15.5	121°57.0	11.2′	23°25.4	6.9′	54.6′
22	149°35.9	15.3	136°27.2	11.3′	23°18.5	6.9′	54.6′
23	164°35.6	15.2	150°57.6	11.4′	23°11.6	7.1′	54.6′
	SD = 16.3′	d = 0.1′	SD = 15.0′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°35.3	S23°15.1	165°28.0	11.5′	S23°04.5	7.2′	54.6′
1	194°34.9	14.9	179°58.4	11.5′	22°57.3	7.3′	54.5′
2	209°34.6	14.8	194°29.0	11.6′	22°50.0	7.4′	54.5′
3	224°34.3	·· 14.6	208°59.6	11.7′	22°42.6	7.5′	54.5′
4	239°34.0	14.5	223°30.2	11.8′	22°35.1	7.6′	54.5′
5	254°33.7	14.4	238°01.0	11.8′	22°27.5	7.7′	54.5′
6	269°33.4	S23°14.2	252°31.8	11.9′	S22°19.8	7.7′	54.5′
7	284°33.1	14.1	267°02.7	12.0′	22°12.1	7.9′	54.5′
8	299°32.8	13.9	281°33.7	12.1′	22°04.2	8.0′	54.5′
9	314°32.5	·· 13.8	296°04.8	12.1′	21°56.2	8.1′	54.4′
10	329°32.2	13.7	310°35.9	12.2′	21°48.1	8.2′	54.4′
11	344°31.9	13.5	325°07.1	12.3′	21°39.9	8.2′	54.4′
12	359°31.6	S23°13.4	339°38.4	12.4′	S21°31.7	8.4′	54.4′
13	14°31.3	13.2	354°09.8	12.4′	21°23.3	8.4′	54.4′
14	29°31.0	13.1	8°41.2	12.5′	21°14.9	8.6′	54.4′
15	44°30.7	·· 12.9	23°12.7	12.6′	21°06.3	8.6′	54.4′
16	59°30.4	12.8	37°44.3	12.7′	20°57.7	8.7′	54.4′
17	74°30.1	12.6	52°15.9	12.7′	20°49.0	8.8′	54.3′
18	89°29.8	S23°12.5	66°47.7	12.8′	S20°40.2	8.9′	54.3′
19	104°29.5	12.3	81°19.5	12.9′	20°31.3	9.0′	54.3′
20	119°29.2	12.2	95°51.4	13.0′	20°22.3	9.0′	54.3′
21	134°28.9	·· 12.0	110°23.3	13.0′	20°13.3	9.2′	54.3′
22	149°28.5	11.9	124°55.3	13.1′	20°04.1	9.2′	54.3′
23	164°28.2	11.7	139°27.4	13.2′	19°54.9	9.3′	54.3′
	SD = 16.3′	d = 0.1′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:27	10:53	▬	▬	13:10	15:36
N 70°	08:07	09:54	▬	▬	14:09	15:56
68°	07:51	09:20	▬	▬	14:43	16:12
66°	07:38	08:55	10:34	13:29	15:08	16:25
64°	07:27	08:35	09:53	14:10	15:28	16:36
62°	07:18	08:20	09:25	14:38	15:43	16:45
60°	07:09	08:06	09:04	14:59	15:57	16:54
N 58°	07:02	07:55	08:46	15:17	16:08	17:01
56°	06:55	07:44	08:32	15:31	16:19	17:08
54°	06:49	07:35	08:19	15:44	16:28	17:14
52°	06:44	07:27	08:08	15:55	16:36	17:19
50°	06:38	07:20	07:58	16:05	16:43	17:25
45°	06:27	07:04	07:38	16:25	16:59	17:36
N 40°	06:16	06:50	07:21	16:42	17:12	17:47
35°	06:07	06:39	07:07	16:56	17:24	17:56
30°	05:58	06:28	06:55	17:08	17:35	18:05
20°	05:42	06:09	06:33	17:29	17:53	18:21
N 10°	05:26	05:52	06:15	17:48	18:11	18:37
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	04:50	05:17	05:40	18:23	18:46	19:13
20°	04:28	04:57	05:21	18:41	19:06	19:35
30°	03:59	04:32	04:59	19:03	19:31	20:04
35°	03:40	04:17	04:46	19:16	19:46	20:23
40°	03:17	03:59	04:31	19:31	20:04	20:46
45°	02:47	03:36	04:14	19:49	20:26	21:16
S 50°	02:02	03:07	03:51	20:11	20:56	22:01
52°	01:34	02:52	03:40	20:22	21:11	22:28
54°	00:50	02:34	03:28	20:34	21:28	23:12
56°	////	02:12	03:14	20:48	21:50	////
58°	////	01:43	02:57	21:05	22:19	////
S 60°	////	00:54	02:37	21:25	23:07	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	12:33	▬	▬	14:28
66°	▬	▬	11:34	▬	▬	15:27
64°	▬	11:10	10:59	▬	14:08	16:01
62°	10:14	10:29	10:34	13:17	14:49	16:25
60°	09:35	10:01	10:14	13:56	15:17	16:44
N 58°	09:08	09:39	09:58	14:23	15:39	17:00
56°	08:46	09:21	09:44	14:44	15:56	17:14
54°	08:29	09:06	09:32	15:01	16:11	17:25
52°	08:14	08:53	09:21	15:16	16:24	17:35
50°	08:01	08:41	09:11	15:29	16:35	17:45
45°	07:34	08:17	08:51	15:56	16:58	18:04
N 40°	07:13	07:58	08:35	16:17	17:17	18:19
35°	06:55	07:41	08:21	16:34	17:33	18:32
30°	06:40	07:27	08:09	16:49	17:46	18:44
20°	06:14	07:03	07:48	17:14	18:09	19:03
N 10°	05:52	06:43	07:30	17:36	18:29	19:20
0°	05:31	06:23	07:13	17:56	18:47	19:35
S 10°	05:10	06:04	06:56	18:17	19:06	19:51
20°	04:48	05:43	06:37	18:38	19:25	20:07
30°	04:22	05:19	06:16	19:03	19:48	20:26
35°	04:07	05:04	06:04	19:18	20:01	20:37
40°	03:49	04:48	05:49	19:35	20:16	20:50
45°	03:28	04:28	05:32	19:55	20:34	21:04
S 50°	03:01	04:03	05:11	20:21	20:56	21:22
52°	02:47	03:51	05:01	20:33	21:06	21:31
54°	02:32	03:37	04:50	20:47	21:18	21:40
56°	02:14	03:21	04:36	21:03	21:32	21:51
58°	01:53	03:02	04:21	21:23	21:47	22:03
S 60°	01:25	02:38	04:03	21:47	22:06	22:16

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 1-1%
27	00:40	00:55	12:01	11:44	–:–	
28	01:10	01:24	12:01	12:35	00:10	
29	01:39	01:54	12:02	13:24	01:00	

December 30, 31, 01 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	98°13.0	142°38.5	S18°49.2	159°37.8	S21°58.0	280°15.6	N02°15.2	77°48.0	N05°50.6
1	113°15.4	157°37.9	48.3	174°38.2	57.6	295°17.9	15.1	92°50.5	50.6
2	128°17.9	172°37.3	47.5	189°38.6	57.2	310°20.3	15.1	107°52.9	50.6
3	143°20.3	187°36.6	·· 46.6	204°39.0	·· 56.9	325°22.7	·· 15.1	122°55.4	·· 50.6
4	158°22.8	202°36.0	45.7	219°39.4	56.5	340°25.0	15.1	137°57.8	50.6
5	173°25.3	217°35.4	44.8	234°39.8	56.1	355°27.4	15.0	153°00.2	50.7
6	188°27.7	232°34.7	S18°43.9	249°40.2	S21°55.7	10°29.8	N02°15.0	168°02.7	N05°50.7
7	203°30.2	247°34.1	43.0	264°40.6	55.4	25°32.1	15.0	183°05.1	50.7
8	218°32.7	262°33.5	42.1	279°41.0	55.0	40°34.5	14.9	198°07.6	50.7
9	233°35.1	277°32.9	·· 41.2	294°41.4	·· 54.6	55°36.9	·· 14.9	213°10.0	·· 50.8
10	248°37.6	292°32.2	40.3	309°41.8	54.2	70°39.2	14.9	228°12.5	50.8
11	263°40.1	307°31.6	39.4	324°42.2	53.9	85°41.6	14.8	243°14.9	50.8
12	278°42.5	322°31.0	S18°38.5	339°42.6	S21°53.5	100°44.0	N02°14.8	258°17.3	N05°50.8
13	293°45.0	337°30.4	37.6	354°43.0	53.1	115°46.3	14.8	273°19.8	50.8
14	308°47.5	352°29.7	36.7	9°43.4	52.7	130°48.7	14.8	288°22.2	50.9
15	323°49.9	7°29.1	·· 35.8	24°43.8	·· 52.4	145°51.1	·· 14.7	303°24.7	·· 50.9
16	338°52.4	22°28.5	34.9	39°44.2	52.0	160°53.4	14.7	318°27.1	50.9
17	353°54.8	37°27.9	34.0	54°44.6	51.6	175°55.8	14.7	333°29.5	50.9
18	8°57.3	52°27.3	S18°33.1	69°45.0	S21°51.2	190°58.2	N02°14.6	348°32.0	N05°51.0
19	23°59.8	67°26.6	32.2	84°45.4	50.9	206°00.5	14.6	3°34.4	51.0
20	39°02.2	82°26.0	31.3	99°45.8	50.5	221°02.9	14.6	18°36.9	51.0
21	54°04.7	97°25.4	·· 30.4	114°46.2	·· 50.1	236°05.3	·· 14.6	33°39.3	·· 51.0
22	69°07.2	112°24.8	29.5	129°46.6	49.7	251°07.6	14.5	48°41.7	51.0
23	84°09.6	127°24.2	28.6	144°47.0	49.4	266°10.0	14.5	63°44.2	51.1
Mer.pass.	17:24	ν -0.6′	d 0.9′	m -3.98	ν 0.4′	d 0.4′	m 1.20	ν 2.4′	d 0.0′ m -2.10	ν 2.4′	d 0.0′ m 0.45

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	99°12.1	142°23.5	S18°27.7	159°47.4	S21°49.0	281°12.4	N02°14.5	78°46.6	N05°51.1
1	114°14.6	157°22.9	26.8	174°47.8	48.6	296°14.7	14.4	93°49.1	51.1
2	129°17.0	172°22.3	25.9	189°48.2	48.2	311°17.1	14.4	108°51.5	51.1
3	144°19.5	187°21.7	·· 25.0	204°48.6	·· 47.8	326°19.5	·· 14.4	123°53.9	·· 51.2
4	159°21.9	202°21.1	24.1	219°49.0	47.5	341°21.9	14.4	138°56.4	51.2
5	174°24.4	217°20.5	23.2	234°49.4	47.1	356°24.2	14.3	153°58.8	51.2
6	189°26.9	232°19.8	S18°22.3	249°49.8	S21°46.7	11°26.6	N02°14.3	169°01.2	N05°51.2
7	204°29.3	247°19.2	21.3	264°50.2	46.3	26°29.0	14.3	184°03.7	51.3
8	219°31.8	262°18.6	20.4	279°50.6	45.9	41°31.3	14.2	199°06.1	51.3
9	234°34.3	277°18.0	·· 19.5	294°51.0	·· 45.5	56°33.7	·· 14.2	214°08.6	·· 51.3
10	249°36.7	292°17.4	18.6	309°51.4	45.2	71°36.1	14.2	229°11.0	51.3
11	264°39.2	307°16.8	17.7	324°51.8	44.8	86°38.5	14.2	244°13.4	51.4
12	279°41.7	322°16.2	S18°16.8	339°52.2	S21°44.4	101°40.8	N02°14.1	259°15.9	N05°51.4
13	294°44.1	337°15.6	15.8	354°52.6	44.0	116°43.2	14.1	274°18.3	51.4
14	309°46.6	352°15.0	14.9	9°53.0	43.6	131°45.6	14.1	289°20.7	51.4
15	324°49.1	7°14.4	·· 14.0	24°53.4	·· 43.2	146°48.0	·· 14.1	304°23.2	·· 51.4
16	339°51.5	22°13.7	13.1	39°53.8	42.8	161°50.3	14.0	319°25.6	51.5
17	354°54.0	37°13.1	12.2	54°54.2	42.5	176°52.7	14.0	334°28.0	51.5
18	9°56.4	52°12.5	S18°11.2	69°54.6	S21°42.1	191°55.1	N02°14.0	349°30.5	N05°51.5
19	24°58.9	67°11.9	10.3	84°55.0	41.7	206°57.5	14.0	4°32.9	51.5
20	40°01.4	82°11.3	09.4	99°55.4	41.3	221°59.8	13.9	19°35.4	51.6
21	55°03.8	97°10.7	·· 08.5	114°55.8	·· 40.9	237°02.2	·· 13.9	34°37.8	·· 51.6
22	70°06.3	112°10.1	07.5	129°56.2	40.5	252°04.6	13.9	49°40.2	51.6
23	85°08.8	127°09.5	06.6	144°56.6	40.1	267°07.0	13.9	64°42.7	51.6
Mer.pass.	17:20	ν -0.6′	d 0.9′	m -3.98	ν 0.4′	d 0.4′	m 1.19	ν 2.4′	d 0.0′ m -2.11	ν 2.4′	d 0.0′ m 0.46

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°11.2	142°08.9	S18°05.7	159°57.0	S21°39.7	282°09.3	N02°13.8	79°45.1	N05°51.7
1	115°13.7	157°08.3	04.8	174°57.4	39.4	297°11.7	13.8	94°47.5	51.7
2	130°16.2	172°07.7	03.8	189°57.8	39.0	312°14.1	13.8	109°50.0	51.7
3	145°18.6	187°07.1	·· 02.9	204°58.2	·· 38.6	327°16.5	·· 13.8	124°52.4	·· 51.7
4	160°21.1	202°06.5	02.0	219°58.6	38.2	342°18.8	13.7	139°54.8	51.8
5	175°23.6	217°05.9	01.0	234°59.0	37.8	357°21.2	13.7	154°57.3	51.8
6	190°26.0	232°05.3	S18°00.1	249°59.4	S21°37.4	12°23.6	N02°13.7	169°59.7	N05°51.8
7	205°28.5	247°04.7	17°59.2	264°59.8	37.0	27°26.0	13.7	185°02.1	51.8
8	220°30.9	262°04.1	58.2	280°00.2	36.6	42°28.4	13.6	200°04.6	51.9
9	235°33.4	277°03.5	·· 57.3	295°00.6	·· 36.2	57°30.7	·· 13.6	215°07.0	·· 51.9
10	250°35.9	292°02.9	56.4	310°01.0	35.8	72°33.1	13.6	230°09.4	51.9
11	265°38.3	307°02.3	55.4	325°01.4	35.4	87°35.5	13.6	245°11.9	51.9
12	280°40.8	322°01.7	S17°54.5	340°01.8	S21°35.0	102°37.9	N02°13.5	260°14.3	N05°52.0
13	295°43.3	337°01.1	53.6	355°02.2	34.6	117°40.3	13.5	275°16.7	52.0
14	310°45.7	352°00.6	52.6	10°02.6	34.2	132°42.6	13.5	290°19.2	52.0
15	325°48.2	7°00.0	·· 51.7	25°03.1	·· 33.8	147°45.0	·· 13.5	305°21.6	·· 52.0
16	340°50.7	21°59.4	50.7	40°03.5	33.5	162°47.4	13.4	320°24.0	52.1
17	355°53.1	36°58.8	49.8	55°03.9	33.1	177°49.8	13.4	335°26.5	52.1
18	10°55.6	51°58.2	S17°48.8	70°04.3	S21°32.7	192°52.2	N02°13.4	350°28.9	N05°52.1
19	25°58.0	66°57.6	47.9	85°04.7	32.3	207°54.6	13.4	5°31.3	52.1
20	41°00.5	81°57.0	47.0	100°05.1	31.9	222°56.9	13.4	20°33.7	52.2
21	56°03.0	96°56.4	·· 46.0	115°05.5	·· 31.5	237°59.3	·· 13.3	35°36.2	·· 52.2
22	71°05.4	111°55.8	45.1	130°05.9	31.1	253°01.7	13.3	50°38.6	52.2
23	86°07.9	126°55.2	44.1	145°06.3	30.7	268°04.1	13.3	65°41.0	52.3
Mer.pass.	17:16	ν -0.6′	d 0.9′	m -3.98	ν 0.4′	d 0.4′	m 1.19	ν 2.4′	d 0.0′ m -2.12	ν 2.4′	d 0.0′ m 0.46

Stars

	SHA	Dec
Alpheratz	357°32.2	29°14.9
Ankaa	353°04.8	-42°09.4
Schedar	349°28.1	56°41.8
Diphda	348°44.8	-17°50.0
Achernar	335°18.3	-57°05.9
Hamal	327°48.2	23°35.8
Polaris	312°22.0	89°23.1
Acamar	315°09.7	-40°11.7
Menkar	314°03.4	4°12.0
Mirfak	308°24.3	49°57.8
Aldebaran	290°36.5	16°33.9
Rigel	281°01.2	-8°10.2
Capella	280°17.8	46°01.6
Bellatrix	278°19.9	6°22.4
Elnath	277°58.4	28°37.8
Alnilam	275°34.9	-1°11.1
Betelgeuse	270°49.1	7°24.7
Canopus	263°50.7	-52°42.7
Sirius	258°23.7	-16°45.4
Adhara	255°03.5	-29°00.7
Procyon	244°47.9	5°09.1
Pollux	243°14.0	27°57.3
Avior	234°13.1	-59°35.9
Suhail	222°44.1	-43°32.7
Miaplacidus	221°36.9	-69°49.8
Alphard	217°45.1	-8°46.9
Regulus	207°31.6	11°49.6
Dubhe	193°37.9	61°35.6
Denebola	182°22.4	14°24.7
Gienah	175°41.0	-17°41.9
Acrux	172°57.2	-63°15.0
Gacrux	171°48.8	-57°16.0
Alioth	166°11.0	55°48.1
Spica	158°19.8	-11°18.5
Alkaid	152°50.3	49°10.1
Hadar	148°32.7	-60°30.2
Menkent	147°54.9	-36°30.3
Arcturus	145°45.8	19°02.0
Rigil Kent.	139°37.2	-60°56.8
Kochab	137°20.7	74°02.1
Zuben'ubi	136°53.5	-16°09.5
Alphecca	126°02.0	26°37.1
Antares	112°13.1	-26°29.5
Atria	107°05.6	-69°04.5
Sabik	102°00.3	-15°45.5
Shaula	96°07.4	-37°07.3
Rasalhague	95°56.6	12°32.4
Eltanin	90°41.6	51°29.1
Kaus Aust.	83°29.7	-34°22.2
Vega	80°32.0	38°48.6
Nunki	75°45.1	-26°15.6
Altair	61°57.9	8°56.6
Peacock	53°02.5	-56°38.7
Deneb	49°24.5	45°23.0
Enif	33°36.6	10°00.3
Al Na'ir	27°30.2	-46°49.6
Fomalhaut	15°12.0	-29°28.5
Scheat	13°42.9	28°14.3
Markab	13°27.6	15°21.5

Dec 30 Thu	SHA	Mer.pass
Venus	44°25.6	14:30
Mars	61°24.9	13:21
Jupiter	182°02.6	05:18
Saturn	339°35.1	18:46

Dec 31 Fri	SHA	Mer.pass
Venus	43°11.4	14:31
Mars	60°35.3	13:20
Jupiter	182°00.3	05:14
Saturn	339°34.5	18:42

Jan 01 Sat	SHA	Mer.pass
Venus	41°57.7	14:32
Mars	59°45.8	13:20
Jupiter	181°58.1	05:11
Saturn	339°33.9	18:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°27.9	S23°11.6	153°59.6	13.2′	S19°45.6	9.4′	54.3′
1	194°27.6	11.4	168°31.8	13.3′	19°36.2	9.5′	54.3′
2	209°27.3	11.3	183°04.2	13.4′	19°26.7	9.5′	54.2′
3	224°27.0	·· 11.1	197°36.5	13.5′	19°17.2	9.7′	54.2′
4	239°26.7	11.0	212°09.0	13.5′	19°07.5	9.7′	54.2′
5	254°26.4	10.8	226°41.5	13.6′	18°57.8	9.7′	54.2′
6	269°26.1	S23°10.6	241°14.1	13.7′	S18°48.1	9.9′	54.2′
7	284°25.8	10.5	255°46.8	13.7′	18°38.2	9.9′	54.2′
8	299°25.5	10.3	270°19.6	13.8′	18°28.3	10.0′	54.2′
9	314°25.2	·· 10.2	284°52.4	13.9′	18°18.3	10.1′	54.2′
10	329°24.9	10.0	299°25.2	13.9′	18°08.2	10.1′	54.2′
11	344°24.6	09.8	313°58.2	14.0′	17°58.1	10.3′	54.2′
12	359°24.3	S23°09.7	328°31.2	14.1′	S17°47.8	10.2′	54.2′
13	14°24.0	09.5	343°04.3	14.2′	17°37.6	10.4′	54.2′
14	29°23.7	09.3	357°37.5	14.2′	17°27.2	10.4′	54.1′
15	44°23.4	·· 09.2	12°10.7	14.3′	17°16.8	10.5′	54.1′
16	59°23.1	09.0	26°44.0	14.4′	17°06.3	10.6′	54.1′
17	74°22.8	08.8	41°17.3	14.4′	16°55.7	10.6′	54.1′
18	89°22.5	S23°08.7	55°50.7	14.5′	S16°45.1	10.7′	54.1′
19	104°22.2	08.5	70°24.2	14.5′	16°34.4	10.7′	54.1′
20	119°21.9	08.3	84°57.7	14.6′	16°23.7	10.8′	54.1′
21	134°21.6	·· 08.2	99°31.3	14.7′	16°12.9	10.9′	54.1′
22	149°21.3	08.0	114°05.0	14.7′	16°02.0	10.9′	54.1′
23	164°21.0	07.8	128°38.7	14.8′	15°51.1	11.0′	54.1′
	SD = 16.3′	d = 0.2′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°20.7	S23°07.7	143°12.5	14.9′	S15°40.1	11.1′	54.1′
1	194°20.4	07.5	157°46.4	14.9′	15°29.0	11.1′	54.1′
2	209°20.1	07.3	172°20.3	15.0′	15°17.9	11.1′	54.1′
3	224°19.8	·· 07.1	186°54.3	15.0′	15°06.8	11.2′	54.1′
4	239°19.5	06.9	201°28.3	15.1′	14°55.6	11.3′	54.1′
5	254°19.2	06.8	216°02.4	15.1′	14°44.3	11.4′	54.0′
6	269°18.9	S23°06.6	230°36.5	15.2′	S14°32.9	11.3′	54.0′
7	284°18.6	06.4	245°10.7	15.3′	14°21.6	11.5′	54.0′
8	299°18.3	06.2	259°45.0	15.3′	14°10.1	11.5′	54.0′
9	314°18.0	·· 06.1	274°19.3	15.4′	13°58.6	11.5′	54.0′
10	329°17.7	05.9	288°53.7	15.4′	13°47.1	11.6′	54.0′
11	344°17.4	05.7	303°28.1	15.5′	13°35.5	11.6′	54.0′
12	359°17.1	S23°05.5	318°02.5	15.5′	S13°23.9	11.7′	54.0′
13	14°16.8	05.3	332°37.1	15.6′	13°12.2	11.8′	54.0′
14	29°16.5	05.1	347°11.6	15.6′	13°00.4	11.7′	54.0′
15	44°16.2	·· 05.0	1°46.3	15.7′	12°48.7	11.9′	54.0′
16	59°15.9	04.8	16°20.9	15.7′	12°36.8	11.8′	54.0′
17	74°15.6	04.6	30°55.6	15.8′	12°25.0	12.0′	54.0′
18	89°15.3	S23°04.4	45°30.4	15.8′	S12°13.0	11.9′	54.0′
19	104°15.0	04.2	60°05.2	15.9′	12°01.1	12.0′	54.0′
20	119°14.7	04.0	74°40.1	15.9′	11°49.1	12.1′	54.0′
21	134°14.4	·· 03.8	89°15.0	15.9′	11°37.0	12.1′	54.0′
22	149°14.1	03.6	103°49.9	16.0′	11°24.9	12.1′	54.0′
23	164°13.8	03.4	118°24.9	16.0′	11°12.8	12.2′	54.0′
	SD = 16.3′	d = 0.2′	SD = 14.7′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°13.5	S23°03.3	133°00.0	16.1′	S11°00.6	12.2′	54.0′
1	194°13.2	03.1	147°35.0	16.1′	10°48.4	12.3′	54.0′
2	209°12.9	02.9	162°10.2	16.2′	10°36.1	12.2′	54.0′
3	224°12.6	·· 02.7	176°45.3	16.2′	10°23.9	12.4′	54.0′
4	239°12.3	02.5	191°20.5	16.2′	10°11.5	12.3′	54.0′
5	254°12.0	02.3	205°55.7	16.3′	09°59.2	12.4′	54.0′
6	269°11.7	S23°02.1	220°31.0	16.3′	S09°46.8	12.5′	54.0′
7	284°11.4	01.9	235°06.3	16.3′	09°34.3	12.4′	54.0′
8	299°11.1	01.7	249°41.6	16.4′	09°21.9	12.5′	54.0′
9	314°10.8	·· 01.5	264°17.0	16.4′	09°09.4	12.6′	54.0′
10	329°10.5	01.3	278°52.4	16.4′	08°56.8	12.6′	54.0′
11	344°10.2	01.1	293°27.9	16.5′	08°44.2	12.6′	54.0′
12	359°09.9	S23°00.9	308°03.3	16.5′	S08°31.6	12.6′	54.0′
13	14°09.6	00.7	322°38.8	16.5′	08°19.0	12.6′	54.0′
14	29°09.3	00.5	337°14.4	16.6′	08°06.4	12.7′	54.0′
15	44°09.1	·· 00.3	351°49.9	16.6′	07°53.7	12.8′	54.0′
16	59°08.8	23°00.1	6°25.5	16.6′	07°40.9	12.7′	54.0′
17	74°08.5	22°59.9	21°01.1	16.6′	07°28.2	12.8′	54.0′
18	89°08.2	S22°59.7	35°36.7	16.7′	S07°15.4	12.8′	54.0′
19	104°07.9	59.4	50°12.4	16.7′	07°02.6	12.8′	54.0′
20	119°07.6	59.2	64°48.1	16.7′	06°49.8	12.9′	54.0′
21	134°07.3	·· 59.0	79°23.8	16.7′	06°36.9	12.8′	54.0′
22	149°07.0	58.8	93°59.5	16.7′	06°24.1	12.9′	54.0′
23	164°06.7	58.6	108°35.3	16.8′	06°11.2	13.0′	54.0′
	SD = 16.3′	d = 0.2′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:25	10:46	▬	▬	13:20	15:41
N 70°	08:06	09:51	▬	▬	14:15	16:00
68°	07:50	09:18	▬	▬	14:48	16:16
66°	07:38	08:54	10:30	13:36	15:12	16:28
64°	07:27	08:35	09:51	14:15	15:31	16:39
62°	07:18	08:19	09:24	14:42	15:47	16:48
60°	07:09	08:06	09:03	15:03	16:00	16:56
N 58°	07:02	07:54	08:46	15:20	16:11	17:04
56°	06:56	07:44	08:31	15:34	16:21	17:10
54°	06:50	07:36	08:19	15:47	16:30	17:16
52°	06:44	07:28	08:08	15:58	16:38	17:22
50°	06:39	07:20	07:59	16:07	16:46	17:27
45°	06:27	07:04	07:38	16:28	17:01	17:39
N 40°	06:17	06:51	07:22	16:44	17:15	17:49
35°	06:08	06:40	07:08	16:58	17:26	17:58
30°	05:59	06:29	06:56	17:10	17:37	18:06
20°	05:43	06:11	06:35	17:31	17:55	18:23
N 10°	05:27	05:54	06:16	17:49	18:12	18:39
0°	05:10	05:37	05:59	18:07	18:29	18:55
S 10°	04:52	05:19	05:42	18:24	18:47	19:14
20°	04:29	04:59	05:23	18:43	19:07	19:36
30°	04:01	04:34	05:01	19:04	19:32	20:05
35°	03:42	04:19	04:49	19:17	19:47	20:23
40°	03:20	04:01	04:34	19:32	20:05	20:46
45°	02:49	03:39	04:16	19:50	20:27	21:16
S 50°	02:05	03:10	03:54	20:12	20:56	22:00
52°	01:39	02:55	03:43	20:22	21:10	22:26
54°	00:57	02:37	03:31	20:34	21:28	23:07
56°	////	02:16	03:17	20:48	21:49	////
58°	////	01:47	03:01	21:04	22:17	////
S 60°	////	01:02	02:41	21:24	23:02	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	13:22	11:58	11:20	15:17	18:10	20:14
N 70°	12:15	11:33	11:07	16:22	18:33	20:25
68°	11:38	11:14	10:57	16:58	18:51	20:33
66°	11:12	10:59	10:48	17:23	19:05	20:40
64°	10:52	10:46	10:41	17:42	19:16	20:46
62°	10:35	10:35	10:34	17:58	19:26	20:51
60°	10:22	10:26	10:29	18:11	19:34	20:55
N 58°	10:10	10:18	10:24	18:22	19:41	20:59
56°	09:59	10:11	10:19	18:31	19:48	21:02
54°	09:50	10:04	10:15	18:40	19:53	21:05
52°	09:42	09:58	10:12	18:48	19:59	21:08
50°	09:35	09:53	10:08	18:54	20:03	21:11
45°	09:19	09:41	10:01	19:09	20:13	21:16
N 40°	09:06	09:32	09:55	19:21	20:21	21:20
35°	08:54	09:24	09:50	19:31	20:28	21:24
30°	08:45	09:17	09:46	19:40	20:34	21:28
20°	08:28	09:04	09:38	19:55	20:45	21:33
N 10°	08:13	08:53	09:31	20:08	20:54	21:38
0°	07:59	08:43	09:24	20:20	21:03	21:43
S 10°	07:45	08:32	09:17	20:33	21:11	21:48
20°	07:30	08:21	09:10	20:45	21:20	21:53
30°	07:13	08:08	09:02	21:00	21:30	21:58
35°	07:03	08:01	08:57	21:09	21:36	22:02
40°	06:51	07:52	08:52	21:18	21:43	22:05
45°	06:38	07:42	08:46	21:29	21:51	22:09
S 50°	06:21	07:30	08:38	21:43	22:00	22:14
52°	06:13	07:25	08:35	21:49	22:04	22:17
54°	06:04	07:18	08:31	21:56	22:09	22:19
56°	05:54	07:11	08:27	22:04	22:14	22:22
58°	05:43	07:03	08:22	22:12	22:19	22:25
S 60°	05:30	06:55	08:16	22:22	22:26	22:28

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 4-15%
30	02:08	02:23	12:02	14:10	01:47	
31	02:37	02:52	12:03	14:53	02:32	
01	03:06	03:20	12:03	15:34	03:13	

Conversion of Arc to Time

0° - 59°		
°	h	m
0	0	00
1	0	04
2	0	08
3	0	12
4	0	16
5	0	20
6	0	24
7	0	28
8	0	32
9	0	36
10	0	40
11	0	44
12	0	48
13	0	52
14	0	56
15	1	00
16	1	04
17	1	08
18	1	12
19	1	16
20	1	20
21	1	24
22	1	28
23	1	32
24	1	36
25	1	40
26	1	44
27	1	48
28	1	52
29	1	56
30	2	00
31	2	04
32	2	08
33	2	12
34	2	16
35	2	20
36	2	24
37	2	28
38	2	32
39	2	36
40	2	40
41	2	44
42	2	48
43	2	52
44	2	56
45	3	00
46	3	04
47	3	08
48	3	12
49	3	16
50	3	20
51	3	24
52	3	28
53	3	32
54	3	36
55	3	40
56	3	44
57	3	48
58	3	52
59	3	56
60	4	00

60° - 119°		
°	h	m
60	4	00
61	4	04
62	4	08
63	4	12
64	4	16
65	4	20
66	4	24
67	4	28
68	4	32
69	4	36
70	4	40
71	4	44
72	4	48
73	4	52
74	4	56
75	5	00
76	5	04
77	5	08
78	5	12
79	5	16
80	5	20
81	5	24
82	5	28
83	5	32
84	5	36
85	5	40
86	5	44
87	5	48
88	5	52
89	5	56
90	6	00
91	6	04
92	6	08
93	6	12
94	6	16
95	6	20
96	6	24
97	6	28
98	6	32
99	6	36
100	6	40
101	6	44
102	6	48
103	6	52
104	6	56
105	7	00
106	7	04
107	7	08
108	7	12
109	7	16
110	7	20
111	7	24
112	7	28
113	7	32
114	7	36
115	7	40
116	7	44
117	7	48
118	7	52
119	7	56
120	8	00

120° - 179°		
°	h	m
120	8	00
121	8	04
122	8	08
123	8	12
124	8	16
125	8	20
126	8	24
127	8	28
128	8	32
129	8	36
130	8	40
131	8	44
132	8	48
133	8	52
134	8	56
135	9	00
136	9	04
137	9	08
138	9	12
139	9	16
140	9	20
141	9	24
142	9	28
143	9	32
144	9	36
145	9	40
146	9	44
147	9	48
148	9	52
149	9	56
150	10	00
151	10	04
152	10	08
153	10	12
154	10	16
155	10	20
156	10	24
157	10	28
158	10	32
159	10	36
160	10	40
161	10	44
162	10	48
163	10	52
164	10	56
165	11	00
166	11	04
167	11	08
168	11	12
169	11	16
170	11	20
171	11	24
172	11	28
173	11	32
174	11	36
175	11	40
176	11	44
177	11	48
178	11	52
179	11	56
180	12	00

180° - 239°		
°	h	m
180	12	00
181	12	04
182	12	08
183	12	12
184	12	16
185	12	20
186	12	24
187	12	28
188	12	32
189	12	36
190	12	40
191	12	44
192	12	48
193	12	52
194	12	56
195	13	00
196	13	04
197	13	08
198	13	12
199	13	16
200	13	20
201	13	24
202	13	28
203	13	32
204	13	36
205	13	40
206	13	44
207	13	48
208	13	52
209	13	56
210	14	00
211	14	04
212	14	08
213	14	12
214	14	16
215	14	20
216	14	24
217	14	28
218	14	32
219	14	36
220	14	40
221	14	44
222	14	48
223	14	52
224	14	56
225	15	00
226	15	04
227	15	08
228	15	12
229	15	16
230	15	20
231	15	24
232	15	28
233	15	32
234	15	36
235	15	40
236	15	44
237	15	48
238	15	52
239	15	56
240	16	00

240° - 299°		
°	h	m
240	16	00
241	16	04
242	16	08
243	16	12
244	16	16
245	16	20
246	16	24
247	16	28
248	16	32
249	16	36
250	16	40
251	16	44
252	16	48
253	16	52
254	16	56
255	17	00
256	17	04
257	17	08
258	17	12
259	17	16
260	17	20
261	17	24
262	17	28
263	17	32
264	17	36
265	17	40
266	17	44
267	17	48
268	17	52
269	17	56
270	18	00
271	18	04
272	18	08
273	18	12
274	18	16
275	18	20
276	18	24
277	18	28
278	18	32
279	18	36
280	18	40
281	18	44
282	18	48
283	18	52
284	18	56
285	19	00
286	19	04
287	19	08
288	19	12
289	19	16
290	19	20
291	19	24
292	19	28
293	19	32
294	19	36
295	19	40
296	19	44
297	19	48
298	19	52
299	19	56
300	20	00

300° - 360°		
°	h	m
300	20	00
301	20	04
302	20	08
303	20	12
304	20	16
305	20	20
306	20	24
307	20	28
308	20	32
309	20	36
310	20	40
311	20	44
312	20	48
313	20	52
314	20	56
315	21	00
316	21	04
317	21	08
318	21	12
319	21	16
320	21	20
321	21	24
322	21	28
323	21	32
324	21	36
325	21	40
326	21	44
327	21	48
328	21	52
329	21	56
330	22	00
331	22	04
332	22	08
333	22	12
334	22	16
335	22	20
336	22	24
337	22	28
338	22	32
339	22	36
340	22	40
341	22	44
342	22	48
343	22	52
344	22	56
345	23	00
346	23	04
347	23	08
348	23	12
349	23	16
350	23	20
351	23	24
352	23	28
353	23	32
354	23	36
355	23	40
356	23	44
357	23	48
358	23	52
359	23	56
360	24	00

0′ - 59′		
′	m	s
0	0	00
1	0	04
2	0	08
3	0	12
4	0	16
5	0	20
6	0	24
7	0	28
8	0	32
9	0	36
10	0	40
11	0	44
12	0	48
13	0	52
14	0	56
15	1	00
16	1	04
17	1	08
18	1	12
19	1	16
20	1	20
21	1	24
22	1	28
23	1	32
24	1	36
25	1	40
26	1	44
27	1	48
28	1	52
29	1	56
30	2	00
31	2	04
32	2	08
33	2	12
34	2	16
35	2	20
36	2	24
37	2	28
38	2	32
39	2	36
40	2	40
41	2	44
42	2	48
43	2	52
44	2	56
45	3	00
46	3	04
47	3	08
48	3	12
49	3	16
50	3	20
51	3	24
52	3	28
53	3	32
54	3	36
55	3	40
56	3	44
57	3	48
58	3	52
59	3	56
60	4	00

0″ - 59″	
″	s
0	0.00
1	0.07
2	0.13
3	0.20
4	0.27
5	0.33
6	0.40
7	0.47
8	0.53
9	0.60
10	0.67
11	0.73
12	0.80
13	0.87
14	0.93
15	1.00
16	1.07
17	1.13
18	1.20
19	1.27
20	1.33
21	1.40
22	1.47
23	1.53
24	1.60
25	1.67
26	1.73
27	1.80
28	1.87
29	1.93
30	2.00
31	2.07
32	2.13
33	2.20
34	2.27
35	2.33
36	2.40
37	2.47
38	2.53
39	2.60
40	2.67
41	2.73
42	2.80
43	2.87
44	2.93
45	3.00
46	3.07
47	3.13
48	3.20
49	3.27
50	3.33
51	3.40
52	3.47
53	3.53
54	3.60
55	3.67
56	3.73
57	3.80
58	3.87
59	3.93
60	4.00

h= hours of time **m**= minutes of time **s** = seconds of time **′** = minutes of arc **″** = seconds of arc

Increments and Corrections

m 0	Sun Plan.	Aries	Moon	v and d corr		
0	0°00.0	0°00.0	0°00.0	0.0 - 0.0	6.0 - 0.1	12.0 - 0.1
1	0°00.3	0°00.3	0°00.2	0.1 - 0.0	6.1 - 0.1	12.1 - 0.1
2	0°00.5	0°00.5	0°00.5	0.2 - 0.0	6.2 - 0.1	12.2 - 0.1
3	0°00.8	0°00.8	0°00.7	0.3 - 0.0	6.3 - 0.1	12.3 - 0.1
4	0°01.0	0°01.0	0°01.0	0.4 - 0.0	6.4 - 0.1	12.4 - 0.1
5	0°01.3	0°01.3	0°01.2	0.5 - 0.0	6.5 - 0.1	12.5 - 0.1
6	0°01.5	0°01.5	0°01.4	0.6 - 0.0	6.6 - 0.1	12.6 - 0.1
7	0°01.8	0°01.8	0°01.7	0.7 - 0.0	6.7 - 0.1	12.7 - 0.1
8	0°02.0	0°02.0	0°01.9	0.8 - 0.0	6.8 - 0.1	12.8 - 0.1
9	0°02.3	0°02.3	0°02.1	0.9 - 0.0	6.9 - 0.1	12.9 - 0.1
10	0°02.5	0°02.5	0°02.4	1.0 - 0.0	7.0 - 0.1	13.0 - 0.1
11	0°02.8	0°02.8	0°02.6	1.1 - 0.0	7.1 - 0.1	13.1 - 0.1
12	0°03.0	0°03.0	0°02.9	1.2 - 0.0	7.2 - 0.1	13.2 - 0.1
13	0°03.3	0°03.3	0°03.1	1.3 - 0.0	7.3 - 0.1	13.3 - 0.1
14	0°03.5	0°03.5	0°03.3	1.4 - 0.0	7.4 - 0.1	13.4 - 0.1
15	0°03.8	0°03.8	0°03.6	1.5 - 0.0	7.5 - 0.1	13.5 - 0.1
16	0°04.0	0°04.0	0°03.8	1.6 - 0.0	7.6 - 0.1	13.6 - 0.1
17	0°04.3	0°04.3	0°04.1	1.7 - 0.0	7.7 - 0.1	13.7 - 0.1
18	0°04.5	0°04.5	0°04.3	1.8 - 0.0	7.8 - 0.1	13.8 - 0.1
19	0°04.8	0°04.8	0°04.5	1.9 - 0.0	7.9 - 0.1	13.9 - 0.1
20	0°05.0	0°05.0	0°04.8	2.0 - 0.0	8.0 - 0.1	14.0 - 0.1
21	0°05.3	0°05.3	0°05.0	2.1 - 0.0	8.1 - 0.1	14.1 - 0.1
22	0°05.5	0°05.5	0°05.2	2.2 - 0.0	8.2 - 0.1	14.2 - 0.1
23	0°05.8	0°05.8	0°05.5	2.3 - 0.0	8.3 - 0.1	14.3 - 0.1
24	0°06.0	0°06.0	0°05.7	2.4 - 0.0	8.4 - 0.1	14.4 - 0.1
25	0°06.3	0°06.3	0°06.0	2.5 - 0.0	8.5 - 0.1	14.5 - 0.1
26	0°06.5	0°06.5	0°06.2	2.6 - 0.0	8.6 - 0.1	14.6 - 0.1
27	0°06.8	0°06.8	0°06.4	2.7 - 0.0	8.7 - 0.1	14.7 - 0.1
28	0°07.0	0°07.0	0°06.7	2.8 - 0.0	8.8 - 0.1	14.8 - 0.1
29	0°07.3	0°07.3	0°06.9	2.9 - 0.0	8.9 - 0.1	14.9 - 0.1
30	0°07.5	0°07.5	0°07.2	3.0 - 0.0	9.0 - 0.1	15.0 - 0.1
31	0°07.8	0°07.8	0°07.4	3.1 - 0.0	9.1 - 0.1	15.1 - 0.1
32	0°08.0	0°08.0	0°07.6	3.2 - 0.0	9.2 - 0.1	15.2 - 0.1
33	0°08.3	0°08.3	0°07.9	3.3 - 0.0	9.3 - 0.1	15.3 - 0.1
34	0°08.5	0°08.5	0°08.1	3.4 - 0.0	9.4 - 0.1	15.4 - 0.1
35	0°08.8	0°08.8	0°08.4	3.5 - 0.0	9.5 - 0.1	15.5 - 0.1
36	0°09.0	0°09.0	0°08.6	3.6 - 0.0	9.6 - 0.1	15.6 - 0.1
37	0°09.3	0°09.3	0°08.8	3.7 - 0.0	9.7 - 0.1	15.7 - 0.1
38	0°09.5	0°09.5	0°09.1	3.8 - 0.0	9.8 - 0.1	15.8 - 0.1
39	0°09.8	0°09.8	0°09.3	3.9 - 0.0	9.9 - 0.1	15.9 - 0.1
40	0°10.0	0°10.0	0°09.5	4.0 - 0.0	10.0 - 0.1	16.0 - 0.1
41	0°10.3	0°10.3	0°09.8	4.1 - 0.0	10.1 - 0.1	16.1 - 0.1
42	0°10.5	0°10.5	0°10.0	4.2 - 0.0	10.2 - 0.1	16.2 - 0.1
43	0°10.8	0°10.8	0°10.3	4.3 - 0.0	10.3 - 0.1	16.3 - 0.1
44	0°11.0	0°11.0	0°10.5	4.4 - 0.0	10.4 - 0.1	16.4 - 0.1
45	0°11.3	0°11.3	0°10.7	4.5 - 0.0	10.5 - 0.1	16.5 - 0.1
46	0°11.5	0°11.5	0°11.0	4.6 - 0.0	10.6 - 0.1	16.6 - 0.1
47	0°11.8	0°11.8	0°11.2	4.7 - 0.0	10.7 - 0.1	16.7 - 0.1
48	0°12.0	0°12.0	0°11.5	4.8 - 0.0	10.8 - 0.1	16.8 - 0.1
49	0°12.3	0°12.3	0°11.7	4.9 - 0.0	10.9 - 0.1	16.9 - 0.1
50	0°12.5	0°12.5	0°11.9	5.0 - 0.0	11.0 - 0.1	17.0 - 0.1
51	0°12.8	0°12.8	0°12.2	5.1 - 0.0	11.1 - 0.1	17.1 - 0.1
52	0°13.0	0°13.0	0°12.4	5.2 - 0.0	11.2 - 0.1	17.2 - 0.1
53	0°13.3	0°13.3	0°12.6	5.3 - 0.0	11.3 - 0.1	17.3 - 0.1
54	0°13.5	0°13.5	0°12.9	5.4 - 0.0	11.4 - 0.1	17.4 - 0.1
55	0°13.8	0°13.8	0°13.1	5.5 - 0.0	11.5 - 0.1	17.5 - 0.1
56	0°14.0	0°14.0	0°13.4	5.6 - 0.0	11.6 - 0.1	17.6 - 0.1
57	0°14.2	0°14.3	0°13.6	5.7 - 0.0	11.7 - 0.1	17.7 - 0.1
58	0°14.5	0°14.5	0°13.8	5.8 - 0.0	11.8 - 0.1	17.8 - 0.1
59	0°14.7	0°14.8	0°14.1	5.9 - 0.0	11.9 - 0.1	17.9 - 0.1

m 1	Sun Plan.	Aries	Moon	v and d corr		
0	0°15.0	0°15.0	0°14.3	0.0 - 0.0	6.0 - 0.2	12.0 - 0.3
1	0°15.3	0°15.3	0°14.6	0.1 - 0.0	6.1 - 0.2	12.1 - 0.3
2	0°15.5	0°15.5	0°14.8	0.2 - 0.0	6.2 - 0.2	12.2 - 0.3
3	0°15.8	0°15.8	0°15.0	0.3 - 0.0	6.3 - 0.2	12.3 - 0.3
4	0°16.0	0°16.0	0°15.3	0.4 - 0.0	6.4 - 0.2	12.4 - 0.3
5	0°16.3	0°16.3	0°15.5	0.5 - 0.0	6.5 - 0.2	12.5 - 0.3
6	0°16.5	0°16.5	0°15.7	0.6 - 0.0	6.6 - 0.2	12.6 - 0.3
7	0°16.8	0°16.8	0°16.0	0.7 - 0.0	6.7 - 0.2	12.7 - 0.3
8	0°17.0	0°17.0	0°16.2	0.8 - 0.0	6.8 - 0.2	12.8 - 0.3
9	0°17.3	0°17.3	0°16.5	0.9 - 0.0	6.9 - 0.2	12.9 - 0.3
10	0°17.5	0°17.5	0°16.7	1.0 - 0.0	7.0 - 0.2	13.0 - 0.3
11	0°17.8	0°17.8	0°16.9	1.1 - 0.0	7.1 - 0.2	13.1 - 0.3
12	0°18.0	0°18.0	0°17.2	1.2 - 0.0	7.2 - 0.2	13.2 - 0.3
13	0°18.3	0°18.3	0°17.4	1.3 - 0.0	7.3 - 0.2	13.3 - 0.3
14	0°18.5	0°18.6	0°17.7	1.4 - 0.0	7.4 - 0.2	13.4 - 0.3
15	0°18.8	0°18.8	0°17.9	1.5 - 0.0	7.5 - 0.2	13.5 - 0.3
16	0°19.0	0°19.1	0°18.1	1.6 - 0.0	7.6 - 0.2	13.6 - 0.3
17	0°19.3	0°19.3	0°18.4	1.7 - 0.0	7.7 - 0.2	13.7 - 0.3
18	0°19.5	0°19.6	0°18.6	1.8 - 0.0	7.8 - 0.2	13.8 - 0.3
19	0°19.8	0°19.8	0°18.9	1.9 - 0.0	7.9 - 0.2	13.9 - 0.3
20	0°20.0	0°20.1	0°19.1	2.0 - 0.1	8.0 - 0.2	14.0 - 0.4
21	0°20.3	0°20.3	0°19.3	2.1 - 0.1	8.1 - 0.2	14.1 - 0.4
22	0°20.5	0°20.6	0°19.6	2.2 - 0.1	8.2 - 0.2	14.2 - 0.4
23	0°20.8	0°20.8	0°19.8	2.3 - 0.1	8.3 - 0.2	14.3 - 0.4
24	0°21.0	0°21.1	0°20.0	2.4 - 0.1	8.4 - 0.2	14.4 - 0.4
25	0°21.3	0°21.3	0°20.3	2.5 - 0.1	8.5 - 0.2	14.5 - 0.4
26	0°21.5	0°21.6	0°20.5	2.6 - 0.1	8.6 - 0.2	14.6 - 0.4
27	0°21.8	0°21.8	0°20.8	2.7 - 0.1	8.7 - 0.2	14.7 - 0.4
28	0°22.0	0°22.1	0°21.0	2.8 - 0.1	8.8 - 0.2	14.8 - 0.4
29	0°22.3	0°22.3	0°21.2	2.9 - 0.1	8.9 - 0.2	14.9 - 0.4
30	0°22.5	0°22.6	0°21.5	3.0 - 0.1	9.0 - 0.2	15.0 - 0.4
31	0°22.8	0°22.8	0°21.7	3.1 - 0.1	9.1 - 0.2	15.1 - 0.4
32	0°23.0	0°23.1	0°22.0	3.2 - 0.1	9.2 - 0.2	15.2 - 0.4
33	0°23.3	0°23.3	0°22.2	3.3 - 0.1	9.3 - 0.2	15.3 - 0.4
34	0°23.5	0°23.6	0°22.4	3.4 - 0.1	9.4 - 0.2	15.4 - 0.4
35	0°23.8	0°23.8	0°22.7	3.5 - 0.1	9.5 - 0.2	15.5 - 0.4
36	0°24.0	0°24.1	0°22.9	3.6 - 0.1	9.6 - 0.2	15.6 - 0.4
37	0°24.3	0°24.3	0°23.1	3.7 - 0.1	9.7 - 0.2	15.7 - 0.4
38	0°24.5	0°24.6	0°23.4	3.8 - 0.1	9.8 - 0.2	15.8 - 0.4
39	0°24.8	0°24.8	0°23.6	3.9 - 0.1	9.9 - 0.2	15.9 - 0.4
40	0°25.0	0°25.1	0°23.9	4.0 - 0.1	10.0 - 0.3	16.0 - 0.4
41	0°25.3	0°25.3	0°24.1	4.1 - 0.1	10.1 - 0.3	16.1 - 0.4
42	0°25.5	0°25.6	0°24.3	4.2 - 0.1	10.2 - 0.3	16.2 - 0.4
43	0°25.8	0°25.8	0°24.6	4.3 - 0.1	10.3 - 0.3	16.3 - 0.4
44	0°26.0	0°26.1	0°24.8	4.4 - 0.1	10.4 - 0.3	16.4 - 0.4
45	0°26.3	0°26.3	0°25.1	4.5 - 0.1	10.5 - 0.3	16.5 - 0.4
46	0°26.5	0°26.6	0°25.3	4.6 - 0.1	10.6 - 0.3	16.6 - 0.4
47	0°26.8	0°26.8	0°25.5	4.7 - 0.1	10.7 - 0.3	16.7 - 0.4
48	0°27.0	0°27.1	0°25.8	4.8 - 0.1	10.8 - 0.3	16.8 - 0.4
49	0°27.3	0°27.3	0°26.0	4.9 - 0.1	10.9 - 0.3	16.9 - 0.4
50	0°27.5	0°27.6	0°26.2	5.0 - 0.1	11.0 - 0.3	17.0 - 0.4
51	0°27.8	0°27.8	0°26.5	5.1 - 0.1	11.1 - 0.3	17.1 - 0.4
52	0°28.0	0°28.1	0°26.7	5.2 - 0.1	11.2 - 0.3	17.2 - 0.4
53	0°28.3	0°28.3	0°27.0	5.3 - 0.1	11.3 - 0.3	17.3 - 0.4
54	0°28.5	0°28.6	0°27.2	5.4 - 0.1	11.4 - 0.3	17.4 - 0.4
55	0°28.7	0°28.8	0°27.4	5.5 - 0.1	11.5 - 0.3	17.5 - 0.4
56	0°29.0	0°29.1	0°27.7	5.6 - 0.1	11.6 - 0.3	17.6 - 0.4
57	0°29.3	0°29.3	0°27.9	5.7 - 0.1	11.7 - 0.3	17.7 - 0.4
58	0°29.5	0°29.6	0°28.2	5.8 - 0.1	11.8 - 0.3	17.8 - 0.4
59	0°29.7	0°29.8	0°28.4	5.9 - 0.1	11.9 - 0.3	17.9 - 0.4

m 2	Sun Plan.	Aries	Moon	v and d corr		
0	0°30.0	0°30.1	0°28.6	0.0 - 0.0	6.0 - 0.3	12.0 - 0.5
1	0°30.3	0°30.3	0°28.9	0.1 - 0.0	6.1 - 0.3	12.1 - 0.5
2	0°30.5	0°30.6	0°29.1	0.2 - 0.0	6.2 - 0.3	12.2 - 0.5
3	0°30.7	0°30.8	0°29.3	0.3 - 0.0	6.3 - 0.3	12.3 - 0.5
4	0°31.0	0°31.1	0°29.6	0.4 - 0.0	6.4 - 0.3	12.4 - 0.5
5	0°31.3	0°31.3	0°29.8	0.5 - 0.0	6.5 - 0.3	12.5 - 0.5
6	0°31.5	0°31.6	0°30.1	0.6 - 0.0	6.6 - 0.3	12.6 - 0.5
7	0°31.8	0°31.8	0°30.3	0.7 - 0.0	6.7 - 0.3	12.7 - 0.5
8	0°32.0	0°32.1	0°30.5	0.8 - 0.0	6.8 - 0.3	12.8 - 0.5
9	0°32.3	0°32.3	0°30.8	0.9 - 0.0	6.9 - 0.3	12.9 - 0.5
10	0°32.5	0°32.6	0°31.0	1.0 - 0.0	7.0 - 0.3	13.0 - 0.5
11	0°32.8	0°32.8	0°31.3	1.1 - 0.0	7.1 - 0.3	13.1 - 0.5
12	0°33.0	0°33.1	0°31.5	1.2 - 0.1	7.2 - 0.3	13.2 - 0.5
13	0°33.3	0°33.3	0°31.7	1.3 - 0.1	7.3 - 0.3	13.3 - 0.6
14	0°33.5	0°33.6	0°32.0	1.4 - 0.1	7.4 - 0.3	13.4 - 0.6
15	0°33.8	0°33.8	0°32.2	1.5 - 0.1	7.5 - 0.3	13.5 - 0.6
16	0°34.0	0°34.1	0°32.5	1.6 - 0.1	7.6 - 0.3	13.6 - 0.6
17	0°34.3	0°34.3	0°32.7	1.7 - 0.1	7.7 - 0.3	13.7 - 0.6
18	0°34.5	0°34.6	0°32.9	1.8 - 0.1	7.8 - 0.3	13.8 - 0.6
19	0°34.8	0°34.8	0°33.2	1.9 - 0.1	7.9 - 0.3	13.9 - 0.6
20	0°35.0	0°35.1	0°33.4	2.0 - 0.1	8.0 - 0.3	14.0 - 0.6
21	0°35.3	0°35.3	0°33.6	2.1 - 0.1	8.1 - 0.3	14.1 - 0.6
22	0°35.5	0°35.6	0°33.9	2.2 - 0.1	8.2 - 0.3	14.2 - 0.6
23	0°35.8	0°35.8	0°34.1	2.3 - 0.1	8.3 - 0.3	14.3 - 0.6
24	0°36.0	0°36.1	0°34.4	2.4 - 0.1	8.4 - 0.3	14.4 - 0.6
25	0°36.3	0°36.3	0°34.6	2.5 - 0.1	8.5 - 0.4	14.5 - 0.6
26	0°36.5	0°36.6	0°34.8	2.6 - 0.1	8.6 - 0.4	14.6 - 0.6
27	0°36.8	0°36.9	0°35.1	2.7 - 0.1	8.7 - 0.4	14.7 - 0.6
28	0°37.0	0°37.1	0°35.3	2.8 - 0.1	8.8 - 0.4	14.8 - 0.6
29	0°37.3	0°37.4	0°35.6	2.9 - 0.1	8.9 - 0.4	14.9 - 0.6
30	0°37.5	0°37.6	0°35.8	3.0 - 0.1	9.0 - 0.4	15.0 - 0.6
31	0°37.8	0°37.9	0°36.0	3.1 - 0.1	9.1 - 0.4	15.1 - 0.6
32	0°38.0	0°38.1	0°36.3	3.2 - 0.1	9.2 - 0.4	15.2 - 0.6
33	0°38.3	0°38.4	0°36.5	3.3 - 0.1	9.3 - 0.4	15.3 - 0.6
34	0°38.5	0°38.6	0°36.7	3.4 - 0.1	9.4 - 0.4	15.4 - 0.6
35	0°38.8	0°38.9	0°37.0	3.5 - 0.1	9.5 - 0.4	15.5 - 0.6
36	0°39.0	0°39.1	0°37.2	3.6 - 0.1	9.6 - 0.4	15.6 - 0.6
37	0°39.3	0°39.4	0°37.5	3.7 - 0.2	9.7 - 0.4	15.7 - 0.7
38	0°39.5	0°39.6	0°37.7	3.8 - 0.2	9.8 - 0.4	15.8 - 0.7
39	0°39.8	0°39.9	0°37.9	3.9 - 0.2	9.9 - 0.4	15.9 - 0.7
40	0°40.0	0°40.1	0°38.2	4.0 - 0.2	10.0 - 0.4	16.0 - 0.7
41	0°40.3	0°40.4	0°38.4	4.1 - 0.2	10.1 - 0.4	16.1 - 0.7
42	0°40.5	0°40.6	0°38.7	4.2 - 0.2	10.2 - 0.4	16.2 - 0.7
43	0°40.8	0°40.9	0°38.9	4.3 - 0.2	10.3 - 0.4	16.3 - 0.7
44	0°41.0	0°41.1	0°39.1	4.4 - 0.2	10.4 - 0.4	16.4 - 0.7
45	0°41.3	0°41.4	0°39.4	4.5 - 0.2	10.5 - 0.4	16.5 - 0.7
46	0°41.5	0°41.6	0°39.6	4.6 - 0.2	10.6 - 0.4	16.6 - 0.7
47	0°41.8	0°41.9	0°39.8	4.7 - 0.2	10.7 - 0.4	16.7 - 0.7
48	0°42.0	0°42.1	0°40.1	4.8 - 0.2	10.8 - 0.5	16.8 - 0.7
49	0°42.3	0°42.4	0°40.3	4.9 - 0.2	10.9 - 0.5	16.9 - 0.7
50	0°42.5	0°42.6	0°40.6	5.0 - 0.2	11.0 - 0.5	17.0 - 0.7
51	0°42.8	0°42.9	0°40.8	5.1 - 0.2	11.1 - 0.5	17.1 - 0.7
52	0°43.0	0°43.1	0°41.0	5.2 - 0.2	11.2 - 0.5	17.2 - 0.7
53	0°43.3	0°43.4	0°41.3	5.3 - 0.2	11.3 - 0.5	17.3 - 0.7
54	0°43.5	0°43.6	0°41.5	5.4 - 0.2	11.4 - 0.5	17.4 - 0.7
55	0°43.8	0°43.9	0°41.8	5.5 - 0.2	11.5 - 0.5	17.5 - 0.7
56	0°44.0	0°44.1	0°42.0	5.6 - 0.2	11.6 - 0.5	17.6 - 0.7
57	0°44.3	0°44.4	0°42.2	5.7 - 0.2	11.7 - 0.5	17.7 - 0.7
58	0°44.5	0°44.6	0°42.5	5.8 - 0.2	11.8 - 0.5	17.8 - 0.7
59	0°44.8	0°44.9	0°42.7	5.9 - 0.2	11.9 - 0.5	17.9 - 0.7

Increments and Corrections

m 3	Sun Plan.	Aries	Moon	v and d corr		
0	0°45.0	0°45.1	0°43.0	0.0 - 0.0	6.0 - 0.3	12.0 - 0.7
1	0°45.3	0°45.4	0°43.2	0.1 - 0.0	6.1 - 0.4	12.1 - 0.7
2	0°45.5	0°45.6	0°43.4	0.2 - 0.0	6.2 - 0.4	12.2 - 0.7
3	0°45.8	0°45.9	0°43.7	0.3 - 0.0	6.3 - 0.4	12.3 - 0.7
4	0°46.0	0°46.1	0°43.9	0.4 - 0.0	6.4 - 0.4	12.4 - 0.7
5	0°46.3	0°46.4	0°44.1	0.5 - 0.0	6.5 - 0.4	12.5 - 0.7
6	0°46.5	0°46.6	0°44.4	0.6 - 0.0	6.6 - 0.4	12.6 - 0.7
7	0°46.8	0°46.9	0°44.6	0.7 - 0.0	6.7 - 0.4	12.7 - 0.7
8	0°47.0	0°47.1	0°44.9	0.8 - 0.0	6.8 - 0.4	12.8 - 0.7
9	0°47.3	0°47.4	0°45.1	0.9 - 0.1	6.9 - 0.4	12.9 - 0.8
10	0°47.5	0°47.6	0°45.3	1.0 - 0.1	7.0 - 0.4	13.0 - 0.8
11	0°47.8	0°47.9	0°45.6	1.1 - 0.1	7.1 - 0.4	13.1 - 0.8
12	0°48.0	0°48.1	0°45.8	1.2 - 0.1	7.2 - 0.4	13.2 - 0.8
13	0°48.3	0°48.4	0°46.1	1.3 - 0.1	7.3 - 0.4	13.3 - 0.8
14	0°48.5	0°48.6	0°46.3	1.4 - 0.1	7.4 - 0.4	13.4 - 0.8
15	0°48.8	0°48.9	0°46.5	1.5 - 0.1	7.5 - 0.4	13.5 - 0.8
16	0°49.0	0°49.1	0°46.8	1.6 - 0.1	7.6 - 0.4	13.6 - 0.8
17	0°49.3	0°49.4	0°47.0	1.7 - 0.1	7.7 - 0.4	13.7 - 0.8
18	0°49.5	0°49.6	0°47.2	1.8 - 0.1	7.8 - 0.5	13.8 - 0.8
19	0°49.8	0°49.9	0°47.5	1.9 - 0.1	7.9 - 0.5	13.9 - 0.8
20	0°50.0	0°50.1	0°47.7	2.0 - 0.1	8.0 - 0.5	14.0 - 0.8
21	0°50.3	0°50.4	0°48.0	2.1 - 0.1	8.1 - 0.5	14.1 - 0.8
22	0°50.5	0°50.6	0°48.2	2.2 - 0.1	8.2 - 0.5	14.2 - 0.8
23	0°50.8	0°50.9	0°48.4	2.3 - 0.1	8.3 - 0.5	14.3 - 0.8
24	0°51.0	0°51.1	0°48.7	2.4 - 0.1	8.4 - 0.5	14.4 - 0.8
25	0°51.3	0°51.4	0°48.9	2.5 - 0.1	8.5 - 0.5	14.5 - 0.8
26	0°51.5	0°51.6	0°49.2	2.6 - 0.2	8.6 - 0.5	14.6 - 0.9
27	0°51.8	0°51.9	0°49.4	2.7 - 0.2	8.7 - 0.5	14.7 - 0.9
28	0°52.0	0°52.1	0°49.6	2.8 - 0.2	8.8 - 0.5	14.8 - 0.9
29	0°52.3	0°52.4	0°49.9	2.9 - 0.2	8.9 - 0.5	14.9 - 0.9
30	0°52.5	0°52.6	0°50.1	3.0 - 0.2	9.0 - 0.5	15.0 - 0.9
31	0°52.8	0°52.9	0°50.3	3.1 - 0.2	9.1 - 0.5	15.1 - 0.9
32	0°53.0	0°53.1	0°50.6	3.2 - 0.2	9.2 - 0.5	15.2 - 0.9
33	0°53.3	0°53.4	0°50.8	3.3 - 0.2	9.3 - 0.5	15.3 - 0.9
34	0°53.5	0°53.6	0°51.1	3.4 - 0.2	9.4 - 0.5	15.4 - 0.9
35	0°53.8	0°53.9	0°51.3	3.5 - 0.2	9.5 - 0.6	15.5 - 0.9
36	0°54.0	0°54.1	0°51.5	3.6 - 0.2	9.6 - 0.6	15.6 - 0.9
37	0°54.3	0°54.4	0°51.8	3.7 - 0.2	9.7 - 0.6	15.7 - 0.9
38	0°54.5	0°54.6	0°52.0	3.8 - 0.2	9.8 - 0.6	15.8 - 0.9
39	0°54.8	0°54.9	0°52.3	3.9 - 0.2	9.9 - 0.6	15.9 - 0.9
40	0°55.0	0°55.2	0°52.5	4.0 - 0.2	10.0 - 0.6	16.0 - 0.9
41	0°55.3	0°55.4	0°52.7	4.1 - 0.2	10.1 - 0.6	16.1 - 0.9
42	0°55.5	0°55.7	0°53.0	4.2 - 0.2	10.2 - 0.6	16.2 - 0.9
43	0°55.8	0°55.9	0°53.2	4.3 - 0.3	10.3 - 0.6	16.3 - 1.0
44	0°56.0	0°56.2	0°53.4	4.4 - 0.3	10.4 - 0.6	16.4 - 1.0
45	0°56.3	0°56.4	0°53.7	4.5 - 0.3	10.5 - 0.6	16.5 - 1.0
46	0°56.5	0°56.7	0°53.9	4.6 - 0.3	10.6 - 0.6	16.6 - 1.0
47	0°56.8	0°56.9	0°54.2	4.7 - 0.3	10.7 - 0.6	16.7 - 1.0
48	0°57.0	0°57.2	0°54.4	4.8 - 0.3	10.8 - 0.6	16.8 - 1.0
49	0°57.3	0°57.4	0°54.6	4.9 - 0.3	10.9 - 0.6	16.9 - 1.0
50	0°57.5	0°57.7	0°54.9	5.0 - 0.3	11.0 - 0.6	17.0 - 1.0
51	0°57.7	0°57.9	0°55.1	5.1 - 0.3	11.1 - 0.6	17.1 - 1.0
52	0°58.0	0°58.2	0°55.4	5.2 - 0.3	11.2 - 0.7	17.2 - 1.0
53	0°58.3	0°58.4	0°55.6	5.3 - 0.3	11.3 - 0.7	17.3 - 1.0
54	0°58.5	0°58.7	0°55.8	5.4 - 0.3	11.4 - 0.7	17.4 - 1.0
55	0°58.8	0°58.9	0°56.1	5.5 - 0.3	11.5 - 0.7	17.5 - 1.0
56	0°59.0	0°59.2	0°56.3	5.6 - 0.3	11.6 - 0.7	17.6 - 1.0
57	0°59.3	0°59.4	0°56.6	5.7 - 0.3	11.7 - 0.7	17.7 - 1.0
58	0°59.5	0°59.7	0°56.8	5.8 - 0.3	11.8 - 0.7	17.8 - 1.0
59	0°59.8	0°59.9	0°57.0	5.9 - 0.3	11.9 - 0.7	17.9 - 1.0

m 4	Sun Plan.	Aries	Moon	v and d corr		
0	1°00.0	1°00.2	0°57.3	0.0 - 0.0	6.0 - 0.4	12.0 - 0.9
1	1°00.2	1°00.4	0°57.5	0.1 - 0.0	6.1 - 0.5	12.1 - 0.9
2	1°00.5	1°00.7	0°57.7	0.2 - 0.0	6.2 - 0.5	12.2 - 0.9
3	1°00.7	1°00.9	0°58.0	0.3 - 0.0	6.3 - 0.5	12.3 - 0.9
4	1°01.0	1°01.2	0°58.2	0.4 - 0.0	6.4 - 0.5	12.4 - 0.9
5	1°01.2	1°01.4	0°58.5	0.5 - 0.0	6.5 - 0.5	12.5 - 0.9
6	1°01.5	1°01.7	0°58.7	0.6 - 0.0	6.6 - 0.5	12.6 - 0.9
7	1°01.7	1°01.9	0°58.9	0.7 - 0.1	6.7 - 0.5	12.7 - 1.0
8	1°02.0	1°02.2	0°59.2	0.8 - 0.1	6.8 - 0.5	12.8 - 1.0
9	1°02.3	1°02.4	0°59.4	0.9 - 0.1	6.9 - 0.5	12.9 - 1.0
10	1°02.5	1°02.7	0°59.7	1.0 - 0.1	7.0 - 0.5	13.0 - 1.0
11	1°02.8	1°02.9	0°59.9	1.1 - 0.1	7.1 - 0.5	13.1 - 1.0
12	1°03.0	1°03.2	1°00.1	1.2 - 0.1	7.2 - 0.5	13.2 - 1.0
13	1°03.3	1°03.4	1°00.4	1.3 - 0.1	7.3 - 0.5	13.3 - 1.0
14	1°03.5	1°03.7	1°00.6	1.4 - 0.1	7.4 - 0.6	13.4 - 1.0
15	1°03.8	1°03.9	1°00.8	1.5 - 0.1	7.5 - 0.6	13.5 - 1.0
16	1°04.0	1°04.2	1°01.1	1.6 - 0.1	7.6 - 0.6	13.6 - 1.0
17	1°04.2	1°04.4	1°01.3	1.7 - 0.1	7.7 - 0.6	13.7 - 1.0
18	1°04.5	1°04.7	1°01.6	1.8 - 0.1	7.8 - 0.6	13.8 - 1.0
19	1°04.7	1°04.9	1°01.8	1.9 - 0.1	7.9 - 0.6	13.9 - 1.0
20	1°05.0	1°05.2	1°02.0	2.0 - 0.1	8.0 - 0.6	14.0 - 1.1
21	1°05.2	1°05.4	1°02.3	2.1 - 0.2	8.1 - 0.6	14.1 - 1.1
22	1°05.5	1°05.7	1°02.5	2.2 - 0.2	8.2 - 0.6	14.2 - 1.1
23	1°05.8	1°05.9	1°02.8	2.3 - 0.2	8.3 - 0.6	14.3 - 1.1
24	1°06.0	1°06.2	1°03.0	2.4 - 0.2	8.4 - 0.6	14.4 - 1.1
25	1°06.3	1°06.4	1°03.2	2.5 - 0.2	8.5 - 0.6	14.5 - 1.1
26	1°06.5	1°06.7	1°03.5	2.6 - 0.2	8.6 - 0.6	14.6 - 1.1
27	1°06.8	1°06.9	1°03.7	2.7 - 0.2	8.7 - 0.7	14.7 - 1.1
28	1°07.0	1°07.2	1°03.9	2.8 - 0.2	8.8 - 0.7	14.8 - 1.1
29	1°07.3	1°07.4	1°04.2	2.9 - 0.2	8.9 - 0.7	14.9 - 1.1
30	1°07.5	1°07.7	1°04.4	3.0 - 0.2	9.0 - 0.7	15.0 - 1.1
31	1°07.7	1°07.9	1°04.7	3.1 - 0.2	9.1 - 0.7	15.1 - 1.1
32	1°08.0	1°08.2	1°04.9	3.2 - 0.2	9.2 - 0.7	15.2 - 1.1
33	1°08.2	1°08.4	1°05.1	3.3 - 0.2	9.3 - 0.7	15.3 - 1.1
34	1°08.5	1°08.7	1°05.4	3.4 - 0.3	9.4 - 0.7	15.4 - 1.2
35	1°08.7	1°08.9	1°05.6	3.5 - 0.3	9.5 - 0.7	15.5 - 1.2
36	1°09.0	1°09.2	1°05.9	3.6 - 0.3	9.6 - 0.7	15.6 - 1.2
37	1°09.3	1°09.4	1°06.1	3.7 - 0.3	9.7 - 0.7	15.7 - 1.2
38	1°09.5	1°09.7	1°06.3	3.8 - 0.3	9.8 - 0.7	15.8 - 1.2
39	1°09.8	1°09.9	1°06.6	3.9 - 0.3	9.9 - 0.7	15.9 - 1.2
40	1°10.0	1°10.2	1°06.8	4.0 - 0.3	10.0 - 0.8	16.0 - 1.2
41	1°10.3	1°10.4	1°07.0	4.1 - 0.3	10.1 - 0.8	16.1 - 1.2
42	1°10.5	1°10.7	1°07.3	4.2 - 0.3	10.2 - 0.8	16.2 - 1.2
43	1°10.8	1°10.9	1°07.5	4.3 - 0.3	10.3 - 0.8	16.3 - 1.2
44	1°11.0	1°11.2	1°07.8	4.4 - 0.3	10.4 - 0.8	16.4 - 1.2
45	1°11.3	1°11.4	1°08.0	4.5 - 0.3	10.5 - 0.8	16.5 - 1.2
46	1°11.5	1°11.7	1°08.2	4.6 - 0.3	10.6 - 0.8	16.6 - 1.2
47	1°11.7	1°11.9	1°08.5	4.7 - 0.4	10.7 - 0.8	16.7 - 1.3
48	1°12.0	1°12.2	1°08.7	4.8 - 0.4	10.8 - 0.8	16.8 - 1.3
49	1°12.2	1°12.4	1°09.0	4.9 - 0.4	10.9 - 0.8	16.9 - 1.3
50	1°12.5	1°12.7	1°09.2	5.0 - 0.4	11.0 - 0.8	17.0 - 1.3
51	1°12.7	1°12.9	1°09.4	5.1 - 0.4	11.1 - 0.8	17.1 - 1.3
52	1°13.0	1°13.2	1°09.7	5.2 - 0.4	11.2 - 0.8	17.2 - 1.3
53	1°13.2	1°13.5	1°09.9	5.3 - 0.4	11.3 - 0.8	17.3 - 1.3
54	1°13.5	1°13.7	1°10.2	5.4 - 0.4	11.4 - 0.9	17.4 - 1.3
55	1°13.8	1°14.0	1°10.4	5.5 - 0.4	11.5 - 0.9	17.5 - 1.3
56	1°14.0	1°14.2	1°10.6	5.6 - 0.4	11.6 - 0.9	17.6 - 1.3
57	1°14.3	1°14.5	1°10.9	5.7 - 0.4	11.7 - 0.9	17.7 - 1.3
58	1°14.5	1°14.7	1°11.1	5.8 - 0.4	11.8 - 0.9	17.8 - 1.3
59	1°14.8	1°15.0	1°11.3	5.9 - 0.4	11.9 - 0.9	17.9 - 1.3

m 5	Sun Plan.	Aries	Moon	v and d corr		
0	1°15.0	1°15.2	1°11.6	0.0 - 0.0	6.0 - 0.5	12.0 - 1.1
1	1°15.3	1°15.5	1°11.8	0.1 - 0.0	6.1 - 0.6	12.1 - 1.1
2	1°15.5	1°15.7	1°12.1	0.2 - 0.0	6.2 - 0.6	12.2 - 1.1
3	1°15.7	1°16.0	1°12.3	0.3 - 0.0	6.3 - 0.6	12.3 - 1.1
4	1°16.0	1°16.2	1°12.5	0.4 - 0.0	6.4 - 0.6	12.4 - 1.1
5	1°16.2	1°16.5	1°12.8	0.5 - 0.0	6.5 - 0.6	12.5 - 1.1
6	1°16.5	1°16.7	1°13.0	0.6 - 0.1	6.6 - 0.6	12.6 - 1.2
7	1°16.7	1°17.0	1°13.3	0.7 - 0.1	6.7 - 0.6	12.7 - 1.2
8	1°17.0	1°17.2	1°13.5	0.8 - 0.1	6.8 - 0.6	12.8 - 1.2
9	1°17.3	1°17.5	1°13.7	0.9 - 0.1	6.9 - 0.6	12.9 - 1.2
10	1°17.5	1°17.7	1°14.0	1.0 - 0.1	7.0 - 0.6	13.0 - 1.2
11	1°17.8	1°18.0	1°14.2	1.1 - 0.1	7.1 - 0.7	13.1 - 1.2
12	1°18.0	1°18.2	1°14.4	1.2 - 0.1	7.2 - 0.7	13.2 - 1.2
13	1°18.3	1°18.5	1°14.7	1.3 - 0.1	7.3 - 0.7	13.3 - 1.2
14	1°18.5	1°18.7	1°14.9	1.4 - 0.1	7.4 - 0.7	13.4 - 1.2
15	1°18.8	1°19.0	1°15.2	1.5 - 0.1	7.5 - 0.7	13.5 - 1.2
16	1°19.0	1°19.2	1°15.4	1.6 - 0.1	7.6 - 0.7	13.6 - 1.2
17	1°19.3	1°19.5	1°15.6	1.7 - 0.2	7.7 - 0.7	13.7 - 1.3
18	1°19.5	1°19.7	1°15.9	1.8 - 0.2	7.8 - 0.7	13.8 - 1.3
19	1°19.7	1°20.0	1°16.1	1.9 - 0.2	7.9 - 0.7	13.9 - 1.3
20	1°20.0	1°20.2	1°16.4	2.0 - 0.2	8.0 - 0.7	14.0 - 1.3
21	1°20.2	1°20.5	1°16.6	2.1 - 0.2	8.1 - 0.7	14.1 - 1.3
22	1°20.5	1°20.7	1°16.8	2.2 - 0.2	8.2 - 0.8	14.2 - 1.3
23	1°20.8	1°21.0	1°17.1	2.3 - 0.2	8.3 - 0.8	14.3 - 1.3
24	1°21.0	1°21.2	1°17.3	2.4 - 0.2	8.4 - 0.8	14.4 - 1.3
25	1°21.3	1°21.5	1°17.5	2.5 - 0.2	8.5 - 0.8	14.5 - 1.3
26	1°21.5	1°21.7	1°17.8	2.6 - 0.2	8.6 - 0.8	14.6 - 1.3
27	1°21.8	1°22.0	1°18.0	2.7 - 0.2	8.7 - 0.8	14.7 - 1.3
28	1°22.0	1°22.2	1°18.3	2.8 - 0.3	8.8 - 0.8	14.8 - 1.4
29	1°22.3	1°22.5	1°18.5	2.9 - 0.3	8.9 - 0.8	14.9 - 1.4
30	1°22.5	1°22.7	1°18.7	3.0 - 0.3	9.0 - 0.8	15.0 - 1.4
31	1°22.8	1°23.0	1°19.0	3.1 - 0.3	9.1 - 0.8	15.1 - 1.4
32	1°23.0	1°23.2	1°19.2	3.2 - 0.3	9.2 - 0.8	15.2 - 1.4
33	1°23.2	1°23.5	1°19.5	3.3 - 0.3	9.3 - 0.9	15.3 - 1.4
34	1°23.5	1°23.7	1°19.7	3.4 - 0.3	9.4 - 0.9	15.4 - 1.4
35	1°23.7	1°24.0	1°19.9	3.5 - 0.3	9.5 - 0.9	15.5 - 1.4
36	1°24.0	1°24.2	1°20.2	3.6 - 0.3	9.6 - 0.9	15.6 - 1.4
37	1°24.3	1°24.5	1°20.4	3.7 - 0.3	9.7 - 0.9	15.7 - 1.4
38	1°24.5	1°24.7	1°20.7	3.8 - 0.3	9.8 - 0.9	15.8 - 1.4
39	1°24.8	1°25.0	1°20.9	3.9 - 0.4	9.9 - 0.9	15.9 - 1.5
40	1°25.0	1°25.2	1°21.1	4.0 - 0.4	10.0 - 0.9	16.0 - 1.5
41	1°25.3	1°25.5	1°21.4	4.1 - 0.4	10.1 - 0.9	16.1 - 1.5
42	1°25.5	1°25.7	1°21.6	4.2 - 0.4	10.2 - 0.9	16.2 - 1.5
43	1°25.8	1°26.0	1°21.8	4.3 - 0.4	10.3 - 0.9	16.3 - 1.5
44	1°26.0	1°26.2	1°22.1	4.4 - 0.4	10.4 - 1.0	16.4 - 1.5
45	1°26.3	1°26.5	1°22.3	4.5 - 0.4	10.5 - 1.0	16.5 - 1.5
46	1°26.5	1°26.7	1°22.6	4.6 - 0.4	10.6 - 1.0	16.6 - 1.5
47	1°26.8	1°27.0	1°22.8	4.7 - 0.4	10.7 - 1.0	16.7 - 1.5
48	1°27.0	1°27.2	1°23.0	4.8 - 0.4	10.8 - 1.0	16.8 - 1.5
49	1°27.2	1°27.5	1°23.3	4.9 - 0.4	10.9 - 1.0	16.9 - 1.5
50	1°27.5	1°27.7	1°23.5	5.0 - 0.5	11.0 - 1.0	17.0 - 1.6
51	1°27.7	1°28.0	1°23.8	5.1 - 0.5	11.1 - 1.0	17.1 - 1.6
52	1°28.0	1°28.2	1°24.0	5.2 - 0.5	11.2 - 1.0	17.2 - 1.6
53	1°28.2	1°28.5	1°24.2	5.3 - 0.5	11.3 - 1.0	17.3 - 1.6
54	1°28.5	1°28.7	1°24.5	5.4 - 0.5	11.4 - 1.0	17.4 - 1.6
55	1°28.8	1°29.0	1°24.7	5.5 - 0.5	11.5 - 1.1	17.5 - 1.6
56	1°29.0	1°29.2	1°24.9	5.6 - 0.5	11.6 - 1.1	17.6 - 1.6
57	1°29.3	1°29.5	1°25.2	5.7 - 0.5	11.7 - 1.1	17.7 - 1.6
58	1°29.5	1°29.7	1°25.4	5.8 - 0.5	11.8 - 1.1	17.8 - 1.6
59	1°29.8	1°30.0	1°25.7	5.9 - 0.5	11.9 - 1.1	17.9 - 1.6

Increments and Corrections

m 6	Sun Plan.	Aries	Moon	v and d corr		
0	1°30.0	1°30.2	1°25.9	0.0 - 0.0	6.0 - 0.7	12.0 - 1.3
1	1°30.3	1°30.5	1°26.1	0.1 - 0.0	6.1 - 0.7	12.1 - 1.3
2	1°30.5	1°30.7	1°26.4	0.2 - 0.0	6.2 - 0.7	12.2 - 1.3
3	1°30.7	1°31.0	1°26.6	0.3 - 0.0	6.3 - 0.7	12.3 - 1.3
4	1°31.0	1°31.2	1°26.9	0.4 - 0.0	6.4 - 0.7	12.4 - 1.3
5	1°31.2	1°31.5	1°27.1	0.5 - 0.1	6.5 - 0.7	12.5 - 1.4
6	1°31.5	1°31.8	1°27.3	0.6 - 0.1	6.6 - 0.7	12.6 - 1.4
7	1°31.7	1°32.0	1°27.6	0.7 - 0.1	6.7 - 0.7	12.7 - 1.4
8	1°32.0	1°32.3	1°27.8	0.8 - 0.1	6.8 - 0.7	12.8 - 1.4
9	1°32.3	1°32.5	1°28.0	0.9 - 0.1	6.9 - 0.7	12.9 - 1.4
10	1°32.5	1°32.8	1°28.3	1.0 - 0.1	7.0 - 0.8	13.0 - 1.4
11	1°32.8	1°33.0	1°28.5	1.1 - 0.1	7.1 - 0.8	13.1 - 1.4
12	1°33.0	1°33.3	1°28.8	1.2 - 0.1	7.2 - 0.8	13.2 - 1.4
13	1°33.3	1°33.5	1°29.0	1.3 - 0.1	7.3 - 0.8	13.3 - 1.4
14	1°33.5	1°33.8	1°29.2	1.4 - 0.2	7.4 - 0.8	13.4 - 1.5
15	1°33.8	1°34.0	1°29.5	1.5 - 0.2	7.5 - 0.8	13.5 - 1.5
16	1°34.0	1°34.3	1°29.7	1.6 - 0.2	7.6 - 0.8	13.6 - 1.5
17	1°34.3	1°34.5	1°30.0	1.7 - 0.2	7.7 - 0.8	13.7 - 1.5
18	1°34.5	1°34.8	1°30.2	1.8 - 0.2	7.8 - 0.8	13.8 - 1.5
19	1°34.8	1°35.0	1°30.4	1.9 - 0.2	7.9 - 0.9	13.9 - 1.5
20	1°35.0	1°35.3	1°30.7	2.0 - 0.2	8.0 - 0.9	14.0 - 1.5
21	1°35.2	1°35.5	1°30.9	2.1 - 0.2	8.1 - 0.9	14.1 - 1.5
22	1°35.5	1°35.8	1°31.1	2.2 - 0.2	8.2 - 0.9	14.2 - 1.5
23	1°35.8	1°36.0	1°31.4	2.3 - 0.2	8.3 - 0.9	14.3 - 1.5
24	1°36.0	1°36.3	1°31.6	2.4 - 0.3	8.4 - 0.9	14.4 - 1.6
25	1°36.3	1°36.5	1°31.9	2.5 - 0.3	8.5 - 0.9	14.5 - 1.6
26	1°36.5	1°36.8	1°32.1	2.6 - 0.3	8.6 - 0.9	14.6 - 1.6
27	1°36.8	1°37.0	1°32.3	2.7 - 0.3	8.7 - 0.9	14.7 - 1.6
28	1°37.0	1°37.3	1°32.6	2.8 - 0.3	8.8 - 1.0	14.8 - 1.6
29	1°37.3	1°37.5	1°32.8	2.9 - 0.3	8.9 - 1.0	14.9 - 1.6
30	1°37.5	1°37.8	1°33.1	3.0 - 0.3	9.0 - 1.0	15.0 - 1.6
31	1°37.8	1°38.0	1°33.3	3.1 - 0.3	9.1 - 1.0	15.1 - 1.6
32	1°38.0	1°38.3	1°33.5	3.2 - 0.3	9.2 - 1.0	15.2 - 1.6
33	1°38.3	1°38.5	1°33.8	3.3 - 0.4	9.3 - 1.0	15.3 - 1.7
34	1°38.5	1°38.8	1°34.0	3.4 - 0.4	9.4 - 1.0	15.4 - 1.7
35	1°38.7	1°39.0	1°34.3	3.5 - 0.4	9.5 - 1.0	15.5 - 1.7
36	1°39.0	1°39.3	1°34.5	3.6 - 0.4	9.6 - 1.0	15.6 - 1.7
37	1°39.3	1°39.5	1°34.7	3.7 - 0.4	9.7 - 1.1	15.7 - 1.7
38	1°39.5	1°39.8	1°35.0	3.8 - 0.4	9.8 - 1.1	15.8 - 1.7
39	1°39.8	1°40.0	1°35.2	3.9 - 0.4	9.9 - 1.1	15.9 - 1.7
40	1°40.0	1°40.3	1°35.4	4.0 - 0.4	10.0 - 1.1	16.0 - 1.7
41	1°40.3	1°40.5	1°35.7	4.1 - 0.4	10.1 - 1.1	16.1 - 1.7
42	1°40.5	1°40.8	1°35.9	4.2 - 0.5	10.2 - 1.1	16.2 - 1.8
43	1°40.8	1°41.0	1°36.2	4.3 - 0.5	10.3 - 1.1	16.3 - 1.8
44	1°41.0	1°41.3	1°36.4	4.4 - 0.5	10.4 - 1.1	16.4 - 1.8
45	1°41.3	1°41.5	1°36.6	4.5 - 0.5	10.5 - 1.1	16.5 - 1.8
46	1°41.5	1°41.8	1°36.9	4.6 - 0.5	10.6 - 1.1	16.6 - 1.8
47	1°41.8	1°42.0	1°37.1	4.7 - 0.5	10.7 - 1.2	16.7 - 1.8
48	1°42.0	1°42.3	1°37.4	4.8 - 0.5	10.8 - 1.2	16.8 - 1.8
49	1°42.3	1°42.5	1°37.6	4.9 - 0.5	10.9 - 1.2	16.9 - 1.8
50	1°42.5	1°42.8	1°37.8	5.0 - 0.5	11.0 - 1.2	17.0 - 1.8
51	1°42.7	1°43.0	1°38.1	5.1 - 0.6	11.1 - 1.2	17.1 - 1.9
52	1°43.0	1°43.3	1°38.3	5.2 - 0.6	11.2 - 1.2	17.2 - 1.9
53	1°43.2	1°43.5	1°38.5	5.3 - 0.6	11.3 - 1.2	17.3 - 1.9
54	1°43.5	1°43.8	1°38.8	5.4 - 0.6	11.4 - 1.2	17.4 - 1.9
55	1°43.8	1°44.0	1°39.0	5.5 - 0.6	11.5 - 1.2	17.5 - 1.9
56	1°44.0	1°44.3	1°39.3	5.6 - 0.6	11.6 - 1.3	17.6 - 1.9
57	1°44.3	1°44.5	1°39.5	5.7 - 0.6	11.7 - 1.3	17.7 - 1.9
58	1°44.5	1°44.8	1°39.7	5.8 - 0.6	11.8 - 1.3	17.8 - 1.9
59	1°44.8	1°45.0	1°40.0	5.9 - 0.6	11.9 - 1.3	17.9 - 1.9

m 7	Sun Plan.	Aries	Moon	v and d corr		
0	1°45.0	1°45.3	1°40.2	0.0 - 0.0	6.0 - 0.8	12.0 - 1.5
1	1°45.3	1°45.5	1°40.5	0.1 - 0.0	6.1 - 0.8	12.1 - 1.5
2	1°45.5	1°45.8	1°40.7	0.2 - 0.0	6.2 - 0.8	12.2 - 1.5
3	1°45.8	1°46.0	1°40.9	0.3 - 0.0	6.3 - 0.8	12.3 - 1.5
4	1°46.0	1°46.3	1°41.2	0.4 - 0.1	6.4 - 0.8	12.4 - 1.6
5	1°46.2	1°46.5	1°41.4	0.5 - 0.1	6.5 - 0.8	12.5 - 1.6
6	1°46.5	1°46.8	1°41.6	0.6 - 0.1	6.6 - 0.8	12.6 - 1.6
7	1°46.7	1°47.0	1°41.9	0.7 - 0.1	6.7 - 0.8	12.7 - 1.6
8	1°47.0	1°47.3	1°42.1	0.8 - 0.1	6.8 - 0.8	12.8 - 1.6
9	1°47.3	1°47.5	1°42.4	0.9 - 0.1	6.9 - 0.9	12.9 - 1.6
10	1°47.5	1°47.8	1°42.6	1.0 - 0.1	7.0 - 0.9	13.0 - 1.6
11	1°47.8	1°48.0	1°42.8	1.1 - 0.1	7.1 - 0.9	13.1 - 1.6
12	1°48.0	1°48.3	1°43.1	1.2 - 0.2	7.2 - 0.9	13.2 - 1.6
13	1°48.3	1°48.5	1°43.3	1.3 - 0.2	7.3 - 0.9	13.3 - 1.7
14	1°48.5	1°48.8	1°43.6	1.4 - 0.2	7.4 - 0.9	13.4 - 1.7
15	1°48.8	1°49.0	1°43.8	1.5 - 0.2	7.5 - 0.9	13.5 - 1.7
16	1°49.0	1°49.3	1°44.0	1.6 - 0.2	7.6 - 0.9	13.6 - 1.7
17	1°49.3	1°49.5	1°44.3	1.7 - 0.2	7.7 - 1.0	13.7 - 1.7
18	1°49.5	1°49.8	1°44.5	1.8 - 0.2	7.8 - 1.0	13.8 - 1.7
19	1°49.8	1°50.0	1°44.8	1.9 - 0.2	7.9 - 1.0	13.9 - 1.7
20	1°50.0	1°50.3	1°45.0	2.0 - 0.3	8.0 - 1.0	14.0 - 1.8
21	1°50.2	1°50.6	1°45.2	2.1 - 0.3	8.1 - 1.0	14.1 - 1.8
22	1°50.5	1°50.8	1°45.5	2.2 - 0.3	8.2 - 1.0	14.2 - 1.8
23	1°50.8	1°51.1	1°45.7	2.3 - 0.3	8.3 - 1.0	14.3 - 1.8
24	1°51.0	1°51.3	1°45.9	2.4 - 0.3	8.4 - 1.1	14.4 - 1.8
25	1°51.3	1°51.6	1°46.2	2.5 - 0.3	8.5 - 1.1	14.5 - 1.8
26	1°51.5	1°51.8	1°46.4	2.6 - 0.3	8.6 - 1.1	14.6 - 1.8
27	1°51.8	1°52.1	1°46.7	2.7 - 0.3	8.7 - 1.1	14.7 - 1.8
28	1°52.0	1°52.3	1°46.9	2.8 - 0.4	8.8 - 1.1	14.8 - 1.9
29	1°52.3	1°52.6	1°47.1	2.9 - 0.4	8.9 - 1.1	14.9 - 1.9
30	1°52.5	1°52.8	1°47.4	3.0 - 0.4	9.0 - 1.1	15.0 - 1.9
31	1°52.7	1°53.1	1°47.6	3.1 - 0.4	9.1 - 1.1	15.1 - 1.9
32	1°53.0	1°53.3	1°47.9	3.2 - 0.4	9.2 - 1.1	15.2 - 1.9
33	1°53.3	1°53.6	1°48.1	3.3 - 0.4	9.3 - 1.2	15.3 - 1.9
34	1°53.5	1°53.8	1°48.3	3.4 - 0.4	9.4 - 1.2	15.4 - 1.9
35	1°53.7	1°54.1	1°48.6	3.5 - 0.4	9.5 - 1.2	15.5 - 1.9
36	1°54.0	1°54.3	1°48.8	3.6 - 0.5	9.6 - 1.2	15.6 - 1.9
37	1°54.2	1°54.6	1°49.0	3.7 - 0.5	9.7 - 1.2	15.7 - 2.0
38	1°54.5	1°54.8	1°49.3	3.8 - 0.5	9.8 - 1.2	15.8 - 2.0
39	1°54.8	1°55.1	1°49.5	3.9 - 0.5	9.9 - 1.2	15.9 - 2.0
40	1°55.0	1°55.3	1°49.8	4.0 - 0.5	10.0 - 1.3	16.0 - 2.0
41	1°55.3	1°55.6	1°50.0	4.1 - 0.5	10.1 - 1.3	16.1 - 2.0
42	1°55.5	1°55.8	1°50.2	4.2 - 0.5	10.2 - 1.3	16.2 - 2.0
43	1°55.8	1°56.1	1°50.5	4.3 - 0.5	10.3 - 1.3	16.3 - 2.0
44	1°56.0	1°56.3	1°50.7	4.4 - 0.6	10.4 - 1.3	16.4 - 2.0
45	1°56.3	1°56.6	1°51.0	4.5 - 0.6	10.5 - 1.3	16.5 - 2.1
46	1°56.5	1°56.8	1°51.2	4.6 - 0.6	10.6 - 1.3	16.6 - 2.1
47	1°56.7	1°57.1	1°51.4	4.7 - 0.6	10.7 - 1.3	16.7 - 2.1
48	1°57.0	1°57.3	1°51.7	4.8 - 0.6	10.8 - 1.4	16.8 - 2.1
49	1°57.3	1°57.6	1°51.9	4.9 - 0.6	10.9 - 1.4	16.9 - 2.1
50	1°57.5	1°57.8	1°52.1	5.0 - 0.6	11.0 - 1.4	17.0 - 2.1
51	1°57.7	1°58.1	1°52.4	5.1 - 0.6	11.1 - 1.4	17.1 - 2.1
52	1°58.0	1°58.3	1°52.6	5.2 - 0.7	11.2 - 1.4	17.2 - 2.1
53	1°58.2	1°58.6	1°52.9	5.3 - 0.7	11.3 - 1.4	17.3 - 2.2
54	1°58.5	1°58.8	1°53.1	5.4 - 0.7	11.4 - 1.4	17.4 - 2.2
55	1°58.8	1°59.1	1°53.3	5.5 - 0.7	11.5 - 1.4	17.5 - 2.2
56	1°59.0	1°59.3	1°53.6	5.6 - 0.7	11.6 - 1.5	17.6 - 2.2
57	1°59.3	1°59.6	1°53.8	5.7 - 0.7	11.7 - 1.5	17.7 - 2.2
58	1°59.5	1°59.8	1°54.1	5.8 - 0.7	11.8 - 1.5	17.8 - 2.2
59	1°59.8	2°00.1	1°54.3	5.9 - 0.7	11.9 - 1.5	17.9 - 2.2

m 8	Sun Plan.	Aries	Moon	v and d corr		
0	2°00.0	2°00.3	1°54.5	0.0 - 0.0	6.0 - 0.8	12.0 - 1.7
1	2°00.3	2°00.6	1°54.8	0.1 - 0.0	6.1 - 0.9	12.1 - 1.7
2	2°00.5	2°00.8	1°55.0	0.2 - 0.0	6.2 - 0.9	12.2 - 1.7
3	2°00.8	2°01.1	1°55.2	0.3 - 0.0	6.3 - 0.9	12.3 - 1.7
4	2°01.0	2°01.3	1°55.5	0.4 - 0.1	6.4 - 0.9	12.4 - 1.8
5	2°01.3	2°01.6	1°55.7	0.5 - 0.1	6.5 - 0.9	12.5 - 1.8
6	2°01.5	2°01.8	1°56.0	0.6 - 0.1	6.6 - 0.9	12.6 - 1.8
7	2°01.8	2°02.1	1°56.2	0.7 - 0.1	6.7 - 0.9	12.7 - 1.8
8	2°02.0	2°02.3	1°56.4	0.8 - 0.1	6.8 - 1.0	12.8 - 1.8
9	2°02.3	2°02.6	1°56.7	0.9 - 0.1	6.9 - 1.0	12.9 - 1.8
10	2°02.5	2°02.8	1°56.9	1.0 - 0.1	7.0 - 1.0	13.0 - 1.8
11	2°02.8	2°03.1	1°57.2	1.1 - 0.2	7.1 - 1.0	13.1 - 1.9
12	2°03.0	2°03.3	1°57.4	1.2 - 0.2	7.2 - 1.0	13.2 - 1.9
13	2°03.3	2°03.6	1°57.6	1.3 - 0.2	7.3 - 1.0	13.3 - 1.9
14	2°03.5	2°03.8	1°57.9	1.4 - 0.2	7.4 - 1.0	13.4 - 1.9
15	2°03.8	2°04.1	1°58.1	1.5 - 0.2	7.5 - 1.1	13.5 - 1.9
16	2°04.0	2°04.3	1°58.4	1.6 - 0.2	7.6 - 1.1	13.6 - 1.9
17	2°04.2	2°04.6	1°58.6	1.7 - 0.2	7.7 - 1.1	13.7 - 1.9
18	2°04.5	2°04.8	1°58.8	1.8 - 0.3	7.8 - 1.1	13.8 - 2.0
19	2°04.7	2°05.1	1°59.1	1.9 - 0.3	7.9 - 1.1	13.9 - 2.0
20	2°05.0	2°05.3	1°59.3	2.0 - 0.3	8.0 - 1.1	14.0 - 2.0
21	2°05.2	2°05.6	1°59.5	2.1 - 0.3	8.1 - 1.1	14.1 - 2.0
22	2°05.5	2°05.8	1°59.8	2.2 - 0.3	8.2 - 1.2	14.2 - 2.0
23	2°05.7	2°06.1	2°00.0	2.3 - 0.3	8.3 - 1.2	14.3 - 2.0
24	2°06.0	2°06.3	2°00.3	2.4 - 0.3	8.4 - 1.2	14.4 - 2.0
25	2°06.2	2°06.6	2°00.5	2.5 - 0.4	8.5 - 1.2	14.5 - 2.1
26	2°06.5	2°06.8	2°00.7	2.6 - 0.4	8.6 - 1.2	14.6 - 2.1
27	2°06.7	2°07.1	2°01.0	2.7 - 0.4	8.7 - 1.2	14.7 - 2.1
28	2°07.0	2°07.3	2°01.2	2.8 - 0.4	8.8 - 1.2	14.8 - 2.1
29	2°07.2	2°07.6	2°01.5	2.9 - 0.4	8.9 - 1.3	14.9 - 2.1
30	2°07.5	2°07.8	2°01.7	3.0 - 0.4	9.0 - 1.3	15.0 - 2.1
31	2°07.8	2°08.1	2°01.9	3.1 - 0.4	9.1 - 1.3	15.1 - 2.1
32	2°08.0	2°08.3	2°02.2	3.2 - 0.5	9.2 - 1.3	15.2 - 2.2
33	2°08.3	2°08.6	2°02.4	3.3 - 0.5	9.3 - 1.3	15.3 - 2.2
34	2°08.5	2°08.9	2°02.6	3.4 - 0.5	9.4 - 1.3	15.4 - 2.2
35	2°08.8	2°09.1	2°02.9	3.5 - 0.5	9.5 - 1.3	15.5 - 2.2
36	2°09.0	2°09.4	2°03.1	3.6 - 0.5	9.6 - 1.4	15.6 - 2.2
37	2°09.3	2°09.6	2°03.4	3.7 - 0.5	9.7 - 1.4	15.7 - 2.2
38	2°09.5	2°09.9	2°03.6	3.8 - 0.5	9.8 - 1.4	15.8 - 2.2
39	2°09.8	2°10.1	2°03.8	3.9 - 0.6	9.9 - 1.4	15.9 - 2.3
40	2°10.0	2°10.4	2°04.1	4.0 - 0.6	10.0 - 1.4	16.0 - 2.3
41	2°10.3	2°10.6	2°04.3	4.1 - 0.6	10.1 - 1.4	16.1 - 2.3
42	2°10.5	2°10.9	2°04.6	4.2 - 0.6	10.2 - 1.4	16.2 - 2.3
43	2°10.8	2°11.1	2°04.8	4.3 - 0.6	10.3 - 1.5	16.3 - 2.3
44	2°11.0	2°11.4	2°05.0	4.4 - 0.6	10.4 - 1.5	16.4 - 2.3
45	2°11.3	2°11.6	2°05.3	4.5 - 0.6	10.5 - 1.5	16.5 - 2.3
46	2°11.5	2°11.9	2°05.5	4.6 - 0.7	10.6 - 1.5	16.6 - 2.4
47	2°11.7	2°12.1	2°05.7	4.7 - 0.7	10.7 - 1.5	16.7 - 2.4
48	2°12.0	2°12.4	2°06.0	4.8 - 0.7	10.8 - 1.5	16.8 - 2.4
49	2°12.2	2°12.6	2°06.2	4.9 - 0.7	10.9 - 1.5	16.9 - 2.4
50	2°12.5	2°12.9	2°06.5	5.0 - 0.7	11.0 - 1.6	17.0 - 2.4
51	2°12.7	2°13.1	2°06.7	5.1 - 0.7	11.1 - 1.6	17.1 - 2.4
52	2°13.0	2°13.4	2°06.9	5.2 - 0.7	11.2 - 1.6	17.2 - 2.4
53	2°13.2	2°13.6	2°07.2	5.3 - 0.8	11.3 - 1.6	17.3 - 2.5
54	2°13.5	2°13.9	2°07.4	5.4 - 0.8	11.4 - 1.6	17.4 - 2.5
55	2°13.7	2°14.1	2°07.7	5.5 - 0.8	11.5 - 1.6	17.5 - 2.5
56	2°14.0	2°14.4	2°07.9	5.6 - 0.8	11.6 - 1.6	17.6 - 2.5
57	2°14.2	2°14.6	2°08.1	5.7 - 0.8	11.7 - 1.7	17.7 - 2.5
58	2°14.5	2°14.9	2°08.4	5.8 - 0.8	11.8 - 1.7	17.8 - 2.5
59	2°14.7	2°15.1	2°08.6	5.9 - 0.8	11.9 - 1.7	17.9 - 2.5

Increments and Corrections

m 9	Sun Plan.	Aries	Moon	v and d corr		
0	2°15.0	2°15.4	2°08.8	0.0 - 0.0	6.0 - 0.9	12.0 - 1.9
1	2°15.3	2°15.6	2°09.1	0.1 - 0.0	6.1 - 1.0	12.1 - 1.9
2	2°15.5	2°15.9	2°09.3	0.2 - 0.0	6.2 - 1.0	12.2 - 1.9
3	2°15.8	2°16.1	2°09.6	0.3 - 0.0	6.3 - 1.0	12.3 - 1.9
4	2°16.0	2°16.4	2°09.8	0.4 - 0.1	6.4 - 1.0	12.4 - 2.0
5	2°16.3	2°16.6	2°10.0	0.5 - 0.1	6.5 - 1.0	12.5 - 2.0
6	2°16.5	2°16.9	2°10.3	0.6 - 0.1	6.6 - 1.0	12.6 - 2.0
7	2°16.8	2°17.1	2°10.5	0.7 - 0.1	6.7 - 1.1	12.7 - 2.0
8	2°17.0	2°17.4	2°10.8	0.8 - 0.1	6.8 - 1.1	12.8 - 2.0
9	2°17.3	2°17.6	2°11.0	0.9 - 0.1	6.9 - 1.1	12.9 - 2.0
10	2°17.5	2°17.9	2°11.2	1.0 - 0.2	7.0 - 1.1	13.0 - 2.1
11	2°17.8	2°18.1	2°11.5	1.1 - 0.2	7.1 - 1.1	13.1 - 2.1
12	2°18.0	2°18.4	2°11.7	1.2 - 0.2	7.2 - 1.1	13.2 - 2.1
13	2°18.3	2°18.6	2°12.0	1.3 - 0.2	7.3 - 1.2	13.3 - 2.1
14	2°18.5	2°18.9	2°12.2	1.4 - 0.2	7.4 - 1.2	13.4 - 2.1
15	2°18.8	2°19.1	2°12.4	1.5 - 0.2	7.5 - 1.2	13.5 - 2.1
16	2°19.0	2°19.4	2°12.7	1.6 - 0.3	7.6 - 1.2	13.6 - 2.2
17	2°19.3	2°19.6	2°12.9	1.7 - 0.3	7.7 - 1.2	13.7 - 2.2
18	2°19.5	2°19.9	2°13.1	1.8 - 0.3	7.8 - 1.2	13.8 - 2.2
19	2°19.7	2°20.1	2°13.4	1.9 - 0.3	7.9 - 1.3	13.9 - 2.2
20	2°20.0	2°20.4	2°13.6	2.0 - 0.3	8.0 - 1.3	14.0 - 2.2
21	2°20.2	2°20.6	2°13.9	2.1 - 0.3	8.1 - 1.3	14.1 - 2.2
22	2°20.5	2°20.9	2°14.1	2.2 - 0.3	8.2 - 1.3	14.2 - 2.2
23	2°20.7	2°21.1	2°14.3	2.3 - 0.4	8.3 - 1.3	14.3 - 2.3
24	2°21.0	2°21.4	2°14.6	2.4 - 0.4	8.4 - 1.3	14.4 - 2.3
25	2°21.2	2°21.6	2°14.8	2.5 - 0.4	8.5 - 1.3	14.5 - 2.3
26	2°21.5	2°21.9	2°15.1	2.6 - 0.4	8.6 - 1.4	14.6 - 2.3
27	2°21.7	2°22.1	2°15.3	2.7 - 0.4	8.7 - 1.4	14.7 - 2.3
28	2°22.0	2°22.4	2°15.5	2.8 - 0.4	8.8 - 1.4	14.8 - 2.3
29	2°22.2	2°22.6	2°15.8	2.9 - 0.5	8.9 - 1.4	14.9 - 2.4
30	2°22.5	2°22.9	2°16.0	3.0 - 0.5	9.0 - 1.4	15.0 - 2.4
31	2°22.8	2°23.1	2°16.2	3.1 - 0.5	9.1 - 1.4	15.1 - 2.4
32	2°23.0	2°23.4	2°16.5	3.2 - 0.5	9.2 - 1.5	15.2 - 2.4
33	2°23.3	2°23.6	2°16.7	3.3 - 0.5	9.3 - 1.5	15.3 - 2.4
34	2°23.5	2°23.9	2°17.0	3.4 - 0.5	9.4 - 1.5	15.4 - 2.4
35	2°23.8	2°24.1	2°17.2	3.5 - 0.6	9.5 - 1.5	15.5 - 2.5
36	2°24.0	2°24.4	2°17.4	3.6 - 0.6	9.6 - 1.5	15.6 - 2.5
37	2°24.3	2°24.6	2°17.7	3.7 - 0.6	9.7 - 1.5	15.7 - 2.5
38	2°24.5	2°24.9	2°17.9	3.8 - 0.6	9.8 - 1.6	15.8 - 2.5
39	2°24.8	2°25.1	2°18.2	3.9 - 0.6	9.9 - 1.6	15.9 - 2.5
40	2°25.0	2°25.4	2°18.4	4.0 - 0.6	10.0 - 1.6	16.0 - 2.5
41	2°25.3	2°25.6	2°18.6	4.1 - 0.6	10.1 - 1.6	16.1 - 2.5
42	2°25.5	2°25.9	2°18.9	4.2 - 0.7	10.2 - 1.6	16.2 - 2.6
43	2°25.8	2°26.1	2°19.1	4.3 - 0.7	10.3 - 1.6	16.3 - 2.6
44	2°26.0	2°26.4	2°19.3	4.4 - 0.7	10.4 - 1.6	16.4 - 2.6
45	2°26.3	2°26.6	2°19.6	4.5 - 0.7	10.5 - 1.7	16.5 - 2.6
46	2°26.5	2°26.9	2°19.8	4.6 - 0.7	10.6 - 1.7	16.6 - 2.6
47	2°26.8	2°27.2	2°20.1	4.7 - 0.7	10.7 - 1.7	16.7 - 2.6
48	2°27.0	2°27.4	2°20.3	4.8 - 0.8	10.8 - 1.7	16.8 - 2.7
49	2°27.2	2°27.7	2°20.5	4.9 - 0.8	10.9 - 1.7	16.9 - 2.7
50	2°27.5	2°27.9	2°20.8	5.0 - 0.8	11.0 - 1.7	17.0 - 2.7
51	2°27.7	2°28.2	2°21.0	5.1 - 0.8	11.1 - 1.8	17.1 - 2.7
52	2°28.0	2°28.4	2°21.3	5.2 - 0.8	11.2 - 1.8	17.2 - 2.7
53	2°28.2	2°28.7	2°21.5	5.3 - 0.8	11.3 - 1.8	17.3 - 2.7
54	2°28.5	2°28.9	2°21.7	5.4 - 0.9	11.4 - 1.8	17.4 - 2.8
55	2°28.7	2°29.2	2°22.0	5.5 - 0.9	11.5 - 1.8	17.5 - 2.8
56	2°29.0	2°29.4	2°22.2	5.6 - 0.9	11.6 - 1.8	17.6 - 2.8
57	2°29.2	2°29.7	2°22.5	5.7 - 0.9	11.7 - 1.9	17.7 - 2.8
58	2°29.5	2°29.9	2°22.7	5.8 - 0.9	11.8 - 1.9	17.8 - 2.8
59	2°29.7	2°30.2	2°22.9	5.9 - 0.9	11.9 - 1.9	17.9 - 2.8

m 10	Sun Plan.	Aries	Moon	v and d corr		
0	2°30.0	2°30.4	2°23.2	0.0 - 0.0	6.0 - 1.0	12.0 - 2.1
1	2°30.3	2°30.7	2°23.4	0.1 - 0.0	6.1 - 1.1	12.1 - 2.1
2	2°30.5	2°30.9	2°23.6	0.2 - 0.0	6.2 - 1.1	12.2 - 2.1
3	2°30.8	2°31.2	2°23.9	0.3 - 0.1	6.3 - 1.1	12.3 - 2.2
4	2°31.0	2°31.4	2°24.1	0.4 - 0.1	6.4 - 1.1	12.4 - 2.2
5	2°31.3	2°31.7	2°24.4	0.5 - 0.1	6.5 - 1.1	12.5 - 2.2
6	2°31.5	2°31.9	2°24.6	0.6 - 0.1	6.6 - 1.2	12.6 - 2.2
7	2°31.8	2°32.2	2°24.8	0.7 - 0.1	6.7 - 1.2	12.7 - 2.2
8	2°32.0	2°32.4	2°25.1	0.8 - 0.1	6.8 - 1.2	12.8 - 2.2
9	2°32.3	2°32.7	2°25.3	0.9 - 0.2	6.9 - 1.2	12.9 - 2.3
10	2°32.5	2°32.9	2°25.6	1.0 - 0.2	7.0 - 1.2	13.0 - 2.3
11	2°32.8	2°33.2	2°25.8	1.1 - 0.2	7.1 - 1.2	13.1 - 2.3
12	2°33.0	2°33.4	2°26.0	1.2 - 0.2	7.2 - 1.3	13.2 - 2.3
13	2°33.3	2°33.7	2°26.3	1.3 - 0.2	7.3 - 1.3	13.3 - 2.3
14	2°33.5	2°33.9	2°26.5	1.4 - 0.2	7.4 - 1.3	13.4 - 2.3
15	2°33.8	2°34.2	2°26.7	1.5 - 0.3	7.5 - 1.3	13.5 - 2.4
16	2°34.0	2°34.4	2°27.0	1.6 - 0.3	7.6 - 1.3	13.6 - 2.4
17	2°34.3	2°34.7	2°27.2	1.7 - 0.3	7.7 - 1.3	13.7 - 2.4
18	2°34.5	2°34.9	2°27.5	1.8 - 0.3	7.8 - 1.4	13.8 - 2.4
19	2°34.8	2°35.2	2°27.7	1.9 - 0.3	7.9 - 1.4	13.9 - 2.4
20	2°35.0	2°35.4	2°27.9	2.0 - 0.3	8.0 - 1.4	14.0 - 2.4
21	2°35.2	2°35.7	2°28.2	2.1 - 0.4	8.1 - 1.4	14.1 - 2.5
22	2°35.5	2°35.9	2°28.4	2.2 - 0.4	8.2 - 1.4	14.2 - 2.5
23	2°35.7	2°36.2	2°28.7	2.3 - 0.4	8.3 - 1.5	14.3 - 2.5
24	2°36.0	2°36.4	2°28.9	2.4 - 0.4	8.4 - 1.5	14.4 - 2.5
25	2°36.2	2°36.7	2°29.1	2.5 - 0.4	8.5 - 1.5	14.5 - 2.5
26	2°36.5	2°36.9	2°29.4	2.6 - 0.5	8.6 - 1.5	14.6 - 2.6
27	2°36.7	2°37.2	2°29.6	2.7 - 0.5	8.7 - 1.5	14.7 - 2.6
28	2°37.0	2°37.4	2°29.8	2.8 - 0.5	8.8 - 1.5	14.8 - 2.6
29	2°37.2	2°37.7	2°30.1	2.9 - 0.5	8.9 - 1.6	14.9 - 2.6
30	2°37.5	2°37.9	2°30.3	3.0 - 0.5	9.0 - 1.6	15.0 - 2.6
31	2°37.8	2°38.2	2°30.6	3.1 - 0.5	9.1 - 1.6	15.1 - 2.6
32	2°38.0	2°38.4	2°30.8	3.2 - 0.6	9.2 - 1.6	15.2 - 2.7
33	2°38.3	2°38.7	2°31.0	3.3 - 0.6	9.3 - 1.6	15.3 - 2.7
34	2°38.5	2°38.9	2°31.3	3.4 - 0.6	9.4 - 1.6	15.4 - 2.7
35	2°38.8	2°39.2	2°31.5	3.5 - 0.6	9.5 - 1.7	15.5 - 2.7
36	2°39.0	2°39.4	2°31.8	3.6 - 0.6	9.6 - 1.7	15.6 - 2.7
37	2°39.3	2°39.7	2°32.0	3.7 - 0.6	9.7 - 1.7	15.7 - 2.7
38	2°39.5	2°39.9	2°32.2	3.8 - 0.7	9.8 - 1.7	15.8 - 2.8
39	2°39.8	2°40.2	2°32.5	3.9 - 0.7	9.9 - 1.7	15.9 - 2.8
40	2°40.0	2°40.4	2°32.7	4.0 - 0.7	10.0 - 1.8	16.0 - 2.8
41	2°40.3	2°40.7	2°32.9	4.1 - 0.7	10.1 - 1.8	16.1 - 2.8
42	2°40.5	2°40.9	2°33.2	4.2 - 0.7	10.2 - 1.8	16.2 - 2.8
43	2°40.8	2°41.2	2°33.4	4.3 - 0.8	10.3 - 1.8	16.3 - 2.9
44	2°41.0	2°41.4	2°33.7	4.4 - 0.8	10.4 - 1.8	16.4 - 2.9
45	2°41.3	2°41.7	2°33.9	4.5 - 0.8	10.5 - 1.8	16.5 - 2.9
46	2°41.5	2°41.9	2°34.1	4.6 - 0.8	10.6 - 1.9	16.6 - 2.9
47	2°41.8	2°42.2	2°34.4	4.7 - 0.8	10.7 - 1.9	16.7 - 2.9
48	2°42.0	2°42.4	2°34.6	4.8 - 0.8	10.8 - 1.9	16.8 - 2.9
49	2°42.3	2°42.7	2°34.9	4.9 - 0.9	10.9 - 1.9	16.9 - 3.0
50	2°42.5	2°42.9	2°35.1	5.0 - 0.9	11.0 - 1.9	17.0 - 3.0
51	2°42.7	2°43.2	2°35.3	5.1 - 0.9	11.1 - 1.9	17.1 - 3.0
52	2°43.0	2°43.4	2°35.6	5.2 - 0.9	11.2 - 2.0	17.2 - 3.0
53	2°43.2	2°43.7	2°35.8	5.3 - 0.9	11.3 - 2.0	17.3 - 3.0
54	2°43.5	2°43.9	2°36.1	5.4 - 0.9	11.4 - 2.0	17.4 - 3.0
55	2°43.7	2°44.2	2°36.3	5.5 - 1.0	11.5 - 2.0	17.5 - 3.1
56	2°44.0	2°44.4	2°36.5	5.6 - 1.0	11.6 - 2.0	17.6 - 3.1
57	2°44.2	2°44.7	2°36.8	5.7 - 1.0	11.7 - 2.0	17.7 - 3.1
58	2°44.5	2°44.9	2°37.0	5.8 - 1.0	11.8 - 2.1	17.8 - 3.1
59	2°44.7	2°45.2	2°37.2	5.9 - 1.0	11.9 - 2.1	17.9 - 3.1

m 11	Sun Plan.	Aries	Moon	v and d corr		
0	2°45.0	2°45.5	2°37.5	0.0 - 0.0	6.0 - 1.2	12.0 - 2.3
1	2°45.3	2°45.7	2°37.7	0.1 - 0.0	6.1 - 1.2	12.1 - 2.3
2	2°45.5	2°46.0	2°38.0	0.2 - 0.0	6.2 - 1.2	12.2 - 2.3
3	2°45.8	2°46.2	2°38.2	0.3 - 0.1	6.3 - 1.2	12.3 - 2.4
4	2°46.0	2°46.5	2°38.4	0.4 - 0.1	6.4 - 1.2	12.4 - 2.4
5	2°46.3	2°46.7	2°38.7	0.5 - 0.1	6.5 - 1.2	12.5 - 2.4
6	2°46.5	2°47.0	2°38.9	0.6 - 0.1	6.6 - 1.3	12.6 - 2.4
7	2°46.8	2°47.2	2°39.2	0.7 - 0.1	6.7 - 1.3	12.7 - 2.4
8	2°47.0	2°47.5	2°39.4	0.8 - 0.2	6.8 - 1.3	12.8 - 2.5
9	2°47.3	2°47.7	2°39.6	0.9 - 0.2	6.9 - 1.3	12.9 - 2.5
10	2°47.5	2°48.0	2°39.9	1.0 - 0.2	7.0 - 1.3	13.0 - 2.5
11	2°47.8	2°48.2	2°40.1	1.1 - 0.2	7.1 - 1.4	13.1 - 2.5
12	2°48.0	2°48.5	2°40.3	1.2 - 0.2	7.2 - 1.4	13.2 - 2.5
13	2°48.3	2°48.7	2°40.6	1.3 - 0.2	7.3 - 1.4	13.3 - 2.5
14	2°48.5	2°49.0	2°40.8	1.4 - 0.3	7.4 - 1.4	13.4 - 2.6
15	2°48.8	2°49.2	2°41.1	1.5 - 0.3	7.5 - 1.4	13.5 - 2.6
16	2°49.0	2°49.5	2°41.3	1.6 - 0.3	7.6 - 1.5	13.6 - 2.6
17	2°49.3	2°49.7	2°41.5	1.7 - 0.3	7.7 - 1.5	13.7 - 2.6
18	2°49.5	2°50.0	2°41.8	1.8 - 0.3	7.8 - 1.5	13.8 - 2.6
19	2°49.8	2°50.2	2°42.0	1.9 - 0.4	7.9 - 1.5	13.9 - 2.7
20	2°50.0	2°50.5	2°42.3	2.0 - 0.4	8.0 - 1.5	14.0 - 2.7
21	2°50.2	2°50.7	2°42.5	2.1 - 0.4	8.1 - 1.6	14.1 - 2.7
22	2°50.5	2°51.0	2°42.7	2.2 - 0.4	8.2 - 1.6	14.2 - 2.7
23	2°50.7	2°51.2	2°43.0	2.3 - 0.4	8.3 - 1.6	14.3 - 2.7
24	2°51.0	2°51.5	2°43.2	2.4 - 0.5	8.4 - 1.6	14.4 - 2.8
25	2°51.2	2°51.7	2°43.4	2.5 - 0.5	8.5 - 1.6	14.5 - 2.8
26	2°51.5	2°52.0	2°43.7	2.6 - 0.5	8.6 - 1.6	14.6 - 2.8
27	2°51.7	2°52.2	2°43.9	2.7 - 0.5	8.7 - 1.7	14.7 - 2.8
28	2°52.0	2°52.5	2°44.2	2.8 - 0.5	8.8 - 1.7	14.8 - 2.8
29	2°52.2	2°52.7	2°44.4	2.9 - 0.6	8.9 - 1.7	14.9 - 2.9
30	2°52.5	2°53.0	2°44.6	3.0 - 0.6	9.0 - 1.7	15.0 - 2.9
31	2°52.8	2°53.2	2°44.9	3.1 - 0.6	9.1 - 1.7	15.1 - 2.9
32	2°53.0	2°53.5	2°45.1	3.2 - 0.6	9.2 - 1.8	15.2 - 2.9
33	2°53.3	2°53.7	2°45.4	3.3 - 0.6	9.3 - 1.8	15.3 - 2.9
34	2°53.5	2°54.0	2°45.6	3.4 - 0.7	9.4 - 1.8	15.4 - 3.0
35	2°53.8	2°54.2	2°45.8	3.5 - 0.7	9.5 - 1.8	15.5 - 3.0
36	2°54.0	2°54.5	2°46.1	3.6 - 0.7	9.6 - 1.8	15.6 - 3.0
37	2°54.3	2°54.7	2°46.3	3.7 - 0.7	9.7 - 1.9	15.7 - 3.0
38	2°54.5	2°55.0	2°46.6	3.8 - 0.7	9.8 - 1.9	15.8 - 3.0
39	2°54.8	2°55.2	2°46.8	3.9 - 0.7	9.9 - 1.9	15.9 - 3.0
40	2°55.0	2°55.5	2°47.0	4.0 - 0.8	10.0 - 1.9	16.0 - 3.1
41	2°55.3	2°55.7	2°47.3	4.1 - 0.8	10.1 - 1.9	16.1 - 3.1
42	2°55.5	2°56.0	2°47.5	4.2 - 0.8	10.2 - 2.0	16.2 - 3.1
43	2°55.8	2°56.2	2°47.7	4.3 - 0.8	10.3 - 2.0	16.3 - 3.1
44	2°56.0	2°56.5	2°48.0	4.4 - 0.8	10.4 - 2.0	16.4 - 3.1
45	2°56.3	2°56.7	2°48.2	4.5 - 0.9	10.5 - 2.0	16.5 - 3.2
46	2°56.5	2°57.0	2°48.5	4.6 - 0.9	10.6 - 2.0	16.6 - 3.2
47	2°56.8	2°57.2	2°48.7	4.7 - 0.9	10.7 - 2.1	16.7 - 3.2
48	2°57.0	2°57.5	2°48.9	4.8 - 0.9	10.8 - 2.1	16.8 - 3.2
49	2°57.3	2°57.7	2°49.2	4.9 - 0.9	10.9 - 2.1	16.9 - 3.2
50	2°57.5	2°58.0	2°49.4	5.0 - 1.0	11.0 - 2.1	17.0 - 3.3
51	2°57.7	2°58.2	2°49.7	5.1 - 1.0	11.1 - 2.1	17.1 - 3.3
52	2°58.0	2°58.5	2°49.9	5.2 - 1.0	11.2 - 2.1	17.2 - 3.3
53	2°58.2	2°58.7	2°50.1	5.3 - 1.0	11.3 - 2.2	17.3 - 3.3
54	2°58.5	2°59.0	2°50.4	5.4 - 1.0	11.4 - 2.2	17.4 - 3.3
55	2°58.7	2°59.2	2°50.6	5.5 - 1.1	11.5 - 2.2	17.5 - 3.4
56	2°59.0	2°59.5	2°50.8	5.6 - 1.1	11.6 - 2.2	17.6 - 3.4
57	2°59.2	2°59.7	2°51.1	5.7 - 1.1	11.7 - 2.2	17.7 - 3.4
58	2°59.5	3°00.0	2°51.3	5.8 - 1.1	11.8 - 2.3	17.8 - 3.4
59	2°59.7	3°00.2	2°51.6	5.9 - 1.1	11.9 - 2.3	17.9 - 3.4

Increments and Corrections

m 12	Sun Plan.	Aries	Moon	v and d corr		
0	3°00.0	3°00.5	2°51.8	0.0 - 0.0	6.0 - 1.3	12.0 - 2.5
1	3°00.3	3°00.7	2°52.0	0.1 - 0.0	6.1 - 1.3	12.1 - 2.5
2	3°00.5	3°01.0	2°52.3	0.2 - 0.0	6.2 - 1.3	12.2 - 2.5
3	3°00.8	3°01.2	2°52.5	0.3 - 0.1	6.3 - 1.3	12.3 - 2.6
4	3°01.0	3°01.5	2°52.8	0.4 - 0.1	6.4 - 1.3	12.4 - 2.6
5	3°01.3	3°01.7	2°53.0	0.5 - 0.1	6.5 - 1.4	12.5 - 2.6
6	3°01.5	3°02.0	2°53.2	0.6 - 0.1	6.6 - 1.4	12.6 - 2.6
7	3°01.8	3°02.2	2°53.5	0.7 - 0.1	6.7 - 1.4	12.7 - 2.6
8	3°02.0	3°02.5	2°53.7	0.8 - 0.2	6.8 - 1.4	12.8 - 2.7
9	3°02.3	3°02.7	2°53.9	0.9 - 0.2	6.9 - 1.4	12.9 - 2.7
10	3°02.5	3°03.0	2°54.2	1.0 - 0.2	7.0 - 1.5	13.0 - 2.7
11	3°02.8	3°03.2	2°54.4	1.1 - 0.2	7.1 - 1.5	13.1 - 2.7
12	3°03.0	3°03.5	2°54.7	1.2 - 0.3	7.2 - 1.5	13.2 - 2.8
13	3°03.3	3°03.8	2°54.9	1.3 - 0.3	7.3 - 1.5	13.3 - 2.8
14	3°03.5	3°04.0	2°55.1	1.4 - 0.3	7.4 - 1.5	13.4 - 2.8
15	3°03.8	3°04.3	2°55.4	1.5 - 0.3	7.5 - 1.6	13.5 - 2.8
16	3°04.0	3°04.5	2°55.6	1.6 - 0.3	7.6 - 1.6	13.6 - 2.8
17	3°04.2	3°04.8	2°55.9	1.7 - 0.4	7.7 - 1.6	13.7 - 2.9
18	3°04.5	3°05.0	2°56.1	1.8 - 0.4	7.8 - 1.6	13.8 - 2.9
19	3°04.7	3°05.3	2°56.3	1.9 - 0.4	7.9 - 1.6	13.9 - 2.9
20	3°05.0	3°05.5	2°56.6	2.0 - 0.4	8.0 - 1.7	14.0 - 2.9
21	3°05.2	3°05.8	2°56.8	2.1 - 0.4	8.1 - 1.7	14.1 - 2.9
22	3°05.5	3°06.0	2°57.0	2.2 - 0.5	8.2 - 1.7	14.2 - 3.0
23	3°05.7	3°06.3	2°57.3	2.3 - 0.5	8.3 - 1.7	14.3 - 3.0
24	3°06.0	3°06.5	2°57.5	2.4 - 0.5	8.4 - 1.8	14.4 - 3.0
25	3°06.2	3°06.8	2°57.8	2.5 - 0.5	8.5 - 1.8	14.5 - 3.0
26	3°06.5	3°07.0	2°58.0	2.6 - 0.5	8.6 - 1.8	14.6 - 3.0
27	3°06.7	3°07.3	2°58.2	2.7 - 0.6	8.7 - 1.8	14.7 - 3.1
28	3°07.0	3°07.5	2°58.5	2.8 - 0.6	8.8 - 1.8	14.8 - 3.1
29	3°07.2	3°07.8	2°58.7	2.9 - 0.6	8.9 - 1.9	14.9 - 3.1
30	3°07.5	3°08.0	2°59.0	3.0 - 0.6	9.0 - 1.9	15.0 - 3.1
31	3°07.8	3°08.3	2°59.2	3.1 - 0.6	9.1 - 1.9	15.1 - 3.1
32	3°08.0	3°08.5	2°59.4	3.2 - 0.7	9.2 - 1.9	15.2 - 3.2
33	3°08.3	3°08.8	2°59.7	3.3 - 0.7	9.3 - 1.9	15.3 - 3.2
34	3°08.5	3°09.0	2°59.9	3.4 - 0.7	9.4 - 2.0	15.4 - 3.2
35	3°08.8	3°09.3	3°00.2	3.5 - 0.7	9.5 - 2.0	15.5 - 3.2
36	3°09.0	3°09.5	3°00.4	3.6 - 0.8	9.6 - 2.0	15.6 - 3.3
37	3°09.3	3°09.8	3°00.6	3.7 - 0.8	9.7 - 2.0	15.7 - 3.3
38	3°09.5	3°10.0	3°00.9	3.8 - 0.8	9.8 - 2.0	15.8 - 3.3
39	3°09.8	3°10.3	3°01.1	3.9 - 0.8	9.9 - 2.1	15.9 - 3.3
40	3°10.0	3°10.5	3°01.3	4.0 - 0.8	10.0 - 2.1	16.0 - 3.3
41	3°10.3	3°10.8	3°01.6	4.1 - 0.9	10.1 - 2.1	16.1 - 3.4
42	3°10.5	3°11.0	3°01.8	4.2 - 0.9	10.2 - 2.1	16.2 - 3.4
43	3°10.8	3°11.3	3°02.1	4.3 - 0.9	10.3 - 2.1	16.3 - 3.4
44	3°11.0	3°11.5	3°02.3	4.4 - 0.9	10.4 - 2.2	16.4 - 3.4
45	3°11.3	3°11.8	3°02.5	4.5 - 0.9	10.5 - 2.2	16.5 - 3.4
46	3°11.5	3°12.0	3°02.8	4.6 - 1.0	10.6 - 2.2	16.6 - 3.5
47	3°11.7	3°12.3	3°03.0	4.7 - 1.0	10.7 - 2.2	16.7 - 3.5
48	3°12.0	3°12.5	3°03.3	4.8 - 1.0	10.8 - 2.3	16.8 - 3.5
49	3°12.2	3°12.8	3°03.5	4.9 - 1.0	10.9 - 2.3	16.9 - 3.5
50	3°12.5	3°13.0	3°03.7	5.0 - 1.0	11.0 - 2.3	17.0 - 3.5
51	3°12.7	3°13.3	3°04.0	5.1 - 1.1	11.1 - 2.3	17.1 - 3.6
52	3°13.0	3°13.5	3°04.2	5.2 - 1.1	11.2 - 2.3	17.2 - 3.6
53	3°13.2	3°13.8	3°04.4	5.3 - 1.1	11.3 - 2.4	17.3 - 3.6
54	3°13.5	3°14.0	3°04.7	5.4 - 1.1	11.4 - 2.4	17.4 - 3.6
55	3°13.7	3°14.3	3°04.9	5.5 - 1.1	11.5 - 2.4	17.5 - 3.6
56	3°14.0	3°14.5	3°05.2	5.6 - 1.2	11.6 - 2.4	17.6 - 3.7
57	3°14.2	3°14.8	3°05.4	5.7 - 1.2	11.7 - 2.4	17.7 - 3.7
58	3°14.5	3°15.0	3°05.6	5.8 - 1.2	11.8 - 2.5	17.8 - 3.7
59	3°14.7	3°15.3	3°05.9	5.9 - 1.2	11.9 - 2.5	17.9 - 3.7

m 13	Sun Plan.	Aries	Moon	v and d corr		
0	3°15.0	3°15.5	3°06.1	0.0 - 0.0	6.0 - 1.4	12.0 - 2.7
1	3°15.3	3°15.8	3°06.4	0.1 - 0.0	6.1 - 1.4	12.1 - 2.7
2	3°15.5	3°16.0	3°06.6	0.2 - 0.0	6.2 - 1.4	12.2 - 2.7
3	3°15.8	3°16.3	3°06.8	0.3 - 0.1	6.3 - 1.4	12.3 - 2.8
4	3°16.0	3°16.5	3°07.1	0.4 - 0.1	6.4 - 1.4	12.4 - 2.8
5	3°16.3	3°16.8	3°07.3	0.5 - 0.1	6.5 - 1.5	12.5 - 2.8
6	3°16.5	3°17.0	3°07.5	0.6 - 0.1	6.6 - 1.5	12.6 - 2.8
7	3°16.8	3°17.3	3°07.8	0.7 - 0.2	6.7 - 1.5	12.7 - 2.9
8	3°17.0	3°17.5	3°08.0	0.8 - 0.2	6.8 - 1.5	12.8 - 2.9
9	3°17.3	3°17.8	3°08.3	0.9 - 0.2	6.9 - 1.6	12.9 - 2.9
10	3°17.5	3°18.0	3°08.5	1.0 - 0.2	7.0 - 1.6	13.0 - 2.9
11	3°17.8	3°18.3	3°08.7	1.1 - 0.2	7.1 - 1.6	13.1 - 2.9
12	3°18.0	3°18.5	3°09.0	1.2 - 0.3	7.2 - 1.6	13.2 - 3.0
13	3°18.3	3°18.8	3°09.2	1.3 - 0.3	7.3 - 1.6	13.3 - 3.0
14	3°18.5	3°19.0	3°09.5	1.4 - 0.3	7.4 - 1.7	13.4 - 3.0
15	3°18.8	3°19.3	3°09.7	1.5 - 0.3	7.5 - 1.7	13.5 - 3.0
16	3°19.0	3°19.5	3°09.9	1.6 - 0.4	7.6 - 1.7	13.6 - 3.1
17	3°19.3	3°19.8	3°10.2	1.7 - 0.4	7.7 - 1.7	13.7 - 3.1
18	3°19.5	3°20.0	3°10.4	1.8 - 0.4	7.8 - 1.8	13.8 - 3.1
19	3°19.7	3°20.3	3°10.7	1.9 - 0.4	7.9 - 1.8	13.9 - 3.1
20	3°20.0	3°20.5	3°10.9	2.0 - 0.5	8.0 - 1.8	14.0 - 3.1
21	3°20.2	3°20.8	3°11.1	2.1 - 0.5	8.1 - 1.8	14.1 - 3.2
22	3°20.5	3°21.0	3°11.4	2.2 - 0.5	8.2 - 1.8	14.2 - 3.2
23	3°20.7	3°21.3	3°11.6	2.3 - 0.5	8.3 - 1.9	14.3 - 3.2
24	3°21.0	3°21.5	3°11.8	2.4 - 0.5	8.4 - 1.9	14.4 - 3.2
25	3°21.2	3°21.8	3°12.1	2.5 - 0.6	8.5 - 1.9	14.5 - 3.3
26	3°21.5	3°22.1	3°12.3	2.6 - 0.6	8.6 - 1.9	14.6 - 3.3
27	3°21.7	3°22.3	3°12.6	2.7 - 0.6	8.7 - 2.0	14.7 - 3.3
28	3°22.0	3°22.6	3°12.8	2.8 - 0.6	8.8 - 2.0	14.8 - 3.3
29	3°22.2	3°22.8	3°13.0	2.9 - 0.7	8.9 - 2.0	14.9 - 3.4
30	3°22.5	3°23.1	3°13.3	3.0 - 0.7	9.0 - 2.0	15.0 - 3.4
31	3°22.8	3°23.3	3°13.5	3.1 - 0.7	9.1 - 2.0	15.1 - 3.4
32	3°23.0	3°23.6	3°13.8	3.2 - 0.7	9.2 - 2.1	15.2 - 3.4
33	3°23.3	3°23.8	3°14.0	3.3 - 0.7	9.3 - 2.1	15.3 - 3.4
34	3°23.5	3°24.1	3°14.2	3.4 - 0.8	9.4 - 2.1	15.4 - 3.5
35	3°23.8	3°24.3	3°14.5	3.5 - 0.8	9.5 - 2.1	15.5 - 3.5
36	3°24.0	3°24.6	3°14.7	3.6 - 0.8	9.6 - 2.2	15.6 - 3.5
37	3°24.3	3°24.8	3°14.9	3.7 - 0.8	9.7 - 2.2	15.7 - 3.5
38	3°24.5	3°25.1	3°15.2	3.8 - 0.9	9.8 - 2.2	15.8 - 3.6
39	3°24.8	3°25.3	3°15.4	3.9 - 0.9	9.9 - 2.2	15.9 - 3.6
40	3°25.0	3°25.6	3°15.7	4.0 - 0.9	10.0 - 2.3	16.0 - 3.6
41	3°25.3	3°25.8	3°15.9	4.1 - 0.9	10.1 - 2.3	16.1 - 3.6
42	3°25.5	3°26.1	3°16.1	4.2 - 0.9	10.2 - 2.3	16.2 - 3.6
43	3°25.8	3°26.3	3°16.4	4.3 - 1.0	10.3 - 2.3	16.3 - 3.7
44	3°26.0	3°26.6	3°16.6	4.4 - 1.0	10.4 - 2.3	16.4 - 3.7
45	3°26.3	3°26.8	3°16.9	4.5 - 1.0	10.5 - 2.4	16.5 - 3.7
46	3°26.5	3°27.1	3°17.1	4.6 - 1.0	10.6 - 2.4	16.6 - 3.7
47	3°26.8	3°27.3	3°17.3	4.7 - 1.1	10.7 - 2.4	16.7 - 3.8
48	3°27.0	3°27.6	3°17.6	4.8 - 1.1	10.8 - 2.4	16.8 - 3.8
49	3°27.2	3°27.8	3°17.8	4.9 - 1.1	10.9 - 2.5	16.9 - 3.8
50	3°27.5	3°28.1	3°18.0	5.0 - 1.1	11.0 - 2.5	17.0 - 3.8
51	3°27.7	3°28.3	3°18.3	5.1 - 1.1	11.1 - 2.5	17.1 - 3.8
52	3°28.0	3°28.6	3°18.5	5.2 - 1.2	11.2 - 2.5	17.2 - 3.9
53	3°28.2	3°28.8	3°18.8	5.3 - 1.2	11.3 - 2.5	17.3 - 3.9
54	3°28.5	3°29.1	3°19.0	5.4 - 1.2	11.4 - 2.6	17.4 - 3.9
55	3°28.7	3°29.3	3°19.2	5.5 - 1.2	11.5 - 2.6	17.5 - 3.9
56	3°29.0	3°29.6	3°19.5	5.6 - 1.3	11.6 - 2.6	17.6 - 4.0
57	3°29.2	3°29.8	3°19.7	5.7 - 1.3	11.7 - 2.6	17.7 - 4.0
58	3°29.5	3°30.1	3°20.0	5.8 - 1.3	11.8 - 2.7	17.8 - 4.0
59	3°29.7	3°30.3	3°20.2	5.9 - 1.3	11.9 - 2.7	17.9 - 4.0

m 14	Sun Plan.	Aries	Moon	v and d corr		
0	3°30.0	3°30.6	3°20.4	0.0 - 0.0	6.0 - 1.4	12.0 - 2.9
1	3°30.3	3°30.8	3°20.7	0.1 - 0.0	6.1 - 1.5	12.1 - 2.9
2	3°30.5	3°31.1	3°20.9	0.2 - 0.0	6.2 - 1.5	12.2 - 2.9
3	3°30.8	3°31.3	3°21.1	0.3 - 0.1	6.3 - 1.5	12.3 - 3.0
4	3°31.0	3°31.6	3°21.4	0.4 - 0.1	6.4 - 1.5	12.4 - 3.0
5	3°31.3	3°31.8	3°21.6	0.5 - 0.1	6.5 - 1.6	12.5 - 3.0
6	3°31.5	3°32.1	3°21.9	0.6 - 0.1	6.6 - 1.6	12.6 - 3.0
7	3°31.8	3°32.3	3°22.1	0.7 - 0.2	6.7 - 1.6	12.7 - 3.1
8	3°32.0	3°32.6	3°22.3	0.8 - 0.2	6.8 - 1.6	12.8 - 3.1
9	3°32.3	3°32.8	3°22.6	0.9 - 0.2	6.9 - 1.7	12.9 - 3.1
10	3°32.5	3°33.1	3°22.8	1.0 - 0.2	7.0 - 1.7	13.0 - 3.1
11	3°32.8	3°33.3	3°23.1	1.1 - 0.3	7.1 - 1.7	13.1 - 3.2
12	3°33.0	3°33.6	3°23.3	1.2 - 0.3	7.2 - 1.7	13.2 - 3.2
13	3°33.3	3°33.8	3°23.5	1.3 - 0.3	7.3 - 1.8	13.3 - 3.2
14	3°33.5	3°34.1	3°23.8	1.4 - 0.3	7.4 - 1.8	13.4 - 3.2
15	3°33.8	3°34.3	3°24.0	1.5 - 0.4	7.5 - 1.8	13.5 - 3.3
16	3°34.0	3°34.6	3°24.3	1.6 - 0.4	7.6 - 1.8	13.6 - 3.3
17	3°34.3	3°34.8	3°24.5	1.7 - 0.4	7.7 - 1.9	13.7 - 3.3
18	3°34.5	3°35.1	3°24.7	1.8 - 0.4	7.8 - 1.9	13.8 - 3.3
19	3°34.8	3°35.3	3°25.0	1.9 - 0.5	7.9 - 1.9	13.9 - 3.4
20	3°35.0	3°35.6	3°25.2	2.0 - 0.5	8.0 - 1.9	14.0 - 3.4
21	3°35.2	3°35.8	3°25.4	2.1 - 0.5	8.1 - 2.0	14.1 - 3.4
22	3°35.5	3°36.1	3°25.7	2.2 - 0.5	8.2 - 2.0	14.2 - 3.4
23	3°35.7	3°36.3	3°25.9	2.3 - 0.6	8.3 - 2.0	14.3 - 3.5
24	3°36.0	3°36.6	3°26.2	2.4 - 0.6	8.4 - 2.0	14.4 - 3.5
25	3°36.2	3°36.8	3°26.4	2.5 - 0.6	8.5 - 2.1	14.5 - 3.5
26	3°36.5	3°37.1	3°26.6	2.6 - 0.6	8.6 - 2.1	14.6 - 3.5
27	3°36.7	3°37.3	3°26.9	2.7 - 0.7	8.7 - 2.1	14.7 - 3.6
28	3°37.0	3°37.6	3°27.1	2.8 - 0.7	8.8 - 2.1	14.8 - 3.6
29	3°37.2	3°37.8	3°27.4	2.9 - 0.7	8.9 - 2.2	14.9 - 3.6
30	3°37.5	3°38.1	3°27.6	3.0 - 0.7	9.0 - 2.2	15.0 - 3.6
31	3°37.8	3°38.3	3°27.8	3.1 - 0.7	9.1 - 2.2	15.1 - 3.6
32	3°38.0	3°38.6	3°28.1	3.2 - 0.8	9.2 - 2.2	15.2 - 3.7
33	3°38.3	3°38.8	3°28.3	3.3 - 0.8	9.3 - 2.2	15.3 - 3.7
34	3°38.5	3°39.1	3°28.5	3.4 - 0.8	9.4 - 2.3	15.4 - 3.7
35	3°38.8	3°39.3	3°28.8	3.5 - 0.8	9.5 - 2.3	15.5 - 3.7
36	3°39.0	3°39.6	3°29.0	3.6 - 0.9	9.6 - 2.3	15.6 - 3.8
37	3°39.3	3°39.8	3°29.3	3.7 - 0.9	9.7 - 2.3	15.7 - 3.8
38	3°39.5	3°40.1	3°29.5	3.8 - 0.9	9.8 - 2.4	15.8 - 3.8
39	3°39.8	3°40.4	3°29.7	3.9 - 0.9	9.9 - 2.4	15.9 - 3.8
40	3°40.0	3°40.6	3°30.0	4.0 - 1.0	10.0 - 2.4	16.0 - 3.9
41	3°40.3	3°40.9	3°30.2	4.1 - 1.0	10.1 - 2.4	16.1 - 3.9
42	3°40.5	3°41.1	3°30.5	4.2 - 1.0	10.2 - 2.5	16.2 - 3.9
43	3°40.8	3°41.4	3°30.7	4.3 - 1.0	10.3 - 2.5	16.3 - 3.9
44	3°41.0	3°41.6	3°30.9	4.4 - 1.1	10.4 - 2.5	16.4 - 4.0
45	3°41.3	3°41.9	3°31.2	4.5 - 1.1	10.5 - 2.5	16.5 - 4.0
46	3°41.5	3°42.1	3°31.4	4.6 - 1.1	10.6 - 2.6	16.6 - 4.0
47	3°41.8	3°42.4	3°31.6	4.7 - 1.1	10.7 - 2.6	16.7 - 4.0
48	3°42.0	3°42.6	3°31.9	4.8 - 1.2	10.8 - 2.6	16.8 - 4.1
49	3°42.3	3°42.9	3°32.1	4.9 - 1.2	10.9 - 2.6	16.9 - 4.1
50	3°42.5	3°43.1	3°32.4	5.0 - 1.2	11.0 - 2.7	17.0 - 4.1
51	3°42.7	3°43.4	3°32.6	5.1 - 1.2	11.1 - 2.7	17.1 - 4.1
52	3°43.0	3°43.6	3°32.8	5.2 - 1.3	11.2 - 2.7	17.2 - 4.2
53	3°43.2	3°43.9	3°33.1	5.3 - 1.3	11.3 - 2.7	17.3 - 4.2
54	3°43.5	3°44.1	3°33.3	5.4 - 1.3	11.4 - 2.8	17.4 - 4.2
55	3°43.7	3°44.4	3°33.6	5.5 - 1.3	11.5 - 2.8	17.5 - 4.2
56	3°44.0	3°44.6	3°33.8	5.6 - 1.4	11.6 - 2.8	17.6 - 4.3
57	3°44.2	3°44.9	3°34.0	5.7 - 1.4	11.7 - 2.8	17.7 - 4.3
58	3°44.5	3°45.1	3°34.3	5.8 - 1.4	11.8 - 2.9	17.8 - 4.3
59	3°44.7	3°45.4	3°34.5	5.9 - 1.4	11.9 - 2.9	17.9 - 4.3

Increments and Corrections

m 15	Sun Plan.	Aries	Moon	v and d corr		
0	3°45.0	3°45.6	3°34.8	0.0 - 0.0	6.0 - 1.6	12.0 - 3.1
1	3°45.2	3°45.9	3°35.0	0.1 - 0.0	6.1 - 1.6	12.1 - 3.1
2	3°45.5	3°46.1	3°35.2	0.2 - 0.1	6.2 - 1.6	12.2 - 3.2
3	3°45.8	3°46.4	3°35.5	0.3 - 0.1	6.3 - 1.6	12.3 - 3.2
4	3°46.0	3°46.6	3°35.7	0.4 - 0.1	6.4 - 1.7	12.4 - 3.2
5	3°46.2	3°46.9	3°35.9	0.5 - 0.1	6.5 - 1.7	12.5 - 3.2
6	3°46.5	3°47.1	3°36.2	0.6 - 0.2	6.6 - 1.7	12.6 - 3.3
7	3°46.8	3°47.4	3°36.4	0.7 - 0.2	6.7 - 1.7	12.7 - 3.3
8	3°47.0	3°47.6	3°36.7	0.8 - 0.2	6.8 - 1.8	12.8 - 3.3
9	3°47.3	3°47.9	3°36.9	0.9 - 0.2	6.9 - 1.8	12.9 - 3.3
10	3°47.5	3°48.1	3°37.1	1.0 - 0.3	7.0 - 1.8	13.0 - 3.4
11	3°47.7	3°48.4	3°37.4	1.1 - 0.3	7.1 - 1.8	13.1 - 3.4
12	3°48.0	3°48.6	3°37.6	1.2 - 0.3	7.2 - 1.9	13.2 - 3.4
13	3°48.3	3°48.9	3°37.9	1.3 - 0.3	7.3 - 1.9	13.3 - 3.4
14	3°48.5	3°49.1	3°38.1	1.4 - 0.4	7.4 - 1.9	13.4 - 3.5
15	3°48.8	3°49.4	3°38.3	1.5 - 0.4	7.5 - 1.9	13.5 - 3.5
16	3°49.0	3°49.6	3°38.6	1.6 - 0.4	7.6 - 2.0	13.6 - 3.5
17	3°49.3	3°49.9	3°38.8	1.7 - 0.4	7.7 - 2.0	13.7 - 3.5
18	3°49.5	3°50.1	3°39.0	1.8 - 0.5	7.8 - 2.0	13.8 - 3.6
19	3°49.8	3°50.4	3°39.3	1.9 - 0.5	7.9 - 2.0	13.9 - 3.6
20	3°50.0	3°50.6	3°39.5	2.0 - 0.5	8.0 - 2.1	14.0 - 3.6
21	3°50.2	3°50.9	3°39.8	2.1 - 0.5	8.1 - 2.1	14.1 - 3.6
22	3°50.5	3°51.1	3°40.0	2.2 - 0.6	8.2 - 2.1	14.2 - 3.7
23	3°50.7	3°51.4	3°40.2	2.3 - 0.6	8.3 - 2.1	14.3 - 3.7
24	3°51.0	3°51.6	3°40.5	2.4 - 0.6	8.4 - 2.2	14.4 - 3.7
25	3°51.2	3°51.9	3°40.7	2.5 - 0.6	8.5 - 2.2	14.5 - 3.7
26	3°51.5	3°52.1	3°41.0	2.6 - 0.7	8.6 - 2.2	14.6 - 3.8
27	3°51.8	3°52.4	3°41.2	2.7 - 0.7	8.7 - 2.2	14.7 - 3.8
28	3°52.0	3°52.6	3°41.4	2.8 - 0.7	8.8 - 2.3	14.8 - 3.8
29	3°52.2	3°52.9	3°41.7	2.9 - 0.7	8.9 - 2.3	14.9 - 3.8
30	3°52.5	3°53.1	3°41.9	3.0 - 0.8	9.0 - 2.3	15.0 - 3.9
31	3°52.8	3°53.4	3°42.1	3.1 - 0.8	9.1 - 2.4	15.1 - 3.9
32	3°53.0	3°53.6	3°42.4	3.2 - 0.8	9.2 - 2.4	15.2 - 3.9
33	3°53.2	3°53.9	3°42.6	3.3 - 0.9	9.3 - 2.4	15.3 - 4.0
34	3°53.5	3°54.1	3°42.9	3.4 - 0.9	9.4 - 2.4	15.4 - 4.0
35	3°53.8	3°54.4	3°43.1	3.5 - 0.9	9.5 - 2.5	15.5 - 4.0
36	3°54.0	3°54.6	3°43.3	3.6 - 0.9	9.6 - 2.5	15.6 - 4.0
37	3°54.3	3°54.9	3°43.6	3.7 - 1.0	9.7 - 2.5	15.7 - 4.1
38	3°54.5	3°55.1	3°43.8	3.8 - 1.0	9.8 - 2.5	15.8 - 4.1
39	3°54.8	3°55.4	3°44.1	3.9 - 1.0	9.9 - 2.6	15.9 - 4.1
40	3°55.0	3°55.6	3°44.3	4.0 - 1.0	10.0 - 2.6	16.0 - 4.1
41	3°55.3	3°55.9	3°44.5	4.1 - 1.1	10.1 - 2.6	16.1 - 4.2
42	3°55.5	3°56.1	3°44.8	4.2 - 1.1	10.2 - 2.6	16.2 - 4.2
43	3°55.7	3°56.4	3°45.0	4.3 - 1.1	10.3 - 2.7	16.3 - 4.2
44	3°56.0	3°56.6	3°45.2	4.4 - 1.1	10.4 - 2.7	16.4 - 4.2
45	3°56.3	3°56.9	3°45.5	4.5 - 1.2	10.5 - 2.7	16.5 - 4.3
46	3°56.5	3°57.1	3°45.7	4.6 - 1.2	10.6 - 2.7	16.6 - 4.3
47	3°56.8	3°57.4	3°46.0	4.7 - 1.2	10.7 - 2.8	16.7 - 4.3
48	3°57.0	3°57.6	3°46.2	4.8 - 1.2	10.8 - 2.8	16.8 - 4.3
49	3°57.3	3°57.9	3°46.4	4.9 - 1.3	10.9 - 2.8	16.9 - 4.4
50	3°57.5	3°58.1	3°46.7	5.0 - 1.3	11.0 - 2.8	17.0 - 4.4
51	3°57.7	3°58.4	3°46.9	5.1 - 1.3	11.1 - 2.9	17.1 - 4.4
52	3°58.0	3°58.7	3°47.2	5.2 - 1.3	11.2 - 2.9	17.2 - 4.4
53	3°58.2	3°58.9	3°47.4	5.3 - 1.4	11.3 - 2.9	17.3 - 4.5
54	3°58.5	3°59.2	3°47.6	5.4 - 1.4	11.4 - 2.9	17.4 - 4.5
55	3°58.7	3°59.4	3°47.9	5.5 - 1.4	11.5 - 3.0	17.5 - 4.5
56	3°59.0	3°59.7	3°48.1	5.6 - 1.4	11.6 - 3.0	17.6 - 4.5
57	3°59.2	3°59.9	3°48.4	5.7 - 1.5	11.7 - 3.0	17.7 - 4.6
58	3°59.5	4°00.2	3°48.6	5.8 - 1.5	11.8 - 3.0	17.8 - 4.6
59	3°59.8	4°00.4	3°48.8	5.9 - 1.5	11.9 - 3.1	17.9 - 4.6

m 16	Sun Plan.	Aries	Moon	v and d corr		
0	4°00.0	4°00.7	3°49.1	0.0 - 0.0	6.0 - 1.7	12.0 - 3.3
1	4°00.2	4°00.9	3°49.3	0.1 - 0.0	6.1 - 1.7	12.1 - 3.3
2	4°00.5	4°01.2	3°49.5	0.2 - 0.1	6.2 - 1.7	12.2 - 3.4
3	4°00.8	4°01.4	3°49.8	0.3 - 0.1	6.3 - 1.7	12.3 - 3.4
4	4°01.0	4°01.7	3°50.0	0.4 - 0.1	6.4 - 1.8	12.4 - 3.4
5	4°01.2	4°01.9	3°50.3	0.5 - 0.1	6.5 - 1.8	12.5 - 3.4
6	4°01.5	4°02.2	3°50.5	0.6 - 0.2	6.6 - 1.8	12.6 - 3.5
7	4°01.8	4°02.4	3°50.7	0.7 - 0.2	6.7 - 1.8	12.7 - 3.5
8	4°02.0	4°02.7	3°51.0	0.8 - 0.2	6.8 - 1.9	12.8 - 3.5
9	4°02.2	4°02.9	3°51.2	0.9 - 0.2	6.9 - 1.9	12.9 - 3.5
10	4°02.5	4°03.2	3°51.5	1.0 - 0.3	7.0 - 1.9	13.0 - 3.6
11	4°02.8	4°03.4	3°51.7	1.1 - 0.3	7.1 - 2.0	13.1 - 3.6
12	4°03.0	4°03.7	3°51.9	1.2 - 0.3	7.2 - 2.0	13.2 - 3.6
13	4°03.2	4°03.9	3°52.2	1.3 - 0.4	7.3 - 2.0	13.3 - 3.7
14	4°03.5	4°04.2	3°52.4	1.4 - 0.4	7.4 - 2.0	13.4 - 3.7
15	4°03.8	4°04.4	3°52.6	1.5 - 0.4	7.5 - 2.1	13.5 - 3.7
16	4°04.0	4°04.7	3°52.9	1.6 - 0.4	7.6 - 2.1	13.6 - 3.7
17	4°04.3	4°04.9	3°53.1	1.7 - 0.5	7.7 - 2.1	13.7 - 3.8
18	4°04.5	4°05.2	3°53.4	1.8 - 0.5	7.8 - 2.1	13.8 - 3.8
19	4°04.7	4°05.4	3°53.6	1.9 - 0.5	7.9 - 2.2	13.9 - 3.8
20	4°05.0	4°05.7	3°53.8	2.0 - 0.6	8.0 - 2.2	14.0 - 3.9
21	4°05.3	4°05.9	3°54.1	2.1 - 0.6	8.1 - 2.2	14.1 - 3.9
22	4°05.5	4°06.2	3°54.3	2.2 - 0.6	8.2 - 2.3	14.2 - 3.9
23	4°05.7	4°06.4	3°54.6	2.3 - 0.6	8.3 - 2.3	14.3 - 3.9
24	4°06.0	4°06.7	3°54.8	2.4 - 0.7	8.4 - 2.3	14.4 - 4.0
25	4°06.3	4°06.9	3°55.0	2.5 - 0.7	8.5 - 2.3	14.5 - 4.0
26	4°06.5	4°07.2	3°55.3	2.6 - 0.7	8.6 - 2.4	14.6 - 4.0
27	4°06.7	4°07.4	3°55.5	2.7 - 0.7	8.7 - 2.4	14.7 - 4.0
28	4°07.0	4°07.7	3°55.7	2.8 - 0.8	8.8 - 2.4	14.8 - 4.1
29	4°07.3	4°07.9	3°56.0	2.9 - 0.8	8.9 - 2.4	14.9 - 4.1
30	4°07.5	4°08.2	3°56.2	3.0 - 0.8	9.0 - 2.5	15.0 - 4.1
31	4°07.7	4°08.4	3°56.5	3.1 - 0.9	9.1 - 2.5	15.1 - 4.2
32	4°08.0	4°08.7	3°56.7	3.2 - 0.9	9.2 - 2.5	15.2 - 4.2
33	4°08.3	4°08.9	3°56.9	3.3 - 0.9	9.3 - 2.6	15.3 - 4.2
34	4°08.5	4°09.2	3°57.2	3.4 - 0.9	9.4 - 2.6	15.4 - 4.2
35	4°08.7	4°09.4	3°57.4	3.5 - 1.0	9.5 - 2.6	15.5 - 4.3
36	4°09.0	4°09.7	3°57.7	3.6 - 1.0	9.6 - 2.6	15.6 - 4.3
37	4°09.3	4°09.9	3°57.9	3.7 - 1.0	9.7 - 2.7	15.7 - 4.3
38	4°09.5	4°10.2	3°58.1	3.8 - 1.0	9.8 - 2.7	15.8 - 4.3
39	4°09.7	4°10.4	3°58.4	3.9 - 1.1	9.9 - 2.7	15.9 - 4.4
40	4°10.0	4°10.7	3°58.6	4.0 - 1.1	10.0 - 2.8	16.0 - 4.4
41	4°10.3	4°10.9	3°58.8	4.1 - 1.1	10.1 - 2.8	16.1 - 4.4
42	4°10.5	4°11.2	3°59.1	4.2 - 1.2	10.2 - 2.8	16.2 - 4.5
43	4°10.7	4°11.4	3°59.3	4.3 - 1.2	10.3 - 2.8	16.3 - 4.5
44	4°11.0	4°11.7	3°59.6	4.4 - 1.2	10.4 - 2.9	16.4 - 4.5
45	4°11.3	4°11.9	3°59.8	4.5 - 1.2	10.5 - 2.9	16.5 - 4.5
46	4°11.5	4°12.2	4°00.0	4.6 - 1.3	10.6 - 2.9	16.6 - 4.6
47	4°11.8	4°12.4	4°00.3	4.7 - 1.3	10.7 - 2.9	16.7 - 4.6
48	4°12.0	4°12.7	4°00.5	4.8 - 1.3	10.8 - 3.0	16.8 - 4.6
49	4°12.2	4°12.9	4°00.8	4.9 - 1.3	10.9 - 3.0	16.9 - 4.6
50	4°12.5	4°13.2	4°01.0	5.0 - 1.4	11.0 - 3.0	17.0 - 4.7
51	4°12.8	4°13.4	4°01.2	5.1 - 1.4	11.1 - 3.1	17.1 - 4.7
52	4°13.0	4°13.7	4°01.5	5.2 - 1.4	11.2 - 3.1	17.2 - 4.7
53	4°13.2	4°13.9	4°01.7	5.3 - 1.5	11.3 - 3.1	17.3 - 4.8
54	4°13.5	4°14.2	4°02.0	5.4 - 1.5	11.4 - 3.1	17.4 - 4.8
55	4°13.8	4°14.4	4°02.2	5.5 - 1.5	11.5 - 3.2	17.5 - 4.8
56	4°14.0	4°14.7	4°02.4	5.6 - 1.5	11.6 - 3.2	17.6 - 4.8
57	4°14.2	4°14.9	4°02.7	5.7 - 1.6	11.7 - 3.2	17.7 - 4.9
58	4°14.5	4°15.2	4°02.9	5.8 - 1.6	11.8 - 3.2	17.8 - 4.9
59	4°14.8	4°15.4	4°03.1	5.9 - 1.6	11.9 - 3.3	17.9 - 4.9

m 17	Sun Plan.	Aries	Moon	v and d corr		
0	4°15.0	4°15.7	4°03.4	0.0 - 0.0	6.0 - 1.8	12.0 - 3.5
1	4°15.2	4°15.9	4°03.6	0.1 - 0.0	6.1 - 1.8	12.1 - 3.5
2	4°15.5	4°16.2	4°03.9	0.2 - 0.1	6.2 - 1.8	12.2 - 3.6
3	4°15.8	4°16.4	4°04.1	0.3 - 0.1	6.3 - 1.8	12.3 - 3.6
4	4°16.0	4°16.7	4°04.3	0.4 - 0.1	6.4 - 1.9	12.4 - 3.6
5	4°16.2	4°17.0	4°04.6	0.5 - 0.1	6.5 - 1.9	12.5 - 3.6
6	4°16.5	4°17.2	4°04.8	0.6 - 0.2	6.6 - 1.9	12.6 - 3.7
7	4°16.8	4°17.5	4°05.1	0.7 - 0.2	6.7 - 2.0	12.7 - 3.7
8	4°17.0	4°17.7	4°05.3	0.8 - 0.2	6.8 - 2.0	12.8 - 3.7
9	4°17.2	4°18.0	4°05.5	0.9 - 0.3	6.9 - 2.0	12.9 - 3.8
10	4°17.5	4°18.2	4°05.8	1.0 - 0.3	7.0 - 2.0	13.0 - 3.8
11	4°17.8	4°18.5	4°06.0	1.1 - 0.3	7.1 - 2.1	13.1 - 3.8
12	4°18.0	4°18.7	4°06.2	1.2 - 0.4	7.2 - 2.1	13.2 - 3.9
13	4°18.2	4°19.0	4°06.5	1.3 - 0.4	7.3 - 2.1	13.3 - 3.9
14	4°18.5	4°19.2	4°06.7	1.4 - 0.4	7.4 - 2.2	13.4 - 3.9
15	4°18.8	4°19.5	4°07.0	1.5 - 0.4	7.5 - 2.2	13.5 - 3.9
16	4°19.0	4°19.7	4°07.2	1.6 - 0.5	7.6 - 2.2	13.6 - 4.0
17	4°19.3	4°20.0	4°07.4	1.7 - 0.5	7.7 - 2.2	13.7 - 4.0
18	4°19.5	4°20.2	4°07.7	1.8 - 0.5	7.8 - 2.3	13.8 - 4.0
19	4°19.7	4°20.5	4°07.9	1.9 - 0.6	7.9 - 2.3	13.9 - 4.1
20	4°20.0	4°20.7	4°08.2	2.0 - 0.6	8.0 - 2.3	14.0 - 4.1
21	4°20.3	4°21.0	4°08.4	2.1 - 0.6	8.1 - 2.4	14.1 - 4.1
22	4°20.5	4°21.2	4°08.6	2.2 - 0.6	8.2 - 2.4	14.2 - 4.1
23	4°20.7	4°21.5	4°08.9	2.3 - 0.7	8.3 - 2.4	14.3 - 4.2
24	4°21.0	4°21.7	4°09.1	2.4 - 0.7	8.4 - 2.5	14.4 - 4.2
25	4°21.3	4°22.0	4°09.3	2.5 - 0.7	8.5 - 2.5	14.5 - 4.2
26	4°21.5	4°22.2	4°09.6	2.6 - 0.8	8.6 - 2.5	14.6 - 4.3
27	4°21.7	4°22.5	4°09.8	2.7 - 0.8	8.7 - 2.5	14.7 - 4.3
28	4°22.0	4°22.7	4°10.1	2.8 - 0.8	8.8 - 2.6	14.8 - 4.3
29	4°22.3	4°23.0	4°10.3	2.9 - 0.8	8.9 - 2.6	14.9 - 4.3
30	4°22.5	4°23.2	4°10.5	3.0 - 0.9	9.0 - 2.6	15.0 - 4.4
31	4°22.7	4°23.5	4°10.8	3.1 - 0.9	9.1 - 2.7	15.1 - 4.4
32	4°23.0	4°23.7	4°11.0	3.2 - 0.9	9.2 - 2.7	15.2 - 4.4
33	4°23.3	4°24.0	4°11.3	3.3 - 1.0	9.3 - 2.7	15.3 - 4.5
34	4°23.5	4°24.2	4°11.5	3.4 - 1.0	9.4 - 2.7	15.4 - 4.5
35	4°23.7	4°24.5	4°11.7	3.5 - 1.0	9.5 - 2.8	15.5 - 4.5
36	4°24.0	4°24.7	4°12.0	3.6 - 1.1	9.6 - 2.8	15.6 - 4.5
37	4°24.3	4°25.0	4°12.2	3.7 - 1.1	9.7 - 2.8	15.7 - 4.6
38	4°24.5	4°25.2	4°12.5	3.8 - 1.1	9.8 - 2.9	15.8 - 4.6
39	4°24.7	4°25.5	4°12.7	3.9 - 1.1	9.9 - 2.9	15.9 - 4.6
40	4°25.0	4°25.7	4°12.9	4.0 - 1.2	10.0 - 2.9	16.0 - 4.7
41	4°25.3	4°26.0	4°13.2	4.1 - 1.2	10.1 - 2.9	16.1 - 4.7
42	4°25.5	4°26.2	4°13.4	4.2 - 1.2	10.2 - 3.0	16.2 - 4.7
43	4°25.7	4°26.5	4°13.6	4.3 - 1.3	10.3 - 3.0	16.3 - 4.8
44	4°26.0	4°26.7	4°13.9	4.4 - 1.3	10.4 - 3.0	16.4 - 4.8
45	4°26.3	4°27.0	4°14.1	4.5 - 1.3	10.5 - 3.1	16.5 - 4.8
46	4°26.5	4°27.2	4°14.4	4.6 - 1.3	10.6 - 3.1	16.6 - 4.8
47	4°26.8	4°27.5	4°14.6	4.7 - 1.4	10.7 - 3.1	16.7 - 4.9
48	4°27.0	4°27.7	4°14.8	4.8 - 1.4	10.8 - 3.2	16.8 - 4.9
49	4°27.2	4°28.0	4°15.1	4.9 - 1.4	10.9 - 3.2	16.9 - 4.9
50	4°27.5	4°28.2	4°15.3	5.0 - 1.5	11.0 - 3.2	17.0 - 5.0
51	4°27.8	4°28.5	4°15.6	5.1 - 1.5	11.1 - 3.2	17.1 - 5.0
52	4°28.0	4°28.7	4°15.8	5.2 - 1.5	11.2 - 3.3	17.2 - 5.0
53	4°28.2	4°29.0	4°16.0	5.3 - 1.5	11.3 - 3.3	17.3 - 5.0
54	4°28.5	4°29.2	4°16.3	5.4 - 1.6	11.4 - 3.3	17.4 - 5.1
55	4°28.8	4°29.5	4°16.5	5.5 - 1.6	11.5 - 3.4	17.5 - 5.1
56	4°29.0	4°29.7	4°16.7	5.6 - 1.6	11.6 - 3.4	17.6 - 5.1
57	4°29.2	4°30.0	4°17.0	5.7 - 1.7	11.7 - 3.4	17.7 - 5.2
58	4°29.5	4°30.2	4°17.2	5.8 - 1.7	11.8 - 3.4	17.8 - 5.2
59	4°29.8	4°30.5	4°17.5	5.9 - 1.7	11.9 - 3.5	17.9 - 5.2

Increments and Corrections

m 18	Sun Plan.	Aries	Moon	v and d corr		
0	4°30.0	4°30.7	4°17.7	0.0 - 0.0	6.0 - 1.9	12.0 - 3.7
1	4°30.2	4°31.0	4°17.9	0.1 - 0.0	6.1 - 1.9	12.1 - 3.7
2	4°30.5	4°31.2	4°18.2	0.2 - 0.1	6.2 - 1.9	12.2 - 3.8
3	4°30.8	4°31.5	4°18.4	0.3 - 0.1	6.3 - 1.9	12.3 - 3.8
4	4°31.0	4°31.7	4°18.7	0.4 - 0.1	6.4 - 2.0	12.4 - 3.8
5	4°31.2	4°32.0	4°18.9	0.5 - 0.2	6.5 - 2.0	12.5 - 3.9
6	4°31.5	4°32.2	4°19.1	0.6 - 0.2	6.6 - 2.0	12.6 - 3.9
7	4°31.8	4°32.5	4°19.4	0.7 - 0.2	6.7 - 2.1	12.7 - 3.9
8	4°32.0	4°32.7	4°19.6	0.8 - 0.2	6.8 - 2.1	12.8 - 3.9
9	4°32.2	4°33.0	4°19.8	0.9 - 0.3	6.9 - 2.1	12.9 - 4.0
10	4°32.5	4°33.2	4°20.1	1.0 - 0.3	7.0 - 2.2	13.0 - 4.0
11	4°32.8	4°33.5	4°20.3	1.1 - 0.3	7.1 - 2.2	13.1 - 4.0
12	4°33.0	4°33.7	4°20.6	1.2 - 0.4	7.2 - 2.2	13.2 - 4.1
13	4°33.2	4°34.0	4°20.8	1.3 - 0.4	7.3 - 2.3	13.3 - 4.1
14	4°33.5	4°34.2	4°21.0	1.4 - 0.4	7.4 - 2.3	13.4 - 4.1
15	4°33.8	4°34.5	4°21.3	1.5 - 0.5	7.5 - 2.3	13.5 - 4.2
16	4°34.0	4°34.7	4°21.5	1.6 - 0.5	7.6 - 2.3	13.6 - 4.2
17	4°34.3	4°35.0	4°21.8	1.7 - 0.5	7.7 - 2.4	13.7 - 4.2
18	4°34.5	4°35.3	4°22.0	1.8 - 0.6	7.8 - 2.4	13.8 - 4.3
19	4°34.8	4°35.5	4°22.2	1.9 - 0.6	7.9 - 2.4	13.9 - 4.3
20	4°35.0	4°35.8	4°22.5	2.0 - 0.6	8.0 - 2.5	14.0 - 4.3
21	4°35.3	4°36.0	4°22.7	2.1 - 0.6	8.1 - 2.5	14.1 - 4.3
22	4°35.5	4°36.3	4°22.9	2.2 - 0.7	8.2 - 2.5	14.2 - 4.4
23	4°35.7	4°36.5	4°23.2	2.3 - 0.7	8.3 - 2.6	14.3 - 4.4
24	4°36.0	4°36.8	4°23.4	2.4 - 0.7	8.4 - 2.6	14.4 - 4.4
25	4°36.3	4°37.0	4°23.7	2.5 - 0.8	8.5 - 2.6	14.5 - 4.5
26	4°36.5	4°37.3	4°23.9	2.6 - 0.8	8.6 - 2.7	14.6 - 4.5
27	4°36.7	4°37.5	4°24.1	2.7 - 0.8	8.7 - 2.7	14.7 - 4.5
28	4°37.0	4°37.8	4°24.4	2.8 - 0.9	8.8 - 2.7	14.8 - 4.6
29	4°37.3	4°38.0	4°24.6	2.9 - 0.9	8.9 - 2.7	14.9 - 4.6
30	4°37.5	4°38.3	4°24.9	3.0 - 0.9	9.0 - 2.8	15.0 - 4.6
31	4°37.7	4°38.5	4°25.1	3.1 - 1.0	9.1 - 2.8	15.1 - 4.7
32	4°38.0	4°38.8	4°25.3	3.2 - 1.0	9.2 - 2.8	15.2 - 4.7
33	4°38.3	4°39.0	4°25.6	3.3 - 1.0	9.3 - 2.9	15.3 - 4.7
34	4°38.5	4°39.3	4°25.8	3.4 - 1.0	9.4 - 2.9	15.4 - 4.7
35	4°38.7	4°39.5	4°26.1	3.5 - 1.1	9.5 - 2.9	15.5 - 4.8
36	4°39.0	4°39.8	4°26.3	3.6 - 1.1	9.6 - 3.0	15.6 - 4.8
37	4°39.3	4°40.0	4°26.5	3.7 - 1.1	9.7 - 3.0	15.7 - 4.8
38	4°39.5	4°40.3	4°26.8	3.8 - 1.2	9.8 - 3.0	15.8 - 4.9
39	4°39.7	4°40.5	4°27.0	3.9 - 1.2	9.9 - 3.1	15.9 - 4.9
40	4°40.0	4°40.8	4°27.2	4.0 - 1.2	10.0 - 3.1	16.0 - 4.9
41	4°40.3	4°41.0	4°27.5	4.1 - 1.3	10.1 - 3.1	16.1 - 5.0
42	4°40.5	4°41.3	4°27.7	4.2 - 1.3	10.2 - 3.1	16.2 - 5.0
43	4°40.7	4°41.5	4°28.0	4.3 - 1.3	10.3 - 3.2	16.3 - 5.0
44	4°41.0	4°41.8	4°28.2	4.4 - 1.4	10.4 - 3.2	16.4 - 5.1
45	4°41.3	4°42.0	4°28.4	4.5 - 1.4	10.5 - 3.2	16.5 - 5.1
46	4°41.5	4°42.3	4°28.7	4.6 - 1.4	10.6 - 3.3	16.6 - 5.1
47	4°41.8	4°42.5	4°28.9	4.7 - 1.4	10.7 - 3.3	16.7 - 5.1
48	4°42.0	4°42.8	4°29.2	4.8 - 1.5	10.8 - 3.3	16.8 - 5.2
49	4°42.3	4°43.0	4°29.4	4.9 - 1.5	10.9 - 3.4	16.9 - 5.2
50	4°42.5	4°43.3	4°29.6	5.0 - 1.5	11.0 - 3.4	17.0 - 5.2
51	4°42.8	4°43.5	4°29.9	5.1 - 1.6	11.1 - 3.4	17.1 - 5.3
52	4°43.0	4°43.8	4°30.1	5.2 - 1.6	11.2 - 3.5	17.2 - 5.3
53	4°43.2	4°44.0	4°30.3	5.3 - 1.6	11.3 - 3.5	17.3 - 5.3
54	4°43.5	4°44.3	4°30.6	5.4 - 1.7	11.4 - 3.5	17.4 - 5.4
55	4°43.8	4°44.5	4°30.8	5.5 - 1.7	11.5 - 3.5	17.5 - 5.4
56	4°44.0	4°44.8	4°31.1	5.6 - 1.7	11.6 - 3.6	17.6 - 5.4
57	4°44.2	4°45.0	4°31.3	5.7 - 1.8	11.7 - 3.6	17.7 - 5.5
58	4°44.5	4°45.3	4°31.5	5.8 - 1.8	11.8 - 3.6	17.8 - 5.5
59	4°44.8	4°45.5	4°31.8	5.9 - 1.8	11.9 - 3.7	17.9 - 5.5

m 19	Sun Plan.	Aries	Moon	v and d corr		
0	4°45.0	4°45.8	4°32.0	0.0 - 0.0	6.0 - 2.0	12.0 - 3.9
1	4°45.2	4°46.0	4°32.3	0.1 - 0.0	6.1 - 2.0	12.1 - 3.9
2	4°45.5	4°46.3	4°32.5	0.2 - 0.1	6.2 - 2.0	12.2 - 4.0
3	4°45.8	4°46.5	4°32.7	0.3 - 0.1	6.3 - 2.0	12.3 - 4.0
4	4°46.0	4°46.8	4°33.0	0.4 - 0.1	6.4 - 2.1	12.4 - 4.0
5	4°46.2	4°47.0	4°33.2	0.5 - 0.2	6.5 - 2.1	12.5 - 4.1
6	4°46.5	4°47.3	4°33.4	0.6 - 0.2	6.6 - 2.1	12.6 - 4.1
7	4°46.8	4°47.5	4°33.7	0.7 - 0.2	6.7 - 2.2	12.7 - 4.1
8	4°47.0	4°47.8	4°33.9	0.8 - 0.3	6.8 - 2.2	12.8 - 4.2
9	4°47.2	4°48.0	4°34.2	0.9 - 0.3	6.9 - 2.2	12.9 - 4.2
10	4°47.5	4°48.3	4°34.4	1.0 - 0.3	7.0 - 2.3	13.0 - 4.2
11	4°47.8	4°48.5	4°34.6	1.1 - 0.4	7.1 - 2.3	13.1 - 4.3
12	4°48.0	4°48.8	4°34.9	1.2 - 0.4	7.2 - 2.3	13.2 - 4.3
13	4°48.2	4°49.0	4°35.1	1.3 - 0.4	7.3 - 2.4	13.3 - 4.3
14	4°48.5	4°49.3	4°35.4	1.4 - 0.5	7.4 - 2.4	13.4 - 4.4
15	4°48.8	4°49.5	4°35.6	1.5 - 0.5	7.5 - 2.4	13.5 - 4.4
16	4°49.0	4°49.8	4°35.8	1.6 - 0.5	7.6 - 2.5	13.6 - 4.4
17	4°49.3	4°50.0	4°36.1	1.7 - 0.6	7.7 - 2.5	13.7 - 4.5
18	4°49.5	4°50.3	4°36.3	1.8 - 0.6	7.8 - 2.5	13.8 - 4.5
19	4°49.8	4°50.5	4°36.6	1.9 - 0.6	7.9 - 2.6	13.9 - 4.5
20	4°50.0	4°50.8	4°36.8	2.0 - 0.7	8.0 - 2.6	14.0 - 4.5
21	4°50.3	4°51.0	4°37.0	2.1 - 0.7	8.1 - 2.6	14.1 - 4.6
22	4°50.5	4°51.3	4°37.3	2.2 - 0.7	8.2 - 2.7	14.2 - 4.6
23	4°50.7	4°51.5	4°37.5	2.3 - 0.7	8.3 - 2.7	14.3 - 4.6
24	4°51.0	4°51.8	4°37.7	2.4 - 0.8	8.4 - 2.7	14.4 - 4.7
25	4°51.3	4°52.0	4°38.0	2.5 - 0.8	8.5 - 2.8	14.5 - 4.7
26	4°51.5	4°52.3	4°38.2	2.6 - 0.8	8.6 - 2.8	14.6 - 4.7
27	4°51.7	4°52.5	4°38.5	2.7 - 0.9	8.7 - 2.8	14.7 - 4.8
28	4°52.0	4°52.8	4°38.7	2.8 - 0.9	8.8 - 2.9	14.8 - 4.8
29	4°52.3	4°53.0	4°38.9	2.9 - 0.9	8.9 - 2.9	14.9 - 4.8
30	4°52.5	4°53.3	4°39.2	3.0 - 1.0	9.0 - 2.9	15.0 - 4.9
31	4°52.7	4°53.6	4°39.4	3.1 - 1.0	9.1 - 3.0	15.1 - 4.9
32	4°53.0	4°53.8	4°39.7	3.2 - 1.0	9.2 - 3.0	15.2 - 4.9
33	4°53.3	4°54.1	4°39.9	3.3 - 1.1	9.3 - 3.0	15.3 - 5.0
34	4°53.5	4°54.3	4°40.1	3.4 - 1.1	9.4 - 3.1	15.4 - 5.0
35	4°53.7	4°54.6	4°40.4	3.5 - 1.1	9.5 - 3.1	15.5 - 5.0
36	4°54.0	4°54.8	4°40.6	3.6 - 1.2	9.6 - 3.1	15.6 - 5.1
37	4°54.3	4°55.1	4°40.8	3.7 - 1.2	9.7 - 3.2	15.7 - 5.1
38	4°54.5	4°55.3	4°41.1	3.8 - 1.2	9.8 - 3.2	15.8 - 5.1
39	4°54.7	4°55.6	4°41.3	3.9 - 1.3	9.9 - 3.2	15.9 - 5.2
40	4°55.0	4°55.8	4°41.6	4.0 - 1.3	10.0 - 3.3	16.0 - 5.2
41	4°55.3	4°56.1	4°41.8	4.1 - 1.3	10.1 - 3.3	16.1 - 5.2
42	4°55.5	4°56.3	4°42.0	4.2 - 1.4	10.2 - 3.3	16.2 - 5.3
43	4°55.7	4°56.6	4°42.3	4.3 - 1.4	10.3 - 3.3	16.3 - 5.3
44	4°56.0	4°56.8	4°42.5	4.4 - 1.4	10.4 - 3.4	16.4 - 5.3
45	4°56.3	4°57.1	4°42.8	4.5 - 1.5	10.5 - 3.4	16.5 - 5.4
46	4°56.5	4°57.3	4°43.0	4.6 - 1.5	10.6 - 3.4	16.6 - 5.4
47	4°56.8	4°57.6	4°43.2	4.7 - 1.5	10.7 - 3.5	16.7 - 5.4
48	4°57.0	4°57.8	4°43.5	4.8 - 1.6	10.8 - 3.5	16.8 - 5.5
49	4°57.3	4°58.1	4°43.7	4.9 - 1.6	10.9 - 3.5	16.9 - 5.5
50	4°57.5	4°58.3	4°43.9	5.0 - 1.6	11.0 - 3.6	17.0 - 5.5
51	4°57.8	4°58.6	4°44.2	5.1 - 1.7	11.1 - 3.6	17.1 - 5.6
52	4°58.0	4°58.8	4°44.4	5.2 - 1.7	11.2 - 3.6	17.2 - 5.6
53	4°58.2	4°59.1	4°44.7	5.3 - 1.7	11.3 - 3.7	17.3 - 5.6
54	4°58.5	4°59.3	4°44.9	5.4 - 1.8	11.4 - 3.7	17.4 - 5.7
55	4°58.8	4°59.6	4°45.1	5.5 - 1.8	11.5 - 3.7	17.5 - 5.7
56	4°59.0	4°59.8	4°45.4	5.6 - 1.8	11.6 - 3.8	17.6 - 5.7
57	4°59.2	5°00.1	4°45.6	5.7 - 1.9	11.7 - 3.8	17.7 - 5.8
58	4°59.5	5°00.3	4°45.9	5.8 - 1.9	11.8 - 3.8	17.8 - 5.8
59	4°59.8	5°00.6	4°46.1	5.9 - 1.9	11.9 - 3.9	17.9 - 5.8

m 20	Sun Plan.	Aries	Moon	v and d corr		
0	5°00.0	5°00.8	4°46.3	0.0 - 0.0	6.0 - 2.0	12.0 - 4.1
1	5°00.2	5°01.1	4°46.6	0.1 - 0.0	6.1 - 2.1	12.1 - 4.1
2	5°00.5	5°01.3	4°46.8	0.2 - 0.1	6.2 - 2.1	12.2 - 4.2
3	5°00.8	5°01.6	4°47.0	0.3 - 0.1	6.3 - 2.2	12.3 - 4.2
4	5°01.0	5°01.8	4°47.3	0.4 - 0.1	6.4 - 2.2	12.4 - 4.2
5	5°01.2	5°02.1	4°47.5	0.5 - 0.2	6.5 - 2.2	12.5 - 4.3
6	5°01.5	5°02.3	4°47.8	0.6 - 0.2	6.6 - 2.3	12.6 - 4.3
7	5°01.8	5°02.6	4°48.0	0.7 - 0.2	6.7 - 2.3	12.7 - 4.3
8	5°02.0	5°02.8	4°48.2	0.8 - 0.3	6.8 - 2.3	12.8 - 4.4
9	5°02.2	5°03.1	4°48.5	0.9 - 0.3	6.9 - 2.4	12.9 - 4.4
10	5°02.5	5°03.3	4°48.7	1.0 - 0.3	7.0 - 2.4	13.0 - 4.4
11	5°02.8	5°03.6	4°49.0	1.1 - 0.4	7.1 - 2.4	13.1 - 4.5
12	5°03.0	5°03.8	4°49.2	1.2 - 0.4	7.2 - 2.5	13.2 - 4.5
13	5°03.2	5°04.1	4°49.4	1.3 - 0.4	7.3 - 2.5	13.3 - 4.5
14	5°03.5	5°04.3	4°49.7	1.4 - 0.5	7.4 - 2.5	13.4 - 4.6
15	5°03.8	5°04.6	4°49.9	1.5 - 0.5	7.5 - 2.6	13.5 - 4.6
16	5°04.0	5°04.8	4°50.2	1.6 - 0.5	7.6 - 2.6	13.6 - 4.6
17	5°04.3	5°05.1	4°50.4	1.7 - 0.6	7.7 - 2.6	13.7 - 4.7
18	5°04.5	5°05.3	4°50.6	1.8 - 0.6	7.8 - 2.7	13.8 - 4.7
19	5°04.7	5°05.6	4°50.9	1.9 - 0.6	7.9 - 2.7	13.9 - 4.7
20	5°05.0	5°05.8	4°51.1	2.0 - 0.7	8.0 - 2.7	14.0 - 4.8
21	5°05.3	5°06.1	4°51.3	2.1 - 0.7	8.1 - 2.8	14.1 - 4.8
22	5°05.5	5°06.3	4°51.6	2.2 - 0.8	8.2 - 2.8	14.2 - 4.9
23	5°05.7	5°06.6	4°51.8	2.3 - 0.8	8.3 - 2.8	14.3 - 4.9
24	5°06.0	5°06.8	4°52.1	2.4 - 0.8	8.4 - 2.9	14.4 - 4.9
25	5°06.3	5°07.1	4°52.3	2.5 - 0.9	8.5 - 2.9	14.5 - 5.0
26	5°06.5	5°07.3	4°52.5	2.6 - 0.9	8.6 - 2.9	14.6 - 5.0
27	5°06.7	5°07.6	4°52.8	2.7 - 0.9	8.7 - 3.0	14.7 - 5.0
28	5°07.0	5°07.8	4°53.0	2.8 - 1.0	8.8 - 3.0	14.8 - 5.1
29	5°07.3	5°08.1	4°53.3	2.9 - 1.0	8.9 - 3.0	14.9 - 5.1
30	5°07.5	5°08.3	4°53.5	3.0 - 1.0	9.0 - 3.1	15.0 - 5.1
31	5°07.7	5°08.6	4°53.7	3.1 - 1.1	9.1 - 3.1	15.1 - 5.2
32	5°08.0	5°08.8	4°54.0	3.2 - 1.1	9.2 - 3.1	15.2 - 5.2
33	5°08.3	5°09.1	4°54.2	3.3 - 1.1	9.3 - 3.2	15.3 - 5.2
34	5°08.5	5°09.3	4°54.4	3.4 - 1.2	9.4 - 3.2	15.4 - 5.3
35	5°08.7	5°09.6	4°54.7	3.5 - 1.2	9.5 - 3.2	15.5 - 5.3
36	5°09.0	5°09.8	4°54.9	3.6 - 1.2	9.6 - 3.3	15.6 - 5.3
37	5°09.3	5°10.1	4°55.2	3.7 - 1.3	9.7 - 3.3	15.7 - 5.4
38	5°09.5	5°10.3	4°55.4	3.8 - 1.3	9.8 - 3.3	15.8 - 5.4
39	5°09.7	5°10.6	4°55.6	3.9 - 1.3	9.9 - 3.4	15.9 - 5.4
40	5°10.0	5°10.8	4°55.9	4.0 - 1.4	10.0 - 3.4	16.0 - 5.5
41	5°10.3	5°11.1	4°56.1	4.1 - 1.4	10.1 - 3.5	16.1 - 5.5
42	5°10.5	5°11.3	4°56.4	4.2 - 1.4	10.2 - 3.5	16.2 - 5.5
43	5°10.7	5°11.6	4°56.6	4.3 - 1.5	10.3 - 3.5	16.3 - 5.6
44	5°11.0	5°11.9	4°56.8	4.4 - 1.5	10.4 - 3.6	16.4 - 5.6
45	5°11.3	5°12.1	4°57.1	4.5 - 1.5	10.5 - 3.6	16.5 - 5.6
46	5°11.5	5°12.4	4°57.3	4.6 - 1.6	10.6 - 3.6	16.6 - 5.7
47	5°11.8	5°12.6	4°57.5	4.7 - 1.6	10.7 - 3.7	16.7 - 5.7
48	5°12.0	5°12.9	4°57.8	4.8 - 1.6	10.8 - 3.7	16.8 - 5.7
49	5°12.2	5°13.1	4°58.0	4.9 - 1.7	10.9 - 3.7	16.9 - 5.8
50	5°12.5	5°13.4	4°58.3	5.0 - 1.7	11.0 - 3.8	17.0 - 5.8
51	5°12.8	5°13.6	4°58.5	5.1 - 1.7	11.1 - 3.8	17.1 - 5.8
52	5°13.0	5°13.9	4°58.7	5.2 - 1.8	11.2 - 3.8	17.2 - 5.9
53	5°13.2	5°14.1	4°59.0	5.3 - 1.8	11.3 - 3.9	17.3 - 5.9
54	5°13.5	5°14.4	4°59.2	5.4 - 1.8	11.4 - 3.9	17.4 - 5.9
55	5°13.8	5°14.6	4°59.5	5.5 - 1.9	11.5 - 3.9	17.5 - 6.0
56	5°14.0	5°14.9	4°59.7	5.6 - 1.9	11.6 - 4.0	17.6 - 6.0
57	5°14.2	5°15.1	4°59.9	5.7 - 1.9	11.7 - 4.0	17.7 - 6.0
58	5°14.5	5°15.4	5°00.2	5.8 - 2.0	11.8 - 4.0	17.8 - 6.1
59	5°14.8	5°15.6	5°00.4	5.9 - 2.0	11.9 - 4.1	17.9 - 6.1

Increments and Corrections

m 21	Sun Plan.	Aries	Moon	v and d corr		
0	5°15.0	5°15.9	5°00.6	0.0 - 0.0	6.0 - 2.1	12.0 - 4.3
1	5°15.2	5°16.1	5°00.9	0.1 - 0.0	6.1 - 2.2	12.1 - 4.3
2	5°15.5	5°16.4	5°01.1	0.2 - 0.1	6.2 - 2.2	12.2 - 4.4
3	5°15.8	5°16.6	5°01.4	0.3 - 0.1	6.3 - 2.3	12.3 - 4.4
4	5°16.0	5°16.9	5°01.6	0.4 - 0.1	6.4 - 2.3	12.4 - 4.4
5	5°16.2	5°17.1	5°01.8	0.5 - 0.2	6.5 - 2.3	12.5 - 4.5
6	5°16.5	5°17.4	5°02.1	0.6 - 0.2	6.6 - 2.4	12.6 - 4.5
7	5°16.8	5°17.6	5°02.3	0.7 - 0.3	6.7 - 2.4	12.7 - 4.6
8	5°17.0	5°17.9	5°02.6	0.8 - 0.3	6.8 - 2.4	12.8 - 4.6
9	5°17.2	5°18.1	5°02.8	0.9 - 0.3	6.9 - 2.5	12.9 - 4.6
10	5°17.5	5°18.4	5°03.0	1.0 - 0.4	7.0 - 2.5	13.0 - 4.7
11	5°17.8	5°18.6	5°03.3	1.1 - 0.4	7.1 - 2.5	13.1 - 4.7
12	5°18.0	5°18.9	5°03.5	1.2 - 0.4	7.2 - 2.6	13.2 - 4.7
13	5°18.2	5°19.1	5°03.8	1.3 - 0.5	7.3 - 2.6	13.3 - 4.8
14	5°18.5	5°19.4	5°04.0	1.4 - 0.5	7.4 - 2.7	13.4 - 4.8
15	5°18.8	5°19.6	5°04.2	1.5 - 0.5	7.5 - 2.7	13.5 - 4.8
16	5°19.0	5°19.9	5°04.5	1.6 - 0.6	7.6 - 2.7	13.6 - 4.9
17	5°19.3	5°20.1	5°04.7	1.7 - 0.6	7.7 - 2.8	13.7 - 4.9
18	5°19.5	5°20.4	5°04.9	1.8 - 0.6	7.8 - 2.8	13.8 - 4.9
19	5°19.7	5°20.6	5°05.2	1.9 - 0.7	7.9 - 2.8	13.9 - 5.0
20	5°20.0	5°20.9	5°05.4	2.0 - 0.7	8.0 - 2.9	14.0 - 5.0
21	5°20.3	5°21.1	5°05.7	2.1 - 0.8	8.1 - 2.9	14.1 - 5.1
22	5°20.5	5°21.4	5°05.9	2.2 - 0.8	8.2 - 2.9	14.2 - 5.1
23	5°20.7	5°21.6	5°06.1	2.3 - 0.8	8.3 - 3.0	14.3 - 5.1
24	5°21.0	5°21.9	5°06.4	2.4 - 0.9	8.4 - 3.0	14.4 - 5.2
25	5°21.3	5°22.1	5°06.6	2.5 - 0.9	8.5 - 3.0	14.5 - 5.2
26	5°21.5	5°22.4	5°06.9	2.6 - 0.9	8.6 - 3.1	14.6 - 5.2
27	5°21.7	5°22.6	5°07.1	2.7 - 1.0	8.7 - 3.1	14.7 - 5.3
28	5°22.0	5°22.9	5°07.3	2.8 - 1.0	8.8 - 3.2	14.8 - 5.3
29	5°22.3	5°23.1	5°07.6	2.9 - 1.0	8.9 - 3.2	14.9 - 5.3
30	5°22.5	5°23.4	5°07.8	3.0 - 1.1	9.0 - 3.2	15.0 - 5.4
31	5°22.7	5°23.6	5°08.0	3.1 - 1.1	9.1 - 3.3	15.1 - 5.4
32	5°23.0	5°23.9	5°08.3	3.2 - 1.1	9.2 - 3.3	15.2 - 5.4
33	5°23.3	5°24.1	5°08.5	3.3 - 1.2	9.3 - 3.3	15.3 - 5.5
34	5°23.5	5°24.4	5°08.8	3.4 - 1.2	9.4 - 3.4	15.4 - 5.5
35	5°23.7	5°24.6	5°09.0	3.5 - 1.3	9.5 - 3.4	15.5 - 5.6
36	5°24.0	5°24.9	5°09.2	3.6 - 1.3	9.6 - 3.4	15.6 - 5.6
37	5°24.3	5°25.1	5°09.5	3.7 - 1.3	9.7 - 3.5	15.7 - 5.6
38	5°24.5	5°25.4	5°09.7	3.8 - 1.4	9.8 - 3.5	15.8 - 5.7
39	5°24.7	5°25.6	5°10.0	3.9 - 1.4	9.9 - 3.5	15.9 - 5.7
40	5°25.0	5°25.9	5°10.2	4.0 - 1.4	10.0 - 3.6	16.0 - 5.7
41	5°25.3	5°26.1	5°10.4	4.1 - 1.5	10.1 - 3.6	16.1 - 5.8
42	5°25.5	5°26.4	5°10.7	4.2 - 1.5	10.2 - 3.7	16.2 - 5.8
43	5°25.7	5°26.6	5°10.9	4.3 - 1.5	10.3 - 3.7	16.3 - 5.8
44	5°26.0	5°26.9	5°11.1	4.4 - 1.6	10.4 - 3.7	16.4 - 5.9
45	5°26.3	5°27.1	5°11.4	4.5 - 1.6	10.5 - 3.8	16.5 - 5.9
46	5°26.5	5°27.4	5°11.6	4.6 - 1.6	10.6 - 3.8	16.6 - 5.9
47	5°26.8	5°27.6	5°11.9	4.7 - 1.7	10.7 - 3.8	16.7 - 6.0
48	5°27.0	5°27.9	5°12.1	4.8 - 1.7	10.8 - 3.9	16.8 - 6.0
49	5°27.2	5°28.1	5°12.3	4.9 - 1.8	10.9 - 3.9	16.9 - 6.1
50	5°27.5	5°28.4	5°12.6	5.0 - 1.8	11.0 - 3.9	17.0 - 6.1
51	5°27.8	5°28.6	5°12.8	5.1 - 1.8	11.1 - 4.0	17.1 - 6.1
52	5°28.0	5°28.9	5°13.1	5.2 - 1.9	11.2 - 4.0	17.2 - 6.2
53	5°28.2	5°29.1	5°13.3	5.3 - 1.9	11.3 - 4.0	17.3 - 6.2
54	5°28.5	5°29.4	5°13.5	5.4 - 1.9	11.4 - 4.1	17.4 - 6.2
55	5°28.8	5°29.6	5°13.8	5.5 - 2.0	11.5 - 4.1	17.5 - 6.3
56	5°29.0	5°29.9	5°14.0	5.6 - 2.0	11.6 - 4.2	17.6 - 6.3
57	5°29.2	5°30.1	5°14.3	5.7 - 2.0	11.7 - 4.2	17.7 - 6.3
58	5°29.5	5°30.4	5°14.5	5.8 - 2.1	11.8 - 4.2	17.8 - 6.4
59	5°29.8	5°30.7	5°14.7	5.9 - 2.1	11.9 - 4.3	17.9 - 6.4

m 22	Sun Plan.	Aries	Moon	v and d corr		
0	5°30.0	5°30.9	5°15.0	0.0 - 0.0	6.0 - 2.3	12.0 - 4.5
1	5°30.2	5°31.2	5°15.2	0.1 - 0.0	6.1 - 2.3	12.1 - 4.5
2	5°30.5	5°31.4	5°15.4	0.2 - 0.1	6.2 - 2.3	12.2 - 4.6
3	5°30.8	5°31.7	5°15.7	0.3 - 0.1	6.3 - 2.4	12.3 - 4.6
4	5°31.0	5°31.9	5°15.9	0.4 - 0.2	6.4 - 2.4	12.4 - 4.7
5	5°31.2	5°32.2	5°16.2	0.5 - 0.2	6.5 - 2.4	12.5 - 4.7
6	5°31.5	5°32.4	5°16.4	0.6 - 0.2	6.6 - 2.5	12.6 - 4.7
7	5°31.8	5°32.7	5°16.6	0.7 - 0.3	6.7 - 2.5	12.7 - 4.8
8	5°32.0	5°32.9	5°16.9	0.8 - 0.3	6.8 - 2.5	12.8 - 4.8
9	5°32.2	5°33.2	5°17.1	0.9 - 0.3	6.9 - 2.6	12.9 - 4.8
10	5°32.5	5°33.4	5°17.4	1.0 - 0.4	7.0 - 2.6	13.0 - 4.9
11	5°32.8	5°33.7	5°17.6	1.1 - 0.4	7.1 - 2.7	13.1 - 4.9
12	5°33.0	5°33.9	5°17.8	1.2 - 0.5	7.2 - 2.7	13.2 - 4.9
13	5°33.2	5°34.2	5°18.1	1.3 - 0.5	7.3 - 2.7	13.3 - 5.0
14	5°33.5	5°34.4	5°18.3	1.4 - 0.5	7.4 - 2.8	13.4 - 5.0
15	5°33.8	5°34.7	5°18.5	1.5 - 0.6	7.5 - 2.8	13.5 - 5.1
16	5°34.0	5°34.9	5°18.8	1.6 - 0.6	7.6 - 2.8	13.6 - 5.1
17	5°34.3	5°35.2	5°19.0	1.7 - 0.6	7.7 - 2.9	13.7 - 5.1
18	5°34.5	5°35.4	5°19.3	1.8 - 0.7	7.8 - 2.9	13.8 - 5.2
19	5°34.8	5°35.7	5°19.5	1.9 - 0.7	7.9 - 3.0	13.9 - 5.2
20	5°35.0	5°35.9	5°19.7	2.0 - 0.8	8.0 - 3.0	14.0 - 5.3
21	5°35.3	5°36.2	5°20.0	2.1 - 0.8	8.1 - 3.0	14.1 - 5.3
22	5°35.5	5°36.4	5°20.2	2.2 - 0.8	8.2 - 3.1	14.2 - 5.3
23	5°35.7	5°36.7	5°20.5	2.3 - 0.9	8.3 - 3.1	14.3 - 5.4
24	5°36.0	5°36.9	5°20.7	2.4 - 0.9	8.4 - 3.2	14.4 - 5.4
25	5°36.3	5°37.2	5°20.9	2.5 - 0.9	8.5 - 3.2	14.5 - 5.4
26	5°36.5	5°37.4	5°21.2	2.6 - 1.0	8.6 - 3.2	14.6 - 5.5
27	5°36.7	5°37.7	5°21.4	2.7 - 1.0	8.7 - 3.3	14.7 - 5.5
28	5°37.0	5°37.9	5°21.6	2.8 - 1.1	8.8 - 3.3	14.8 - 5.6
29	5°37.3	5°38.2	5°21.9	2.9 - 1.1	8.9 - 3.3	14.9 - 5.6
30	5°37.5	5°38.4	5°22.1	3.0 - 1.1	9.0 - 3.4	15.0 - 5.6
31	5°37.7	5°38.7	5°22.4	3.1 - 1.2	9.1 - 3.4	15.1 - 5.7
32	5°38.0	5°38.9	5°22.6	3.2 - 1.2	9.2 - 3.4	15.2 - 5.7
33	5°38.3	5°39.2	5°22.8	3.3 - 1.2	9.3 - 3.5	15.3 - 5.7
34	5°38.5	5°39.4	5°23.1	3.4 - 1.3	9.4 - 3.5	15.4 - 5.8
35	5°38.7	5°39.7	5°23.3	3.5 - 1.3	9.5 - 3.6	15.5 - 5.8
36	5°39.0	5°39.9	5°23.6	3.6 - 1.4	9.6 - 3.6	15.6 - 5.8
37	5°39.3	5°40.2	5°23.8	3.7 - 1.4	9.7 - 3.6	15.7 - 5.9
38	5°39.5	5°40.4	5°24.0	3.8 - 1.4	9.8 - 3.7	15.8 - 5.9
39	5°39.7	5°40.7	5°24.3	3.9 - 1.5	9.9 - 3.7	15.9 - 6.0
40	5°40.0	5°40.9	5°24.5	4.0 - 1.5	10.0 - 3.8	16.0 - 6.0
41	5°40.3	5°41.2	5°24.7	4.1 - 1.5	10.1 - 3.8	16.1 - 6.0
42	5°40.5	5°41.4	5°25.0	4.2 - 1.6	10.2 - 3.8	16.2 - 6.1
43	5°40.7	5°41.7	5°25.2	4.3 - 1.6	10.3 - 3.9	16.3 - 6.1
44	5°41.0	5°41.9	5°25.5	4.4 - 1.7	10.4 - 3.9	16.4 - 6.1
45	5°41.3	5°42.2	5°25.7	4.5 - 1.7	10.5 - 3.9	16.5 - 6.2
46	5°41.5	5°42.4	5°25.9	4.6 - 1.7	10.6 - 4.0	16.6 - 6.2
47	5°41.8	5°42.7	5°26.2	4.7 - 1.8	10.7 - 4.0	16.7 - 6.3
48	5°42.0	5°42.9	5°26.4	4.8 - 1.8	10.8 - 4.1	16.8 - 6.3
49	5°42.3	5°43.2	5°26.7	4.9 - 1.8	10.9 - 4.1	16.9 - 6.3
50	5°42.5	5°43.4	5°26.9	5.0 - 1.9	11.0 - 4.1	17.0 - 6.4
51	5°42.8	5°43.7	5°27.1	5.1 - 1.9	11.1 - 4.2	17.1 - 6.4
52	5°43.0	5°43.9	5°27.4	5.2 - 2.0	11.2 - 4.2	17.2 - 6.4
53	5°43.2	5°44.2	5°27.6	5.3 - 2.0	11.3 - 4.2	17.3 - 6.5
54	5°43.5	5°44.4	5°27.9	5.4 - 2.0	11.4 - 4.3	17.4 - 6.5
55	5°43.8	5°44.7	5°28.1	5.5 - 2.1	11.5 - 4.3	17.5 - 6.6
56	5°44.0	5°44.9	5°28.3	5.6 - 2.1	11.6 - 4.4	17.6 - 6.6
57	5°44.2	5°45.2	5°28.6	5.7 - 2.1	11.7 - 4.4	17.7 - 6.6
58	5°44.5	5°45.4	5°28.8	5.8 - 2.2	11.8 - 4.4	17.8 - 6.7
59	5°44.8	5°45.7	5°29.0	5.9 - 2.2	11.9 - 4.5	17.9 - 6.7

m 23	Sun Plan.	Aries	Moon	v and d corr		
0	5°45.0	5°45.9	5°29.3	0.0 - 0.0	6.0 - 2.4	12.0 - 4.7
1	5°45.2	5°46.2	5°29.5	0.1 - 0.0	6.1 - 2.4	12.1 - 4.7
2	5°45.5	5°46.4	5°29.8	0.2 - 0.1	6.2 - 2.4	12.2 - 4.8
3	5°45.8	5°46.7	5°30.0	0.3 - 0.1	6.3 - 2.5	12.3 - 4.8
4	5°46.0	5°46.9	5°30.2	0.4 - 0.2	6.4 - 2.5	12.4 - 4.9
5	5°46.2	5°47.2	5°30.5	0.5 - 0.2	6.5 - 2.5	12.5 - 4.9
6	5°46.5	5°47.4	5°30.7	0.6 - 0.2	6.6 - 2.6	12.6 - 4.9
7	5°46.8	5°47.7	5°31.0	0.7 - 0.3	6.7 - 2.6	12.7 - 5.0
8	5°47.0	5°47.9	5°31.2	0.8 - 0.3	6.8 - 2.7	12.8 - 5.0
9	5°47.2	5°48.2	5°31.4	0.9 - 0.4	6.9 - 2.7	12.9 - 5.1
10	5°47.5	5°48.4	5°31.7	1.0 - 0.4	7.0 - 2.7	13.0 - 5.1
11	5°47.8	5°48.7	5°31.9	1.1 - 0.4	7.1 - 2.8	13.1 - 5.1
12	5°48.0	5°49.0	5°32.1	1.2 - 0.5	7.2 - 2.8	13.2 - 5.2
13	5°48.2	5°49.2	5°32.4	1.3 - 0.5	7.3 - 2.9	13.3 - 5.2
14	5°48.5	5°49.5	5°32.6	1.4 - 0.5	7.4 - 2.9	13.4 - 5.2
15	5°48.8	5°49.7	5°32.9	1.5 - 0.6	7.5 - 2.9	13.5 - 5.3
16	5°49.0	5°50.0	5°33.1	1.6 - 0.6	7.6 - 3.0	13.6 - 5.3
17	5°49.3	5°50.2	5°33.3	1.7 - 0.7	7.7 - 3.0	13.7 - 5.4
18	5°49.5	5°50.5	5°33.6	1.8 - 0.7	7.8 - 3.1	13.8 - 5.4
19	5°49.8	5°50.7	5°33.8	1.9 - 0.7	7.9 - 3.1	13.9 - 5.4
20	5°50.0	5°51.0	5°34.1	2.0 - 0.8	8.0 - 3.1	14.0 - 5.5
21	5°50.3	5°51.2	5°34.3	2.1 - 0.8	8.1 - 3.2	14.1 - 5.5
22	5°50.5	5°51.5	5°34.5	2.2 - 0.9	8.2 - 3.2	14.2 - 5.6
23	5°50.7	5°51.7	5°34.8	2.3 - 0.9	8.3 - 3.3	14.3 - 5.6
24	5°51.0	5°52.0	5°35.0	2.4 - 0.9	8.4 - 3.3	14.4 - 5.6
25	5°51.3	5°52.2	5°35.2	2.5 - 1.0	8.5 - 3.3	14.5 - 5.7
26	5°51.5	5°52.5	5°35.5	2.6 - 1.0	8.6 - 3.4	14.6 - 5.7
27	5°51.7	5°52.7	5°35.7	2.7 - 1.1	8.7 - 3.4	14.7 - 5.8
28	5°52.0	5°53.0	5°36.0	2.8 - 1.1	8.8 - 3.4	14.8 - 5.8
29	5°52.3	5°53.2	5°36.2	2.9 - 1.1	8.9 - 3.5	14.9 - 5.8
30	5°52.5	5°53.5	5°36.4	3.0 - 1.2	9.0 - 3.5	15.0 - 5.9
31	5°52.7	5°53.7	5°36.7	3.1 - 1.2	9.1 - 3.6	15.1 - 5.9
32	5°53.0	5°54.0	5°36.9	3.2 - 1.3	9.2 - 3.6	15.2 - 6.0
33	5°53.3	5°54.2	5°37.2	3.3 - 1.3	9.3 - 3.6	15.3 - 6.0
34	5°53.5	5°54.5	5°37.4	3.4 - 1.3	9.4 - 3.7	15.4 - 6.0
35	5°53.7	5°54.7	5°37.6	3.5 - 1.4	9.5 - 3.7	15.5 - 6.1
36	5°54.0	5°55.0	5°37.9	3.6 - 1.4	9.6 - 3.8	15.6 - 6.1
37	5°54.3	5°55.2	5°38.1	3.7 - 1.4	9.7 - 3.8	15.7 - 6.1
38	5°54.5	5°55.5	5°38.4	3.8 - 1.5	9.8 - 3.8	15.8 - 6.2
39	5°54.7	5°55.7	5°38.6	3.9 - 1.5	9.9 - 3.9	15.9 - 6.2
40	5°55.0	5°56.0	5°38.8	4.0 - 1.6	10.0 - 3.9	16.0 - 6.3
41	5°55.3	5°56.2	5°39.1	4.1 - 1.6	10.1 - 4.0	16.1 - 6.3
42	5°55.5	5°56.5	5°39.3	4.2 - 1.6	10.2 - 4.0	16.2 - 6.3
43	5°55.7	5°56.7	5°39.5	4.3 - 1.7	10.3 - 4.0	16.3 - 6.4
44	5°56.0	5°57.0	5°39.8	4.4 - 1.7	10.4 - 4.1	16.4 - 6.4
45	5°56.3	5°57.2	5°40.0	4.5 - 1.8	10.5 - 4.1	16.5 - 6.5
46	5°56.5	5°57.5	5°40.3	4.6 - 1.8	10.6 - 4.2	16.6 - 6.5
47	5°56.8	5°57.7	5°40.5	4.7 - 1.8	10.7 - 4.2	16.7 - 6.5
48	5°57.0	5°58.0	5°40.7	4.8 - 1.9	10.8 - 4.2	16.8 - 6.6
49	5°57.3	5°58.2	5°41.0	4.9 - 1.9	10.9 - 4.3	16.9 - 6.6
50	5°57.5	5°58.5	5°41.2	5.0 - 2.0	11.0 - 4.3	17.0 - 6.7
51	5°57.8	5°58.7	5°41.5	5.1 - 2.0	11.1 - 4.3	17.1 - 6.7
52	5°58.0	5°59.0	5°41.7	5.2 - 2.0	11.2 - 4.4	17.2 - 6.7
53	5°58.2	5°59.2	5°41.9	5.3 - 2.1	11.3 - 4.4	17.3 - 6.8
54	5°58.5	5°59.5	5°42.2	5.4 - 2.1	11.4 - 4.5	17.4 - 6.8
55	5°58.8	5°59.7	5°42.4	5.5 - 2.2	11.5 - 4.5	17.5 - 6.9
56	5°59.0	6°00.0	5°42.6	5.6 - 2.2	11.6 - 4.5	17.6 - 6.9
57	5°59.2	6°00.2	5°42.9	5.7 - 2.2	11.7 - 4.6	17.7 - 6.9
58	5°59.5	6°00.5	5°43.1	5.8 - 2.3	11.8 - 4.6	17.8 - 7.0
59	5°59.8	6°00.7	5°43.4	5.9 - 2.3	11.9 - 4.7	17.9 - 7.0

Increments and Corrections

m 24	Sun Plan.	Aries	Moon	v and d corr		
0	6°00.0	6°01.0	5°43.6	0.0 - 0.0	6.0 - 2.5	12.0 - 4.9
1	6°00.2	6°01.2	5°43.8	0.1 - 0.0	6.1 - 2.5	12.1 - 4.9
2	6°00.5	6°01.5	5°44.1	0.2 - 0.1	6.2 - 2.5	12.2 - 5.0
3	6°00.8	6°01.7	5°44.3	0.3 - 0.1	6.3 - 2.6	12.3 - 5.0
4	6°01.0	6°02.0	5°44.6	0.4 - 0.2	6.4 - 2.6	12.4 - 5.1
5	6°01.2	6°02.2	5°44.8	0.5 - 0.2	6.5 - 2.7	12.5 - 5.1
6	6°01.5	6°02.5	5°45.0	0.6 - 0.2	6.6 - 2.7	12.6 - 5.1
7	6°01.8	6°02.7	5°45.3	0.7 - 0.3	6.7 - 2.7	12.7 - 5.2
8	6°02.0	6°03.0	5°45.5	0.8 - 0.3	6.8 - 2.8	12.8 - 5.2
9	6°02.2	6°03.2	5°45.7	0.9 - 0.4	6.9 - 2.8	12.9 - 5.3
10	6°02.5	6°03.5	5°46.0	1.0 - 0.4	7.0 - 2.9	13.0 - 5.3
11	6°02.8	6°03.7	5°46.2	1.1 - 0.4	7.1 - 2.9	13.1 - 5.3
12	6°03.0	6°04.0	5°46.5	1.2 - 0.5	7.2 - 2.9	13.2 - 5.4
13	6°03.2	6°04.2	5°46.7	1.3 - 0.5	7.3 - 3.0	13.3 - 5.4
14	6°03.5	6°04.5	5°46.9	1.4 - 0.6	7.4 - 3.0	13.4 - 5.5
15	6°03.8	6°04.7	5°47.2	1.5 - 0.6	7.5 - 3.1	13.5 - 5.5
16	6°04.0	6°05.0	5°47.4	1.6 - 0.7	7.6 - 3.1	13.6 - 5.6
17	6°04.3	6°05.2	5°47.7	1.7 - 0.7	7.7 - 3.1	13.7 - 5.6
18	6°04.5	6°05.5	5°47.9	1.8 - 0.7	7.8 - 3.2	13.8 - 5.6
19	6°04.7	6°05.7	5°48.1	1.9 - 0.8	7.9 - 3.2	13.9 - 5.7
20	6°05.0	6°06.0	5°48.4	2.0 - 0.8	8.0 - 3.3	14.0 - 5.7
21	6°05.3	6°06.2	5°48.6	2.1 - 0.9	8.1 - 3.3	14.1 - 5.8
22	6°05.5	6°06.5	5°48.8	2.2 - 0.9	8.2 - 3.3	14.2 - 5.8
23	6°05.7	6°06.7	5°49.1	2.3 - 0.9	8.3 - 3.4	14.3 - 5.8
24	6°06.0	6°07.0	5°49.3	2.4 - 1.0	8.4 - 3.4	14.4 - 5.9
25	6°06.3	6°07.3	5°49.6	2.5 - 1.0	8.5 - 3.5	14.5 - 5.9
26	6°06.5	6°07.5	5°49.8	2.6 - 1.1	8.6 - 3.5	14.6 - 6.0
27	6°06.7	6°07.8	5°50.0	2.7 - 1.1	8.7 - 3.6	14.7 - 6.0
28	6°07.0	6°08.0	5°50.3	2.8 - 1.1	8.8 - 3.6	14.8 - 6.0
29	6°07.3	6°08.3	5°50.5	2.9 - 1.2	8.9 - 3.6	14.9 - 6.1
30	6°07.5	6°08.5	5°50.8	3.0 - 1.2	9.0 - 3.7	15.0 - 6.1
31	6°07.7	6°08.8	5°51.0	3.1 - 1.3	9.1 - 3.7	15.1 - 6.2
32	6°08.0	6°09.0	5°51.2	3.2 - 1.3	9.2 - 3.8	15.2 - 6.2
33	6°08.3	6°09.3	5°51.5	3.3 - 1.3	9.3 - 3.8	15.3 - 6.2
34	6°08.5	6°09.5	5°51.7	3.4 - 1.4	9.4 - 3.8	15.4 - 6.3
35	6°08.7	6°09.8	5°52.0	3.5 - 1.4	9.5 - 3.9	15.5 - 6.3
36	6°09.0	6°10.0	5°52.2	3.6 - 1.5	9.6 - 3.9	15.6 - 6.4
37	6°09.3	6°10.3	5°52.4	3.7 - 1.5	9.7 - 4.0	15.7 - 6.4
38	6°09.5	6°10.5	5°52.7	3.8 - 1.6	9.8 - 4.0	15.8 - 6.5
39	6°09.7	6°10.8	5°52.9	3.9 - 1.6	9.9 - 4.0	15.9 - 6.5
40	6°10.0	6°11.0	5°53.1	4.0 - 1.6	10.0 - 4.1	16.0 - 6.5
41	6°10.3	6°11.3	5°53.4	4.1 - 1.7	10.1 - 4.1	16.1 - 6.6
42	6°10.5	6°11.5	5°53.6	4.2 - 1.7	10.2 - 4.2	16.2 - 6.6
43	6°10.7	6°11.8	5°53.9	4.3 - 1.8	10.3 - 4.2	16.3 - 6.7
44	6°11.0	6°12.0	5°54.1	4.4 - 1.8	10.4 - 4.2	16.4 - 6.7
45	6°11.3	6°12.3	5°54.3	4.5 - 1.8	10.5 - 4.3	16.5 - 6.7
46	6°11.5	6°12.5	5°54.6	4.6 - 1.9	10.6 - 4.3	16.6 - 6.8
47	6°11.8	6°12.8	5°54.8	4.7 - 1.9	10.7 - 4.4	16.7 - 6.8
48	6°12.0	6°13.0	5°55.1	4.8 - 2.0	10.8 - 4.4	16.8 - 6.9
49	6°12.2	6°13.3	5°55.3	4.9 - 2.0	10.9 - 4.5	16.9 - 6.9
50	6°12.5	6°13.5	5°55.5	5.0 - 2.0	11.0 - 4.5	17.0 - 6.9
51	6°12.8	6°13.8	5°55.8	5.1 - 2.1	11.1 - 4.5	17.1 - 7.0
52	6°13.0	6°14.0	5°56.0	5.2 - 2.1	11.2 - 4.6	17.2 - 7.0
53	6°13.2	6°14.3	5°56.2	5.3 - 2.2	11.3 - 4.6	17.3 - 7.1
54	6°13.5	6°14.5	5°56.5	5.4 - 2.2	11.4 - 4.7	17.4 - 7.1
55	6°13.8	6°14.8	5°56.7	5.5 - 2.2	11.5 - 4.7	17.5 - 7.1
56	6°14.0	6°15.0	5°57.0	5.6 - 2.3	11.6 - 4.7	17.6 - 7.2
57	6°14.2	6°15.3	5°57.2	5.7 - 2.3	11.7 - 4.8	17.7 - 7.2
58	6°14.5	6°15.5	5°57.4	5.8 - 2.4	11.8 - 4.8	17.8 - 7.3
59	6°14.8	6°15.8	5°57.7	5.9 - 2.4	11.9 - 4.9	17.9 - 7.3

m 25	Sun Plan.	Aries	Moon	v and d corr		
0	6°15.0	6°16.0	5°57.9	0.0 - 0.0	6.0 - 2.5	12.0 - 5.1
1	6°15.2	6°16.3	5°58.2	0.1 - 0.0	6.1 - 2.6	12.1 - 5.1
2	6°15.5	6°16.5	5°58.4	0.2 - 0.1	6.2 - 2.6	12.2 - 5.2
3	6°15.8	6°16.8	5°58.6	0.3 - 0.1	6.3 - 2.7	12.3 - 5.2
4	6°16.0	6°17.0	5°58.9	0.4 - 0.2	6.4 - 2.7	12.4 - 5.3
5	6°16.2	6°17.3	5°59.1	0.5 - 0.2	6.5 - 2.8	12.5 - 5.3
6	6°16.5	6°17.5	5°59.3	0.6 - 0.3	6.6 - 2.8	12.6 - 5.4
7	6°16.8	6°17.8	5°59.6	0.7 - 0.3	6.7 - 2.8	12.7 - 5.4
8	6°17.0	6°18.0	5°59.8	0.8 - 0.3	6.8 - 2.9	12.8 - 5.4
9	6°17.2	6°18.3	6°00.1	0.9 - 0.4	6.9 - 2.9	12.9 - 5.5
10	6°17.5	6°18.5	6°00.3	1.0 - 0.4	7.0 - 3.0	13.0 - 5.5
11	6°17.8	6°18.8	6°00.5	1.1 - 0.5	7.1 - 3.0	13.1 - 5.6
12	6°18.0	6°19.0	6°00.8	1.2 - 0.5	7.2 - 3.1	13.2 - 5.6
13	6°18.2	6°19.3	6°01.0	1.3 - 0.6	7.3 - 3.1	13.3 - 5.7
14	6°18.5	6°19.5	6°01.3	1.4 - 0.6	7.4 - 3.1	13.4 - 5.7
15	6°18.8	6°19.8	6°01.5	1.5 - 0.6	7.5 - 3.2	13.5 - 5.7
16	6°19.0	6°20.0	6°01.7	1.6 - 0.7	7.6 - 3.2	13.6 - 5.8
17	6°19.3	6°20.3	6°02.0	1.7 - 0.7	7.7 - 3.3	13.7 - 5.8
18	6°19.5	6°20.5	6°02.2	1.8 - 0.8	7.8 - 3.3	13.8 - 5.9
19	6°19.7	6°20.8	6°02.5	1.9 - 0.8	7.9 - 3.4	13.9 - 5.9
20	6°20.0	6°21.0	6°02.7	2.0 - 0.8	8.0 - 3.4	14.0 - 6.0
21	6°20.3	6°21.3	6°02.9	2.1 - 0.9	8.1 - 3.4	14.1 - 6.0
22	6°20.5	6°21.5	6°03.2	2.2 - 0.9	8.2 - 3.5	14.2 - 6.0
23	6°20.7	6°21.8	6°03.4	2.3 - 1.0	8.3 - 3.5	14.3 - 6.1
24	6°21.0	6°22.0	6°03.6	2.4 - 1.0	8.4 - 3.6	14.4 - 6.1
25	6°21.3	6°22.3	6°03.9	2.5 - 1.1	8.5 - 3.6	14.5 - 6.2
26	6°21.5	6°22.5	6°04.1	2.6 - 1.1	8.6 - 3.7	14.6 - 6.2
27	6°21.7	6°22.8	6°04.4	2.7 - 1.1	8.7 - 3.7	14.7 - 6.2
28	6°22.0	6°23.0	6°04.6	2.8 - 1.2	8.8 - 3.7	14.8 - 6.3
29	6°22.3	6°23.3	6°04.8	2.9 - 1.2	8.9 - 3.8	14.9 - 6.3
30	6°22.5	6°23.5	6°05.1	3.0 - 1.3	9.0 - 3.8	15.0 - 6.4
31	6°22.7	6°23.8	6°05.3	3.1 - 1.3	9.1 - 3.9	15.1 - 6.4
32	6°23.0	6°24.0	6°05.6	3.2 - 1.4	9.2 - 3.9	15.2 - 6.5
33	6°23.3	6°24.3	6°05.8	3.3 - 1.4	9.3 - 4.0	15.3 - 6.5
34	6°23.5	6°24.5	6°06.0	3.4 - 1.4	9.4 - 4.0	15.4 - 6.5
35	6°23.7	6°24.8	6°06.3	3.5 - 1.5	9.5 - 4.0	15.5 - 6.6
36	6°24.0	6°25.0	6°06.5	3.6 - 1.5	9.6 - 4.1	15.6 - 6.6
37	6°24.3	6°25.3	6°06.7	3.7 - 1.6	9.7 - 4.1	15.7 - 6.7
38	6°24.5	6°25.6	6°07.0	3.8 - 1.6	9.8 - 4.2	15.8 - 6.7
39	6°24.7	6°25.8	6°07.2	3.9 - 1.7	9.9 - 4.2	15.9 - 6.8
40	6°25.0	6°26.1	6°07.5	4.0 - 1.7	10.0 - 4.3	16.0 - 6.8
41	6°25.3	6°26.3	6°07.7	4.1 - 1.7	10.1 - 4.3	16.1 - 6.8
42	6°25.5	6°26.6	6°07.9	4.2 - 1.8	10.2 - 4.3	16.2 - 6.9
43	6°25.7	6°26.8	6°08.2	4.3 - 1.8	10.3 - 4.4	16.3 - 6.9
44	6°26.0	6°27.1	6°08.4	4.4 - 1.9	10.4 - 4.4	16.4 - 7.0
45	6°26.3	6°27.3	6°08.7	4.5 - 1.9	10.5 - 4.5	16.5 - 7.0
46	6°26.5	6°27.6	6°08.9	4.6 - 2.0	10.6 - 4.5	16.6 - 7.1
47	6°26.8	6°27.8	6°09.1	4.7 - 2.0	10.7 - 4.5	16.7 - 7.1
48	6°27.0	6°28.1	6°09.4	4.8 - 2.0	10.8 - 4.6	16.8 - 7.1
49	6°27.2	6°28.3	6°09.6	4.9 - 2.1	10.9 - 4.6	16.9 - 7.2
50	6°27.5	6°28.6	6°09.8	5.0 - 2.1	11.0 - 4.7	17.0 - 7.2
51	6°27.8	6°28.8	6°10.1	5.1 - 2.2	11.1 - 4.7	17.1 - 7.3
52	6°28.0	6°29.1	6°10.3	5.2 - 2.2	11.2 - 4.8	17.2 - 7.3
53	6°28.2	6°29.3	6°10.6	5.3 - 2.3	11.3 - 4.8	17.3 - 7.4
54	6°28.5	6°29.6	6°10.8	5.4 - 2.3	11.4 - 4.8	17.4 - 7.4
55	6°28.8	6°29.8	6°11.0	5.5 - 2.3	11.5 - 4.9	17.5 - 7.4
56	6°29.0	6°30.1	6°11.3	5.6 - 2.4	11.6 - 4.9	17.6 - 7.5
57	6°29.2	6°30.3	6°11.5	5.7 - 2.4	11.7 - 5.0	17.7 - 7.5
58	6°29.5	6°30.6	6°11.8	5.8 - 2.5	11.8 - 5.0	17.8 - 7.6
59	6°29.8	6°30.8	6°12.0	5.9 - 2.5	11.9 - 5.1	17.9 - 7.6

m 26	Sun Plan.	Aries	Moon	v and d corr		
0	6°30.0	6°31.1	6°12.2	0.0 - 0.0	6.0 - 2.6	12.0 - 5.3
1	6°30.2	6°31.3	6°12.5	0.1 - 0.0	6.1 - 2.7	12.1 - 5.3
2	6°30.5	6°31.6	6°12.7	0.2 - 0.1	6.2 - 2.7	12.2 - 5.4
3	6°30.8	6°31.8	6°12.9	0.3 - 0.1	6.3 - 2.8	12.3 - 5.4
4	6°31.0	6°32.1	6°13.2	0.4 - 0.2	6.4 - 2.8	12.4 - 5.5
5	6°31.2	6°32.3	6°13.4	0.5 - 0.2	6.5 - 2.9	12.5 - 5.5
6	6°31.5	6°32.6	6°13.7	0.6 - 0.3	6.6 - 2.9	12.6 - 5.6
7	6°31.8	6°32.8	6°13.9	0.7 - 0.3	6.7 - 3.0	12.7 - 5.6
8	6°32.0	6°33.1	6°14.1	0.8 - 0.4	6.8 - 3.0	12.8 - 5.7
9	6°32.2	6°33.3	6°14.4	0.9 - 0.4	6.9 - 3.0	12.9 - 5.7
10	6°32.5	6°33.6	6°14.6	1.0 - 0.4	7.0 - 3.1	13.0 - 5.7
11	6°32.8	6°33.8	6°14.9	1.1 - 0.5	7.1 - 3.1	13.1 - 5.8
12	6°33.0	6°34.1	6°15.1	1.2 - 0.5	7.2 - 3.2	13.2 - 5.8
13	6°33.2	6°34.3	6°15.3	1.3 - 0.6	7.3 - 3.2	13.3 - 5.9
14	6°33.5	6°34.6	6°15.6	1.4 - 0.6	7.4 - 3.3	13.4 - 5.9
15	6°33.8	6°34.8	6°15.8	1.5 - 0.7	7.5 - 3.3	13.5 - 6.0
16	6°34.0	6°35.1	6°16.1	1.6 - 0.7	7.6 - 3.4	13.6 - 6.0
17	6°34.3	6°35.3	6°16.3	1.7 - 0.8	7.7 - 3.4	13.7 - 6.1
18	6°34.5	6°35.6	6°16.5	1.8 - 0.8	7.8 - 3.4	13.8 - 6.1
19	6°34.8	6°35.8	6°16.8	1.9 - 0.8	7.9 - 3.5	13.9 - 6.1
20	6°35.0	6°36.1	6°17.0	2.0 - 0.9	8.0 - 3.5	14.0 - 6.2
21	6°35.3	6°36.3	6°17.2	2.1 - 0.9	8.1 - 3.6	14.1 - 6.2
22	6°35.5	6°36.6	6°17.5	2.2 - 1.0	8.2 - 3.6	14.2 - 6.3
23	6°35.7	6°36.8	6°17.7	2.3 - 1.0	8.3 - 3.7	14.3 - 6.3
24	6°36.0	6°37.1	6°18.0	2.4 - 1.1	8.4 - 3.7	14.4 - 6.4
25	6°36.3	6°37.3	6°18.2	2.5 - 1.1	8.5 - 3.8	14.5 - 6.4
26	6°36.5	6°37.6	6°18.4	2.6 - 1.1	8.6 - 3.8	14.6 - 6.4
27	6°36.7	6°37.8	6°18.7	2.7 - 1.2	8.7 - 3.8	14.7 - 6.5
28	6°37.0	6°38.1	6°18.9	2.8 - 1.2	8.8 - 3.9	14.8 - 6.5
29	6°37.3	6°38.3	6°19.2	2.9 - 1.3	8.9 - 3.9	14.9 - 6.6
30	6°37.5	6°38.6	6°19.4	3.0 - 1.3	9.0 - 4.0	15.0 - 6.6
31	6°37.7	6°38.8	6°19.6	3.1 - 1.4	9.1 - 4.0	15.1 - 6.7
32	6°38.0	6°39.1	6°19.9	3.2 - 1.4	9.2 - 4.1	15.2 - 6.7
33	6°38.3	6°39.3	6°20.1	3.3 - 1.5	9.3 - 4.1	15.3 - 6.8
34	6°38.5	6°39.6	6°20.3	3.4 - 1.5	9.4 - 4.2	15.4 - 6.8
35	6°38.7	6°39.8	6°20.6	3.5 - 1.5	9.5 - 4.2	15.5 - 6.8
36	6°39.0	6°40.1	6°20.8	3.6 - 1.6	9.6 - 4.2	15.6 - 6.9
37	6°39.3	6°40.3	6°21.1	3.7 - 1.6	9.7 - 4.3	15.7 - 6.9
38	6°39.5	6°40.6	6°21.3	3.8 - 1.7	9.8 - 4.3	15.8 - 7.0
39	6°39.7	6°40.8	6°21.5	3.9 - 1.7	9.9 - 4.4	15.9 - 7.0
40	6°40.0	6°41.1	6°21.8	4.0 - 1.8	10.0 - 4.4	16.0 - 7.1
41	6°40.3	6°41.3	6°22.0	4.1 - 1.8	10.1 - 4.5	16.1 - 7.1
42	6°40.5	6°41.6	6°22.3	4.2 - 1.9	10.2 - 4.5	16.2 - 7.2
43	6°40.7	6°41.8	6°22.5	4.3 - 1.9	10.3 - 4.5	16.3 - 7.2
44	6°41.0	6°42.1	6°22.7	4.4 - 1.9	10.4 - 4.6	16.4 - 7.2
45	6°41.3	6°42.3	6°23.0	4.5 - 2.0	10.5 - 4.6	16.5 - 7.3
46	6°41.5	6°42.6	6°23.2	4.6 - 2.0	10.6 - 4.7	16.6 - 7.3
47	6°41.8	6°42.8	6°23.4	4.7 - 2.1	10.7 - 4.7	16.7 - 7.4
48	6°42.0	6°43.1	6°23.7	4.8 - 2.1	10.8 - 4.8	16.8 - 7.4
49	6°42.3	6°43.3	6°23.9	4.9 - 2.2	10.9 - 4.8	16.9 - 7.5
50	6°42.5	6°43.6	6°24.2	5.0 - 2.2	11.0 - 4.9	17.0 - 7.5
51	6°42.8	6°43.9	6°24.4	5.1 - 2.3	11.1 - 4.9	17.1 - 7.6
52	6°43.0	6°44.1	6°24.6	5.2 - 2.3	11.2 - 4.9	17.2 - 7.6
53	6°43.2	6°44.4	6°24.9	5.3 - 2.3	11.3 - 5.0	17.3 - 7.6
54	6°43.5	6°44.6	6°25.1	5.4 - 2.4	11.4 - 5.0	17.4 - 7.7
55	6°43.8	6°44.9	6°25.4	5.5 - 2.4	11.5 - 5.1	17.5 - 7.7
56	6°44.0	6°45.1	6°25.6	5.6 - 2.5	11.6 - 5.1	17.6 - 7.8
57	6°44.2	6°45.4	6°25.8	5.7 - 2.5	11.7 - 5.2	17.7 - 7.8
58	6°44.5	6°45.6	6°26.1	5.8 - 2.6	11.8 - 5.2	17.8 - 7.9
59	6°44.8	6°45.9	6°26.3	5.9 - 2.6	11.9 - 5.3	17.9 - 7.9

Increments and Corrections

m 27	Sun Plan.	Aries	Moon	v and d corr		
0	6°45.0	6°46.1	6°26.5	0.0 - 0.0	6.0 - 2.8	12.0 - 5.5
1	6°45.2	6°46.4	6°26.8	0.1 - 0.0	6.1 - 2.8	12.1 - 5.5
2	6°45.5	6°46.6	6°27.0	0.2 - 0.1	6.2 - 2.8	12.2 - 5.6
3	6°45.8	6°46.9	6°27.3	0.3 - 0.1	6.3 - 2.9	12.3 - 5.6
4	6°46.0	6°47.1	6°27.5	0.4 - 0.2	6.4 - 2.9	12.4 - 5.7
5	6°46.2	6°47.4	6°27.7	0.5 - 0.2	6.5 - 3.0	12.5 - 5.7
6	6°46.5	6°47.6	6°28.0	0.6 - 0.3	6.6 - 3.0	12.6 - 5.8
7	6°46.8	6°47.9	6°28.2	0.7 - 0.3	6.7 - 3.1	12.7 - 5.8
8	6°47.0	6°48.1	6°28.5	0.8 - 0.4	6.8 - 3.1	12.8 - 5.9
9	6°47.2	6°48.4	6°28.7	0.9 - 0.4	6.9 - 3.2	12.9 - 5.9
10	6°47.5	6°48.6	6°28.9	1.0 - 0.5	7.0 - 3.2	13.0 - 6.0
11	6°47.8	6°48.9	6°29.2	1.1 - 0.5	7.1 - 3.3	13.1 - 6.0
12	6°48.0	6°49.1	6°29.4	1.2 - 0.6	7.2 - 3.3	13.2 - 6.0
13	6°48.2	6°49.4	6°29.7	1.3 - 0.6	7.3 - 3.3	13.3 - 6.1
14	6°48.5	6°49.6	6°29.9	1.4 - 0.6	7.4 - 3.4	13.4 - 6.1
15	6°48.8	6°49.9	6°30.1	1.5 - 0.7	7.5 - 3.4	13.5 - 6.2
16	6°49.0	6°50.1	6°30.4	1.6 - 0.7	7.6 - 3.5	13.6 - 6.2
17	6°49.3	6°50.4	6°30.6	1.7 - 0.8	7.7 - 3.5	13.7 - 6.3
18	6°49.5	6°50.6	6°30.8	1.8 - 0.8	7.8 - 3.6	13.8 - 6.3
19	6°49.8	6°50.9	6°31.1	1.9 - 0.9	7.9 - 3.6	13.9 - 6.4
20	6°50.0	6°51.1	6°31.3	2.0 - 0.9	8.0 - 3.7	14.0 - 6.4
21	6°50.3	6°51.4	6°31.6	2.1 - 1.0	8.1 - 3.7	14.1 - 6.5
22	6°50.5	6°51.6	6°31.8	2.2 - 1.0	8.2 - 3.8	14.2 - 6.5
23	6°50.7	6°51.9	6°32.0	2.3 - 1.1	8.3 - 3.8	14.3 - 6.6
24	6°51.0	6°52.1	6°32.3	2.4 - 1.1	8.4 - 3.9	14.4 - 6.6
25	6°51.3	6°52.4	6°32.5	2.5 - 1.1	8.5 - 3.9	14.5 - 6.6
26	6°51.5	6°52.6	6°32.8	2.6 - 1.2	8.6 - 3.9	14.6 - 6.7
27	6°51.7	6°52.9	6°33.0	2.7 - 1.2	8.7 - 4.0	14.7 - 6.7
28	6°52.0	6°53.1	6°33.2	2.8 - 1.3	8.8 - 4.0	14.8 - 6.8
29	6°52.3	6°53.4	6°33.5	2.9 - 1.3	8.9 - 4.1	14.9 - 6.8
30	6°52.5	6°53.6	6°33.7	3.0 - 1.4	9.0 - 4.1	15.0 - 6.9
31	6°52.7	6°53.9	6°33.9	3.1 - 1.4	9.1 - 4.2	15.1 - 6.9
32	6°53.0	6°54.1	6°34.2	3.2 - 1.5	9.2 - 4.2	15.2 - 7.0
33	6°53.3	6°54.4	6°34.4	3.3 - 1.5	9.3 - 4.3	15.3 - 7.0
34	6°53.5	6°54.6	6°34.7	3.4 - 1.6	9.4 - 4.3	15.4 - 7.1
35	6°53.7	6°54.9	6°34.9	3.5 - 1.6	9.5 - 4.4	15.5 - 7.1
36	6°54.0	6°55.1	6°35.1	3.6 - 1.6	9.6 - 4.4	15.6 - 7.1
37	6°54.3	6°55.4	6°35.4	3.7 - 1.7	9.7 - 4.4	15.7 - 7.2
38	6°54.5	6°55.6	6°35.6	3.8 - 1.7	9.8 - 4.5	15.8 - 7.2
39	6°54.7	6°55.9	6°35.9	3.9 - 1.8	9.9 - 4.5	15.9 - 7.3
40	6°55.0	6°56.1	6°36.1	4.0 - 1.8	10.0 - 4.6	16.0 - 7.3
41	6°55.3	6°56.4	6°36.3	4.1 - 1.9	10.1 - 4.6	16.1 - 7.4
42	6°55.5	6°56.6	6°36.6	4.2 - 1.9	10.2 - 4.7	16.2 - 7.4
43	6°55.7	6°56.9	6°36.8	4.3 - 2.0	10.3 - 4.7	16.3 - 7.5
44	6°56.0	6°57.1	6°37.0	4.4 - 2.0	10.4 - 4.8	16.4 - 7.5
45	6°56.3	6°57.4	6°37.3	4.5 - 2.1	10.5 - 4.8	16.5 - 7.6
46	6°56.5	6°57.6	6°37.5	4.6 - 2.1	10.6 - 4.9	16.6 - 7.6
47	6°56.8	6°57.9	6°37.8	4.7 - 2.2	10.7 - 4.9	16.7 - 7.7
48	6°57.0	6°58.1	6°38.0	4.8 - 2.2	10.8 - 5.0	16.8 - 7.7
49	6°57.3	6°58.4	6°38.2	4.9 - 2.2	10.9 - 5.0	16.9 - 7.7
50	6°57.5	6°58.6	6°38.5	5.0 - 2.3	11.0 - 5.0	17.0 - 7.8
51	6°57.8	6°58.9	6°38.7	5.1 - 2.3	11.1 - 5.1	17.1 - 7.8
52	6°58.0	6°59.1	6°39.0	5.2 - 2.4	11.2 - 5.1	17.2 - 7.9
53	6°58.2	6°59.4	6°39.2	5.3 - 2.4	11.3 - 5.2	17.3 - 7.9
54	6°58.5	6°59.6	6°39.4	5.4 - 2.5	11.4 - 5.2	17.4 - 8.0
55	6°58.8	6°59.9	6°39.7	5.5 - 2.5	11.5 - 5.3	17.5 - 8.0
56	6°59.0	7°00.1	6°39.9	5.6 - 2.6	11.6 - 5.3	17.6 - 8.1
57	6°59.2	7°00.4	6°40.2	5.7 - 2.6	11.7 - 5.4	17.7 - 8.1
58	6°59.5	7°00.6	6°40.4	5.8 - 2.7	11.8 - 5.4	17.8 - 8.2
59	6°59.8	7°00.9	6°40.6	5.9 - 2.7	11.9 - 5.5	17.9 - 8.2

m 28	Sun Plan.	Aries	Moon	v and d corr		
0	7°00.0	7°01.1	6°40.9	0.0 - 0.0	6.0 - 2.8	12.0 - 5.7
1	7°00.2	7°01.4	6°41.1	0.1 - 0.0	6.1 - 2.9	12.1 - 5.7
2	7°00.5	7°01.6	6°41.3	0.2 - 0.1	6.2 - 2.9	12.2 - 5.8
3	7°00.8	7°01.9	6°41.6	0.3 - 0.1	6.3 - 3.0	12.3 - 5.8
4	7°01.0	7°02.2	6°41.8	0.4 - 0.2	6.4 - 3.0	12.4 - 5.9
5	7°01.2	7°02.4	6°42.1	0.5 - 0.2	6.5 - 3.1	12.5 - 5.9
6	7°01.5	7°02.7	6°42.3	0.6 - 0.3	6.6 - 3.1	12.6 - 6.0
7	7°01.8	7°02.9	6°42.5	0.7 - 0.3	6.7 - 3.2	12.7 - 6.0
8	7°02.0	7°03.2	6°42.8	0.8 - 0.4	6.8 - 3.2	12.8 - 6.1
9	7°02.2	7°03.4	6°43.0	0.9 - 0.4	6.9 - 3.3	12.9 - 6.1
10	7°02.5	7°03.7	6°43.3	1.0 - 0.5	7.0 - 3.3	13.0 - 6.2
11	7°02.8	7°03.9	6°43.5	1.1 - 0.5	7.1 - 3.4	13.1 - 6.2
12	7°03.0	7°04.2	6°43.7	1.2 - 0.6	7.2 - 3.4	13.2 - 6.3
13	7°03.2	7°04.4	6°44.0	1.3 - 0.6	7.3 - 3.5	13.3 - 6.3
14	7°03.5	7°04.7	6°44.2	1.4 - 0.7	7.4 - 3.5	13.4 - 6.4
15	7°03.8	7°04.9	6°44.4	1.5 - 0.7	7.5 - 3.6	13.5 - 6.4
16	7°04.0	7°05.2	6°44.7	1.6 - 0.8	7.6 - 3.6	13.6 - 6.5
17	7°04.3	7°05.4	6°44.9	1.7 - 0.8	7.7 - 3.7	13.7 - 6.5
18	7°04.5	7°05.7	6°45.2	1.8 - 0.9	7.8 - 3.7	13.8 - 6.6
19	7°04.7	7°05.9	6°45.4	1.9 - 0.9	7.9 - 3.8	13.9 - 6.6
20	7°05.0	7°06.2	6°45.6	2.0 - 0.9	8.0 - 3.8	14.0 - 6.6
21	7°05.3	7°06.4	6°45.9	2.1 - 1.0	8.1 - 3.8	14.1 - 6.7
22	7°05.5	7°06.7	6°46.1	2.2 - 1.0	8.2 - 3.9	14.2 - 6.7
23	7°05.7	7°06.9	6°46.4	2.3 - 1.1	8.3 - 3.9	14.3 - 6.8
24	7°06.0	7°07.2	6°46.6	2.4 - 1.1	8.4 - 4.0	14.4 - 6.8
25	7°06.3	7°07.4	6°46.8	2.5 - 1.2	8.5 - 4.0	14.5 - 6.9
26	7°06.5	7°07.7	6°47.1	2.6 - 1.2	8.6 - 4.1	14.6 - 6.9
27	7°06.7	7°07.9	6°47.3	2.7 - 1.3	8.7 - 4.1	14.7 - 7.0
28	7°07.0	7°08.2	6°47.5	2.8 - 1.3	8.8 - 4.2	14.8 - 7.0
29	7°07.3	7°08.4	6°47.8	2.9 - 1.4	8.9 - 4.2	14.9 - 7.1
30	7°07.5	7°08.7	6°48.0	3.0 - 1.4	9.0 - 4.3	15.0 - 7.1
31	7°07.7	7°08.9	6°48.3	3.1 - 1.5	9.1 - 4.3	15.1 - 7.2
32	7°08.0	7°09.2	6°48.5	3.2 - 1.5	9.2 - 4.4	15.2 - 7.2
33	7°08.3	7°09.4	6°48.7	3.3 - 1.6	9.3 - 4.4	15.3 - 7.3
34	7°08.5	7°09.7	6°49.0	3.4 - 1.6	9.4 - 4.5	15.4 - 7.3
35	7°08.7	7°09.9	6°49.2	3.5 - 1.7	9.5 - 4.5	15.5 - 7.4
36	7°09.0	7°10.2	6°49.5	3.6 - 1.7	9.6 - 4.6	15.6 - 7.4
37	7°09.3	7°10.4	6°49.7	3.7 - 1.8	9.7 - 4.6	15.7 - 7.5
38	7°09.5	7°10.7	6°49.9	3.8 - 1.8	9.8 - 4.7	15.8 - 7.5
39	7°09.7	7°10.9	6°50.2	3.9 - 1.9	9.9 - 4.7	15.9 - 7.6
40	7°10.0	7°11.2	6°50.4	4.0 - 1.9	10.0 - 4.8	16.0 - 7.6
41	7°10.3	7°11.4	6°50.6	4.1 - 1.9	10.1 - 4.8	16.1 - 7.6
42	7°10.5	7°11.7	6°50.9	4.2 - 2.0	10.2 - 4.8	16.2 - 7.7
43	7°10.7	7°11.9	6°51.1	4.3 - 2.0	10.3 - 4.9	16.3 - 7.7
44	7°11.0	7°12.2	6°51.4	4.4 - 2.1	10.4 - 4.9	16.4 - 7.8
45	7°11.3	7°12.4	6°51.6	4.5 - 2.1	10.5 - 5.0	16.5 - 7.8
46	7°11.5	7°12.7	6°51.8	4.6 - 2.2	10.6 - 5.0	16.6 - 7.9
47	7°11.8	7°12.9	6°52.1	4.7 - 2.2	10.7 - 5.1	16.7 - 7.9
48	7°12.0	7°13.2	6°52.3	4.8 - 2.3	10.8 - 5.1	16.8 - 8.0
49	7°12.2	7°13.4	6°52.6	4.9 - 2.3	10.9 - 5.2	16.9 - 8.0
50	7°12.5	7°13.7	6°52.8	5.0 - 2.4	11.0 - 5.2	17.0 - 8.1
51	7°12.8	7°13.9	6°53.0	5.1 - 2.4	11.1 - 5.3	17.1 - 8.1
52	7°13.0	7°14.2	6°53.3	5.2 - 2.5	11.2 - 5.3	17.2 - 8.2
53	7°13.2	7°14.4	6°53.5	5.3 - 2.5	11.3 - 5.4	17.3 - 8.2
54	7°13.5	7°14.7	6°53.8	5.4 - 2.6	11.4 - 5.4	17.4 - 8.3
55	7°13.8	7°14.9	6°54.0	5.5 - 2.6	11.5 - 5.5	17.5 - 8.3
56	7°14.0	7°15.2	6°54.2	5.6 - 2.7	11.6 - 5.5	17.6 - 8.4
57	7°14.2	7°15.4	6°54.5	5.7 - 2.7	11.7 - 5.6	17.7 - 8.4
58	7°14.5	7°15.7	6°54.7	5.8 - 2.8	11.8 - 5.6	17.8 - 8.5
59	7°14.8	7°15.9	6°54.9	5.9 - 2.8	11.9 - 5.7	17.9 - 8.5

m 29	Sun Plan.	Aries	Moon	v and d corr		
0	7°15.0	7°16.2	6°55.2	0.0 - 0.0	6.0 - 2.9	12.0 - 5.9
1	7°15.2	7°16.4	6°55.4	0.1 - 0.0	6.1 - 3.0	12.1 - 5.9
2	7°15.5	7°16.7	6°55.7	0.2 - 0.1	6.2 - 3.0	12.2 - 6.0
3	7°15.8	7°16.9	6°55.9	0.3 - 0.1	6.3 - 3.1	12.3 - 6.0
4	7°16.0	7°17.2	6°56.1	0.4 - 0.2	6.4 - 3.1	12.4 - 6.1
5	7°16.2	7°17.4	6°56.4	0.5 - 0.2	6.5 - 3.2	12.5 - 6.1
6	7°16.5	7°17.7	6°56.6	0.6 - 0.3	6.6 - 3.2	12.6 - 6.2
7	7°16.8	7°17.9	6°56.9	0.7 - 0.3	6.7 - 3.3	12.7 - 6.2
8	7°17.0	7°18.2	6°57.1	0.8 - 0.4	6.8 - 3.3	12.8 - 6.3
9	7°17.2	7°18.4	6°57.3	0.9 - 0.4	6.9 - 3.4	12.9 - 6.3
10	7°17.5	7°18.7	6°57.6	1.0 - 0.5	7.0 - 3.4	13.0 - 6.4
11	7°17.8	7°18.9	6°57.8	1.1 - 0.5	7.1 - 3.5	13.1 - 6.4
12	7°18.0	7°19.2	6°58.0	1.2 - 0.6	7.2 - 3.5	13.2 - 6.5
13	7°18.2	7°19.4	6°58.3	1.3 - 0.6	7.3 - 3.6	13.3 - 6.5
14	7°18.5	7°19.7	6°58.5	1.4 - 0.7	7.4 - 3.6	13.4 - 6.6
15	7°18.8	7°19.9	6°58.8	1.5 - 0.7	7.5 - 3.7	13.5 - 6.6
16	7°19.0	7°20.2	6°59.0	1.6 - 0.8	7.6 - 3.7	13.6 - 6.7
17	7°19.3	7°20.5	6°59.2	1.7 - 0.8	7.7 - 3.8	13.7 - 6.7
18	7°19.5	7°20.7	6°59.5	1.8 - 0.9	7.8 - 3.8	13.8 - 6.8
19	7°19.7	7°21.0	6°59.7	1.9 - 0.9	7.9 - 3.9	13.9 - 6.8
20	7°20.0	7°21.2	7°00.0	2.0 - 1.0	8.0 - 3.9	14.0 - 6.9
21	7°20.3	7°21.5	7°00.2	2.1 - 1.0	8.1 - 4.0	14.1 - 6.9
22	7°20.5	7°21.7	7°00.4	2.2 - 1.1	8.2 - 4.0	14.2 - 7.0
23	7°20.7	7°22.0	7°00.7	2.3 - 1.1	8.3 - 4.1	14.3 - 7.0
24	7°21.0	7°22.2	7°00.9	2.4 - 1.2	8.4 - 4.1	14.4 - 7.1
25	7°21.3	7°22.5	7°01.1	2.5 - 1.2	8.5 - 4.2	14.5 - 7.1
26	7°21.5	7°22.7	7°01.4	2.6 - 1.3	8.6 - 4.2	14.6 - 7.2
27	7°21.7	7°23.0	7°01.6	2.7 - 1.3	8.7 - 4.3	14.7 - 7.2
28	7°22.0	7°23.2	7°01.9	2.8 - 1.4	8.8 - 4.3	14.8 - 7.3
29	7°22.3	7°23.5	7°02.1	2.9 - 1.4	8.9 - 4.4	14.9 - 7.3
30	7°22.5	7°23.7	7°02.3	3.0 - 1.5	9.0 - 4.4	15.0 - 7.4
31	7°22.7	7°24.0	7°02.6	3.1 - 1.5	9.1 - 4.5	15.1 - 7.4
32	7°23.0	7°24.2	7°02.8	3.2 - 1.6	9.2 - 4.5	15.2 - 7.5
33	7°23.3	7°24.5	7°03.1	3.3 - 1.6	9.3 - 4.6	15.3 - 7.5
34	7°23.5	7°24.7	7°03.3	3.4 - 1.7	9.4 - 4.6	15.4 - 7.6
35	7°23.7	7°25.0	7°03.5	3.5 - 1.7	9.5 - 4.7	15.5 - 7.6
36	7°24.0	7°25.2	7°03.8	3.6 - 1.8	9.6 - 4.7	15.6 - 7.7
37	7°24.3	7°25.5	7°04.0	3.7 - 1.8	9.7 - 4.8	15.7 - 7.7
38	7°24.5	7°25.7	7°04.3	3.8 - 1.9	9.8 - 4.8	15.8 - 7.8
39	7°24.7	7°26.0	7°04.5	3.9 - 1.9	9.9 - 4.9	15.9 - 7.8
40	7°25.0	7°26.2	7°04.7	4.0 - 2.0	10.0 - 4.9	16.0 - 7.9
41	7°25.3	7°26.5	7°05.0	4.1 - 2.0	10.1 - 5.0	16.1 - 7.9
42	7°25.5	7°26.7	7°05.2	4.2 - 2.1	10.2 - 5.0	16.2 - 8.0
43	7°25.7	7°27.0	7°05.4	4.3 - 2.1	10.3 - 5.1	16.3 - 8.0
44	7°26.0	7°27.2	7°05.7	4.4 - 2.2	10.4 - 5.1	16.4 - 8.1
45	7°26.3	7°27.5	7°05.9	4.5 - 2.2	10.5 - 5.2	16.5 - 8.1
46	7°26.5	7°27.7	7°06.2	4.6 - 2.3	10.6 - 5.2	16.6 - 8.2
47	7°26.8	7°28.0	7°06.4	4.7 - 2.3	10.7 - 5.3	16.7 - 8.2
48	7°27.0	7°28.2	7°06.6	4.8 - 2.4	10.8 - 5.3	16.8 - 8.3
49	7°27.2	7°28.5	7°06.9	4.9 - 2.4	10.9 - 5.4	16.9 - 8.3
50	7°27.5	7°28.7	7°07.1	5.0 - 2.5	11.0 - 5.4	17.0 - 8.4
51	7°27.8	7°29.0	7°07.4	5.1 - 2.5	11.1 - 5.5	17.1 - 8.4
52	7°28.0	7°29.2	7°07.6	5.2 - 2.6	11.2 - 5.5	17.2 - 8.5
53	7°28.2	7°29.5	7°07.8	5.3 - 2.6	11.3 - 5.6	17.3 - 8.5
54	7°28.5	7°29.7	7°08.1	5.4 - 2.7	11.4 - 5.6	17.4 - 8.6
55	7°28.8	7°30.0	7°08.3	5.5 - 2.7	11.5 - 5.7	17.5 - 8.6
56	7°29.0	7°30.2	7°08.5	5.6 - 2.8	11.6 - 5.7	17.6 - 8.7
57	7°29.2	7°30.5	7°08.8	5.7 - 2.8	11.7 - 5.8	17.7 - 8.7
58	7°29.5	7°30.7	7°09.0	5.8 - 2.9	11.8 - 5.8	17.8 - 8.8
59	7°29.8	7°31.0	7°09.3	5.9 - 2.9	11.9 - 5.9	17.9 - 8.8

Increments and Corrections

m 30	Sun Plan.	Aries	Moon	v and d corr		
0	7°30.0	7°31.2	7°09.5	0.0 - 0.0	6.0 - 3.0	12.0 - 6.1
1	7°30.2	7°31.5	7°09.7	0.1 - 0.1	6.1 - 3.1	12.1 - 6.2
2	7°30.5	7°31.7	7°10.0	0.2 - 0.1	6.2 - 3.2	12.2 - 6.2
3	7°30.8	7°32.0	7°10.2	0.3 - 0.2	6.3 - 3.2	12.3 - 6.3
4	7°31.0	7°32.2	7°10.5	0.4 - 0.2	6.4 - 3.3	12.4 - 6.3
5	7°31.2	7°32.5	7°10.7	0.5 - 0.3	6.5 - 3.3	12.5 - 6.4
6	7°31.5	7°32.7	7°10.9	0.6 - 0.3	6.6 - 3.4	12.6 - 6.4
7	7°31.7	7°33.0	7°11.2	0.7 - 0.4	6.7 - 3.4	12.7 - 6.5
8	7°32.0	7°33.2	7°11.4	0.8 - 0.4	6.8 - 3.5	12.8 - 6.5
9	7°32.2	7°33.5	7°11.6	0.9 - 0.5	6.9 - 3.5	12.9 - 6.6
10	7°32.5	7°33.7	7°11.9	1.0 - 0.5	7.0 - 3.6	13.0 - 6.6
11	7°32.8	7°34.0	7°12.1	1.1 - 0.6	7.1 - 3.6	13.1 - 6.7
12	7°33.0	7°34.2	7°12.4	1.2 - 0.6	7.2 - 3.7	13.2 - 6.7
13	7°33.3	7°34.5	7°12.6	1.3 - 0.7	7.3 - 3.7	13.3 - 6.8
14	7°33.5	7°34.7	7°12.8	1.4 - 0.7	7.4 - 3.8	13.4 - 6.8
15	7°33.8	7°35.0	7°13.1	1.5 - 0.8	7.5 - 3.8	13.5 - 6.9
16	7°34.0	7°35.2	7°13.3	1.6 - 0.8	7.6 - 3.9	13.6 - 6.9
17	7°34.3	7°35.5	7°13.6	1.7 - 0.9	7.7 - 3.9	13.7 - 7.0
18	7°34.5	7°35.7	7°13.8	1.8 - 0.9	7.8 - 4.0	13.8 - 7.0
19	7°34.8	7°36.0	7°14.0	1.9 - 1.0	7.9 - 4.0	13.9 - 7.1
20	7°35.0	7°36.2	7°14.3	2.0 - 1.0	8.0 - 4.1	14.0 - 7.1
21	7°35.3	7°36.5	7°14.5	2.1 - 1.1	8.1 - 4.1	14.1 - 7.2
22	7°35.5	7°36.7	7°14.7	2.2 - 1.1	8.2 - 4.2	14.2 - 7.2
23	7°35.7	7°37.0	7°15.0	2.3 - 1.2	8.3 - 4.2	14.3 - 7.3
24	7°36.0	7°37.2	7°15.2	2.4 - 1.2	8.4 - 4.3	14.4 - 7.3
25	7°36.2	7°37.5	7°15.5	2.5 - 1.3	8.5 - 4.3	14.5 - 7.4
26	7°36.5	7°37.7	7°15.7	2.6 - 1.3	8.6 - 4.4	14.6 - 7.4
27	7°36.7	7°38.0	7°15.9	2.7 - 1.4	8.7 - 4.4	14.7 - 7.5
28	7°37.0	7°38.2	7°16.2	2.8 - 1.4	8.8 - 4.5	14.8 - 7.5
29	7°37.3	7°38.5	7°16.4	2.9 - 1.5	8.9 - 4.5	14.9 - 7.6
30	7°37.5	7°38.8	7°16.7	3.0 - 1.5	9.0 - 4.6	15.0 - 7.6
31	7°37.7	7°39.0	7°16.9	3.1 - 1.6	9.1 - 4.6	15.1 - 7.7
32	7°38.0	7°39.3	7°17.1	3.2 - 1.6	9.2 - 4.7	15.2 - 7.7
33	7°38.3	7°39.5	7°17.4	3.3 - 1.7	9.3 - 4.7	15.3 - 7.8
34	7°38.5	7°39.8	7°17.6	3.4 - 1.7	9.4 - 4.8	15.4 - 7.8
35	7°38.7	7°40.0	7°17.9	3.5 - 1.8	9.5 - 4.8	15.5 - 7.9
36	7°39.0	7°40.3	7°18.1	3.6 - 1.8	9.6 - 4.9	15.6 - 7.9
37	7°39.3	7°40.5	7°18.3	3.7 - 1.9	9.7 - 4.9	15.7 - 8.0
38	7°39.5	7°40.8	7°18.6	3.8 - 1.9	9.8 - 5.0	15.8 - 8.0
39	7°39.8	7°41.0	7°18.8	3.9 - 2.0	9.9 - 5.0	15.9 - 8.1
40	7°40.0	7°41.3	7°19.0	4.0 - 2.0	10.0 - 5.1	16.0 - 8.1
41	7°40.3	7°41.5	7°19.3	4.1 - 2.1	10.1 - 5.1	16.1 - 8.2
42	7°40.5	7°41.8	7°19.5	4.2 - 2.1	10.2 - 5.2	16.2 - 8.2
43	7°40.7	7°42.0	7°19.8	4.3 - 2.2	10.3 - 5.2	16.3 - 8.3
44	7°41.0	7°42.3	7°20.0	4.4 - 2.2	10.4 - 5.3	16.4 - 8.3
45	7°41.2	7°42.5	7°20.2	4.5 - 2.3	10.5 - 5.3	16.5 - 8.4
46	7°41.5	7°42.8	7°20.5	4.6 - 2.3	10.6 - 5.4	16.6 - 8.4
47	7°41.8	7°43.0	7°20.7	4.7 - 2.4	10.7 - 5.4	16.7 - 8.5
48	7°42.0	7°43.3	7°21.0	4.8 - 2.4	10.8 - 5.5	16.8 - 8.5
49	7°42.3	7°43.5	7°21.2	4.9 - 2.5	10.9 - 5.5	16.9 - 8.6
50	7°42.5	7°43.8	7°21.4	5.0 - 2.5	11.0 - 5.6	17.0 - 8.6
51	7°42.8	7°44.0	7°21.7	5.1 - 2.6	11.1 - 5.6	17.1 - 8.7
52	7°43.0	7°44.3	7°21.9	5.2 - 2.6	11.2 - 5.7	17.2 - 8.7
53	7°43.2	7°44.5	7°22.1	5.3 - 2.7	11.3 - 5.7	17.3 - 8.8
54	7°43.5	7°44.8	7°22.4	5.4 - 2.7	11.4 - 5.8	17.4 - 8.8
55	7°43.8	7°45.0	7°22.6	5.5 - 2.8	11.5 - 5.8	17.5 - 8.9
56	7°44.0	7°45.3	7°22.9	5.6 - 2.8	11.6 - 5.9	17.6 - 8.9
57	7°44.3	7°45.5	7°23.1	5.7 - 2.9	11.7 - 5.9	17.7 - 9.0
58	7°44.5	7°45.8	7°23.3	5.8 - 2.9	11.8 - 6.0	17.8 - 9.0
59	7°44.8	7°46.0	7°23.6	5.9 - 3.0	11.9 - 6.0	17.9 - 9.1

m 31	Sun Plan.	Aries	Moon	v and d corr		
0	7°45.0	7°46.3	7°23.8	0.0 - 0.0	6.0 - 3.2	12.0 - 6.3
1	7°45.2	7°46.5	7°24.1	0.1 - 0.1	6.1 - 3.2	12.1 - 6.4
2	7°45.5	7°46.8	7°24.3	0.2 - 0.1	6.2 - 3.3	12.2 - 6.4
3	7°45.7	7°47.0	7°24.5	0.3 - 0.2	6.3 - 3.3	12.3 - 6.5
4	7°46.0	7°47.3	7°24.8	0.4 - 0.2	6.4 - 3.4	12.4 - 6.5
5	7°46.2	7°47.5	7°25.0	0.5 - 0.3	6.5 - 3.4	12.5 - 6.6
6	7°46.5	7°47.8	7°25.2	0.6 - 0.3	6.6 - 3.5	12.6 - 6.6
7	7°46.8	7°48.0	7°25.5	0.7 - 0.4	6.7 - 3.5	12.7 - 6.7
8	7°47.0	7°48.3	7°25.7	0.8 - 0.4	6.8 - 3.6	12.8 - 6.7
9	7°47.2	7°48.5	7°26.0	0.9 - 0.5	6.9 - 3.6	12.9 - 6.8
10	7°47.5	7°48.8	7°26.2	1.0 - 0.5	7.0 - 3.7	13.0 - 6.8
11	7°47.7	7°49.0	7°26.4	1.1 - 0.6	7.1 - 3.7	13.1 - 6.9
12	7°48.0	7°49.3	7°26.7	1.2 - 0.6	7.2 - 3.8	13.2 - 6.9
13	7°48.2	7°49.5	7°26.9	1.3 - 0.7	7.3 - 3.8	13.3 - 7.0
14	7°48.5	7°49.8	7°27.2	1.4 - 0.7	7.4 - 3.9	13.4 - 7.0
15	7°48.8	7°50.0	7°27.4	1.5 - 0.8	7.5 - 3.9	13.5 - 7.1
16	7°49.0	7°50.3	7°27.6	1.6 - 0.8	7.6 - 4.0	13.6 - 7.1
17	7°49.3	7°50.5	7°27.9	1.7 - 0.9	7.7 - 4.0	13.7 - 7.2
18	7°49.5	7°50.8	7°28.1	1.8 - 0.9	7.8 - 4.1	13.8 - 7.2
19	7°49.8	7°51.0	7°28.4	1.9 - 1.0	7.9 - 4.1	13.9 - 7.3
20	7°50.0	7°51.3	7°28.6	2.0 - 1.1	8.0 - 4.2	14.0 - 7.4
21	7°50.3	7°51.5	7°28.8	2.1 - 1.1	8.1 - 4.3	14.1 - 7.4
22	7°50.5	7°51.8	7°29.1	2.2 - 1.2	8.2 - 4.3	14.2 - 7.5
23	7°50.7	7°52.0	7°29.3	2.3 - 1.2	8.3 - 4.4	14.3 - 7.5
24	7°51.0	7°52.3	7°29.5	2.4 - 1.3	8.4 - 4.4	14.4 - 7.6
25	7°51.3	7°52.5	7°29.8	2.5 - 1.3	8.5 - 4.5	14.5 - 7.6
26	7°51.5	7°52.8	7°30.0	2.6 - 1.4	8.6 - 4.5	14.6 - 7.7
27	7°51.7	7°53.0	7°30.3	2.7 - 1.4	8.7 - 4.6	14.7 - 7.7
28	7°52.0	7°53.3	7°30.5	2.8 - 1.5	8.8 - 4.6	14.8 - 7.8
29	7°52.2	7°53.5	7°30.7	2.9 - 1.5	8.9 - 4.7	14.9 - 7.8
30	7°52.5	7°53.8	7°31.0	3.0 - 1.6	9.0 - 4.7	15.0 - 7.9
31	7°52.7	7°54.0	7°31.2	3.1 - 1.6	9.1 - 4.8	15.1 - 7.9
32	7°53.0	7°54.3	7°31.5	3.2 - 1.7	9.2 - 4.8	15.2 - 8.0
33	7°53.3	7°54.5	7°31.7	3.3 - 1.7	9.3 - 4.9	15.3 - 8.0
34	7°53.5	7°54.8	7°31.9	3.4 - 1.8	9.4 - 4.9	15.4 - 8.1
35	7°53.8	7°55.0	7°32.2	3.5 - 1.8	9.5 - 5.0	15.5 - 8.1
36	7°54.0	7°55.3	7°32.4	3.6 - 1.9	9.6 - 5.0	15.6 - 8.2
37	7°54.3	7°55.5	7°32.6	3.7 - 1.9	9.7 - 5.1	15.7 - 8.2
38	7°54.5	7°55.8	7°32.9	3.8 - 2.0	9.8 - 5.1	15.8 - 8.3
39	7°54.7	7°56.0	7°33.1	3.9 - 2.0	9.9 - 5.2	15.9 - 8.3
40	7°55.0	7°56.3	7°33.4	4.0 - 2.1	10.0 - 5.3	16.0 - 8.4
41	7°55.3	7°56.5	7°33.6	4.1 - 2.2	10.1 - 5.3	16.1 - 8.5
42	7°55.5	7°56.8	7°33.8	4.2 - 2.2	10.2 - 5.4	16.2 - 8.5
43	7°55.7	7°57.1	7°34.1	4.3 - 2.3	10.3 - 5.4	16.3 - 8.6
44	7°56.0	7°57.3	7°34.3	4.4 - 2.3	10.4 - 5.5	16.4 - 8.6
45	7°56.3	7°57.6	7°34.6	4.5 - 2.4	10.5 - 5.5	16.5 - 8.7
46	7°56.5	7°57.8	7°34.8	4.6 - 2.4	10.6 - 5.6	16.6 - 8.7
47	7°56.7	7°58.1	7°35.0	4.7 - 2.5	10.7 - 5.6	16.7 - 8.8
48	7°57.0	7°58.3	7°35.3	4.8 - 2.5	10.8 - 5.7	16.8 - 8.8
49	7°57.2	7°58.6	7°35.5	4.9 - 2.6	10.9 - 5.7	16.9 - 8.9
50	7°57.5	7°58.8	7°35.7	5.0 - 2.6	11.0 - 5.8	17.0 - 8.9
51	7°57.8	7°59.1	7°36.0	5.1 - 2.7	11.1 - 5.8	17.1 - 9.0
52	7°58.0	7°59.3	7°36.2	5.2 - 2.7	11.2 - 5.9	17.2 - 9.0
53	7°58.2	7°59.6	7°36.5	5.3 - 2.8	11.3 - 5.9	17.3 - 9.1
54	7°58.5	7°59.8	7°36.7	5.4 - 2.8	11.4 - 6.0	17.4 - 9.1
55	7°58.8	8°00.1	7°36.9	5.5 - 2.9	11.5 - 6.0	17.5 - 9.2
56	7°59.0	8°00.3	7°37.2	5.6 - 2.9	11.6 - 6.1	17.6 - 9.2
57	7°59.2	8°00.6	7°37.4	5.7 - 3.0	11.7 - 6.1	17.7 - 9.3
58	7°59.5	8°00.8	7°37.7	5.8 - 3.0	11.8 - 6.2	17.8 - 9.3
59	7°59.8	8°01.1	7°37.9	5.9 - 3.1	11.9 - 6.2	17.9 - 9.4

m 32	Sun Plan.	Aries	Moon	v and d corr		
0	8°00.0	8°01.3	7°38.1	0.0 - 0.0	6.0 - 3.3	12.0 - 6.5
1	8°00.2	8°01.6	7°38.4	0.1 - 0.1	6.1 - 3.3	12.1 - 6.6
2	8°00.5	8°01.8	7°38.6	0.2 - 0.1	6.2 - 3.4	12.2 - 6.6
3	8°00.7	8°02.1	7°38.8	0.3 - 0.2	6.3 - 3.4	12.3 - 6.7
4	8°01.0	8°02.3	7°39.1	0.4 - 0.2	6.4 - 3.5	12.4 - 6.7
5	8°01.3	8°02.6	7°39.3	0.5 - 0.3	6.5 - 3.5	12.5 - 6.8
6	8°01.5	8°02.8	7°39.6	0.6 - 0.3	6.6 - 3.6	12.6 - 6.8
7	8°01.8	8°03.1	7°39.8	0.7 - 0.4	6.7 - 3.6	12.7 - 6.9
8	8°02.0	8°03.3	7°40.0	0.8 - 0.4	6.8 - 3.7	12.8 - 6.9
9	8°02.2	8°03.6	7°40.3	0.9 - 0.5	6.9 - 3.7	12.9 - 7.0
10	8°02.5	8°03.8	7°40.5	1.0 - 0.5	7.0 - 3.8	13.0 - 7.0
11	8°02.7	8°04.1	7°40.8	1.1 - 0.6	7.1 - 3.8	13.1 - 7.1
12	8°03.0	8°04.3	7°41.0	1.2 - 0.7	7.2 - 3.9	13.2 - 7.1
13	8°03.3	8°04.6	7°41.2	1.3 - 0.7	7.3 - 4.0	13.3 - 7.2
14	8°03.5	8°04.8	7°41.5	1.4 - 0.8	7.4 - 4.0	13.4 - 7.3
15	8°03.8	8°05.1	7°41.7	1.5 - 0.8	7.5 - 4.1	13.5 - 7.3
16	8°04.0	8°05.3	7°42.0	1.6 - 0.9	7.6 - 4.1	13.6 - 7.4
17	8°04.2	8°05.6	7°42.2	1.7 - 0.9	7.7 - 4.2	13.7 - 7.4
18	8°04.5	8°05.8	7°42.4	1.8 - 1.0	7.8 - 4.2	13.8 - 7.5
19	8°04.8	8°06.1	7°42.7	1.9 - 1.0	7.9 - 4.3	13.9 - 7.5
20	8°05.0	8°06.3	7°42.9	2.0 - 1.1	8.0 - 4.3	14.0 - 7.6
21	8°05.3	8°06.6	7°43.1	2.1 - 1.1	8.1 - 4.4	14.1 - 7.6
22	8°05.5	8°06.8	7°43.4	2.2 - 1.2	8.2 - 4.4	14.2 - 7.7
23	8°05.7	8°07.1	7°43.6	2.3 - 1.2	8.3 - 4.5	14.3 - 7.7
24	8°06.0	8°07.3	7°43.9	2.4 - 1.3	8.4 - 4.5	14.4 - 7.8
25	8°06.2	8°07.6	7°44.1	2.5 - 1.4	8.5 - 4.6	14.5 - 7.9
26	8°06.5	8°07.8	7°44.3	2.6 - 1.4	8.6 - 4.7	14.6 - 7.9
27	8°06.8	8°08.1	7°44.6	2.7 - 1.5	8.7 - 4.7	14.7 - 8.0
28	8°07.0	8°08.3	7°44.8	2.8 - 1.5	8.8 - 4.8	14.8 - 8.0
29	8°07.3	8°08.6	7°45.1	2.9 - 1.6	8.9 - 4.8	14.9 - 8.1
30	8°07.5	8°08.8	7°45.3	3.0 - 1.6	9.0 - 4.9	15.0 - 8.1
31	8°07.7	8°09.1	7°45.5	3.1 - 1.7	9.1 - 4.9	15.1 - 8.2
32	8°08.0	8°09.3	7°45.8	3.2 - 1.7	9.2 - 5.0	15.2 - 8.2
33	8°08.2	8°09.6	7°46.0	3.3 - 1.8	9.3 - 5.0	15.3 - 8.3
34	8°08.5	8°09.8	7°46.2	3.4 - 1.8	9.4 - 5.1	15.4 - 8.3
35	8°08.8	8°10.1	7°46.5	3.5 - 1.9	9.5 - 5.1	15.5 - 8.4
36	8°09.0	8°10.3	7°46.7	3.6 - 1.9	9.6 - 5.2	15.6 - 8.4
37	8°09.3	8°10.6	7°47.0	3.7 - 2.0	9.7 - 5.3	15.7 - 8.5
38	8°09.5	8°10.8	7°47.2	3.8 - 2.1	9.8 - 5.3	15.8 - 8.6
39	8°09.7	8°11.1	7°47.4	3.9 - 2.1	9.9 - 5.4	15.9 - 8.6
40	8°10.0	8°11.3	7°47.7	4.0 - 2.2	10.0 - 5.4	16.0 - 8.7
41	8°10.2	8°11.6	7°47.9	4.1 - 2.2	10.1 - 5.5	16.1 - 8.7
42	8°10.5	8°11.8	7°48.2	4.2 - 2.3	10.2 - 5.5	16.2 - 8.8
43	8°10.8	8°12.1	7°48.4	4.3 - 2.3	10.3 - 5.6	16.3 - 8.8
44	8°11.0	8°12.3	7°48.6	4.4 - 2.4	10.4 - 5.6	16.4 - 8.9
45	8°11.3	8°12.6	7°48.9	4.5 - 2.4	10.5 - 5.7	16.5 - 8.9
46	8°11.5	8°12.8	7°49.1	4.6 - 2.5	10.6 - 5.7	16.6 - 9.0
47	8°11.7	8°13.1	7°49.3	4.7 - 2.5	10.7 - 5.8	16.7 - 9.0
48	8°12.0	8°13.3	7°49.6	4.8 - 2.6	10.8 - 5.8	16.8 - 9.1
49	8°12.3	8°13.6	7°49.8	4.9 - 2.7	10.9 - 5.9	16.9 - 9.2
50	8°12.5	8°13.8	7°50.1	5.0 - 2.7	11.0 - 6.0	17.0 - 9.2
51	8°12.8	8°14.1	7°50.3	5.1 - 2.8	11.1 - 6.0	17.1 - 9.3
52	8°13.0	8°14.3	7°50.5	5.2 - 2.8	11.2 - 6.1	17.2 - 9.3
53	8°13.2	8°14.6	7°50.8	5.3 - 2.9	11.3 - 6.1	17.3 - 9.4
54	8°13.5	8°14.8	7°51.0	5.4 - 2.9	11.4 - 6.2	17.4 - 9.4
55	8°13.7	8°15.1	7°51.3	5.5 - 3.0	11.5 - 6.2	17.5 - 9.5
56	8°14.0	8°15.4	7°51.5	5.6 - 3.0	11.6 - 6.3	17.6 - 9.5
57	8°14.3	8°15.6	7°51.7	5.7 - 3.1	11.7 - 6.3	17.7 - 9.6
58	8°14.5	8°15.9	7°52.0	5.8 - 3.1	11.8 - 6.4	17.8 - 9.6
59	8°14.8	8°16.1	7°52.2	5.9 - 3.2	11.9 - 6.4	17.9 - 9.7

Increments and Corrections

m 33	Sun Plan.	Aries	Moon	v and d corr		
0	8°15.0	8°16.4	7°52.5	0.0 - 0.0	6.0 - 3.4	12.0 - 6.7
1	8°15.2	8°16.6	7°52.7	0.1 - 0.1	6.1 - 3.4	12.1 - 6.8
2	8°15.5	8°16.9	7°52.9	0.2 - 0.1	6.2 - 3.5	12.2 - 6.8
3	8°15.7	8°17.1	7°53.2	0.3 - 0.2	6.3 - 3.5	12.3 - 6.9
4	8°16.0	8°17.4	7°53.4	0.4 - 0.2	6.4 - 3.6	12.4 - 6.9
5	8°16.3	8°17.6	7°53.6	0.5 - 0.3	6.5 - 3.6	12.5 - 7.0
6	8°16.5	8°17.9	7°53.9	0.6 - 0.3	6.6 - 3.7	12.6 - 7.0
7	8°16.8	8°18.1	7°54.1	0.7 - 0.4	6.7 - 3.7	12.7 - 7.1
8	8°17.0	8°18.4	7°54.4	0.8 - 0.4	6.8 - 3.8	12.8 - 7.1
9	8°17.2	8°18.6	7°54.6	0.9 - 0.5	6.9 - 3.9	12.9 - 7.2
10	8°17.5	8°18.9	7°54.8	1.0 - 0.6	7.0 - 3.9	13.0 - 7.3
11	8°17.7	8°19.1	7°55.1	1.1 - 0.6	7.1 - 4.0	13.1 - 7.3
12	8°18.0	8°19.4	7°55.3	1.2 - 0.7	7.2 - 4.0	13.2 - 7.4
13	8°18.3	8°19.6	7°55.6	1.3 - 0.7	7.3 - 4.1	13.3 - 7.4
14	8°18.5	8°19.9	7°55.8	1.4 - 0.8	7.4 - 4.1	13.4 - 7.5
15	8°18.8	8°20.1	7°56.0	1.5 - 0.8	7.5 - 4.2	13.5 - 7.5
16	8°19.0	8°20.4	7°56.3	1.6 - 0.9	7.6 - 4.2	13.6 - 7.6
17	8°19.2	8°20.6	7°56.5	1.7 - 0.9	7.7 - 4.3	13.7 - 7.6
18	8°19.5	8°20.9	7°56.7	1.8 - 1.0	7.8 - 4.4	13.8 - 7.7
19	8°19.8	8°21.1	7°57.0	1.9 - 1.1	7.9 - 4.4	13.9 - 7.8
20	8°20.0	8°21.4	7°57.2	2.0 - 1.1	8.0 - 4.5	14.0 - 7.8
21	8°20.3	8°21.6	7°57.5	2.1 - 1.2	8.1 - 4.5	14.1 - 7.9
22	8°20.5	8°21.9	7°57.7	2.2 - 1.2	8.2 - 4.6	14.2 - 7.9
23	8°20.7	8°22.1	7°57.9	2.3 - 1.3	8.3 - 4.6	14.3 - 8.0
24	8°21.0	8°22.4	7°58.2	2.4 - 1.3	8.4 - 4.7	14.4 - 8.0
25	8°21.2	8°22.6	7°58.4	2.5 - 1.4	8.5 - 4.7	14.5 - 8.1
26	8°21.5	8°22.9	7°58.7	2.6 - 1.5	8.6 - 4.8	14.6 - 8.2
27	8°21.8	8°23.1	7°58.9	2.7 - 1.5	8.7 - 4.9	14.7 - 8.2
28	8°22.0	8°23.4	7°59.1	2.8 - 1.6	8.8 - 4.9	14.8 - 8.3
29	8°22.3	8°23.6	7°59.4	2.9 - 1.6	8.9 - 5.0	14.9 - 8.3
30	8°22.5	8°23.9	7°59.6	3.0 - 1.7	9.0 - 5.0	15.0 - 8.4
31	8°22.7	8°24.1	7°59.8	3.1 - 1.7	9.1 - 5.1	15.1 - 8.4
32	8°23.0	8°24.4	8°00.1	3.2 - 1.8	9.2 - 5.1	15.2 - 8.5
33	8°23.2	8°24.6	8°00.3	3.3 - 1.8	9.3 - 5.2	15.3 - 8.5
34	8°23.5	8°24.9	8°00.6	3.4 - 1.9	9.4 - 5.2	15.4 - 8.6
35	8°23.8	8°25.1	8°00.8	3.5 - 2.0	9.5 - 5.3	15.5 - 8.7
36	8°24.0	8°25.4	8°01.0	3.6 - 2.0	9.6 - 5.4	15.6 - 8.7
37	8°24.3	8°25.6	8°01.3	3.7 - 2.1	9.7 - 5.4	15.7 - 8.8
38	8°24.5	8°25.9	8°01.5	3.8 - 2.1	9.8 - 5.5	15.8 - 8.8
39	8°24.7	8°26.1	8°01.8	3.9 - 2.2	9.9 - 5.5	15.9 - 8.9
40	8°25.0	8°26.4	8°02.0	4.0 - 2.2	10.0 - 5.6	16.0 - 8.9
41	8°25.2	8°26.6	8°02.2	4.1 - 2.3	10.1 - 5.6	16.1 - 9.0
42	8°25.5	8°26.9	8°02.5	4.2 - 2.3	10.2 - 5.7	16.2 - 9.0
43	8°25.8	8°27.1	8°02.7	4.3 - 2.4	10.3 - 5.8	16.3 - 9.1
44	8°26.0	8°27.4	8°02.9	4.4 - 2.5	10.4 - 5.8	16.4 - 9.2
45	8°26.3	8°27.6	8°03.2	4.5 - 2.5	10.5 - 5.9	16.5 - 9.2
46	8°26.5	8°27.9	8°03.4	4.6 - 2.6	10.6 - 5.9	16.6 - 9.3
47	8°26.7	8°28.1	8°03.7	4.7 - 2.6	10.7 - 6.0	16.7 - 9.3
48	8°27.0	8°28.4	8°03.9	4.8 - 2.7	10.8 - 6.0	16.8 - 9.4
49	8°27.3	8°28.6	8°04.1	4.9 - 2.7	10.9 - 6.1	16.9 - 9.4
50	8°27.5	8°28.9	8°04.4	5.0 - 2.8	11.0 - 6.1	17.0 - 9.5
51	8°27.8	8°29.1	8°04.6	5.1 - 2.8	11.1 - 6.2	17.1 - 9.5
52	8°28.0	8°29.4	8°04.9	5.2 - 2.9	11.2 - 6.3	17.2 - 9.6
53	8°28.2	8°29.6	8°05.1	5.3 - 3.0	11.3 - 6.3	17.3 - 9.7
54	8°28.5	8°29.9	8°05.3	5.4 - 3.0	11.4 - 6.4	17.4 - 9.7
55	8°28.7	8°30.1	8°05.6	5.5 - 3.1	11.5 - 6.4	17.5 - 9.8
56	8°29.0	8°30.4	8°05.8	5.6 - 3.1	11.6 - 6.5	17.6 - 9.8
57	8°29.3	8°30.6	8°06.1	5.7 - 3.2	11.7 - 6.5	17.7 - 9.9
58	8°29.5	8°30.9	8°06.3	5.8 - 3.2	11.8 - 6.6	17.8 - 9.9
59	8°29.8	8°31.1	8°06.5	5.9 - 3.3	11.9 - 6.6	17.9 - 10.0

m 34	Sun Plan.	Aries	Moon	v and d corr		
0	8°30.0	8°31.4	8°06.8	0.0 - 0.0	6.0 - 3.4	12.0 - 6.9
1	8°30.2	8°31.6	8°07.0	0.1 - 0.1	6.1 - 3.5	12.1 - 7.0
2	8°30.5	8°31.9	8°07.2	0.2 - 0.1	6.2 - 3.6	12.2 - 7.0
3	8°30.7	8°32.1	8°07.5	0.3 - 0.2	6.3 - 3.6	12.3 - 7.1
4	8°31.0	8°32.4	8°07.7	0.4 - 0.2	6.4 - 3.7	12.4 - 7.1
5	8°31.3	8°32.6	8°08.0	0.5 - 0.3	6.5 - 3.7	12.5 - 7.2
6	8°31.5	8°32.9	8°08.2	0.6 - 0.3	6.6 - 3.8	12.6 - 7.2
7	8°31.8	8°33.1	8°08.4	0.7 - 0.4	6.7 - 3.9	12.7 - 7.3
8	8°32.0	8°33.4	8°08.7	0.8 - 0.5	6.8 - 3.9	12.8 - 7.4
9	8°32.2	8°33.7	8°08.9	0.9 - 0.5	6.9 - 4.0	12.9 - 7.4
10	8°32.5	8°33.9	8°09.2	1.0 - 0.6	7.0 - 4.0	13.0 - 7.5
11	8°32.7	8°34.2	8°09.4	1.1 - 0.6	7.1 - 4.1	13.1 - 7.5
12	8°33.0	8°34.4	8°09.6	1.2 - 0.7	7.2 - 4.1	13.2 - 7.6
13	8°33.3	8°34.7	8°09.9	1.3 - 0.7	7.3 - 4.2	13.3 - 7.6
14	8°33.5	8°34.9	8°10.1	1.4 - 0.8	7.4 - 4.3	13.4 - 7.7
15	8°33.8	8°35.2	8°10.3	1.5 - 0.9	7.5 - 4.3	13.5 - 7.8
16	8°34.0	8°35.4	8°10.6	1.6 - 0.9	7.6 - 4.4	13.6 - 7.8
17	8°34.2	8°35.7	8°10.8	1.7 - 1.0	7.7 - 4.4	13.7 - 7.9
18	8°34.5	8°35.9	8°11.1	1.8 - 1.0	7.8 - 4.5	13.8 - 7.9
19	8°34.8	8°36.2	8°11.3	1.9 - 1.1	7.9 - 4.5	13.9 - 8.0
20	8°35.0	8°36.4	8°11.5	2.0 - 1.1	8.0 - 4.6	14.0 - 8.0
21	8°35.3	8°36.7	8°11.8	2.1 - 1.2	8.1 - 4.7	14.1 - 8.1
22	8°35.5	8°36.9	8°12.0	2.2 - 1.3	8.2 - 4.7	14.2 - 8.2
23	8°35.7	8°37.2	8°12.3	2.3 - 1.3	8.3 - 4.8	14.3 - 8.2
24	8°36.0	8°37.4	8°12.5	2.4 - 1.4	8.4 - 4.8	14.4 - 8.3
25	8°36.2	8°37.7	8°12.7	2.5 - 1.4	8.5 - 4.9	14.5 - 8.3
26	8°36.5	8°37.9	8°13.0	2.6 - 1.5	8.6 - 4.9	14.6 - 8.4
27	8°36.8	8°38.2	8°13.2	2.7 - 1.6	8.7 - 5.0	14.7 - 8.5
28	8°37.0	8°38.4	8°13.4	2.8 - 1.6	8.8 - 5.1	14.8 - 8.5
29	8°37.3	8°38.7	8°13.7	2.9 - 1.7	8.9 - 5.1	14.9 - 8.6
30	8°37.5	8°38.9	8°13.9	3.0 - 1.7	9.0 - 5.2	15.0 - 8.6
31	8°37.7	8°39.2	8°14.2	3.1 - 1.8	9.1 - 5.2	15.1 - 8.7
32	8°38.0	8°39.4	8°14.4	3.2 - 1.8	9.2 - 5.3	15.2 - 8.7
33	8°38.2	8°39.7	8°14.6	3.3 - 1.9	9.3 - 5.3	15.3 - 8.8
34	8°38.5	8°39.9	8°14.9	3.4 - 2.0	9.4 - 5.4	15.4 - 8.9
35	8°38.8	8°40.2	8°15.1	3.5 - 2.0	9.5 - 5.5	15.5 - 8.9
36	8°39.0	8°40.4	8°15.4	3.6 - 2.1	9.6 - 5.5	15.6 - 9.0
37	8°39.3	8°40.7	8°15.6	3.7 - 2.1	9.7 - 5.6	15.7 - 9.0
38	8°39.5	8°40.9	8°15.8	3.8 - 2.2	9.8 - 5.6	15.8 - 9.1
39	8°39.7	8°41.2	8°16.1	3.9 - 2.2	9.9 - 5.7	15.9 - 9.1
40	8°40.0	8°41.4	8°16.3	4.0 - 2.3	10.0 - 5.8	16.0 - 9.2
41	8°40.2	8°41.7	8°16.5	4.1 - 2.4	10.1 - 5.8	16.1 - 9.3
42	8°40.5	8°41.9	8°16.8	4.2 - 2.4	10.2 - 5.9	16.2 - 9.3
43	8°40.8	8°42.2	8°17.0	4.3 - 2.5	10.3 - 5.9	16.3 - 9.4
44	8°41.0	8°42.4	8°17.3	4.4 - 2.5	10.4 - 6.0	16.4 - 9.4
45	8°41.3	8°42.7	8°17.5	4.5 - 2.6	10.5 - 6.0	16.5 - 9.5
46	8°41.5	8°42.9	8°17.7	4.6 - 2.6	10.6 - 6.1	16.6 - 9.5
47	8°41.7	8°43.2	8°18.0	4.7 - 2.7	10.7 - 6.2	16.7 - 9.6
48	8°42.0	8°43.4	8°18.2	4.8 - 2.8	10.8 - 6.2	16.8 - 9.7
49	8°42.3	8°43.7	8°18.5	4.9 - 2.8	10.9 - 6.3	16.9 - 9.7
50	8°42.5	8°43.9	8°18.7	5.0 - 2.9	11.0 - 6.3	17.0 - 9.8
51	8°42.8	8°44.2	8°18.9	5.1 - 2.9	11.1 - 6.4	17.1 - 9.8
52	8°43.0	8°44.4	8°19.2	5.2 - 3.0	11.2 - 6.4	17.2 - 9.9
53	8°43.2	8°44.7	8°19.4	5.3 - 3.0	11.3 - 6.5	17.3 - 9.9
54	8°43.5	8°44.9	8°19.7	5.4 - 3.1	11.4 - 6.6	17.4 - 10.0
55	8°43.7	8°45.2	8°19.9	5.5 - 3.2	11.5 - 6.6	17.5 - 10.1
56	8°44.0	8°45.4	8°20.1	5.6 - 3.2	11.6 - 6.7	17.6 - 10.1
57	8°44.3	8°45.7	8°20.4	5.7 - 3.3	11.7 - 6.7	17.7 - 10.2
58	8°44.5	8°45.9	8°20.6	5.8 - 3.3	11.8 - 6.8	17.8 - 10.2
59	8°44.8	8°46.2	8°20.8	5.9 - 3.4	11.9 - 6.8	17.9 - 10.3

m 35	Sun Plan.	Aries	Moon	v and d corr		
0	8°45.0	8°46.4	8°21.1	0.0 - 0.0	6.0 - 3.5	12.0 - 7.1
1	8°45.2	8°46.7	8°21.3	0.1 - 0.1	6.1 - 3.6	12.1 - 7.2
2	8°45.5	8°46.9	8°21.6	0.2 - 0.1	6.2 - 3.7	12.2 - 7.2
3	8°45.7	8°47.2	8°21.8	0.3 - 0.2	6.3 - 3.7	12.3 - 7.3
4	8°46.0	8°47.4	8°22.0	0.4 - 0.2	6.4 - 3.8	12.4 - 7.3
5	8°46.3	8°47.7	8°22.3	0.5 - 0.3	6.5 - 3.8	12.5 - 7.4
6	8°46.5	8°47.9	8°22.5	0.6 - 0.4	6.6 - 3.9	12.6 - 7.5
7	8°46.8	8°48.2	8°22.8	0.7 - 0.4	6.7 - 4.0	12.7 - 7.5
8	8°47.0	8°48.4	8°23.0	0.8 - 0.5	6.8 - 4.0	12.8 - 7.6
9	8°47.2	8°48.7	8°23.2	0.9 - 0.5	6.9 - 4.1	12.9 - 7.6
10	8°47.5	8°48.9	8°23.5	1.0 - 0.6	7.0 - 4.1	13.0 - 7.7
11	8°47.7	8°49.2	8°23.7	1.1 - 0.7	7.1 - 4.2	13.1 - 7.8
12	8°48.0	8°49.4	8°23.9	1.2 - 0.7	7.2 - 4.3	13.2 - 7.8
13	8°48.3	8°49.7	8°24.2	1.3 - 0.8	7.3 - 4.3	13.3 - 7.9
14	8°48.5	8°49.9	8°24.4	1.4 - 0.8	7.4 - 4.4	13.4 - 7.9
15	8°48.8	8°50.2	8°24.7	1.5 - 0.9	7.5 - 4.4	13.5 - 8.0
16	8°49.0	8°50.4	8°24.9	1.6 - 0.9	7.6 - 4.5	13.6 - 8.0
17	8°49.2	8°50.7	8°25.1	1.7 - 1.0	7.7 - 4.6	13.7 - 8.1
18	8°49.5	8°50.9	8°25.4	1.8 - 1.1	7.8 - 4.6	13.8 - 8.2
19	8°49.8	8°51.2	8°25.6	1.9 - 1.1	7.9 - 4.7	13.9 - 8.2
20	8°50.0	8°51.4	8°25.9	2.0 - 1.2	8.0 - 4.7	14.0 - 8.3
21	8°50.3	8°51.7	8°26.1	2.1 - 1.2	8.1 - 4.8	14.1 - 8.3
22	8°50.5	8°52.0	8°26.3	2.2 - 1.3	8.2 - 4.9	14.2 - 8.4
23	8°50.7	8°52.2	8°26.6	2.3 - 1.4	8.3 - 4.9	14.3 - 8.5
24	8°51.0	8°52.5	8°26.8	2.4 - 1.4	8.4 - 5.0	14.4 - 8.5
25	8°51.2	8°52.7	8°27.0	2.5 - 1.5	8.5 - 5.0	14.5 - 8.6
26	8°51.5	8°53.0	8°27.3	2.6 - 1.5	8.6 - 5.1	14.6 - 8.6
27	8°51.8	8°53.2	8°27.5	2.7 - 1.6	8.7 - 5.1	14.7 - 8.7
28	8°52.0	8°53.5	8°27.8	2.8 - 1.7	8.8 - 5.2	14.8 - 8.8
29	8°52.3	8°53.7	8°28.0	2.9 - 1.7	8.9 - 5.3	14.9 - 8.8
30	8°52.5	8°54.0	8°28.2	3.0 - 1.8	9.0 - 5.3	15.0 - 8.9
31	8°52.7	8°54.2	8°28.5	3.1 - 1.8	9.1 - 5.4	15.1 - 8.9
32	8°53.0	8°54.5	8°28.7	3.2 - 1.9	9.2 - 5.4	15.2 - 9.0
33	8°53.2	8°54.7	8°29.0	3.3 - 2.0	9.3 - 5.5	15.3 - 9.1
34	8°53.5	8°55.0	8°29.2	3.4 - 2.0	9.4 - 5.6	15.4 - 9.1
35	8°53.8	8°55.2	8°29.4	3.5 - 2.1	9.5 - 5.6	15.5 - 9.2
36	8°54.0	8°55.5	8°29.7	3.6 - 2.1	9.6 - 5.7	15.6 - 9.2
37	8°54.3	8°55.7	8°29.9	3.7 - 2.2	9.7 - 5.7	15.7 - 9.3
38	8°54.5	8°56.0	8°30.2	3.8 - 2.2	9.8 - 5.8	15.8 - 9.3
39	8°54.7	8°56.2	8°30.4	3.9 - 2.3	9.9 - 5.9	15.9 - 9.4
40	8°55.0	8°56.5	8°30.6	4.0 - 2.4	10.0 - 5.9	16.0 - 9.5
41	8°55.2	8°56.7	8°30.9	4.1 - 2.4	10.1 - 6.0	16.1 - 9.5
42	8°55.5	8°57.0	8°31.1	4.2 - 2.5	10.2 - 6.0	16.2 - 9.6
43	8°55.8	8°57.2	8°31.3	4.3 - 2.5	10.3 - 6.1	16.3 - 9.6
44	8°56.0	8°57.5	8°31.6	4.4 - 2.6	10.4 - 6.2	16.4 - 9.7
45	8°56.3	8°57.7	8°31.8	4.5 - 2.7	10.5 - 6.2	16.5 - 9.8
46	8°56.5	8°58.0	8°32.1	4.6 - 2.7	10.6 - 6.3	16.6 - 9.8
47	8°56.7	8°58.2	8°32.3	4.7 - 2.8	10.7 - 6.3	16.7 - 9.9
48	8°57.0	8°58.5	8°32.5	4.8 - 2.8	10.8 - 6.4	16.8 - 9.9
49	8°57.3	8°58.7	8°32.8	4.9 - 2.9	10.9 - 6.4	16.9 - 10.0
50	8°57.5	8°59.0	8°33.0	5.0 - 3.0	11.0 - 6.5	17.0 - 10.1
51	8°57.8	8°59.2	8°33.3	5.1 - 3.0	11.1 - 6.6	17.1 - 10.1
52	8°58.0	8°59.5	8°33.5	5.2 - 3.1	11.2 - 6.6	17.2 - 10.2
53	8°58.2	8°59.7	8°33.7	5.3 - 3.1	11.3 - 6.7	17.3 - 10.2
54	8°58.5	9°00.0	8°34.0	5.4 - 3.2	11.4 - 6.7	17.4 - 10.3
55	8°58.7	9°00.2	8°34.2	5.5 - 3.3	11.5 - 6.8	17.5 - 10.4
56	8°59.0	9°00.5	8°34.4	5.6 - 3.3	11.6 - 6.9	17.6 - 10.4
57	8°59.3	9°00.7	8°34.7	5.7 - 3.4	11.7 - 6.9	17.7 - 10.5
58	8°59.5	9°01.0	8°34.9	5.8 - 3.4	11.8 - 7.0	17.8 - 10.5
59	8°59.8	9°01.2	8°35.2	5.9 - 3.5	11.9 - 7.0	17.9 - 10.6

Increments and Corrections

m 36	Sun Plan.	Aries	Moon	v and d corr		
0	9°00.0	9°01.5	8°35.4	0.0 - 0.0	6.0 - 3.6	12.0 - 7.3
1	9°00.2	9°01.7	8°35.6	0.1 - 0.1	6.1 - 3.7	12.1 - 7.4
2	9°00.5	9°02.0	8°35.9	0.2 - 0.1	6.2 - 3.8	12.2 - 7.4
3	9°00.7	9°02.2	8°36.1	0.3 - 0.2	6.3 - 3.8	12.3 - 7.5
4	9°01.0	9°02.5	8°36.4	0.4 - 0.2	6.4 - 3.9	12.4 - 7.5
5	9°01.3	9°02.7	8°36.6	0.5 - 0.3	6.5 - 4.0	12.5 - 7.6
6	9°01.5	9°03.0	8°36.8	0.6 - 0.4	6.6 - 4.0	12.6 - 7.7
7	9°01.8	9°03.2	8°37.1	0.7 - 0.4	6.7 - 4.1	12.7 - 7.7
8	9°02.0	9°03.5	8°37.3	0.8 - 0.5	6.8 - 4.1	12.8 - 7.8
9	9°02.2	9°03.7	8°37.5	0.9 - 0.5	6.9 - 4.2	12.9 - 7.8
10	9°02.5	9°04.0	8°37.8	1.0 - 0.6	7.0 - 4.3	13.0 - 7.9
11	9°02.7	9°04.2	8°38.0	1.1 - 0.7	7.1 - 4.3	13.1 - 8.0
12	9°03.0	9°04.5	8°38.3	1.2 - 0.7	7.2 - 4.4	13.2 - 8.0
13	9°03.3	9°04.7	8°38.5	1.3 - 0.8	7.3 - 4.4	13.3 - 8.1
14	9°03.5	9°05.0	8°38.7	1.4 - 0.9	7.4 - 4.5	13.4 - 8.2
15	9°03.8	9°05.2	8°39.0	1.5 - 0.9	7.5 - 4.6	13.5 - 8.2
16	9°04.0	9°05.5	8°39.2	1.6 - 1.0	7.6 - 4.6	13.6 - 8.3
17	9°04.2	9°05.7	8°39.5	1.7 - 1.0	7.7 - 4.7	13.7 - 8.3
18	9°04.5	9°06.0	8°39.7	1.8 - 1.1	7.8 - 4.7	13.8 - 8.4
19	9°04.8	9°06.2	8°39.9	1.9 - 1.2	7.9 - 4.8	13.9 - 8.5
20	9°05.0	9°06.5	8°40.2	2.0 - 1.2	8.0 - 4.9	14.0 - 8.5
21	9°05.3	9°06.7	8°40.4	2.1 - 1.3	8.1 - 4.9	14.1 - 8.6
22	9°05.5	9°07.0	8°40.6	2.2 - 1.3	8.2 - 5.0	14.2 - 8.6
23	9°05.7	9°07.2	8°40.9	2.3 - 1.4	8.3 - 5.0	14.3 - 8.7
24	9°06.0	9°07.5	8°41.1	2.4 - 1.5	8.4 - 5.1	14.4 - 8.8
25	9°06.2	9°07.7	8°41.4	2.5 - 1.5	8.5 - 5.2	14.5 - 8.8
26	9°06.5	9°08.0	8°41.6	2.6 - 1.6	8.6 - 5.2	14.6 - 8.9
27	9°06.8	9°08.2	8°41.8	2.7 - 1.6	8.7 - 5.3	14.7 - 8.9
28	9°07.0	9°08.5	8°42.1	2.8 - 1.7	8.8 - 5.4	14.8 - 9.0
29	9°07.3	9°08.7	8°42.3	2.9 - 1.8	8.9 - 5.4	14.9 - 9.1
30	9°07.5	9°09.0	8°42.6	3.0 - 1.8	9.0 - 5.5	15.0 - 9.1
31	9°07.7	9°09.2	8°42.8	3.1 - 1.9	9.1 - 5.5	15.1 - 9.2
32	9°08.0	9°09.5	8°43.0	3.2 - 1.9	9.2 - 5.6	15.2 - 9.2
33	9°08.2	9°09.7	8°43.3	3.3 - 2.0	9.3 - 5.7	15.3 - 9.3
34	9°08.5	9°10.0	8°43.5	3.4 - 2.1	9.4 - 5.7	15.4 - 9.4
35	9°08.8	9°10.2	8°43.8	3.5 - 2.1	9.5 - 5.8	15.5 - 9.4
36	9°09.0	9°10.5	8°44.0	3.6 - 2.2	9.6 - 5.8	15.6 - 9.5
37	9°09.3	9°10.8	8°44.2	3.7 - 2.3	9.7 - 5.9	15.7 - 9.6
38	9°09.5	9°11.0	8°44.5	3.8 - 2.3	9.8 - 6.0	15.8 - 9.6
39	9°09.7	9°11.3	8°44.7	3.9 - 2.4	9.9 - 6.0	15.9 - 9.7
40	9°10.0	9°11.5	8°44.9	4.0 - 2.4	10.0 - 6.1	16.0 - 9.7
41	9°10.2	9°11.8	8°45.2	4.1 - 2.5	10.1 - 6.1	16.1 - 9.8
42	9°10.5	9°12.0	8°45.4	4.2 - 2.6	10.2 - 6.2	16.2 - 9.9
43	9°10.8	9°12.3	8°45.7	4.3 - 2.6	10.3 - 6.3	16.3 - 9.9
44	9°11.0	9°12.5	8°45.9	4.4 - 2.7	10.4 - 6.3	16.4 - 10.0
45	9°11.3	9°12.8	8°46.1	4.5 - 2.7	10.5 - 6.4	16.5 - 10.0
46	9°11.5	9°13.0	8°46.4	4.6 - 2.8	10.6 - 6.4	16.6 - 10.1
47	9°11.7	9°13.3	8°46.6	4.7 - 2.9	10.7 - 6.5	16.7 - 10.2
48	9°12.0	9°13.5	8°46.9	4.8 - 2.9	10.8 - 6.6	16.8 - 10.2
49	9°12.3	9°13.8	8°47.1	4.9 - 3.0	10.9 - 6.6	16.9 - 10.3
50	9°12.5	9°14.0	8°47.3	5.0 - 3.0	11.0 - 6.7	17.0 - 10.3
51	9°12.8	9°14.3	8°47.6	5.1 - 3.1	11.1 - 6.8	17.1 - 10.4
52	9°13.0	9°14.5	8°47.8	5.2 - 3.2	11.2 - 6.8	17.2 - 10.5
53	9°13.2	9°14.8	8°48.0	5.3 - 3.2	11.3 - 6.9	17.3 - 10.5
54	9°13.5	9°15.0	8°48.3	5.4 - 3.3	11.4 - 6.9	17.4 - 10.6
55	9°13.7	9°15.3	8°48.5	5.5 - 3.3	11.5 - 7.0	17.5 - 10.6
56	9°14.0	9°15.5	8°48.8	5.6 - 3.4	11.6 - 7.1	17.6 - 10.7
57	9°14.3	9°15.8	8°49.0	5.7 - 3.5	11.7 - 7.1	17.7 - 10.8
58	9°14.5	9°16.0	8°49.2	5.8 - 3.5	11.8 - 7.2	17.8 - 10.8
59	9°14.8	9°16.3	8°49.5	5.9 - 3.6	11.9 - 7.2	17.9 - 10.9

m 37	Sun Plan.	Aries	Moon	v and d corr		
0	9°15.0	9°16.5	8°49.7	0.0 - 0.0	6.0 - 3.8	12.0 - 7.5
1	9°15.2	9°16.8	8°50.0	0.1 - 0.1	6.1 - 3.8	12.1 - 7.6
2	9°15.5	9°17.0	8°50.2	0.2 - 0.1	6.2 - 3.9	12.2 - 7.6
3	9°15.7	9°17.3	8°50.4	0.3 - 0.2	6.3 - 3.9	12.3 - 7.7
4	9°16.0	9°17.5	8°50.7	0.4 - 0.3	6.4 - 4.0	12.4 - 7.8
5	9°16.3	9°17.8	8°50.9	0.5 - 0.3	6.5 - 4.1	12.5 - 7.8
6	9°16.5	9°18.0	8°51.1	0.6 - 0.4	6.6 - 4.1	12.6 - 7.9
7	9°16.8	9°18.3	8°51.4	0.7 - 0.4	6.7 - 4.2	12.7 - 7.9
8	9°17.0	9°18.5	8°51.6	0.8 - 0.5	6.8 - 4.3	12.8 - 8.0
9	9°17.2	9°18.8	8°51.9	0.9 - 0.6	6.9 - 4.3	12.9 - 8.1
10	9°17.5	9°19.0	8°52.1	1.0 - 0.6	7.0 - 4.4	13.0 - 8.1
11	9°17.7	9°19.3	8°52.3	1.1 - 0.7	7.1 - 4.4	13.1 - 8.2
12	9°18.0	9°19.5	8°52.6	1.2 - 0.8	7.2 - 4.5	13.2 - 8.3
13	9°18.3	9°19.8	8°52.8	1.3 - 0.8	7.3 - 4.6	13.3 - 8.3
14	9°18.5	9°20.0	8°53.1	1.4 - 0.9	7.4 - 4.6	13.4 - 8.4
15	9°18.8	9°20.3	8°53.3	1.5 - 0.9	7.5 - 4.7	13.5 - 8.4
16	9°19.0	9°20.5	8°53.5	1.6 - 1.0	7.6 - 4.8	13.6 - 8.5
17	9°19.2	9°20.8	8°53.8	1.7 - 1.1	7.7 - 4.8	13.7 - 8.6
18	9°19.5	9°21.0	8°54.0	1.8 - 1.1	7.8 - 4.9	13.8 - 8.6
19	9°19.8	9°21.3	8°54.3	1.9 - 1.2	7.9 - 4.9	13.9 - 8.7
20	9°20.0	9°21.5	8°54.5	2.0 - 1.3	8.0 - 5.0	14.0 - 8.8
21	9°20.3	9°21.8	8°54.7	2.1 - 1.3	8.1 - 5.1	14.1 - 8.8
22	9°20.5	9°22.0	8°55.0	2.2 - 1.4	8.2 - 5.1	14.2 - 8.9
23	9°20.7	9°22.3	8°55.2	2.3 - 1.4	8.3 - 5.2	14.3 - 8.9
24	9°21.0	9°22.5	8°55.4	2.4 - 1.5	8.4 - 5.3	14.4 - 9.0
25	9°21.2	9°22.8	8°55.7	2.5 - 1.6	8.5 - 5.3	14.5 - 9.1
26	9°21.5	9°23.0	8°55.9	2.6 - 1.6	8.6 - 5.4	14.6 - 9.1
27	9°21.8	9°23.3	8°56.2	2.7 - 1.7	8.7 - 5.4	14.7 - 9.2
28	9°22.0	9°23.5	8°56.4	2.8 - 1.8	8.8 - 5.5	14.8 - 9.3
29	9°22.3	9°23.8	8°56.6	2.9 - 1.8	8.9 - 5.6	14.9 - 9.3
30	9°22.5	9°24.0	8°56.9	3.0 - 1.9	9.0 - 5.6	15.0 - 9.4
31	9°22.7	9°24.3	8°57.1	3.1 - 1.9	9.1 - 5.7	15.1 - 9.4
32	9°23.0	9°24.5	8°57.4	3.2 - 2.0	9.2 - 5.8	15.2 - 9.5
33	9°23.2	9°24.8	8°57.6	3.3 - 2.1	9.3 - 5.8	15.3 - 9.6
34	9°23.5	9°25.0	8°57.8	3.4 - 2.1	9.4 - 5.9	15.4 - 9.6
35	9°23.8	9°25.3	8°58.1	3.5 - 2.2	9.5 - 5.9	15.5 - 9.7
36	9°24.0	9°25.5	8°58.3	3.6 - 2.3	9.6 - 6.0	15.6 - 9.8
37	9°24.3	9°25.8	8°58.5	3.7 - 2.3	9.7 - 6.1	15.7 - 9.8
38	9°24.5	9°26.0	8°58.8	3.8 - 2.4	9.8 - 6.1	15.8 - 9.9
39	9°24.7	9°26.3	8°59.0	3.9 - 2.4	9.9 - 6.2	15.9 - 9.9
40	9°25.0	9°26.5	8°59.3	4.0 - 2.5	10.0 - 6.3	16.0 - 10.0
41	9°25.2	9°26.8	8°59.5	4.1 - 2.6	10.1 - 6.3	16.1 - 10.1
42	9°25.5	9°27.0	8°59.7	4.2 - 2.6	10.2 - 6.4	16.2 - 10.1
43	9°25.8	9°27.3	9°00.0	4.3 - 2.7	10.3 - 6.4	16.3 - 10.2
44	9°26.0	9°27.5	9°00.2	4.4 - 2.8	10.4 - 6.5	16.4 - 10.3
45	9°26.3	9°27.8	9°00.5	4.5 - 2.8	10.5 - 6.6	16.5 - 10.3
46	9°26.5	9°28.0	9°00.7	4.6 - 2.9	10.6 - 6.6	16.6 - 10.4
47	9°26.7	9°28.3	9°00.9	4.7 - 2.9	10.7 - 6.7	16.7 - 10.4
48	9°27.0	9°28.5	9°01.2	4.8 - 3.0	10.8 - 6.8	16.8 - 10.5
49	9°27.3	9°28.8	9°01.4	4.9 - 3.1	10.9 - 6.8	16.9 - 10.6
50	9°27.5	9°29.1	9°01.6	5.0 - 3.1	11.0 - 6.9	17.0 - 10.6
51	9°27.8	9°29.3	9°01.9	5.1 - 3.2	11.1 - 6.9	17.1 - 10.7
52	9°28.0	9°29.6	9°02.1	5.2 - 3.3	11.2 - 7.0	17.2 - 10.8
53	9°28.2	9°29.8	9°02.4	5.3 - 3.3	11.3 - 7.1	17.3 - 10.8
54	9°28.5	9°30.1	9°02.6	5.4 - 3.4	11.4 - 7.1	17.4 - 10.9
55	9°28.7	9°30.3	9°02.8	5.5 - 3.4	11.5 - 7.2	17.5 - 10.9
56	9°29.0	9°30.6	9°03.1	5.6 - 3.5	11.6 - 7.3	17.6 - 11.0
57	9°29.3	9°30.8	9°03.3	5.7 - 3.6	11.7 - 7.3	17.7 - 11.1
58	9°29.5	9°31.1	9°03.6	5.8 - 3.6	11.8 - 7.4	17.8 - 11.1
59	9°29.8	9°31.3	9°03.8	5.9 - 3.7	11.9 - 7.4	17.9 - 11.2

m 38	Sun Plan.	Aries	Moon	v and d corr		
0	9°30.0	9°31.6	9°04.0	0.0 - 0.0	6.0 - 3.9	12.0 - 7.7
1	9°30.2	9°31.8	9°04.3	0.1 - 0.1	6.1 - 3.9	12.1 - 7.8
2	9°30.5	9°32.1	9°04.5	0.2 - 0.1	6.2 - 4.0	12.2 - 7.8
3	9°30.7	9°32.3	9°04.7	0.3 - 0.2	6.3 - 4.0	12.3 - 7.9
4	9°31.0	9°32.6	9°05.0	0.4 - 0.3	6.4 - 4.1	12.4 - 8.0
5	9°31.3	9°32.8	9°05.2	0.5 - 0.3	6.5 - 4.2	12.5 - 8.0
6	9°31.5	9°33.1	9°05.5	0.6 - 0.4	6.6 - 4.2	12.6 - 8.1
7	9°31.8	9°33.3	9°05.7	0.7 - 0.4	6.7 - 4.3	12.7 - 8.1
8	9°32.0	9°33.6	9°05.9	0.8 - 0.5	6.8 - 4.4	12.8 - 8.2
9	9°32.2	9°33.8	9°06.2	0.9 - 0.6	6.9 - 4.4	12.9 - 8.3
10	9°32.5	9°34.1	9°06.4	1.0 - 0.6	7.0 - 4.5	13.0 - 8.3
11	9°32.7	9°34.3	9°06.7	1.1 - 0.7	7.1 - 4.6	13.1 - 8.4
12	9°33.0	9°34.6	9°06.9	1.2 - 0.8	7.2 - 4.6	13.2 - 8.5
13	9°33.3	9°34.8	9°07.1	1.3 - 0.8	7.3 - 4.7	13.3 - 8.5
14	9°33.5	9°35.1	9°07.4	1.4 - 0.9	7.4 - 4.7	13.4 - 8.6
15	9°33.8	9°35.3	9°07.6	1.5 - 1.0	7.5 - 4.8	13.5 - 8.7
16	9°34.0	9°35.6	9°07.9	1.6 - 1.0	7.6 - 4.9	13.6 - 8.7
17	9°34.2	9°35.8	9°08.1	1.7 - 1.1	7.7 - 4.9	13.7 - 8.8
18	9°34.5	9°36.1	9°08.3	1.8 - 1.2	7.8 - 5.0	13.8 - 8.9
19	9°34.8	9°36.3	9°08.6	1.9 - 1.2	7.9 - 5.1	13.9 - 8.9
20	9°35.0	9°36.6	9°08.8	2.0 - 1.3	8.0 - 5.1	14.0 - 9.0
21	9°35.3	9°36.8	9°09.0	2.1 - 1.3	8.1 - 5.2	14.1 - 9.0
22	9°35.5	9°37.1	9°09.3	2.2 - 1.4	8.2 - 5.3	14.2 - 9.1
23	9°35.7	9°37.3	9°09.5	2.3 - 1.5	8.3 - 5.3	14.3 - 9.2
24	9°36.0	9°37.6	9°09.8	2.4 - 1.5	8.4 - 5.4	14.4 - 9.2
25	9°36.2	9°37.8	9°10.0	2.5 - 1.6	8.5 - 5.5	14.5 - 9.3
26	9°36.5	9°38.1	9°10.2	2.6 - 1.7	8.6 - 5.5	14.6 - 9.4
27	9°36.8	9°38.3	9°10.5	2.7 - 1.7	8.7 - 5.6	14.7 - 9.4
28	9°37.0	9°38.6	9°10.7	2.8 - 1.8	8.8 - 5.6	14.8 - 9.5
29	9°37.3	9°38.8	9°11.0	2.9 - 1.9	8.9 - 5.7	14.9 - 9.6
30	9°37.5	9°39.1	9°11.2	3.0 - 1.9	9.0 - 5.8	15.0 - 9.6
31	9°37.7	9°39.3	9°11.4	3.1 - 2.0	9.1 - 5.8	15.1 - 9.7
32	9°38.0	9°39.6	9°11.7	3.2 - 2.1	9.2 - 5.9	15.2 - 9.8
33	9°38.2	9°39.8	9°11.9	3.3 - 2.1	9.3 - 6.0	15.3 - 9.8
34	9°38.5	9°40.1	9°12.1	3.4 - 2.2	9.4 - 6.0	15.4 - 9.9
35	9°38.8	9°40.3	9°12.4	3.5 - 2.2	9.5 - 6.1	15.5 - 9.9
36	9°39.0	9°40.6	9°12.6	3.6 - 2.3	9.6 - 6.2	15.6 - 10.0
37	9°39.3	9°40.8	9°12.9	3.7 - 2.4	9.7 - 6.2	15.7 - 10.1
38	9°39.5	9°41.1	9°13.1	3.8 - 2.4	9.8 - 6.3	15.8 - 10.1
39	9°39.7	9°41.3	9°13.3	3.9 - 2.5	9.9 - 6.4	15.9 - 10.2
40	9°40.0	9°41.6	9°13.6	4.0 - 2.6	10.0 - 6.4	16.0 - 10.3
41	9°40.2	9°41.8	9°13.8	4.1 - 2.6	10.1 - 6.5	16.1 - 10.3
42	9°40.5	9°42.1	9°14.1	4.2 - 2.7	10.2 - 6.5	16.2 - 10.4
43	9°40.8	9°42.3	9°14.3	4.3 - 2.8	10.3 - 6.6	16.3 - 10.5
44	9°41.0	9°42.6	9°14.5	4.4 - 2.8	10.4 - 6.7	16.4 - 10.5
45	9°41.3	9°42.8	9°14.8	4.5 - 2.9	10.5 - 6.7	16.5 - 10.6
46	9°41.5	9°43.1	9°15.0	4.6 - 3.0	10.6 - 6.8	16.6 - 10.7
47	9°41.7	9°43.3	9°15.2	4.7 - 3.0	10.7 - 6.9	16.7 - 10.7
48	9°42.0	9°43.6	9°15.5	4.8 - 3.1	10.8 - 6.9	16.8 - 10.8
49	9°42.3	9°43.8	9°15.7	4.9 - 3.1	10.9 - 7.0	16.9 - 10.8
50	9°42.5	9°44.1	9°16.0	5.0 - 3.2	11.0 - 7.1	17.0 - 10.9
51	9°42.8	9°44.3	9°16.2	5.1 - 3.3	11.1 - 7.1	17.1 - 11.0
52	9°43.0	9°44.6	9°16.4	5.2 - 3.3	11.2 - 7.2	17.2 - 11.0
53	9°43.2	9°44.8	9°16.7	5.3 - 3.4	11.3 - 7.3	17.3 - 11.1
54	9°43.5	9°45.1	9°16.9	5.4 - 3.5	11.4 - 7.3	17.4 - 11.2
55	9°43.7	9°45.3	9°17.2	5.5 - 3.5	11.5 - 7.4	17.5 - 11.2
56	9°44.0	9°45.6	9°17.4	5.6 - 3.6	11.6 - 7.4	17.6 - 11.3
57	9°44.3	9°45.8	9°17.6	5.7 - 3.7	11.7 - 7.5	17.7 - 11.4
58	9°44.5	9°46.1	9°17.9	5.8 - 3.7	11.8 - 7.6	17.8 - 11.4
59	9°44.8	9°46.3	9°18.1	5.9 - 3.8	11.9 - 7.6	17.9 - 11.5

Increments and Corrections

m 39	Sun Plan.	Aries	Moon	v and d corr		
0	9°45.0	9°46.6	9°18.4	0.0 - 0.0	6.0 - 4.0	12.0 - 7.9
1	9°45.2	9°46.8	9°18.6	0.1 - 0.1	6.1 - 4.0	12.1 - 8.0
2	9°45.5	9°47.1	9°18.8	0.2 - 0.1	6.2 - 4.1	12.2 - 8.0
3	9°45.7	9°47.4	9°19.1	0.3 - 0.2	6.3 - 4.1	12.3 - 8.1
4	9°46.0	9°47.6	9°19.3	0.4 - 0.3	6.4 - 4.2	12.4 - 8.2
5	9°46.3	9°47.9	9°19.5	0.5 - 0.3	6.5 - 4.3	12.5 - 8.2
6	9°46.5	9°48.1	9°19.8	0.6 - 0.4	6.6 - 4.3	12.6 - 8.3
7	9°46.8	9°48.4	9°20.0	0.7 - 0.5	6.7 - 4.4	12.7 - 8.4
8	9°47.0	9°48.6	9°20.3	0.8 - 0.5	6.8 - 4.5	12.8 - 8.4
9	9°47.2	9°48.9	9°20.5	0.9 - 0.6	6.9 - 4.5	12.9 - 8.5
10	9°47.5	9°49.1	9°20.7	1.0 - 0.7	7.0 - 4.6	13.0 - 8.6
11	9°47.7	9°49.4	9°21.0	1.1 - 0.7	7.1 - 4.7	13.1 - 8.6
12	9°48.0	9°49.6	9°21.2	1.2 - 0.8	7.2 - 4.7	13.2 - 8.7
13	9°48.3	9°49.9	9°21.5	1.3 - 0.9	7.3 - 4.8	13.3 - 8.8
14	9°48.5	9°50.1	9°21.7	1.4 - 0.9	7.4 - 4.9	13.4 - 8.8
15	9°48.8	9°50.4	9°21.9	1.5 - 1.0	7.5 - 4.9	13.5 - 8.9
16	9°49.0	9°50.6	9°22.2	1.6 - 1.1	7.6 - 5.0	13.6 - 9.0
17	9°49.2	9°50.9	9°22.4	1.7 - 1.1	7.7 - 5.1	13.7 - 9.0
18	9°49.5	9°51.1	9°22.6	1.8 - 1.2	7.8 - 5.1	13.8 - 9.1
19	9°49.8	9°51.4	9°22.9	1.9 - 1.3	7.9 - 5.2	13.9 - 9.2
20	9°50.0	9°51.6	9°23.1	2.0 - 1.3	8.0 - 5.3	14.0 - 9.2
21	9°50.3	9°51.9	9°23.4	2.1 - 1.4	8.1 - 5.3	14.1 - 9.3
22	9°50.5	9°52.1	9°23.6	2.2 - 1.4	8.2 - 5.4	14.2 - 9.3
23	9°50.7	9°52.4	9°23.8	2.3 - 1.5	8.3 - 5.5	14.3 - 9.4
24	9°51.0	9°52.6	9°24.1	2.4 - 1.6	8.4 - 5.5	14.4 - 9.5
25	9°51.2	9°52.9	9°24.3	2.5 - 1.6	8.5 - 5.6	14.5 - 9.5
26	9°51.5	9°53.1	9°24.6	2.6 - 1.7	8.6 - 5.7	14.6 - 9.6
27	9°51.8	9°53.4	9°24.8	2.7 - 1.8	8.7 - 5.7	14.7 - 9.7
28	9°52.0	9°53.6	9°25.0	2.8 - 1.8	8.8 - 5.8	14.8 - 9.7
29	9°52.3	9°53.9	9°25.3	2.9 - 1.9	8.9 - 5.9	14.9 - 9.8
30	9°52.5	9°54.1	9°25.5	3.0 - 2.0	9.0 - 5.9	15.0 - 9.9
31	9°52.7	9°54.4	9°25.7	3.1 - 2.0	9.1 - 6.0	15.1 - 9.9
32	9°53.0	9°54.6	9°26.0	3.2 - 2.1	9.2 - 6.1	15.2 - 10.0
33	9°53.2	9°54.9	9°26.2	3.3 - 2.2	9.3 - 6.1	15.3 - 10.1
34	9°53.5	9°55.1	9°26.5	3.4 - 2.2	9.4 - 6.2	15.4 - 10.1
35	9°53.8	9°55.4	9°26.7	3.5 - 2.3	9.5 - 6.3	15.5 - 10.2
36	9°54.0	9°55.6	9°26.9	3.6 - 2.4	9.6 - 6.3	15.6 - 10.3
37	9°54.3	9°55.9	9°27.2	3.7 - 2.4	9.7 - 6.4	15.7 - 10.3
38	9°54.5	9°56.1	9°27.4	3.8 - 2.5	9.8 - 6.5	15.8 - 10.4
39	9°54.7	9°56.4	9°27.7	3.9 - 2.6	9.9 - 6.5	15.9 - 10.5
40	9°55.0	9°56.6	9°27.9	4.0 - 2.6	10.0 - 6.6	16.0 - 10.5
41	9°55.2	9°56.9	9°28.1	4.1 - 2.7	10.1 - 6.6	16.1 - 10.6
42	9°55.5	9°57.1	9°28.4	4.2 - 2.8	10.2 - 6.7	16.2 - 10.7
43	9°55.8	9°57.4	9°28.6	4.3 - 2.8	10.3 - 6.8	16.3 - 10.7
44	9°56.0	9°57.6	9°28.8	4.4 - 2.9	10.4 - 6.8	16.4 - 10.8
45	9°56.3	9°57.9	9°29.1	4.5 - 3.0	10.5 - 6.9	16.5 - 10.9
46	9°56.5	9°58.1	9°29.3	4.6 - 3.0	10.6 - 7.0	16.6 - 10.9
47	9°56.7	9°58.4	9°29.6	4.7 - 3.1	10.7 - 7.0	16.7 - 11.0
48	9°57.0	9°58.6	9°29.8	4.8 - 3.2	10.8 - 7.1	16.8 - 11.1
49	9°57.3	9°58.9	9°30.0	4.9 - 3.2	10.9 - 7.2	16.9 - 11.1
50	9°57.5	9°59.1	9°30.3	5.0 - 3.3	11.0 - 7.2	17.0 - 11.2
51	9°57.8	9°59.4	9°30.5	5.1 - 3.4	11.1 - 7.3	17.1 - 11.3
52	9°58.0	9°59.6	9°30.8	5.2 - 3.4	11.2 - 7.4	17.2 - 11.3
53	9°58.2	9°59.9	9°31.0	5.3 - 3.5	11.3 - 7.4	17.3 - 11.4
54	9°58.5	10°00.1	9°31.2	5.4 - 3.6	11.4 - 7.5	17.4 - 11.5
55	9°58.7	10°00.4	9°31.5	5.5 - 3.6	11.5 - 7.6	17.5 - 11.5
56	9°59.0	10°00.6	9°31.7	5.6 - 3.7	11.6 - 7.6	17.6 - 11.6
57	9°59.3	10°00.9	9°32.0	5.7 - 3.8	11.7 - 7.7	17.7 - 11.7
58	9°59.5	10°01.1	9°32.2	5.8 - 3.8	11.8 - 7.8	17.8 - 11.7
59	9°59.8	10°01.4	9°32.4	5.9 - 3.9	11.9 - 7.8	17.9 - 11.8

m 40	Sun Plan.	Aries	Moon	v and d corr		
0	10°00.0	10°01.6	9°32.7	0.0 - 0.0	6.0 - 4.1	12.0 - 8.1
1	10°00.2	10°01.9	9°32.9	0.1 - 0.1	6.1 - 4.1	12.1 - 8.2
2	10°00.5	10°02.1	9°33.1	0.2 - 0.1	6.2 - 4.2	12.2 - 8.2
3	10°00.7	10°02.4	9°33.4	0.3 - 0.2	6.3 - 4.3	12.3 - 8.3
4	10°01.0	10°02.6	9°33.6	0.4 - 0.3	6.4 - 4.3	12.4 - 8.4
5	10°01.3	10°02.9	9°33.9	0.5 - 0.3	6.5 - 4.4	12.5 - 8.4
6	10°01.5	10°03.1	9°34.1	0.6 - 0.4	6.6 - 4.5	12.6 - 8.5
7	10°01.8	10°03.4	9°34.3	0.7 - 0.5	6.7 - 4.5	12.7 - 8.6
8	10°02.0	10°03.6	9°34.6	0.8 - 0.5	6.8 - 4.6	12.8 - 8.6
9	10°02.2	10°03.9	9°34.8	0.9 - 0.6	6.9 - 4.7	12.9 - 8.7
10	10°02.5	10°04.1	9°35.1	1.0 - 0.7	7.0 - 4.7	13.0 - 8.8
11	10°02.7	10°04.4	9°35.3	1.1 - 0.7	7.1 - 4.8	13.1 - 8.8
12	10°03.0	10°04.6	9°35.5	1.2 - 0.8	7.2 - 4.9	13.2 - 8.9
13	10°03.3	10°04.9	9°35.8	1.3 - 0.9	7.3 - 4.9	13.3 - 9.0
14	10°03.5	10°05.1	9°36.0	1.4 - 0.9	7.4 - 5.0	13.4 - 9.0
15	10°03.8	10°05.4	9°36.2	1.5 - 1.0	7.5 - 5.1	13.5 - 9.1
16	10°04.0	10°05.7	9°36.5	1.6 - 1.1	7.6 - 5.1	13.6 - 9.2
17	10°04.2	10°05.9	9°36.7	1.7 - 1.1	7.7 - 5.2	13.7 - 9.2
18	10°04.5	10°06.2	9°37.0	1.8 - 1.2	7.8 - 5.3	13.8 - 9.3
19	10°04.8	10°06.4	9°37.2	1.9 - 1.3	7.9 - 5.3	13.9 - 9.4
20	10°05.0	10°06.7	9°37.4	2.0 - 1.4	8.0 - 5.4	14.0 - 9.5
21	10°05.3	10°06.9	9°37.7	2.1 - 1.4	8.1 - 5.5	14.1 - 9.5
22	10°05.5	10°07.2	9°37.9	2.2 - 1.5	8.2 - 5.5	14.2 - 9.6
23	10°05.7	10°07.4	9°38.2	2.3 - 1.6	8.3 - 5.6	14.3 - 9.7
24	10°06.0	10°07.7	9°38.4	2.4 - 1.6	8.4 - 5.7	14.4 - 9.7
25	10°06.2	10°07.9	9°38.6	2.5 - 1.7	8.5 - 5.7	14.5 - 9.8
26	10°06.5	10°08.2	9°38.9	2.6 - 1.8	8.6 - 5.8	14.6 - 9.9
27	10°06.8	10°08.4	9°39.1	2.7 - 1.8	8.7 - 5.9	14.7 - 9.9
28	10°07.0	10°08.7	9°39.3	2.8 - 1.9	8.8 - 5.9	14.8 - 10.0
29	10°07.3	10°08.9	9°39.6	2.9 - 2.0	8.9 - 6.0	14.9 - 10.1
30	10°07.5	10°09.2	9°39.8	3.0 - 2.0	9.0 - 6.1	15.0 - 10.1
31	10°07.7	10°09.4	9°40.1	3.1 - 2.1	9.1 - 6.1	15.1 - 10.2
32	10°08.0	10°09.7	9°40.3	3.2 - 2.2	9.2 - 6.2	15.2 - 10.3
33	10°08.2	10°09.9	9°40.5	3.3 - 2.2	9.3 - 6.3	15.3 - 10.3
34	10°08.5	10°10.2	9°40.8	3.4 - 2.3	9.4 - 6.3	15.4 - 10.4
35	10°08.8	10°10.4	9°41.0	3.5 - 2.4	9.5 - 6.4	15.5 - 10.5
36	10°09.0	10°10.7	9°41.3	3.6 - 2.4	9.6 - 6.5	15.6 - 10.5
37	10°09.3	10°10.9	9°41.5	3.7 - 2.5	9.7 - 6.5	15.7 - 10.6
38	10°09.5	10°11.2	9°41.7	3.8 - 2.6	9.8 - 6.6	15.8 - 10.7
39	10°09.7	10°11.4	9°42.0	3.9 - 2.6	9.9 - 6.7	15.9 - 10.7
40	10°10.0	10°11.7	9°42.2	4.0 - 2.7	10.0 - 6.8	16.0 - 10.8
41	10°10.2	10°11.9	9°42.4	4.1 - 2.8	10.1 - 6.8	16.1 - 10.9
42	10°10.5	10°12.2	9°42.7	4.2 - 2.8	10.2 - 6.9	16.2 - 10.9
43	10°10.8	10°12.4	9°42.9	4.3 - 2.9	10.3 - 7.0	16.3 - 11.0
44	10°11.0	10°12.7	9°43.2	4.4 - 3.0	10.4 - 7.0	16.4 - 11.1
45	10°11.3	10°12.9	9°43.4	4.5 - 3.0	10.5 - 7.1	16.5 - 11.1
46	10°11.5	10°13.2	9°43.6	4.6 - 3.1	10.6 - 7.2	16.6 - 11.2
47	10°11.7	10°13.4	9°43.9	4.7 - 3.2	10.7 - 7.2	16.7 - 11.3
48	10°12.0	10°13.7	9°44.1	4.8 - 3.2	10.8 - 7.3	16.8 - 11.3
49	10°12.3	10°13.9	9°44.4	4.9 - 3.3	10.9 - 7.4	16.9 - 11.4
50	10°12.5	10°14.2	9°44.6	5.0 - 3.4	11.0 - 7.4	17.0 - 11.5
51	10°12.8	10°14.4	9°44.8	5.1 - 3.4	11.1 - 7.5	17.1 - 11.5
52	10°13.0	10°14.7	9°45.1	5.2 - 3.5	11.2 - 7.6	17.2 - 11.6
53	10°13.2	10°14.9	9°45.3	5.3 - 3.6	11.3 - 7.6	17.3 - 11.7
54	10°13.5	10°15.2	9°45.6	5.4 - 3.6	11.4 - 7.7	17.4 - 11.7
55	10°13.7	10°15.4	9°45.8	5.5 - 3.7	11.5 - 7.8	17.5 - 11.8
56	10°14.0	10°15.7	9°46.0	5.6 - 3.8	11.6 - 7.8	17.6 - 11.9
57	10°14.3	10°15.9	9°46.3	5.7 - 3.8	11.7 - 7.9	17.7 - 11.9
58	10°14.5	10°16.2	9°46.5	5.8 - 3.9	11.8 - 8.0	17.8 - 12.0
59	10°14.8	10°16.4	9°46.7	5.9 - 4.0	11.9 - 8.0	17.9 - 12.1

m 41	Sun Plan.	Aries	Moon	v and d corr		
0	10°15.0	10°16.7	9°47.0	0.0 - 0.0	6.0 - 4.2	12.0 - 8.3
1	10°15.2	10°16.9	9°47.2	0.1 - 0.1	6.1 - 4.2	12.1 - 8.4
2	10°15.5	10°17.2	9°47.5	0.2 - 0.1	6.2 - 4.3	12.2 - 8.4
3	10°15.7	10°17.4	9°47.7	0.3 - 0.2	6.3 - 4.4	12.3 - 8.5
4	10°16.0	10°17.7	9°47.9	0.4 - 0.3	6.4 - 4.4	12.4 - 8.6
5	10°16.3	10°17.9	9°48.2	0.5 - 0.3	6.5 - 4.5	12.5 - 8.6
6	10°16.5	10°18.2	9°48.4	0.6 - 0.4	6.6 - 4.6	12.6 - 8.7
7	10°16.8	10°18.4	9°48.7	0.7 - 0.5	6.7 - 4.6	12.7 - 8.8
8	10°17.0	10°18.7	9°48.9	0.8 - 0.6	6.8 - 4.7	12.8 - 8.9
9	10°17.2	10°18.9	9°49.1	0.9 - 0.6	6.9 - 4.8	12.9 - 8.9
10	10°17.5	10°19.2	9°49.4	1.0 - 0.7	7.0 - 4.8	13.0 - 9.0
11	10°17.7	10°19.4	9°49.6	1.1 - 0.8	7.1 - 4.9	13.1 - 9.1
12	10°18.0	10°19.7	9°49.8	1.2 - 0.8	7.2 - 5.0	13.2 - 9.1
13	10°18.3	10°19.9	9°50.1	1.3 - 0.9	7.3 - 5.0	13.3 - 9.2
14	10°18.5	10°20.2	9°50.3	1.4 - 1.0	7.4 - 5.1	13.4 - 9.3
15	10°18.8	10°20.4	9°50.6	1.5 - 1.0	7.5 - 5.2	13.5 - 9.3
16	10°19.0	10°20.7	9°50.8	1.6 - 1.1	7.6 - 5.3	13.6 - 9.4
17	10°19.2	10°20.9	9°51.0	1.7 - 1.2	7.7 - 5.3	13.7 - 9.5
18	10°19.5	10°21.2	9°51.3	1.8 - 1.2	7.8 - 5.4	13.8 - 9.5
19	10°19.8	10°21.4	9°51.5	1.9 - 1.3	7.9 - 5.5	13.9 - 9.6
20	10°20.0	10°21.7	9°51.8	2.0 - 1.4	8.0 - 5.5	14.0 - 9.7
21	10°20.3	10°21.9	9°52.0	2.1 - 1.5	8.1 - 5.6	14.1 - 9.8
22	10°20.5	10°22.2	9°52.2	2.2 - 1.5	8.2 - 5.7	14.2 - 9.8
23	10°20.7	10°22.4	9°52.5	2.3 - 1.6	8.3 - 5.7	14.3 - 9.9
24	10°21.0	10°22.7	9°52.7	2.4 - 1.7	8.4 - 5.8	14.4 - 10.0
25	10°21.2	10°22.9	9°52.9	2.5 - 1.7	8.5 - 5.9	14.5 - 10.0
26	10°21.5	10°23.2	9°53.2	2.6 - 1.8	8.6 - 5.9	14.6 - 10.1
27	10°21.8	10°23.4	9°53.4	2.7 - 1.9	8.7 - 6.0	14.7 - 10.2
28	10°22.0	10°23.7	9°53.7	2.8 - 1.9	8.8 - 6.1	14.8 - 10.2
29	10°22.3	10°24.0	9°53.9	2.9 - 2.0	8.9 - 6.2	14.9 - 10.3
30	10°22.5	10°24.2	9°54.1	3.0 - 2.1	9.0 - 6.2	15.0 - 10.4
31	10°22.7	10°24.5	9°54.4	3.1 - 2.1	9.1 - 6.3	15.1 - 10.4
32	10°23.0	10°24.7	9°54.6	3.2 - 2.2	9.2 - 6.4	15.2 - 10.5
33	10°23.2	10°25.0	9°54.9	3.3 - 2.3	9.3 - 6.4	15.3 - 10.6
34	10°23.5	10°25.2	9°55.1	3.4 - 2.4	9.4 - 6.5	15.4 - 10.7
35	10°23.8	10°25.5	9°55.3	3.5 - 2.4	9.5 - 6.6	15.5 - 10.7
36	10°24.0	10°25.7	9°55.6	3.6 - 2.5	9.6 - 6.6	15.6 - 10.8
37	10°24.3	10°26.0	9°55.8	3.7 - 2.6	9.7 - 6.7	15.7 - 10.9
38	10°24.5	10°26.2	9°56.1	3.8 - 2.6	9.8 - 6.8	15.8 - 10.9
39	10°24.7	10°26.5	9°56.3	3.9 - 2.7	9.9 - 6.8	15.9 - 11.0
40	10°25.0	10°26.7	9°56.5	4.0 - 2.8	10.0 - 6.9	16.0 - 11.1
41	10°25.2	10°27.0	9°56.8	4.1 - 2.8	10.1 - 7.0	16.1 - 11.1
42	10°25.5	10°27.2	9°57.0	4.2 - 2.9	10.2 - 7.1	16.2 - 11.2
43	10°25.8	10°27.5	9°57.2	4.3 - 3.0	10.3 - 7.1	16.3 - 11.3
44	10°26.0	10°27.7	9°57.5	4.4 - 3.0	10.4 - 7.2	16.4 - 11.3
45	10°26.3	10°28.0	9°57.7	4.5 - 3.1	10.5 - 7.3	16.5 - 11.4
46	10°26.5	10°28.2	9°58.0	4.6 - 3.2	10.6 - 7.3	16.6 - 11.5
47	10°26.7	10°28.5	9°58.2	4.7 - 3.3	10.7 - 7.4	16.7 - 11.6
48	10°27.0	10°28.7	9°58.4	4.8 - 3.3	10.8 - 7.5	16.8 - 11.6
49	10°27.3	10°29.0	9°58.7	4.9 - 3.4	10.9 - 7.5	16.9 - 11.7
50	10°27.5	10°29.2	9°58.9	5.0 - 3.5	11.0 - 7.6	17.0 - 11.8
51	10°27.8	10°29.5	9°59.2	5.1 - 3.5	11.1 - 7.7	17.1 - 11.8
52	10°28.0	10°29.7	9°59.4	5.2 - 3.6	11.2 - 7.7	17.2 - 11.9
53	10°28.2	10°30.0	9°59.6	5.3 - 3.7	11.3 - 7.8	17.3 - 12.0
54	10°28.5	10°30.2	9°59.9	5.4 - 3.7	11.4 - 7.9	17.4 - 12.0
55	10°28.7	10°30.5	10°00.1	5.5 - 3.8	11.5 - 8.0	17.5 - 12.1
56	10°29.0	10°30.7	10°00.3	5.6 - 3.9	11.6 - 8.0	17.6 - 12.2
57	10°29.3	10°31.0	10°00.6	5.7 - 3.9	11.7 - 8.1	17.7 - 12.2
58	10°29.5	10°31.2	10°00.8	5.8 - 4.0	11.8 - 8.2	17.8 - 12.3
59	10°29.8	10°31.5	10°01.1	5.9 - 4.1	11.9 - 8.2	17.9 - 12.4

Increments and Corrections

m 42	Sun Plan.	Aries	Moon	v and d corr		
0	10°30.0	10°31.7	10°01.3	0.0 - 0.0	6.0 - 4.3	12.0 - 8.5
1	10°30.2	10°32.0	10°01.5	0.1 - 0.1	6.1 - 4.3	12.1 - 8.6
2	10°30.5	10°32.2	10°01.8	0.2 - 0.1	6.2 - 4.4	12.2 - 8.6
3	10°30.7	10°32.5	10°02.0	0.3 - 0.2	6.3 - 4.5	12.3 - 8.7
4	10°31.0	10°32.7	10°02.3	0.4 - 0.3	6.4 - 4.5	12.4 - 8.8
5	10°31.3	10°33.0	10°02.5	0.5 - 0.4	6.5 - 4.6	12.5 - 8.9
6	10°31.5	10°33.2	10°02.7	0.6 - 0.4	6.6 - 4.7	12.6 - 8.9
7	10°31.8	10°33.5	10°03.0	0.7 - 0.5	6.7 - 4.7	12.7 - 9.0
8	10°32.0	10°33.7	10°03.2	0.8 - 0.6	6.8 - 4.8	12.8 - 9.1
9	10°32.2	10°34.0	10°03.4	0.9 - 0.6	6.9 - 4.9	12.9 - 9.1
10	10°32.5	10°34.2	10°03.7	1.0 - 0.7	7.0 - 5.0	13.0 - 9.2
11	10°32.7	10°34.5	10°03.9	1.1 - 0.8	7.1 - 5.0	13.1 - 9.3
12	10°33.0	10°34.7	10°04.2	1.2 - 0.9	7.2 - 5.1	13.2 - 9.3
13	10°33.3	10°35.0	10°04.4	1.3 - 0.9	7.3 - 5.2	13.3 - 9.4
14	10°33.5	10°35.2	10°04.6	1.4 - 1.0	7.4 - 5.2	13.4 - 9.5
15	10°33.8	10°35.5	10°04.9	1.5 - 1.1	7.5 - 5.3	13.5 - 9.6
16	10°34.0	10°35.7	10°05.1	1.6 - 1.1	7.6 - 5.4	13.6 - 9.6
17	10°34.2	10°36.0	10°05.4	1.7 - 1.2	7.7 - 5.5	13.7 - 9.7
18	10°34.5	10°36.2	10°05.6	1.8 - 1.3	7.8 - 5.5	13.8 - 9.8
19	10°34.8	10°36.5	10°05.8	1.9 - 1.3	7.9 - 5.6	13.9 - 9.8
20	10°35.0	10°36.7	10°06.1	2.0 - 1.4	8.0 - 5.7	14.0 - 9.9
21	10°35.3	10°37.0	10°06.3	2.1 - 1.5	8.1 - 5.7	14.1 - 10.0
22	10°35.5	10°37.2	10°06.5	2.2 - 1.6	8.2 - 5.8	14.2 - 10.1
23	10°35.7	10°37.5	10°06.8	2.3 - 1.6	8.3 - 5.9	14.3 - 10.1
24	10°36.0	10°37.7	10°07.0	2.4 - 1.7	8.4 - 6.0	14.4 - 10.2
25	10°36.2	10°38.0	10°07.3	2.5 - 1.8	8.5 - 6.0	14.5 - 10.3
26	10°36.5	10°38.2	10°07.5	2.6 - 1.8	8.6 - 6.1	14.6 - 10.3
27	10°36.8	10°38.5	10°07.7	2.7 - 1.9	8.7 - 6.2	14.7 - 10.4
28	10°37.0	10°38.7	10°08.0	2.8 - 2.0	8.8 - 6.2	14.8 - 10.5
29	10°37.3	10°39.0	10°08.2	2.9 - 2.1	8.9 - 6.3	14.9 - 10.6
30	10°37.5	10°39.2	10°08.5	3.0 - 2.1	9.0 - 6.4	15.0 - 10.6
31	10°37.7	10°39.5	10°08.7	3.1 - 2.2	9.1 - 6.4	15.1 - 10.7
32	10°38.0	10°39.7	10°08.9	3.2 - 2.3	9.2 - 6.5	15.2 - 10.8
33	10°38.2	10°40.0	10°09.2	3.3 - 2.3	9.3 - 6.6	15.3 - 10.8
34	10°38.5	10°40.2	10°09.4	3.4 - 2.4	9.4 - 6.7	15.4 - 10.9
35	10°38.8	10°40.5	10°09.7	3.5 - 2.5	9.5 - 6.7	15.5 - 11.0
36	10°39.0	10°40.7	10°09.9	3.6 - 2.6	9.6 - 6.8	15.6 - 11.1
37	10°39.3	10°41.0	10°10.1	3.7 - 2.6	9.7 - 6.9	15.7 - 11.1
38	10°39.5	10°41.2	10°10.4	3.8 - 2.7	9.8 - 6.9	15.8 - 11.2
39	10°39.7	10°41.5	10°10.6	3.9 - 2.8	9.9 - 7.0	15.9 - 11.3
40	10°40.0	10°41.7	10°10.8	4.0 - 2.8	10.0 - 7.1	16.0 - 11.3
41	10°40.2	10°42.0	10°11.1	4.1 - 2.9	10.1 - 7.2	16.1 - 11.4
42	10°40.5	10°42.3	10°11.3	4.2 - 3.0	10.2 - 7.2	16.2 - 11.5
43	10°40.8	10°42.5	10°11.6	4.3 - 3.0	10.3 - 7.3	16.3 - 11.5
44	10°41.0	10°42.8	10°11.8	4.4 - 3.1	10.4 - 7.4	16.4 - 11.6
45	10°41.3	10°43.0	10°12.0	4.5 - 3.2	10.5 - 7.4	16.5 - 11.7
46	10°41.5	10°43.3	10°12.3	4.6 - 3.3	10.6 - 7.5	16.6 - 11.8
47	10°41.7	10°43.5	10°12.5	4.7 - 3.3	10.7 - 7.6	16.7 - 11.8
48	10°42.0	10°43.8	10°12.8	4.8 - 3.4	10.8 - 7.7	16.8 - 11.9
49	10°42.3	10°44.0	10°13.0	4.9 - 3.5	10.9 - 7.7	16.9 - 12.0
50	10°42.5	10°44.3	10°13.2	5.0 - 3.5	11.0 - 7.8	17.0 - 12.0
51	10°42.8	10°44.5	10°13.5	5.1 - 3.6	11.1 - 7.9	17.1 - 12.1
52	10°43.0	10°44.8	10°13.7	5.2 - 3.7	11.2 - 7.9	17.2 - 12.2
53	10°43.2	10°45.0	10°13.9	5.3 - 3.8	11.3 - 8.0	17.3 - 12.3
54	10°43.5	10°45.3	10°14.2	5.4 - 3.8	11.4 - 8.1	17.4 - 12.3
55	10°43.7	10°45.5	10°14.4	5.5 - 3.9	11.5 - 8.1	17.5 - 12.4
56	10°44.0	10°45.8	10°14.7	5.6 - 4.0	11.6 - 8.2	17.6 - 12.5
57	10°44.3	10°46.0	10°14.9	5.7 - 4.0	11.7 - 8.3	17.7 - 12.5
58	10°44.5	10°46.3	10°15.1	5.8 - 4.1	11.8 - 8.4	17.8 - 12.6
59	10°44.8	10°46.5	10°15.4	5.9 - 4.2	11.9 - 8.4	17.9 - 12.7

m 43	Sun Plan.	Aries	Moon	v and d corr		
0	10°45.0	10°46.8	10°15.6	0.0 - 0.0	6.0 - 4.3	12.0 - 8.7
1	10°45.2	10°47.0	10°15.9	0.1 - 0.1	6.1 - 4.4	12.1 - 8.8
2	10°45.5	10°47.3	10°16.1	0.2 - 0.1	6.2 - 4.5	12.2 - 8.8
3	10°45.7	10°47.5	10°16.3	0.3 - 0.2	6.3 - 4.6	12.3 - 8.9
4	10°46.0	10°47.8	10°16.6	0.4 - 0.3	6.4 - 4.6	12.4 - 9.0
5	10°46.3	10°48.0	10°16.8	0.5 - 0.4	6.5 - 4.7	12.5 - 9.1
6	10°46.5	10°48.3	10°17.0	0.6 - 0.4	6.6 - 4.8	12.6 - 9.1
7	10°46.8	10°48.5	10°17.3	0.7 - 0.5	6.7 - 4.9	12.7 - 9.2
8	10°47.0	10°48.8	10°17.5	0.8 - 0.6	6.8 - 4.9	12.8 - 9.3
9	10°47.2	10°49.0	10°17.8	0.9 - 0.7	6.9 - 5.0	12.9 - 9.4
10	10°47.5	10°49.3	10°18.0	1.0 - 0.7	7.0 - 5.1	13.0 - 9.4
11	10°47.7	10°49.5	10°18.2	1.1 - 0.8	7.1 - 5.1	13.1 - 9.5
12	10°48.0	10°49.8	10°18.5	1.2 - 0.9	7.2 - 5.2	13.2 - 9.6
13	10°48.3	10°50.0	10°18.7	1.3 - 0.9	7.3 - 5.3	13.3 - 9.6
14	10°48.5	10°50.3	10°19.0	1.4 - 1.0	7.4 - 5.4	13.4 - 9.7
15	10°48.8	10°50.5	10°19.2	1.5 - 1.1	7.5 - 5.4	13.5 - 9.8
16	10°49.0	10°50.8	10°19.4	1.6 - 1.2	7.6 - 5.5	13.6 - 9.9
17	10°49.2	10°51.0	10°19.7	1.7 - 1.2	7.7 - 5.6	13.7 - 9.9
18	10°49.5	10°51.3	10°19.9	1.8 - 1.3	7.8 - 5.7	13.8 - 10.0
19	10°49.8	10°51.5	10°20.2	1.9 - 1.4	7.9 - 5.7	13.9 - 10.1
20	10°50.0	10°51.8	10°20.4	2.0 - 1.4	8.0 - 5.8	14.0 - 10.2
21	10°50.3	10°52.0	10°20.6	2.1 - 1.5	8.1 - 5.9	14.1 - 10.2
22	10°50.5	10°52.3	10°20.9	2.2 - 1.6	8.2 - 5.9	14.2 - 10.3
23	10°50.7	10°52.5	10°21.1	2.3 - 1.7	8.3 - 6.0	14.3 - 10.4
24	10°51.0	10°52.8	10°21.3	2.4 - 1.7	8.4 - 6.1	14.4 - 10.4
25	10°51.2	10°53.0	10°21.6	2.5 - 1.8	8.5 - 6.2	14.5 - 10.5
26	10°51.5	10°53.3	10°21.8	2.6 - 1.9	8.6 - 6.2	14.6 - 10.6
27	10°51.8	10°53.5	10°22.1	2.7 - 2.0	8.7 - 6.3	14.7 - 10.7
28	10°52.0	10°53.8	10°22.3	2.8 - 2.0	8.8 - 6.4	14.8 - 10.7
29	10°52.3	10°54.0	10°22.5	2.9 - 2.1	8.9 - 6.5	14.9 - 10.8
30	10°52.5	10°54.3	10°22.8	3.0 - 2.2	9.0 - 6.5	15.0 - 10.9
31	10°52.7	10°54.5	10°23.0	3.1 - 2.2	9.1 - 6.6	15.1 - 10.9
32	10°53.0	10°54.8	10°23.3	3.2 - 2.3	9.2 - 6.7	15.2 - 11.0
33	10°53.2	10°55.0	10°23.5	3.3 - 2.4	9.3 - 6.7	15.3 - 11.1
34	10°53.5	10°55.3	10°23.7	3.4 - 2.5	9.4 - 6.8	15.4 - 11.2
35	10°53.8	10°55.5	10°24.0	3.5 - 2.5	9.5 - 6.9	15.5 - 11.2
36	10°54.0	10°55.8	10°24.2	3.6 - 2.6	9.6 - 7.0	15.6 - 11.3
37	10°54.3	10°56.0	10°24.4	3.7 - 2.7	9.7 - 7.0	15.7 - 11.4
38	10°54.5	10°56.3	10°24.7	3.8 - 2.8	9.8 - 7.1	15.8 - 11.5
39	10°54.7	10°56.5	10°24.9	3.9 - 2.8	9.9 - 7.2	15.9 - 11.5
40	10°55.0	10°56.8	10°25.2	4.0 - 2.9	10.0 - 7.3	16.0 - 11.6
41	10°55.2	10°57.0	10°25.4	4.1 - 3.0	10.1 - 7.3	16.1 - 11.7
42	10°55.5	10°57.3	10°25.6	4.2 - 3.0	10.2 - 7.4	16.2 - 11.7
43	10°55.8	10°57.5	10°25.9	4.3 - 3.1	10.3 - 7.5	16.3 - 11.8
44	10°56.0	10°57.8	10°26.1	4.4 - 3.2	10.4 - 7.5	16.4 - 11.9
45	10°56.3	10°58.0	10°26.4	4.5 - 3.3	10.5 - 7.6	16.5 - 12.0
46	10°56.5	10°58.3	10°26.6	4.6 - 3.3	10.6 - 7.7	16.6 - 12.0
47	10°56.7	10°58.5	10°26.8	4.7 - 3.4	10.7 - 7.8	16.7 - 12.1
48	10°57.0	10°58.8	10°27.1	4.8 - 3.5	10.8 - 7.8	16.8 - 12.2
49	10°57.3	10°59.0	10°27.3	4.9 - 3.6	10.9 - 7.9	16.9 - 12.3
50	10°57.5	10°59.3	10°27.5	5.0 - 3.6	11.0 - 8.0	17.0 - 12.3
51	10°57.8	10°59.5	10°27.8	5.1 - 3.7	11.1 - 8.0	17.1 - 12.4
52	10°58.0	10°59.8	10°28.0	5.2 - 3.8	11.2 - 8.1	17.2 - 12.5
53	10°58.2	11°00.0	10°28.3	5.3 - 3.8	11.3 - 8.2	17.3 - 12.5
54	10°58.5	11°00.3	10°28.5	5.4 - 3.9	11.4 - 8.3	17.4 - 12.6
55	10°58.7	11°00.6	10°28.7	5.5 - 4.0	11.5 - 8.3	17.5 - 12.7
56	10°59.0	11°00.8	10°29.0	5.6 - 4.1	11.6 - 8.4	17.6 - 12.8
57	10°59.3	11°01.1	10°29.2	5.7 - 4.1	11.7 - 8.5	17.7 - 12.8
58	10°59.5	11°01.3	10°29.5	5.8 - 4.2	11.8 - 8.6	17.8 - 12.9
59	10°59.8	11°01.6	10°29.7	5.9 - 4.3	11.9 - 8.6	17.9 - 13.0

m 44	Sun Plan.	Aries	Moon	v and d corr		
0	11°00.0	11°01.8	10°29.9	0.0 - 0.0	6.0 - 4.5	12.0 - 8.9
1	11°00.2	11°02.1	10°30.2	0.1 - 0.1	6.1 - 4.5	12.1 - 9.0
2	11°00.5	11°02.3	10°30.4	0.2 - 0.1	6.2 - 4.6	12.2 - 9.0
3	11°00.7	11°02.6	10°30.6	0.3 - 0.2	6.3 - 4.7	12.3 - 9.1
4	11°01.0	11°02.8	10°30.9	0.4 - 0.3	6.4 - 4.7	12.4 - 9.2
5	11°01.3	11°03.1	10°31.1	0.5 - 0.4	6.5 - 4.8	12.5 - 9.3
6	11°01.5	11°03.3	10°31.4	0.6 - 0.4	6.6 - 4.9	12.6 - 9.3
7	11°01.8	11°03.6	10°31.6	0.7 - 0.5	6.7 - 5.0	12.7 - 9.4
8	11°02.0	11°03.8	10°31.8	0.8 - 0.6	6.8 - 5.0	12.8 - 9.5
9	11°02.2	11°04.1	10°32.1	0.9 - 0.7	6.9 - 5.1	12.9 - 9.6
10	11°02.5	11°04.3	10°32.3	1.0 - 0.7	7.0 - 5.2	13.0 - 9.6
11	11°02.7	11°04.6	10°32.6	1.1 - 0.8	7.1 - 5.3	13.1 - 9.7
12	11°03.0	11°04.8	10°32.8	1.2 - 0.9	7.2 - 5.3	13.2 - 9.8
13	11°03.3	11°05.1	10°33.0	1.3 - 1.0	7.3 - 5.4	13.3 - 9.9
14	11°03.5	11°05.3	10°33.3	1.4 - 1.0	7.4 - 5.5	13.4 - 9.9
15	11°03.8	11°05.6	10°33.5	1.5 - 1.1	7.5 - 5.6	13.5 - 10.0
16	11°04.0	11°05.8	10°33.8	1.6 - 1.2	7.6 - 5.6	13.6 - 10.1
17	11°04.2	11°06.1	10°34.0	1.7 - 1.3	7.7 - 5.7	13.7 - 10.2
18	11°04.5	11°06.3	10°34.2	1.8 - 1.3	7.8 - 5.8	13.8 - 10.2
19	11°04.8	11°06.6	10°34.5	1.9 - 1.4	7.9 - 5.9	13.9 - 10.3
20	11°05.0	11°06.8	10°34.7	2.0 - 1.5	8.0 - 5.9	14.0 - 10.4
21	11°05.3	11°07.1	10°34.9	2.1 - 1.6	8.1 - 6.0	14.1 - 10.5
22	11°05.5	11°07.3	10°35.2	2.2 - 1.6	8.2 - 6.1	14.2 - 10.5
23	11°05.7	11°07.6	10°35.4	2.3 - 1.7	8.3 - 6.2	14.3 - 10.6
24	11°06.0	11°07.8	10°35.7	2.4 - 1.8	8.4 - 6.2	14.4 - 10.7
25	11°06.2	11°08.1	10°35.9	2.5 - 1.9	8.5 - 6.3	14.5 - 10.8
26	11°06.5	11°08.3	10°36.1	2.6 - 1.9	8.6 - 6.4	14.6 - 10.8
27	11°06.8	11°08.6	10°36.4	2.7 - 2.0	8.7 - 6.5	14.7 - 10.9
28	11°07.0	11°08.8	10°36.6	2.8 - 2.1	8.8 - 6.5	14.8 - 11.0
29	11°07.3	11°09.1	10°36.9	2.9 - 2.2	8.9 - 6.6	14.9 - 11.1
30	11°07.5	11°09.3	10°37.1	3.0 - 2.2	9.0 - 6.7	15.0 - 11.1
31	11°07.7	11°09.6	10°37.3	3.1 - 2.3	9.1 - 6.7	15.1 - 11.2
32	11°08.0	11°09.8	10°37.6	3.2 - 2.4	9.2 - 6.8	15.2 - 11.3
33	11°08.2	11°10.1	10°37.8	3.3 - 2.4	9.3 - 6.9	15.3 - 11.3
34	11°08.5	11°10.3	10°38.0	3.4 - 2.5	9.4 - 7.0	15.4 - 11.4
35	11°08.8	11°10.6	10°38.3	3.5 - 2.6	9.5 - 7.0	15.5 - 11.5
36	11°09.0	11°10.8	10°38.5	3.6 - 2.7	9.6 - 7.1	15.6 - 11.6
37	11°09.3	11°11.1	10°38.8	3.7 - 2.7	9.7 - 7.2	15.7 - 11.6
38	11°09.5	11°11.3	10°39.0	3.8 - 2.8	9.8 - 7.3	15.8 - 11.7
39	11°09.7	11°11.6	10°39.2	3.9 - 2.9	9.9 - 7.3	15.9 - 11.8
40	11°10.0	11°11.8	10°39.5	4.0 - 3.0	10.0 - 7.4	16.0 - 11.9
41	11°10.2	11°12.1	10°39.7	4.1 - 3.0	10.1 - 7.5	16.1 - 11.9
42	11°10.5	11°12.3	10°40.0	4.2 - 3.1	10.2 - 7.6	16.2 - 12.0
43	11°10.8	11°12.6	10°40.2	4.3 - 3.2	10.3 - 7.6	16.3 - 12.1
44	11°11.0	11°12.8	10°40.4	4.4 - 3.3	10.4 - 7.7	16.4 - 12.2
45	11°11.3	11°13.1	10°40.7	4.5 - 3.3	10.5 - 7.8	16.5 - 12.2
46	11°11.5	11°13.3	10°40.9	4.6 - 3.4	10.6 - 7.9	16.6 - 12.3
47	11°11.7	11°13.6	10°41.1	4.7 - 3.5	10.7 - 7.9	16.7 - 12.4
48	11°12.0	11°13.8	10°41.4	4.8 - 3.6	10.8 - 8.0	16.8 - 12.5
49	11°12.3	11°14.1	10°41.6	4.9 - 3.6	10.9 - 8.1	16.9 - 12.5
50	11°12.5	11°14.3	10°41.9	5.0 - 3.7	11.0 - 8.2	17.0 - 12.6
51	11°12.8	11°14.6	10°42.1	5.1 - 3.8	11.1 - 8.2	17.1 - 12.7
52	11°13.0	11°14.8	10°42.3	5.2 - 3.9	11.2 - 8.3	17.2 - 12.8
53	11°13.2	11°15.1	10°42.6	5.3 - 3.9	11.3 - 8.4	17.3 - 12.8
54	11°13.5	11°15.3	10°42.8	5.4 - 4.0	11.4 - 8.5	17.4 - 12.9
55	11°13.7	11°15.6	10°43.1	5.5 - 4.1	11.5 - 8.5	17.5 - 13.0
56	11°14.0	11°15.8	10°43.3	5.6 - 4.2	11.6 - 8.6	17.6 - 13.1
57	11°14.3	11°16.1	10°43.5	5.7 - 4.2	11.7 - 8.7	17.7 - 13.1
58	11°14.5	11°16.3	10°43.8	5.8 - 4.3	11.8 - 8.8	17.8 - 13.2
59	11°14.8	11°16.6	10°44.0	5.9 - 4.4	11.9 - 8.8	17.9 - 13.3

Increments and Corrections

m 45	Sun Plan.	Aries	Moon	v and d corr		
0	11°15.0	11°16.8	10°44.3	0.0 - 0.0	6.0 - 4.5	12.0 - 9.1
1	11°15.2	11°17.1	10°44.5	0.1 - 0.1	6.1 - 4.6	12.1 - 9.2
2	11°15.5	11°17.3	10°44.7	0.2 - 0.2	6.2 - 4.7	12.2 - 9.3
3	11°15.7	11°17.6	10°45.0	0.3 - 0.2	6.3 - 4.8	12.3 - 9.3
4	11°16.0	11°17.8	10°45.2	0.4 - 0.3	6.4 - 4.9	12.4 - 9.4
5	11°16.3	11°18.1	10°45.4	0.5 - 0.4	6.5 - 4.9	12.5 - 9.5
6	11°16.5	11°18.3	10°45.7	0.6 - 0.5	6.6 - 5.0	12.6 - 9.6
7	11°16.8	11°18.6	10°45.9	0.7 - 0.5	6.7 - 5.1	12.7 - 9.6
8	11°17.0	11°18.9	10°46.2	0.8 - 0.6	6.8 - 5.2	12.8 - 9.7
9	11°17.2	11°19.1	10°46.4	0.9 - 0.7	6.9 - 5.2	12.9 - 9.8
10	11°17.5	11°19.4	10°46.6	1.0 - 0.8	7.0 - 5.3	13.0 - 9.9
11	11°17.7	11°19.6	10°46.9	1.1 - 0.8	7.1 - 5.4	13.1 - 9.9
12	11°18.0	11°19.9	10°47.1	1.2 - 0.9	7.2 - 5.5	13.2 - 10.0
13	11°18.3	11°20.1	10°47.4	1.3 - 1.0	7.3 - 5.5	13.3 - 10.1
14	11°18.5	11°20.4	10°47.6	1.4 - 1.1	7.4 - 5.6	13.4 - 10.2
15	11°18.8	11°20.6	10°47.8	1.5 - 1.1	7.5 - 5.7	13.5 - 10.2
16	11°19.0	11°20.9	10°48.1	1.6 - 1.2	7.6 - 5.8	13.6 - 10.3
17	11°19.2	11°21.1	10°48.3	1.7 - 1.3	7.7 - 5.8	13.7 - 10.4
18	11°19.5	11°21.4	10°48.5	1.8 - 1.4	7.8 - 5.9	13.8 - 10.5
19	11°19.8	11°21.6	10°48.8	1.9 - 1.4	7.9 - 6.0	13.9 - 10.5
20	11°20.0	11°21.9	10°49.0	2.0 - 1.5	8.0 - 6.1	14.0 - 10.6
21	11°20.3	11°22.1	10°49.3	2.1 - 1.6	8.1 - 6.1	14.1 - 10.7
22	11°20.5	11°22.4	10°49.5	2.2 - 1.7	8.2 - 6.2	14.2 - 10.8
23	11°20.7	11°22.6	10°49.7	2.3 - 1.7	8.3 - 6.3	14.3 - 10.8
24	11°21.0	11°22.9	10°50.0	2.4 - 1.8	8.4 - 6.4	14.4 - 10.9
25	11°21.2	11°23.1	10°50.2	2.5 - 1.9	8.5 - 6.4	14.5 - 11.0
26	11°21.5	11°23.4	10°50.5	2.6 - 2.0	8.6 - 6.5	14.6 - 11.1
27	11°21.8	11°23.6	10°50.7	2.7 - 2.0	8.7 - 6.6	14.7 - 11.1
28	11°22.0	11°23.9	10°50.9	2.8 - 2.1	8.8 - 6.7	14.8 - 11.2
29	11°22.3	11°24.1	10°51.2	2.9 - 2.2	8.9 - 6.7	14.9 - 11.3
30	11°22.5	11°24.4	10°51.4	3.0 - 2.3	9.0 - 6.8	15.0 - 11.4
31	11°22.7	11°24.6	10°51.6	3.1 - 2.4	9.1 - 6.9	15.1 - 11.5
32	11°23.0	11°24.9	10°51.9	3.2 - 2.4	9.2 - 7.0	15.2 - 11.5
33	11°23.2	11°25.1	10°52.1	3.3 - 2.5	9.3 - 7.1	15.3 - 11.6
34	11°23.5	11°25.4	10°52.4	3.4 - 2.6	9.4 - 7.1	15.4 - 11.7
35	11°23.8	11°25.6	10°52.6	3.5 - 2.7	9.5 - 7.2	15.5 - 11.8
36	11°24.0	11°25.9	10°52.8	3.6 - 2.7	9.6 - 7.3	15.6 - 11.8
37	11°24.3	11°26.1	10°53.1	3.7 - 2.8	9.7 - 7.4	15.7 - 11.9
38	11°24.5	11°26.4	10°53.3	3.8 - 2.9	9.8 - 7.4	15.8 - 12.0
39	11°24.7	11°26.6	10°53.6	3.9 - 3.0	9.9 - 7.5	15.9 - 12.1
40	11°25.0	11°26.9	10°53.8	4.0 - 3.0	10.0 - 7.6	16.0 - 12.1
41	11°25.2	11°27.1	10°54.0	4.1 - 3.1	10.1 - 7.7	16.1 - 12.2
42	11°25.5	11°27.4	10°54.3	4.2 - 3.2	10.2 - 7.7	16.2 - 12.3
43	11°25.8	11°27.6	10°54.5	4.3 - 3.3	10.3 - 7.8	16.3 - 12.4
44	11°26.0	11°27.9	10°54.7	4.4 - 3.3	10.4 - 7.9	16.4 - 12.4
45	11°26.3	11°28.1	10°55.0	4.5 - 3.4	10.5 - 8.0	16.5 - 12.5
46	11°26.5	11°28.4	10°55.2	4.6 - 3.5	10.6 - 8.0	16.6 - 12.6
47	11°26.7	11°28.6	10°55.5	4.7 - 3.6	10.7 - 8.1	16.7 - 12.7
48	11°27.0	11°28.9	10°55.7	4.8 - 3.6	10.8 - 8.2	16.8 - 12.7
49	11°27.3	11°29.1	10°55.9	4.9 - 3.7	10.9 - 8.3	16.9 - 12.8
50	11°27.5	11°29.4	10°56.2	5.0 - 3.8	11.0 - 8.3	17.0 - 12.9
51	11°27.8	11°29.6	10°56.4	5.1 - 3.9	11.1 - 8.4	17.1 - 13.0
52	11°28.0	11°29.9	10°56.7	5.2 - 3.9	11.2 - 8.5	17.2 - 13.0
53	11°28.2	11°30.1	10°56.9	5.3 - 4.0	11.3 - 8.6	17.3 - 13.1
54	11°28.5	11°30.4	10°57.1	5.4 - 4.1	11.4 - 8.6	17.4 - 13.2
55	11°28.7	11°30.6	10°57.4	5.5 - 4.2	11.5 - 8.7	17.5 - 13.3
56	11°29.0	11°30.9	10°57.6	5.6 - 4.2	11.6 - 8.8	17.6 - 13.3
57	11°29.3	11°31.1	10°57.9	5.7 - 4.3	11.7 - 8.9	17.7 - 13.4
58	11°29.5	11°31.4	10°58.1	5.8 - 4.4	11.8 - 8.9	17.8 - 13.5
59	11°29.8	11°31.6	10°58.3	5.9 - 4.5	11.9 - 9.0	17.9 - 13.6

m 46	Sun Plan.	Aries	Moon	v and d corr		
0	11°30.0	11°31.9	10°58.6	0.0 - 0.0	6.0 - 4.7	12.0 - 9.3
1	11°30.2	11°32.1	10°58.8	0.1 - 0.1	6.1 - 4.7	12.1 - 9.4
2	11°30.5	11°32.4	10°59.0	0.2 - 0.2	6.2 - 4.8	12.2 - 9.5
3	11°30.7	11°32.6	10°59.3	0.3 - 0.2	6.3 - 4.9	12.3 - 9.5
4	11°31.0	11°32.9	10°59.5	0.4 - 0.3	6.4 - 5.0	12.4 - 9.6
5	11°31.3	11°33.1	10°59.8	0.5 - 0.4	6.5 - 5.0	12.5 - 9.7
6	11°31.5	11°33.4	11°00.0	0.6 - 0.5	6.6 - 5.1	12.6 - 9.8
7	11°31.8	11°33.6	11°00.2	0.7 - 0.5	6.7 - 5.2	12.7 - 9.8
8	11°32.0	11°33.9	11°00.5	0.8 - 0.6	6.8 - 5.3	12.8 - 9.9
9	11°32.2	11°34.1	11°00.7	0.9 - 0.7	6.9 - 5.3	12.9 - 10.0
10	11°32.5	11°34.4	11°01.0	1.0 - 0.8	7.0 - 5.4	13.0 - 10.1
11	11°32.7	11°34.6	11°01.2	1.1 - 0.9	7.1 - 5.5	13.1 - 10.2
12	11°33.0	11°34.9	11°01.4	1.2 - 0.9	7.2 - 5.6	13.2 - 10.2
13	11°33.3	11°35.1	11°01.7	1.3 - 1.0	7.3 - 5.7	13.3 - 10.3
14	11°33.5	11°35.4	11°01.9	1.4 - 1.1	7.4 - 5.7	13.4 - 10.4
15	11°33.8	11°35.6	11°02.1	1.5 - 1.2	7.5 - 5.8	13.5 - 10.5
16	11°34.0	11°35.9	11°02.4	1.6 - 1.2	7.6 - 5.9	13.6 - 10.5
17	11°34.2	11°36.1	11°02.6	1.7 - 1.3	7.7 - 6.0	13.7 - 10.6
18	11°34.5	11°36.4	11°02.9	1.8 - 1.4	7.8 - 6.0	13.8 - 10.7
19	11°34.8	11°36.6	11°03.1	1.9 - 1.5	7.9 - 6.1	13.9 - 10.8
20	11°35.0	11°36.9	11°03.3	2.0 - 1.6	8.0 - 6.2	14.0 - 10.8
21	11°35.3	11°37.2	11°03.6	2.1 - 1.6	8.1 - 6.3	14.1 - 10.9
22	11°35.5	11°37.4	11°03.8	2.2 - 1.7	8.2 - 6.4	14.2 - 11.0
23	11°35.7	11°37.7	11°04.1	2.3 - 1.8	8.3 - 6.4	14.3 - 11.1
24	11°36.0	11°37.9	11°04.3	2.4 - 1.9	8.4 - 6.5	14.4 - 11.2
25	11°36.2	11°38.2	11°04.5	2.5 - 1.9	8.5 - 6.6	14.5 - 11.2
26	11°36.5	11°38.4	11°04.8	2.6 - 2.0	8.6 - 6.7	14.6 - 11.3
27	11°36.8	11°38.7	11°05.0	2.7 - 2.1	8.7 - 6.7	14.7 - 11.4
28	11°37.0	11°38.9	11°05.2	2.8 - 2.2	8.8 - 6.8	14.8 - 11.5
29	11°37.3	11°39.2	11°05.5	2.9 - 2.2	8.9 - 6.9	14.9 - 11.5
30	11°37.5	11°39.4	11°05.7	3.0 - 2.3	9.0 - 7.0	15.0 - 11.6
31	11°37.7	11°39.7	11°06.0	3.1 - 2.4	9.1 - 7.1	15.1 - 11.7
32	11°38.0	11°39.9	11°06.2	3.2 - 2.5	9.2 - 7.1	15.2 - 11.8
33	11°38.2	11°40.2	11°06.4	3.3 - 2.6	9.3 - 7.2	15.3 - 11.9
34	11°38.5	11°40.4	11°06.7	3.4 - 2.6	9.4 - 7.3	15.4 - 11.9
35	11°38.8	11°40.7	11°06.9	3.5 - 2.7	9.5 - 7.4	15.5 - 12.0
36	11°39.0	11°40.9	11°07.2	3.6 - 2.8	9.6 - 7.4	15.6 - 12.1
37	11°39.3	11°41.2	11°07.4	3.7 - 2.9	9.7 - 7.5	15.7 - 12.2
38	11°39.5	11°41.4	11°07.6	3.8 - 2.9	9.8 - 7.6	15.8 - 12.2
39	11°39.7	11°41.7	11°07.9	3.9 - 3.0	9.9 - 7.7	15.9 - 12.3
40	11°40.0	11°41.9	11°08.1	4.0 - 3.1	10.0 - 7.8	16.0 - 12.4
41	11°40.2	11°42.2	11°08.3	4.1 - 3.2	10.1 - 7.8	16.1 - 12.5
42	11°40.5	11°42.4	11°08.6	4.2 - 3.3	10.2 - 7.9	16.2 - 12.6
43	11°40.8	11°42.7	11°08.8	4.3 - 3.3	10.3 - 8.0	16.3 - 12.6
44	11°41.0	11°42.9	11°09.1	4.4 - 3.4	10.4 - 8.1	16.4 - 12.7
45	11°41.3	11°43.2	11°09.3	4.5 - 3.5	10.5 - 8.1	16.5 - 12.8
46	11°41.5	11°43.4	11°09.5	4.6 - 3.6	10.6 - 8.2	16.6 - 12.9
47	11°41.7	11°43.7	11°09.8	4.7 - 3.6	10.7 - 8.3	16.7 - 12.9
48	11°42.0	11°43.9	11°10.0	4.8 - 3.7	10.8 - 8.4	16.8 - 13.0
49	11°42.3	11°44.2	11°10.3	4.9 - 3.8	10.9 - 8.4	16.9 - 13.1
50	11°42.5	11°44.4	11°10.5	5.0 - 3.9	11.0 - 8.5	17.0 - 13.2
51	11°42.8	11°44.7	11°10.7	5.1 - 4.0	11.1 - 8.6	17.1 - 13.3
52	11°43.0	11°44.9	11°11.0	5.2 - 4.0	11.2 - 8.7	17.2 - 13.3
53	11°43.2	11°45.2	11°11.2	5.3 - 4.1	11.3 - 8.8	17.3 - 13.4
54	11°43.5	11°45.4	11°11.5	5.4 - 4.2	11.4 - 8.8	17.4 - 13.5
55	11°43.7	11°45.7	11°11.7	5.5 - 4.3	11.5 - 8.9	17.5 - 13.6
56	11°44.0	11°45.9	11°11.9	5.6 - 4.3	11.6 - 9.0	17.6 - 13.6
57	11°44.3	11°46.2	11°12.2	5.7 - 4.4	11.7 - 9.1	17.7 - 13.7
58	11°44.5	11°46.4	11°12.4	5.8 - 4.5	11.8 - 9.1	17.8 - 13.8
59	11°44.8	11°46.7	11°12.6	5.9 - 4.6	11.9 - 9.2	17.9 - 13.9

m 47	Sun Plan.	Aries	Moon	v and d corr		
0	11°45.0	11°46.9	11°12.9	0.0 - 0.0	6.0 - 4.8	12.0 - 9.5
1	11°45.2	11°47.2	11°13.1	0.1 - 0.1	6.1 - 4.8	12.1 - 9.6
2	11°45.5	11°47.4	11°13.4	0.2 - 0.2	6.2 - 4.9	12.2 - 9.7
3	11°45.7	11°47.7	11°13.6	0.3 - 0.2	6.3 - 5.0	12.3 - 9.7
4	11°46.0	11°47.9	11°13.8	0.4 - 0.3	6.4 - 5.1	12.4 - 9.8
5	11°46.3	11°48.2	11°14.1	0.5 - 0.4	6.5 - 5.1	12.5 - 9.9
6	11°46.5	11°48.4	11°14.3	0.6 - 0.5	6.6 - 5.2	12.6 - 10.0
7	11°46.8	11°48.7	11°14.6	0.7 - 0.6	6.7 - 5.3	12.7 - 10.1
8	11°47.0	11°48.9	11°14.8	0.8 - 0.6	6.8 - 5.4	12.8 - 10.1
9	11°47.2	11°49.2	11°15.0	0.9 - 0.7	6.9 - 5.5	12.9 - 10.2
10	11°47.5	11°49.4	11°15.3	1.0 - 0.8	7.0 - 5.5	13.0 - 10.3
11	11°47.7	11°49.7	11°15.5	1.1 - 0.9	7.1 - 5.6	13.1 - 10.4
12	11°48.0	11°49.9	11°15.7	1.2 - 1.0	7.2 - 5.7	13.2 - 10.4
13	11°48.3	11°50.2	11°16.0	1.3 - 1.0	7.3 - 5.8	13.3 - 10.5
14	11°48.5	11°50.4	11°16.2	1.4 - 1.1	7.4 - 5.9	13.4 - 10.6
15	11°48.8	11°50.7	11°16.5	1.5 - 1.2	7.5 - 5.9	13.5 - 10.7
16	11°49.0	11°50.9	11°16.7	1.6 - 1.3	7.6 - 6.0	13.6 - 10.8
17	11°49.2	11°51.2	11°16.9	1.7 - 1.3	7.7 - 6.1	13.7 - 10.8
18	11°49.5	11°51.4	11°17.2	1.8 - 1.4	7.8 - 6.2	13.8 - 10.9
19	11°49.8	11°51.7	11°17.4	1.9 - 1.5	7.9 - 6.3	13.9 - 11.0
20	11°50.0	11°51.9	11°17.7	2.0 - 1.6	8.0 - 6.3	14.0 - 11.1
21	11°50.3	11°52.2	11°17.9	2.1 - 1.7	8.1 - 6.4	14.1 - 11.2
22	11°50.5	11°52.4	11°18.1	2.2 - 1.7	8.2 - 6.5	14.2 - 11.2
23	11°50.7	11°52.7	11°18.4	2.3 - 1.8	8.3 - 6.6	14.3 - 11.3
24	11°51.0	11°52.9	11°18.6	2.4 - 1.9	8.4 - 6.7	14.4 - 11.4
25	11°51.2	11°53.2	11°18.8	2.5 - 2.0	8.5 - 6.7	14.5 - 11.5
26	11°51.5	11°53.4	11°19.1	2.6 - 2.1	8.6 - 6.8	14.6 - 11.6
27	11°51.8	11°53.7	11°19.3	2.7 - 2.1	8.7 - 6.9	14.7 - 11.6
28	11°52.0	11°53.9	11°19.6	2.8 - 2.2	8.8 - 7.0	14.8 - 11.7
29	11°52.3	11°54.2	11°19.8	2.9 - 2.3	8.9 - 7.0	14.9 - 11.8
30	11°52.5	11°54.4	11°20.0	3.0 - 2.4	9.0 - 7.1	15.0 - 11.9
31	11°52.7	11°54.7	11°20.3	3.1 - 2.5	9.1 - 7.2	15.1 - 12.0
32	11°53.0	11°54.9	11°20.5	3.2 - 2.5	9.2 - 7.3	15.2 - 12.0
33	11°53.2	11°55.2	11°20.8	3.3 - 2.6	9.3 - 7.4	15.3 - 12.1
34	11°53.5	11°55.5	11°21.0	3.4 - 2.7	9.4 - 7.4	15.4 - 12.2
35	11°53.8	11°55.7	11°21.2	3.5 - 2.8	9.5 - 7.5	15.5 - 12.3
36	11°54.0	11°56.0	11°21.5	3.6 - 2.9	9.6 - 7.6	15.6 - 12.3
37	11°54.3	11°56.2	11°21.7	3.7 - 2.9	9.7 - 7.7	15.7 - 12.4
38	11°54.5	11°56.5	11°22.0	3.8 - 3.0	9.8 - 7.8	15.8 - 12.5
39	11°54.7	11°56.7	11°22.2	3.9 - 3.1	9.9 - 7.8	15.9 - 12.6
40	11°55.0	11°57.0	11°22.4	4.0 - 3.2	10.0 - 7.9	16.0 - 12.7
41	11°55.2	11°57.2	11°22.7	4.1 - 3.2	10.1 - 8.0	16.1 - 12.7
42	11°55.5	11°57.5	11°22.9	4.2 - 3.3	10.2 - 8.1	16.2 - 12.8
43	11°55.8	11°57.7	11°23.1	4.3 - 3.4	10.3 - 8.2	16.3 - 12.9
44	11°56.0	11°58.0	11°23.4	4.4 - 3.5	10.4 - 8.2	16.4 - 13.0
45	11°56.3	11°58.2	11°23.6	4.5 - 3.6	10.5 - 8.3	16.5 - 13.1
46	11°56.5	11°58.5	11°23.9	4.6 - 3.6	10.6 - 8.4	16.6 - 13.1
47	11°56.7	11°58.7	11°24.1	4.7 - 3.7	10.7 - 8.5	16.7 - 13.2
48	11°57.0	11°59.0	11°24.3	4.8 - 3.8	10.8 - 8.6	16.8 - 13.3
49	11°57.3	11°59.2	11°24.6	4.9 - 3.9	10.9 - 8.6	16.9 - 13.4
50	11°57.5	11°59.5	11°24.8	5.0 - 4.0	11.0 - 8.7	17.0 - 13.5
51	11°57.8	11°59.7	12°25.1	5.1 - 4.0	11.1 - 8.8	17.1 - 13.5
52	11°58.0	12°00.0	11°25.3	5.2 - 4.1	11.2 - 8.9	17.2 - 13.6
53	11°58.2	12°00.2	11°25.5	5.3 - 4.2	11.3 - 8.9	17.3 - 13.7
54	11°58.5	12°00.5	11°25.8	5.4 - 4.3	11.4 - 9.0	17.4 - 13.8
55	11°58.7	12°00.7	11°26.0	5.5 - 4.4	11.5 - 9.1	17.5 - 13.9
56	11°59.0	12°01.0	11°26.2	5.6 - 4.4	11.6 - 9.2	17.6 - 13.9
57	11°59.3	12°01.2	11°26.5	5.7 - 4.5	11.7 - 9.3	17.7 - 14.0
58	11°59.5	12°01.5	11°26.7	5.8 - 4.6	11.8 - 9.3	17.8 - 14.1
59	11°59.8	12°01.7	11°27.0	5.9 - 4.7	11.9 - 9.4	17.9 - 14.2

Increments and Corrections

m 48	Sun Plan.	Aries	Moon	v and d corr		
0	12°00.0	12°02.0	11°27.2	0.0 - 0.0	6.0 - 4.8	12.0 - 9.7
1	12°00.2	12°02.2	11°27.4	0.1 - 0.1	6.1 - 4.9	12.1 - 9.8
2	12°00.5	12°02.5	11°27.7	0.2 - 0.2	6.2 - 5.0	12.2 - 9.9
3	12°00.7	12°02.7	11°27.9	0.3 - 0.2	6.3 - 5.1	12.3 - 9.9
4	12°01.0	12°03.0	11°28.2	0.4 - 0.3	6.4 - 5.2	12.4 - 10.0
5	12°01.3	12°03.2	11°28.4	0.5 - 0.4	6.5 - 5.3	12.5 - 10.1
6	12°01.5	12°03.5	11°28.6	0.6 - 0.5	6.6 - 5.3	12.6 - 10.2
7	12°01.8	12°03.7	11°28.9	0.7 - 0.6	6.7 - 5.4	12.7 - 10.3
8	12°02.0	12°04.0	11°29.1	0.8 - 0.6	6.8 - 5.5	12.8 - 10.3
9	12°02.2	12°04.2	11°29.3	0.9 - 0.7	6.9 - 5.6	12.9 - 10.4
10	12°02.5	12°04.5	11°29.6	1.0 - 0.8	7.0 - 5.7	13.0 - 10.5
11	12°02.7	12°04.7	11°29.8	1.1 - 0.9	7.1 - 5.7	13.1 - 10.6
12	12°03.0	12°05.0	11°30.1	1.2 - 1.0	7.2 - 5.8	13.2 - 10.7
13	12°03.3	12°05.2	11°30.3	1.3 - 1.1	7.3 - 5.9	13.3 - 10.8
14	12°03.5	12°05.5	11°30.5	1.4 - 1.1	7.4 - 6.0	13.4 - 10.8
15	12°03.8	12°05.7	11°30.8	1.5 - 1.2	7.5 - 6.1	13.5 - 10.9
16	12°04.0	12°06.0	11°31.0	1.6 - 1.3	7.6 - 6.1	13.6 - 11.0
17	12°04.2	12°06.2	11°31.3	1.7 - 1.4	7.7 - 6.2	13.7 - 11.1
18	12°04.5	12°06.5	11°31.5	1.8 - 1.5	7.8 - 6.3	13.8 - 11.2
19	12°04.8	12°06.7	11°31.7	1.9 - 1.5	7.9 - 6.4	13.9 - 11.2
20	12°05.0	12°07.0	11°32.0	2.0 - 1.6	8.0 - 6.5	14.0 - 11.3
21	12°05.3	12°07.2	11°32.2	2.1 - 1.7	8.1 - 6.5	14.1 - 11.4
22	12°05.5	12°07.5	11°32.4	2.2 - 1.8	8.2 - 6.6	14.2 - 11.5
23	12°05.7	12°07.7	11°32.7	2.3 - 1.9	8.3 - 6.7	14.3 - 11.6
24	12°06.0	12°08.0	11°32.9	2.4 - 1.9	8.4 - 6.8	14.4 - 11.6
25	12°06.2	12°08.2	11°33.2	2.5 - 2.0	8.5 - 6.9	14.5 - 11.7
26	12°06.5	12°08.5	11°33.4	2.6 - 2.1	8.6 - 7.0	14.6 - 11.8
27	12°06.8	12°08.7	11°33.6	2.7 - 2.2	8.7 - 7.0	14.7 - 11.9
28	12°07.0	12°09.0	11°33.9	2.8 - 2.3	8.8 - 7.1	14.8 - 12.0
29	12°07.3	12°09.2	11°34.1	2.9 - 2.3	8.9 - 7.2	14.9 - 12.0
30	12°07.5	12°09.5	11°34.4	3.0 - 2.4	9.0 - 7.3	15.0 - 12.1
31	12°07.7	12°09.7	11°34.6	3.1 - 2.5	9.1 - 7.4	15.1 - 12.2
32	12°08.0	12°10.0	11°34.8	3.2 - 2.6	9.2 - 7.4	15.2 - 12.3
33	12°08.2	12°10.2	11°35.1	3.3 - 2.7	9.3 - 7.5	15.3 - 12.4
34	12°08.5	12°10.5	11°35.3	3.4 - 2.7	9.4 - 7.6	15.4 - 12.4
35	12°08.8	12°10.7	11°35.6	3.5 - 2.8	9.5 - 7.7	15.5 - 12.5
36	12°09.0	12°11.0	11°35.8	3.6 - 2.9	9.6 - 7.8	15.6 - 12.6
37	12°09.3	12°11.2	11°36.0	3.7 - 3.0	9.7 - 7.8	15.7 - 12.7
38	12°09.5	12°11.5	11°36.3	3.8 - 3.1	9.8 - 7.9	15.8 - 12.8
39	12°09.7	12°11.7	11°36.5	3.9 - 3.2	9.9 - 8.0	15.9 - 12.9
40	12°10.0	12°12.0	11°36.7	4.0 - 3.2	10.0 - 8.1	16.0 - 12.9
41	12°10.2	12°12.2	11°37.0	4.1 - 3.3	10.1 - 8.2	16.1 - 13.0
42	12°10.5	12°12.5	11°37.2	4.2 - 3.4	10.2 - 8.2	16.2 - 13.1
43	12°10.8	12°12.7	11°37.5	4.3 - 3.5	10.3 - 8.3	16.3 - 13.2
44	12°11.0	12°13.0	11°37.7	4.4 - 3.6	10.4 - 8.4	16.4 - 13.3
45	12°11.3	12°13.2	11°37.9	4.5 - 3.6	10.5 - 8.5	16.5 - 13.3
46	12°11.5	12°13.5	11°38.2	4.6 - 3.7	10.6 - 8.6	16.6 - 13.4
47	12°11.7	12°13.8	11°38.4	4.7 - 3.8	10.7 - 8.6	16.7 - 13.5
48	12°12.0	12°14.0	11°38.7	4.8 - 3.9	10.8 - 8.7	16.8 - 13.6
49	12°12.3	12°14.3	11°38.9	4.9 - 4.0	10.9 - 8.8	16.9 - 13.7
50	12°12.5	12°14.5	11°39.1	5.0 - 4.0	11.0 - 8.9	17.0 - 13.7
51	12°12.8	12°14.8	11°39.4	5.1 - 4.1	11.1 - 9.0	17.1 - 13.8
52	12°13.0	12°15.0	11°39.6	5.2 - 4.2	11.2 - 9.1	17.2 - 13.9
53	12°13.2	12°15.3	11°39.8	5.3 - 4.3	11.3 - 9.1	17.3 - 14.0
54	12°13.5	12°15.5	11°40.1	5.4 - 4.4	11.4 - 9.2	17.4 - 14.1
55	12°13.7	12°15.8	11°40.3	5.5 - 4.4	11.5 - 9.3	17.5 - 14.1
56	12°14.0	12°16.0	11°40.6	5.6 - 4.5	11.6 - 9.4	17.6 - 14.2
57	12°14.3	12°16.3	11°40.8	5.7 - 4.6	11.7 - 9.5	17.7 - 14.3
58	12°14.5	12°16.5	11°41.0	5.8 - 4.7	11.8 - 9.5	17.8 - 14.4
59	12°14.8	12°16.8	11°41.3	5.9 - 4.8	11.9 - 9.6	17.9 - 14.5

m 49	Sun Plan.	Aries	Moon	v and d corr		
0	12°15.0	12°17.0	11°41.5	0.0 - 0.0	6.0 - 4.9	12.0 - 9.9
1	12°15.2	12°17.3	11°41.8	0.1 - 0.1	6.1 - 5.0	12.1 - 10.0
2	12°15.5	12°17.5	11°42.0	0.2 - 0.2	6.2 - 5.1	12.2 - 10.1
3	12°15.7	12°17.8	11°42.2	0.3 - 0.2	6.3 - 5.2	12.3 - 10.1
4	12°16.0	12°18.0	11°42.5	0.4 - 0.3	6.4 - 5.3	12.4 - 10.2
5	12°16.3	12°18.3	11°42.7	0.5 - 0.4	6.5 - 5.4	12.5 - 10.3
6	12°16.5	12°18.5	11°42.9	0.6 - 0.5	6.6 - 5.4	12.6 - 10.4
7	12°16.8	12°18.8	11°43.2	0.7 - 0.6	6.7 - 5.5	12.7 - 10.5
8	12°17.0	12°19.0	11°43.4	0.8 - 0.7	6.8 - 5.6	12.8 - 10.6
9	12°17.2	12°19.3	11°43.7	0.9 - 0.7	6.9 - 5.7	12.9 - 10.6
10	12°17.5	12°19.5	11°43.9	1.0 - 0.8	7.0 - 5.8	13.0 - 10.7
11	12°17.7	12°19.8	11°44.1	1.1 - 0.9	7.1 - 5.9	13.1 - 10.8
12	12°18.0	12°20.0	11°44.4	1.2 - 1.0	7.2 - 5.9	13.2 - 10.9
13	12°18.3	12°20.3	11°44.6	1.3 - 1.1	7.3 - 6.0	13.3 - 11.0
14	12°18.5	12°20.5	11°44.9	1.4 - 1.2	7.4 - 6.1	13.4 - 11.1
15	12°18.8	12°20.8	11°45.1	1.5 - 1.2	7.5 - 6.2	13.5 - 11.1
16	12°19.0	12°21.0	11°45.3	1.6 - 1.3	7.6 - 6.3	13.6 - 11.2
17	12°19.2	12°21.3	11°45.6	1.7 - 1.4	7.7 - 6.4	13.7 - 11.3
18	12°19.5	12°21.5	11°45.8	1.8 - 1.5	7.8 - 6.4	13.8 - 11.4
19	12°19.8	12°21.8	11°46.1	1.9 - 1.6	7.9 - 6.5	13.9 - 11.5
20	12°20.0	12°22.0	11°46.3	2.0 - 1.6	8.0 - 6.6	14.0 - 11.5
21	12°20.3	12°22.3	11°46.5	2.1 - 1.7	8.1 - 6.7	14.1 - 11.6
22	12°20.5	12°22.5	11°46.8	2.2 - 1.8	8.2 - 6.8	14.2 - 11.7
23	12°20.7	12°22.8	11°47.0	2.3 - 1.9	8.3 - 6.8	14.3 - 11.8
24	12°21.0	12°23.0	11°47.2	2.4 - 2.0	8.4 - 6.9	14.4 - 11.9
25	12°21.2	12°23.3	11°47.5	2.5 - 2.1	8.5 - 7.0	14.5 - 12.0
26	12°21.5	12°23.5	11°47.7	2.6 - 2.1	8.6 - 7.1	14.6 - 12.0
27	12°21.8	12°23.8	11°48.0	2.7 - 2.2	8.7 - 7.2	14.7 - 12.1
28	12°22.0	12°24.0	11°48.2	2.8 - 2.3	8.8 - 7.3	14.8 - 12.2
29	12°22.3	12°24.3	11°48.4	2.9 - 2.4	8.9 - 7.3	14.9 - 12.3
30	12°22.5	12°24.5	11°48.7	3.0 - 2.5	9.0 - 7.4	15.0 - 12.4
31	12°22.7	12°24.8	11°48.9	3.1 - 2.6	9.1 - 7.5	15.1 - 12.5
32	12°23.0	12°25.0	11°49.2	3.2 - 2.6	9.2 - 7.6	15.2 - 12.5
33	12°23.2	12°25.3	11°49.4	3.3 - 2.7	9.3 - 7.7	15.3 - 12.6
34	12°23.5	12°25.5	11°49.6	3.4 - 2.8	9.4 - 7.8	15.4 - 12.7
35	12°23.8	12°25.8	11°49.9	3.5 - 2.9	9.5 - 7.8	15.5 - 12.8
36	12°24.0	12°26.0	11°50.1	3.6 - 3.0	9.6 - 7.9	15.6 - 12.9
37	12°24.3	12°26.3	11°50.3	3.7 - 3.1	9.7 - 8.0	15.7 - 13.0
38	12°24.5	12°26.5	11°50.6	3.8 - 3.1	9.8 - 8.1	15.8 - 13.0
39	12°24.7	12°26.8	11°50.8	3.9 - 3.2	9.9 - 8.2	15.9 - 13.1
40	12°25.0	12°27.0	11°51.1	4.0 - 3.3	10.0 - 8.3	16.0 - 13.2
41	12°25.2	12°27.3	11°51.3	4.1 - 3.4	10.1 - 8.3	16.1 - 13.3
42	12°25.5	12°27.5	11°51.5	4.2 - 3.5	10.2 - 8.4	16.2 - 13.4
43	12°25.8	12°27.8	11°51.8	4.3 - 3.5	10.3 - 8.5	16.3 - 13.4
44	12°26.0	12°28.0	11°52.0	4.4 - 3.6	10.4 - 8.6	16.4 - 13.5
45	12°26.3	12°28.3	11°52.3	4.5 - 3.7	10.5 - 8.7	16.5 - 13.6
46	12°26.5	12°28.5	11°52.5	4.6 - 3.8	10.6 - 8.7	16.6 - 13.7
47	12°26.7	12°28.8	11°52.7	4.7 - 3.9	10.7 - 8.8	16.7 - 13.8
48	12°27.0	12°29.0	11°53.0	4.8 - 4.0	10.8 - 8.9	16.8 - 13.9
49	12°27.3	12°29.3	11°53.2	4.9 - 4.0	10.9 - 9.0	16.9 - 13.9
50	12°27.5	12°29.5	11°53.4	5.0 - 4.1	11.0 - 9.1	17.0 - 14.0
51	12°27.8	12°29.8	11°53.7	5.1 - 4.2	11.1 - 9.2	17.1 - 14.1
52	12°28.0	12°30.0	11°53.9	5.2 - 4.3	11.2 - 9.2	17.2 - 14.2
53	12°28.2	12°30.3	11°54.2	5.3 - 4.4	11.3 - 9.3	17.3 - 14.3
54	12°28.5	12°30.5	11°54.4	5.4 - 4.5	11.4 - 9.4	17.4 - 14.4
55	12°28.7	12°30.8	11°54.6	5.5 - 4.5	11.5 - 9.5	17.5 - 14.4
56	12°29.0	12°31.0	11°54.9	5.6 - 4.6	11.6 - 9.6	17.6 - 14.5
57	12°29.3	12°31.3	11°55.1	5.7 - 4.7	11.7 - 9.7	17.7 - 14.6
58	12°29.5	12°31.5	11°55.4	5.8 - 4.8	11.8 - 9.7	17.8 - 14.7
59	12°29.8	12°31.8	11°55.6	5.9 - 4.9	11.9 - 9.8	17.9 - 14.8

m 50	Sun Plan.	Aries	Moon	v and d corr		
0	12°30.0	12°32.1	11°55.8	0.0 - 0.0	6.0 - 5.0	12.0 - 10.1
1	12°30.2	12°32.3	11°56.1	0.1 - 0.1	6.1 - 5.1	12.1 - 10.2
2	12°30.5	12°32.6	11°56.3	0.2 - 0.2	6.2 - 5.2	12.2 - 10.3
3	12°30.7	12°32.8	11°56.5	0.3 - 0.3	6.3 - 5.3	12.3 - 10.4
4	12°31.0	12°33.1	11°56.8	0.4 - 0.3	6.4 - 5.4	12.4 - 10.4
5	12°31.3	12°33.3	11°57.0	0.5 - 0.4	6.5 - 5.5	12.5 - 10.5
6	12°31.5	12°33.6	11°57.3	0.6 - 0.5	6.6 - 5.6	12.6 - 10.6
7	12°31.8	12°33.8	11°57.5	0.7 - 0.6	6.7 - 5.6	12.7 - 10.7
8	12°32.0	12°34.1	11°57.7	0.8 - 0.7	6.8 - 5.7	12.8 - 10.8
9	12°32.2	12°34.3	11°58.0	0.9 - 0.8	6.9 - 5.8	12.9 - 10.9
10	12°32.5	12°34.6	11°58.2	1.0 - 0.8	7.0 - 5.9	13.0 - 10.9
11	12°32.7	12°34.8	11°58.5	1.1 - 0.9	7.1 - 6.0	13.1 - 11.0
12	12°33.0	12°35.1	11°58.7	1.2 - 1.0	7.2 - 6.1	13.2 - 11.1
13	12°33.3	12°35.3	11°58.9	1.3 - 1.1	7.3 - 6.1	13.3 - 11.2
14	12°33.5	12°35.6	11°59.2	1.4 - 1.2	7.4 - 6.2	13.4 - 11.3
15	12°33.8	12°35.8	11°59.4	1.5 - 1.3	7.5 - 6.3	13.5 - 11.4
16	12°34.0	12°36.1	11°59.7	1.6 - 1.3	7.6 - 6.4	13.6 - 11.4
17	12°34.2	12°36.3	11°59.9	1.7 - 1.4	7.7 - 6.5	13.7 - 11.5
18	12°34.5	12°36.6	12°00.1	1.8 - 1.5	7.8 - 6.6	13.8 - 11.6
19	12°34.8	12°36.8	12°00.4	1.9 - 1.6	7.9 - 6.6	13.9 - 11.7
20	12°35.0	12°37.1	12°00.6	2.0 - 1.7	8.0 - 6.7	14.0 - 11.8
21	12°35.3	12°37.3	12°00.8	2.1 - 1.8	8.1 - 6.8	14.1 - 11.9
22	12°35.5	12°37.6	12°01.1	2.2 - 1.9	8.2 - 6.9	14.2 - 12.0
23	12°35.7	12°37.8	12°01.3	2.3 - 1.9	8.3 - 7.0	14.3 - 12.0
24	12°36.0	12°38.1	12°01.6	2.4 - 2.0	8.4 - 7.1	14.4 - 12.1
25	12°36.2	12°38.3	12°01.8	2.5 - 2.1	8.5 - 7.2	14.5 - 12.2
26	12°36.5	12°38.6	12°02.0	2.6 - 2.2	8.6 - 7.2	14.6 - 12.3
27	12°36.8	12°38.8	12°02.3	2.7 - 2.3	8.7 - 7.3	14.7 - 12.4
28	12°37.0	12°39.1	12°02.5	2.8 - 2.4	8.8 - 7.4	14.8 - 12.5
29	12°37.3	12°39.3	12°02.8	2.9 - 2.4	8.9 - 7.5	14.9 - 12.5
30	12°37.5	12°39.6	12°03.0	3.0 - 2.5	9.0 - 7.6	15.0 - 12.6
31	12°37.7	12°39.8	12°03.2	3.1 - 2.6	9.1 - 7.7	15.1 - 12.7
32	12°38.0	12°40.1	12°03.5	3.2 - 2.7	9.2 - 7.7	15.2 - 12.8
33	12°38.2	12°40.3	12°03.7	3.3 - 2.8	9.3 - 7.8	15.3 - 12.9
34	12°38.5	12°40.6	12°03.9	3.4 - 2.9	9.4 - 7.9	15.4 - 13.0
35	12°38.8	12°40.8	12°04.2	3.5 - 2.9	9.5 - 8.0	15.5 - 13.0
36	12°39.0	12°41.1	12°04.4	3.6 - 3.0	9.6 - 8.1	15.6 - 13.1
37	12°39.3	12°41.3	12°04.7	3.7 - 3.1	9.7 - 8.2	15.7 - 13.2
38	12°39.5	12°41.6	12°04.9	3.8 - 3.2	9.8 - 8.2	15.8 - 13.3
39	12°39.7	12°41.8	12°05.1	3.9 - 3.3	9.9 - 8.3	15.9 - 13.4
40	12°40.0	12°42.1	12°05.4	4.0 - 3.4	10.0 - 8.4	16.0 - 13.5
41	12°40.2	12°42.3	12°05.6	4.1 - 3.5	10.1 - 8.5	16.1 - 13.6
42	12°40.5	12°42.6	12°05.9	4.2 - 3.5	10.2 - 8.6	16.2 - 13.6
43	12°40.8	12°42.8	12°06.1	4.3 - 3.6	10.3 - 8.7	16.3 - 13.7
44	12°41.0	12°43.1	12°06.3	4.4 - 3.7	10.4 - 8.8	16.4 - 13.8
45	12°41.3	12°43.3	12°06.6	4.5 - 3.8	10.5 - 8.8	16.5 - 13.9
46	12°41.5	12°43.6	12°06.8	4.6 - 3.9	10.6 - 8.9	16.6 - 14.0
47	12°41.7	12°43.8	12°07.0	4.7 - 4.0	10.7 - 9.0	16.7 - 14.1
48	12°42.0	12°44.1	12°07.3	4.8 - 4.0	10.8 - 9.1	16.8 - 14.1
49	12°42.3	12°44.3	12°07.5	4.9 - 4.1	10.9 - 9.2	16.9 - 14.2
50	12°42.5	12°44.6	12°07.8	5.0 - 4.2	11.0 - 9.3	17.0 - 14.3
51	12°42.8	12°44.8	12°08.0	5.1 - 4.3	11.1 - 9.3	17.1 - 14.4
52	12°43.0	12°45.1	12°08.2	5.2 - 4.4	11.2 - 9.4	17.2 - 14.5
53	12°43.2	12°45.3	12°08.5	5.3 - 4.5	11.3 - 9.5	17.3 - 14.6
54	12°43.5	12°45.6	12°08.7	5.4 - 4.5	11.4 - 9.6	17.4 - 14.6
55	12°43.7	12°45.8	12°09.0	5.5 - 4.6	11.5 - 9.7	17.5 - 14.7
56	12°44.0	12°46.1	12°09.2	5.6 - 4.7	11.6 - 9.8	17.6 - 14.8
57	12°44.3	12°46.3	12°09.4	5.7 - 4.8	11.7 - 9.8	17.7 - 14.9
58	12°44.5	12°46.6	12°09.7	5.8 - 4.9	11.8 - 9.9	17.8 - 15.0
59	12°44.8	12°46.8	12°09.9	5.9 - 5.0	11.9 - 10.0	17.9 - 15.1

Increments and Corrections

m 51	Sun Plan.	Aries	Moon	v and d corr		
0	12°45.0	12°47.1	12°10.1	0.0 - 0.0	6.0 - 5.1	12.0 - 10.3
1	12°45.2	12°47.3	12°10.4	0.1 - 0.1	6.1 - 5.2	12.1 - 10.4
2	12°45.5	12°47.6	12°10.6	0.2 - 0.2	6.2 - 5.3	12.2 - 10.5
3	12°45.7	12°47.8	12°10.9	0.3 - 0.3	6.3 - 5.4	12.3 - 10.6
4	12°46.0	12°48.1	12°11.1	0.4 - 0.3	6.4 - 5.5	12.4 - 10.6
5	12°46.3	12°48.3	12°11.3	0.5 - 0.4	6.5 - 5.6	12.5 - 10.7
6	12°46.5	12°48.6	12°11.6	0.6 - 0.5	6.6 - 5.7	12.6 - 10.8
7	12°46.8	12°48.8	12°11.8	0.7 - 0.6	6.7 - 5.8	12.7 - 10.9
8	12°47.0	12°49.1	12°12.1	0.8 - 0.7	6.8 - 5.8	12.8 - 11.0
9	12°47.2	12°49.3	12°12.3	0.9 - 0.8	6.9 - 5.9	12.9 - 11.1
10	12°47.5	12°49.6	12°12.5	1.0 - 0.9	7.0 - 6.0	13.0 - 11.2
11	12°47.7	12°49.8	12°12.8	1.1 - 0.9	7.1 - 6.1	13.1 - 11.2
12	12°48.0	12°50.1	12°13.0	1.2 - 1.0	7.2 - 6.2	13.2 - 11.3
13	12°48.3	12°50.3	12°13.3	1.3 - 1.1	7.3 - 6.3	13.3 - 11.4
14	12°48.5	12°50.6	12°13.5	1.4 - 1.2	7.4 - 6.4	13.4 - 11.5
15	12°48.8	12°50.9	12°13.7	1.5 - 1.3	7.5 - 6.4	13.5 - 11.6
16	12°49.0	12°51.1	12°14.0	1.6 - 1.4	7.6 - 6.5	13.6 - 11.7
17	12°49.2	12°51.4	12°14.2	1.7 - 1.5	7.7 - 6.6	13.7 - 11.8
18	12°49.5	12°51.6	12°14.4	1.8 - 1.5	7.8 - 6.7	13.8 - 11.8
19	12°49.8	12°51.9	12°14.7	1.9 - 1.6	7.9 - 6.8	13.9 - 11.9
20	12°50.0	12°52.1	12°14.9	2.0 - 1.7	8.0 - 6.9	14.0 - 12.0
21	12°50.3	12°52.4	12°15.2	2.1 - 1.8	8.1 - 7.0	14.1 - 12.1
22	12°50.5	12°52.6	12°15.4	2.2 - 1.9	8.2 - 7.0	14.2 - 12.2
23	12°50.7	12°52.9	12°15.6	2.3 - 2.0	8.3 - 7.1	14.3 - 12.3
24	12°51.0	12°53.1	12°15.9	2.4 - 2.1	8.4 - 7.2	14.4 - 12.4
25	12°51.2	12°53.4	12°16.1	2.5 - 2.1	8.5 - 7.3	14.5 - 12.4
26	12°51.5	12°53.6	12°16.4	2.6 - 2.2	8.6 - 7.4	14.6 - 12.5
27	12°51.8	12°53.9	12°16.6	2.7 - 2.3	8.7 - 7.5	14.7 - 12.6
28	12°52.0	12°54.1	12°16.8	2.8 - 2.4	8.8 - 7.6	14.8 - 12.7
29	12°52.3	12°54.4	12°17.1	2.9 - 2.5	8.9 - 7.6	14.9 - 12.8
30	12°52.5	12°54.6	12°17.3	3.0 - 2.6	9.0 - 7.7	15.0 - 12.9
31	12°52.7	12°54.9	12°17.5	3.1 - 2.7	9.1 - 7.8	15.1 - 13.0
32	12°53.0	12°55.1	12°17.8	3.2 - 2.7	9.2 - 7.9	15.2 - 13.0
33	12°53.2	12°55.4	12°18.0	3.3 - 2.8	9.3 - 8.0	15.3 - 13.1
34	12°53.5	12°55.6	12°18.3	3.4 - 2.9	9.4 - 8.1	15.4 - 13.2
35	12°53.8	12°55.9	12°18.5	3.5 - 3.0	9.5 - 8.2	15.5 - 13.3
36	12°54.0	12°56.1	12°18.7	3.6 - 3.1	9.6 - 8.2	15.6 - 13.4
37	12°54.3	12°56.4	12°19.0	3.7 - 3.2	9.7 - 8.3	15.7 - 13.5
38	12°54.5	12°56.6	12°19.2	3.8 - 3.3	9.8 - 8.4	15.8 - 13.6
39	12°54.7	12°56.9	12°19.5	3.9 - 3.3	9.9 - 8.5	15.9 - 13.6
40	12°55.0	12°57.1	12°19.7	4.0 - 3.4	10.0 - 8.6	16.0 - 13.7
41	12°55.2	12°57.4	12°19.9	4.1 - 3.5	10.1 - 8.7	16.1 - 13.8
42	12°55.5	12°57.6	12°20.2	4.2 - 3.6	10.2 - 8.8	16.2 - 13.9
43	12°55.8	12°57.9	12°20.4	4.3 - 3.7	10.3 - 8.8	16.3 - 14.0
44	12°56.0	12°58.1	12°20.6	4.4 - 3.8	10.4 - 8.9	16.4 - 14.1
45	12°56.3	12°58.4	12°20.9	4.5 - 3.9	10.5 - 9.0	16.5 - 14.2
46	12°56.5	12°58.6	12°21.1	4.6 - 3.9	10.6 - 9.1	16.6 - 14.2
47	12°56.7	12°58.9	12°21.4	4.7 - 4.0	10.7 - 9.2	16.7 - 14.3
48	12°57.0	12°59.1	12°21.6	4.8 - 4.1	10.8 - 9.3	16.8 - 14.4
49	12°57.3	12°59.4	12°21.8	4.9 - 4.2	10.9 - 9.4	16.9 - 14.5
50	12°57.5	12°59.6	12°22.1	5.0 - 4.3	11.0 - 9.4	17.0 - 14.6
51	12°57.8	12°59.9	12°22.3	5.1 - 4.4	11.1 - 9.5	17.1 - 14.7
52	12°58.0	13°00.1	12°22.6	5.2 - 4.5	11.2 - 9.6	17.2 - 14.8
53	12°58.2	13°00.4	12°22.8	5.3 - 4.5	11.3 - 9.7	17.3 - 14.8
54	12°58.5	13°00.6	12°23.0	5.4 - 4.6	11.4 - 9.8	17.4 - 14.9
55	12°58.7	13°00.9	12°23.3	5.5 - 4.7	11.5 - 9.9	17.5 - 15.0
56	12°59.0	13°01.1	12°23.5	5.6 - 4.8	11.6 - 10.0	17.6 - 15.1
57	12°59.3	13°01.4	12°23.8	5.7 - 4.9	11.7 - 10.0	17.7 - 15.2
58	12°59.5	13°01.6	12°24.0	5.8 - 5.0	11.8 - 10.1	17.8 - 15.3
59	12°59.8	13°01.9	12°24.2	5.9 - 5.1	11.9 - 10.2	17.9 - 15.4

m 52	Sun Plan.	Aries	Moon	v and d corr		
0	13°00.0	13°02.1	12°24.5	0.0 - 0.0	6.0 - 5.3	12.0 - 10.5
1	13°00.2	13°02.4	12°24.7	0.1 - 0.1	6.1 - 5.3	12.1 - 10.6
2	13°00.5	13°02.6	12°24.9	0.2 - 0.2	6.2 - 5.4	12.2 - 10.7
3	13°00.7	13°02.9	12°25.2	0.3 - 0.3	6.3 - 5.5	12.3 - 10.8
4	13°01.0	13°03.1	12°25.4	0.4 - 0.4	6.4 - 5.6	12.4 - 10.8
5	13°01.3	13°03.4	12°25.7	0.5 - 0.4	6.5 - 5.7	12.5 - 10.9
6	13°01.5	13°03.6	12°25.9	0.6 - 0.5	6.6 - 5.8	12.6 - 11.0
7	13°01.8	13°03.9	12°26.1	0.7 - 0.6	6.7 - 5.9	12.7 - 11.1
8	13°02.0	13°04.1	12°26.4	0.8 - 0.7	6.8 - 6.0	12.8 - 11.2
9	13°02.2	13°04.4	12°26.6	0.9 - 0.8	6.9 - 6.0	12.9 - 11.3
10	13°02.5	13°04.6	12°26.9	1.0 - 0.9	7.0 - 6.1	13.0 - 11.4
11	13°02.7	13°04.9	12°27.1	1.1 - 1.0	7.1 - 6.2	13.1 - 11.5
12	13°03.0	13°05.1	12°27.3	1.2 - 1.1	7.2 - 6.3	13.2 - 11.5
13	13°03.3	13°05.4	12°27.6	1.3 - 1.1	7.3 - 6.4	13.3 - 11.6
14	13°03.5	13°05.6	12°27.8	1.4 - 1.2	7.4 - 6.5	13.4 - 11.7
15	13°03.8	13°05.9	12°28.0	1.5 - 1.3	7.5 - 6.6	13.5 - 11.8
16	13°04.0	13°06.1	12°28.3	1.6 - 1.4	7.6 - 6.6	13.6 - 11.9
17	13°04.2	13°06.4	12°28.5	1.7 - 1.5	7.7 - 6.7	13.7 - 12.0
18	13°04.5	13°06.6	12°28.8	1.8 - 1.6	7.8 - 6.8	13.8 - 12.1
19	13°04.8	13°06.9	12°29.0	1.9 - 1.7	7.9 - 6.9	13.9 - 12.2
20	13°05.0	13°07.1	12°29.2	2.0 - 1.8	8.0 - 7.0	14.0 - 12.3
21	13°05.3	13°07.4	12°29.5	2.1 - 1.8	8.1 - 7.1	14.1 - 12.3
22	13°05.5	13°07.6	12°29.7	2.2 - 1.9	8.2 - 7.2	14.2 - 12.4
23	13°05.7	13°07.9	12°30.0	2.3 - 2.0	8.3 - 7.3	14.3 - 12.5
24	13°06.0	13°08.1	12°30.2	2.4 - 2.1	8.4 - 7.4	14.4 - 12.6
25	13°06.2	13°08.4	12°30.4	2.5 - 2.2	8.5 - 7.4	14.5 - 12.7
26	13°06.5	13°08.6	12°30.7	2.6 - 2.3	8.6 - 7.5	14.6 - 12.8
27	13°06.8	13°08.9	12°30.9	2.7 - 2.4	8.7 - 7.6	14.7 - 12.9
28	13°07.0	13°09.2	12°31.1	2.8 - 2.5	8.8 - 7.7	14.8 - 13.0
29	13°07.3	13°09.4	12°31.4	2.9 - 2.5	8.9 - 7.8	14.9 - 13.0
30	13°07.5	13°09.7	12°31.6	3.0 - 2.6	9.0 - 7.9	15.0 - 13.1
31	13°07.7	13°09.9	12°31.9	3.1 - 2.7	9.1 - 8.0	15.1 - 13.2
32	13°08.0	13°10.2	12°32.1	3.2 - 2.8	9.2 - 8.0	15.2 - 13.3
33	13°08.2	13°10.4	12°32.3	3.3 - 2.9	9.3 - 8.1	15.3 - 13.4
34	13°08.5	13°10.7	12°32.6	3.4 - 3.0	9.4 - 8.2	15.4 - 13.5
35	13°08.8	13°10.9	12°32.8	3.5 - 3.1	9.5 - 8.3	15.5 - 13.6
36	13°09.0	13°11.2	12°33.1	3.6 - 3.1	9.6 - 8.4	15.6 - 13.7
37	13°09.3	13°11.4	12°33.3	3.7 - 3.2	9.7 - 8.5	15.7 - 13.7
38	13°09.5	13°11.7	12°33.5	3.8 - 3.3	9.8 - 8.6	15.8 - 13.8
39	13°09.7	13°11.9	12°33.8	3.9 - 3.4	9.9 - 8.7	15.9 - 13.9
40	13°10.0	13°12.2	12°34.0	4.0 - 3.5	10.0 - 8.8	16.0 - 14.0
41	13°10.2	13°12.4	12°34.2	4.1 - 3.6	10.1 - 8.8	16.1 - 14.1
42	13°10.5	13°12.7	12°34.5	4.2 - 3.7	10.2 - 8.9	16.2 - 14.2
43	13°10.8	13°12.9	12°34.7	4.3 - 3.8	10.3 - 9.0	16.3 - 14.3
44	13°11.0	13°13.2	12°35.0	4.4 - 3.9	10.4 - 9.1	16.4 - 14.3
45	13°11.3	13°13.4	12°35.2	4.5 - 3.9	10.5 - 9.2	16.5 - 14.4
46	13°11.5	13°13.7	12°35.4	4.6 - 4.0	10.6 - 9.3	16.6 - 14.5
47	13°11.7	13°13.9	12°35.7	4.7 - 4.1	10.7 - 9.4	16.7 - 14.6
48	13°12.0	13°14.2	12°35.9	4.8 - 4.2	10.8 - 9.5	16.8 - 14.7
49	13°12.3	13°14.4	12°36.2	4.9 - 4.3	10.9 - 9.5	16.9 - 14.8
50	13°12.5	13°14.7	12°36.4	5.0 - 4.4	11.0 - 9.6	17.0 - 14.9
51	13°12.8	13°14.9	12°36.6	5.1 - 4.5	11.1 - 9.7	17.1 - 15.0
52	13°13.0	13°15.2	12°36.9	5.2 - 4.5	11.2 - 9.8	17.2 - 15.0
53	13°13.2	13°15.4	12°37.1	5.3 - 4.6	11.3 - 9.9	17.3 - 15.1
54	13°13.5	13°15.7	12°37.4	5.4 - 4.7	11.4 - 10.0	17.4 - 15.2
55	13°13.7	13°15.9	12°37.6	5.5 - 4.8	11.5 - 10.1	17.5 - 15.3
56	13°14.0	13°16.2	12°37.8	5.6 - 4.9	11.6 - 10.2	17.6 - 15.4
57	13°14.3	13°16.4	12°38.1	5.7 - 5.0	11.7 - 10.2	17.7 - 15.5
58	13°14.5	13°16.7	12°38.3	5.8 - 5.1	11.8 - 10.3	17.8 - 15.6
59	13°14.8	13°16.9	12°38.5	5.9 - 5.2	11.9 - 10.4	17.9 - 15.7

m 53	Sun Plan.	Aries	Moon	v and d corr		
0	13°15.0	13°17.2	12°38.8	0.0 - 0.0	6.0 - 5.4	12.0 - 10.7
1	13°15.2	13°17.4	12°39.0	0.1 - 0.1	6.1 - 5.4	12.1 - 10.8
2	13°15.5	13°17.7	12°39.3	0.2 - 0.2	6.2 - 5.5	12.2 - 10.9
3	13°15.7	13°17.9	12°39.5	0.3 - 0.3	6.3 - 5.6	12.3 - 11.0
4	13°16.0	13°18.2	12°39.7	0.4 - 0.4	6.4 - 5.7	12.4 - 11.1
5	13°16.3	13°18.4	12°40.0	0.5 - 0.4	6.5 - 5.8	12.5 - 11.1
6	13°16.5	13°18.7	12°40.2	0.6 - 0.5	6.6 - 5.9	12.6 - 11.2
7	13°16.8	13°18.9	12°40.5	0.7 - 0.6	6.7 - 6.0	12.7 - 11.3
8	13°17.0	13°19.2	12°40.7	0.8 - 0.7	6.8 - 6.1	12.8 - 11.4
9	13°17.2	13°19.4	12°40.9	0.9 - 0.8	6.9 - 6.2	12.9 - 11.5
10	13°17.5	13°19.7	12°41.2	1.0 - 0.9	7.0 - 6.2	13.0 - 11.6
11	13°17.7	13°19.9	12°41.4	1.1 - 1.0	7.1 - 6.3	13.1 - 11.7
12	13°18.0	13°20.2	12°41.6	1.2 - 1.1	7.2 - 6.4	13.2 - 11.8
13	13°18.3	13°20.4	12°41.9	1.3 - 1.2	7.3 - 6.5	13.3 - 11.9
14	13°18.5	13°20.7	12°42.1	1.4 - 1.2	7.4 - 6.6	13.4 - 11.9
15	13°18.8	13°20.9	12°42.4	1.5 - 1.3	7.5 - 6.7	13.5 - 12.0
16	13°19.0	13°21.2	12°42.6	1.6 - 1.4	7.6 - 6.8	13.6 - 12.1
17	13°19.2	13°21.4	12°42.8	1.7 - 1.5	7.7 - 6.9	13.7 - 12.2
18	13°19.5	13°21.7	12°43.1	1.8 - 1.6	7.8 - 7.0	13.8 - 12.3
19	13°19.8	13°21.9	12°43.3	1.9 - 1.7	7.9 - 7.0	13.9 - 12.4
20	13°20.0	13°22.2	12°43.6	2.0 - 1.8	8.0 - 7.1	14.0 - 12.5
21	13°20.3	13°22.4	12°43.8	2.1 - 1.9	8.1 - 7.2	14.1 - 12.6
22	13°20.5	13°22.7	12°44.0	2.2 - 2.0	8.2 - 7.3	14.2 - 12.7
23	13°20.7	13°22.9	12°44.3	2.3 - 2.1	8.3 - 7.4	14.3 - 12.8
24	13°21.0	13°23.2	12°44.5	2.4 - 2.1	8.4 - 7.5	14.4 - 12.8
25	13°21.2	13°23.4	12°44.7	2.5 - 2.2	8.5 - 7.6	14.5 - 12.9
26	13°21.5	13°23.7	12°45.0	2.6 - 2.3	8.6 - 7.7	14.6 - 13.0
27	13°21.8	13°23.9	12°45.2	2.7 - 2.4	8.7 - 7.8	14.7 - 13.1
28	13°22.0	13°24.2	12°45.5	2.8 - 2.5	8.8 - 7.8	14.8 - 13.2
29	13°22.3	13°24.4	12°45.7	2.9 - 2.6	8.9 - 7.9	14.9 - 13.3
30	13°22.5	13°24.7	12°45.9	3.0 - 2.7	9.0 - 8.0	15.0 - 13.4
31	13°22.7	13°24.9	12°46.2	3.1 - 2.8	9.1 - 8.1	15.1 - 13.5
32	13°23.0	13°25.2	12°46.4	3.2 - 2.9	9.2 - 8.2	15.2 - 13.6
33	13°23.2	13°25.4	12°46.7	3.3 - 2.9	9.3 - 8.3	15.3 - 13.6
34	13°23.5	13°25.7	12°46.9	3.4 - 3.0	9.4 - 8.4	15.4 - 13.7
35	13°23.8	13°25.9	12°47.1	3.5 - 3.1	9.5 - 8.5	15.5 - 13.8
36	13°24.0	13°26.2	12°47.4	3.6 - 3.2	9.6 - 8.6	15.6 - 13.9
37	13°24.3	13°26.4	12°47.6	3.7 - 3.3	9.7 - 8.6	15.7 - 14.0
38	13°24.5	13°26.7	12°47.9	3.8 - 3.4	9.8 - 8.7	15.8 - 14.1
39	13°24.7	13°26.9	12°48.1	3.9 - 3.5	9.9 - 8.8	15.9 - 14.2
40	13°25.0	13°27.2	12°48.3	4.0 - 3.6	10.0 - 8.9	16.0 - 14.3
41	13°25.2	13°27.5	12°48.6	4.1 - 3.7	10.1 - 9.0	16.1 - 14.4
42	13°25.5	13°27.7	12°48.8	4.2 - 3.7	10.2 - 9.1	16.2 - 14.4
43	13°25.8	13°28.0	12°49.0	4.3 - 3.8	10.3 - 9.2	16.3 - 14.5
44	13°26.0	13°28.2	12°49.3	4.4 - 3.9	10.4 - 9.3	16.4 - 14.6
45	13°26.3	13°28.5	12°49.5	4.5 - 4.0	10.5 - 9.4	16.5 - 14.7
46	13°26.5	13°28.7	12°49.8	4.6 - 4.1	10.6 - 9.5	16.6 - 14.8
47	13°26.7	13°29.0	12°50.0	4.7 - 4.2	10.7 - 9.5	16.7 - 14.9
48	13°27.0	13°29.2	12°50.2	4.8 - 4.3	10.8 - 9.6	16.8 - 15.0
49	13°27.3	13°29.5	12°50.5	4.9 - 4.4	10.9 - 9.7	16.9 - 15.1
50	13°27.5	13°29.7	12°50.7	5.0 - 4.5	11.0 - 9.8	17.0 - 15.2
51	13°27.8	13°30.0	12°51.0	5.1 - 4.5	11.1 - 9.9	17.1 - 15.2
52	13°28.0	13°30.2	12°51.2	5.2 - 4.6	11.2 - 10.0	17.2 - 15.3
53	13°28.2	13°30.5	12°51.4	5.3 - 4.7	11.3 - 10.1	17.3 - 15.4
54	13°28.5	13°30.7	12°51.7	5.4 - 4.8	11.4 - 10.2	17.4 - 15.5
55	13°28.7	13°31.0	12°51.9	5.5 - 4.9	11.5 - 10.3	17.5 - 15.6
56	13°29.0	13°31.2	12°52.1	5.6 - 5.0	11.6 - 10.3	17.6 - 15.7
57	13°29.3	13°31.5	12°52.4	5.7 - 5.1	11.7 - 10.4	17.7 - 15.8
58	13°29.5	13°31.7	12°52.6	5.8 - 5.2	11.8 - 10.5	17.8 - 15.9
59	13°29.8	13°32.0	12°52.9	5.9 - 5.3	11.9 - 10.6	17.9 - 16.0

Increments and Corrections

m 54	Sun Plan.	Aries	Moon	v and d corr		
0	13°30.0	13°32.2	12°53.1	0.0 - 0.0	6.0 - 5.5	12.0 - 10.9
1	13°30.2	13°32.5	12°53.3	0.1 - 0.1	6.1 - 5.5	12.1 - 11.0
2	13°30.5	13°32.7	12°53.6	0.2 - 0.2	6.2 - 5.6	12.2 - 11.1
3	13°30.7	13°33.0	12°53.8	0.3 - 0.3	6.3 - 5.7	12.3 - 11.2
4	13°31.0	13°33.2	12°54.1	0.4 - 0.4	6.4 - 5.8	12.4 - 11.3
5	13°31.3	13°33.5	12°54.3	0.5 - 0.5	6.5 - 5.9	12.5 - 11.4
6	13°31.5	13°33.7	12°54.5	0.6 - 0.5	6.6 - 6.0	12.6 - 11.4
7	13°31.8	13°34.0	12°54.8	0.7 - 0.6	6.7 - 6.1	12.7 - 11.5
8	13°32.0	13°34.2	12°55.0	0.8 - 0.7	6.8 - 6.2	12.8 - 11.6
9	13°32.2	13°34.5	12°55.2	0.9 - 0.8	6.9 - 6.3	12.9 - 11.7
10	13°32.5	13°34.7	12°55.5	1.0 - 0.9	7.0 - 6.4	13.0 - 11.8
11	13°32.7	13°35.0	12°55.7	1.1 - 1.0	7.1 - 6.4	13.1 - 11.9
12	13°33.0	13°35.2	12°56.0	1.2 - 1.1	7.2 - 6.5	13.2 - 12.0
13	13°33.3	13°35.5	12°56.2	1.3 - 1.2	7.3 - 6.6	13.3 - 12.1
14	13°33.5	13°35.7	12°56.4	1.4 - 1.3	7.4 - 6.7	13.4 - 12.2
15	13°33.8	13°36.0	12°56.7	1.5 - 1.4	7.5 - 6.8	13.5 - 12.3
16	13°34.0	13°36.2	12°56.9	1.6 - 1.5	7.6 - 6.9	13.6 - 12.4
17	13°34.2	13°36.5	12°57.2	1.7 - 1.5	7.7 - 7.0	13.7 - 12.4
18	13°34.5	13°36.7	12°57.4	1.8 - 1.6	7.8 - 7.1	13.8 - 12.5
19	13°34.8	13°37.0	12°57.6	1.9 - 1.7	7.9 - 7.2	13.9 - 12.6
20	13°35.0	13°37.2	12°57.9	2.0 - 1.8	8.0 - 7.3	14.0 - 12.7
21	13°35.3	13°37.5	12°58.1	2.1 - 1.9	8.1 - 7.4	14.1 - 12.8
22	13°35.5	13°37.7	12°58.3	2.2 - 2.0	8.2 - 7.4	14.2 - 12.9
23	13°35.7	13°38.0	12°58.6	2.3 - 2.1	8.3 - 7.5	14.3 - 13.0
24	13°36.0	13°38.2	12°58.8	2.4 - 2.2	8.4 - 7.6	14.4 - 13.1
25	13°36.2	13°38.5	12°59.1	2.5 - 2.3	8.5 - 7.7	14.5 - 13.2
26	13°36.5	13°38.7	12°59.3	2.6 - 2.4	8.6 - 7.8	14.6 - 13.3
27	13°36.8	13°39.0	12°59.5	2.7 - 2.5	8.7 - 7.9	14.7 - 13.4
28	13°37.0	13°39.2	12°59.8	2.8 - 2.5	8.8 - 8.0	14.8 - 13.4
29	13°37.3	13°39.5	13°00.0	2.9 - 2.6	8.9 - 8.1	14.9 - 13.5
30	13°37.5	13°39.7	13°00.3	3.0 - 2.7	9.0 - 8.2	15.0 - 13.6
31	13°37.7	13°40.0	13°00.5	3.1 - 2.8	9.1 - 8.3	15.1 - 13.7
32	13°38.0	13°40.2	13°00.7	3.2 - 2.9	9.2 - 8.4	15.2 - 13.8
33	13°38.2	13°40.5	13°01.0	3.3 - 3.0	9.3 - 8.4	15.3 - 13.9
34	13°38.5	13°40.7	13°01.2	3.4 - 3.1	9.4 - 8.5	15.4 - 14.0
35	13°38.8	13°41.0	13°01.5	3.5 - 3.2	9.5 - 8.6	15.5 - 14.1
36	13°39.0	13°41.2	13°01.7	3.6 - 3.3	9.6 - 8.7	15.6 - 14.2
37	13°39.3	13°41.5	13°01.9	3.7 - 3.4	9.7 - 8.8	15.7 - 14.3
38	13°39.5	13°41.7	13°02.2	3.8 - 3.5	9.8 - 8.9	15.8 - 14.4
39	13°39.7	13°42.0	13°02.4	3.9 - 3.5	9.9 - 9.0	15.9 - 14.4
40	13°40.0	13°42.2	13°02.6	4.0 - 3.6	10.0 - 9.1	16.0 - 14.5
41	13°40.2	13°42.5	13°02.9	4.1 - 3.7	10.1 - 9.2	16.1 - 14.6
42	13°40.5	13°42.7	13°03.1	4.2 - 3.8	10.2 - 9.3	16.2 - 14.7
43	13°40.8	13°43.0	13°03.4	4.3 - 3.9	10.3 - 9.4	16.3 - 14.8
44	13°41.0	13°43.2	13°03.6	4.4 - 4.0	10.4 - 9.4	16.4 - 14.9
45	13°41.3	13°43.5	13°03.8	4.5 - 4.1	10.5 - 9.5	16.5 - 15.0
46	13°41.5	13°43.7	13°04.1	4.6 - 4.2	10.6 - 9.6	16.6 - 15.1
47	13°41.7	13°44.0	13°04.3	4.7 - 4.3	10.7 - 9.7	16.7 - 15.2
48	13°42.0	13°44.2	13°04.6	4.8 - 4.4	10.8 - 9.8	16.8 - 15.3
49	13°42.3	13°44.5	13°04.8	4.9 - 4.5	10.9 - 9.9	16.9 - 15.4
50	13°42.5	13°44.7	13°05.0	5.0 - 4.5	11.0 - 10.0	17.0 - 15.4
51	13°42.8	13°45.0	13°05.3	5.1 - 4.6	11.1 - 10.1	17.1 - 15.5
52	13°43.0	13°45.2	13°05.5	5.2 - 4.7	11.2 - 10.2	17.2 - 15.6
53	13°43.2	13°45.5	13°05.7	5.3 - 4.8	11.3 - 10.3	17.3 - 15.7
54	13°43.5	13°45.8	13°06.0	5.4 - 4.9	11.4 - 10.4	17.4 - 15.8
55	13°43.7	13°46.0	13°06.2	5.5 - 5.0	11.5 - 10.4	17.5 - 15.9
56	13°44.0	13°46.3	13°06.5	5.6 - 5.1	11.6 - 10.5	17.6 - 16.0
57	13°44.3	13°46.5	13°06.7	5.7 - 5.2	11.7 - 10.6	17.7 - 16.1
58	13°44.5	13°46.8	13°06.9	5.8 - 5.3	11.8 - 10.7	17.8 - 16.2
59	13°44.8	13°47.0	13°07.2	5.9 - 5.4	11.9 - 10.8	17.9 - 16.3

m 55	Sun Plan.	Aries	Moon	v and d corr		
0	13°45.0	13°47.3	13°07.4	0.0 - 0.0	6.0 - 5.6	12.0 - 11.1
1	13°45.2	13°47.5	13°07.7	0.1 - 0.1	6.1 - 5.6	12.1 - 11.2
2	13°45.5	13°47.8	13°07.9	0.2 - 0.2	6.2 - 5.7	12.2 - 11.3
3	13°45.7	13°48.0	13°08.1	0.3 - 0.3	6.3 - 5.8	12.3 - 11.4
4	13°46.0	13°48.3	13°08.4	0.4 - 0.4	6.4 - 5.9	12.4 - 11.5
5	13°46.3	13°48.5	13°08.6	0.5 - 0.5	6.5 - 6.0	12.5 - 11.6
6	13°46.5	13°48.8	13°08.8	0.6 - 0.6	6.6 - 6.1	12.6 - 11.7
7	13°46.8	13°49.0	13°09.1	0.7 - 0.6	6.7 - 6.2	12.7 - 11.7
8	13°47.0	13°49.3	13°09.3	0.8 - 0.7	6.8 - 6.3	12.8 - 11.8
9	13°47.2	13°49.5	13°09.6	0.9 - 0.8	6.9 - 6.4	12.9 - 11.9
10	13°47.5	13°49.8	13°09.8	1.0 - 0.9	7.0 - 6.5	13.0 - 12.0
11	13°47.7	13°50.0	13°10.0	1.1 - 1.0	7.1 - 6.6	13.1 - 12.1
12	13°48.0	13°50.3	13°10.3	1.2 - 1.1	7.2 - 6.7	13.2 - 12.2
13	13°48.3	13°50.5	13°10.5	1.3 - 1.2	7.3 - 6.8	13.3 - 12.3
14	13°48.5	13°50.8	13°10.8	1.4 - 1.3	7.4 - 6.8	13.4 - 12.4
15	13°48.8	13°51.0	13°11.0	1.5 - 1.4	7.5 - 6.9	13.5 - 12.5
16	13°49.0	13°51.3	13°11.2	1.6 - 1.5	7.6 - 7.0	13.6 - 12.6
17	13°49.2	13°51.5	13°11.5	1.7 - 1.6	7.7 - 7.1	13.7 - 12.7
18	13°49.5	13°51.8	13°11.7	1.8 - 1.7	7.8 - 7.2	13.8 - 12.8
19	13°49.8	13°52.0	13°12.0	1.9 - 1.8	7.9 - 7.3	13.9 - 12.9
20	13°50.0	13°52.3	13°12.2	2.0 - 1.9	8.0 - 7.4	14.0 - 13.0
21	13°50.3	13°52.5	13°12.4	2.1 - 1.9	8.1 - 7.5	14.1 - 13.0
22	13°50.5	13°52.8	13°12.7	2.2 - 2.0	8.2 - 7.6	14.2 - 13.1
23	13°50.7	13°53.0	13°12.9	2.3 - 2.1	8.3 - 7.7	14.3 - 13.2
24	13°51.0	13°53.3	13°13.1	2.4 - 2.2	8.4 - 7.8	14.4 - 13.3
25	13°51.2	13°53.5	13°13.4	2.5 - 2.3	8.5 - 7.9	14.5 - 13.4
26	13°51.5	13°53.8	13°13.6	2.6 - 2.4	8.6 - 8.0	14.6 - 13.5
27	13°51.8	13°54.0	13°13.9	2.7 - 2.5	8.7 - 8.0	14.7 - 13.6
28	13°52.0	13°54.3	13°14.1	2.8 - 2.6	8.8 - 8.1	14.8 - 13.7
29	13°52.3	13°54.5	13°14.3	2.9 - 2.7	8.9 - 8.2	14.9 - 13.8
30	13°52.5	13°54.8	13°14.6	3.0 - 2.8	9.0 - 8.3	15.0 - 13.9
31	13°52.7	13°55.0	13°14.8	3.1 - 2.9	9.1 - 8.4	15.1 - 14.0
32	13°53.0	13°55.3	13°15.1	3.2 - 3.0	9.2 - 8.5	15.2 - 14.1
33	13°53.2	13°55.5	13°15.3	3.3 - 3.1	9.3 - 8.6	15.3 - 14.2
34	13°53.5	13°55.8	13°15.5	3.4 - 3.1	9.4 - 8.7	15.4 - 14.2
35	13°53.8	13°56.0	13°15.8	3.5 - 3.2	9.5 - 8.8	15.5 - 14.3
36	13°54.0	13°56.3	13°16.0	3.6 - 3.3	9.6 - 8.9	15.6 - 14.4
37	13°54.3	13°56.5	13°16.2	3.7 - 3.4	9.7 - 9.0	15.7 - 14.5
38	13°54.5	13°56.8	13°16.5	3.8 - 3.5	9.8 - 9.1	15.8 - 14.6
39	13°54.7	13°57.0	13°16.7	3.9 - 3.6	9.9 - 9.2	15.9 - 14.7
40	13°55.0	13°57.3	13°17.0	4.0 - 3.7	10.0 - 9.3	16.0 - 14.8
41	13°55.2	13°57.5	13°17.2	4.1 - 3.8	10.1 - 9.3	16.1 - 14.9
42	13°55.5	13°57.8	13°17.4	4.2 - 3.9	10.2 - 9.4	16.2 - 15.0
43	13°55.8	13°58.0	13°17.7	4.3 - 4.0	10.3 - 9.5	16.3 - 15.1
44	13°56.0	13°58.3	13°17.9	4.4 - 4.1	10.4 - 9.6	16.4 - 15.2
45	13°56.3	13°58.5	13°18.2	4.5 - 4.2	10.5 - 9.7	16.5 - 15.3
46	13°56.5	13°58.8	13°18.4	4.6 - 4.3	10.6 - 9.8	16.6 - 15.4
47	13°56.7	13°59.0	13°18.6	4.7 - 4.3	10.7 - 9.9	16.7 - 15.4
48	13°57.0	13°59.3	13°18.9	4.8 - 4.4	10.8 - 10.0	16.8 - 15.5
49	13°57.3	13°59.5	13°19.1	4.9 - 4.5	10.9 - 10.1	16.9 - 15.6
50	13°57.5	13°59.8	13°19.3	5.0 - 4.6	11.0 - 10.2	17.0 - 15.7
51	13°57.8	14°00.0	13°19.6	5.1 - 4.7	11.1 - 10.3	17.1 - 15.8
52	13°58.0	14°00.3	13°19.8	5.2 - 4.8	11.2 - 10.4	17.2 - 15.9
53	13°58.2	14°00.5	13°20.1	5.3 - 4.9	11.3 - 10.5	17.3 - 16.0
54	13°58.5	14°00.8	13°20.3	5.4 - 5.0	11.4 - 10.5	17.4 - 16.1
55	13°58.7	14°01.0	13°20.5	5.5 - 5.1	11.5 - 10.6	17.5 - 16.2
56	13°59.0	14°01.3	13°20.8	5.6 - 5.2	11.6 - 10.7	17.6 - 16.3
57	13°59.3	14°01.5	13°21.0	5.7 - 5.3	11.7 - 10.8	17.7 - 16.4
58	13°59.5	14°01.8	13°21.3	5.8 - 5.4	11.8 - 10.9	17.8 - 16.5
59	13°59.8	14°02.0	13°21.5	5.9 - 5.5	11.9 - 11.0	17.9 - 16.6

m 56	Sun Plan.	Aries	Moon	v and d corr		
0	14°00.0	14°02.3	13°21.7	0.0 - 0.0	6.0 - 5.7	12.0 - 11.3
1	14°00.2	14°02.5	13°22.0	0.1 - 0.1	6.1 - 5.7	12.1 - 11.4
2	14°00.5	14°02.8	13°22.2	0.2 - 0.2	6.2 - 5.8	12.2 - 11.5
3	14°00.7	14°03.0	13°22.4	0.3 - 0.3	6.3 - 5.9	12.3 - 11.6
4	14°01.0	14°03.3	13°22.7	0.4 - 0.4	6.4 - 6.0	12.4 - 11.7
5	14°01.3	14°03.5	13°22.9	0.5 - 0.5	6.5 - 6.1	12.5 - 11.8
6	14°01.5	14°03.8	13°23.2	0.6 - 0.6	6.6 - 6.2	12.6 - 11.9
7	14°01.8	14°04.1	13°23.4	0.7 - 0.7	6.7 - 6.3	12.7 - 12.0
8	14°02.0	14°04.3	13°23.6	0.8 - 0.8	6.8 - 6.4	12.8 - 12.1
9	14°02.2	14°04.6	13°23.9	0.9 - 0.8	6.9 - 6.5	12.9 - 12.1
10	14°02.5	14°04.8	13°24.1	1.0 - 0.9	7.0 - 6.6	13.0 - 12.2
11	14°02.7	14°05.1	13°24.4	1.1 - 1.0	7.1 - 6.7	13.1 - 12.3
12	14°03.0	14°05.3	13°24.6	1.2 - 1.1	7.2 - 6.8	13.2 - 12.4
13	14°03.3	14°05.6	13°24.8	1.3 - 1.2	7.3 - 6.9	13.3 - 12.5
14	14°03.5	14°05.8	13°25.1	1.4 - 1.3	7.4 - 7.0	13.4 - 12.6
15	14°03.8	14°06.1	13°25.3	1.5 - 1.4	7.5 - 7.1	13.5 - 12.7
16	14°04.0	14°06.3	13°25.6	1.6 - 1.5	7.6 - 7.2	13.6 - 12.8
17	14°04.2	14°06.6	13°25.8	1.7 - 1.6	7.7 - 7.3	13.7 - 12.9
18	14°04.5	14°06.8	13°26.0	1.8 - 1.7	7.8 - 7.3	13.8 - 13.0
19	14°04.8	14°07.1	13°26.3	1.9 - 1.8	7.9 - 7.4	13.9 - 13.1
20	14°05.0	14°07.3	13°26.5	2.0 - 1.9	8.0 - 7.5	14.0 - 13.2
21	14°05.3	14°07.6	13°26.7	2.1 - 2.0	8.1 - 7.6	14.1 - 13.3
22	14°05.5	14°07.8	13°27.0	2.2 - 2.1	8.2 - 7.7	14.2 - 13.4
23	14°05.7	14°08.1	13°27.2	2.3 - 2.2	8.3 - 7.8	14.3 - 13.5
24	14°06.0	14°08.3	13°27.5	2.4 - 2.3	8.4 - 7.9	14.4 - 13.6
25	14°06.2	14°08.6	13°27.7	2.5 - 2.4	8.5 - 8.0	14.5 - 13.7
26	14°06.5	14°08.8	13°27.9	2.6 - 2.4	8.6 - 8.1	14.6 - 13.7
27	14°06.8	14°09.1	13°28.2	2.7 - 2.5	8.7 - 8.2	14.7 - 13.8
28	14°07.0	14°09.3	13°28.4	2.8 - 2.6	8.8 - 8.3	14.8 - 13.9
29	14°07.3	14°09.6	13°28.7	2.9 - 2.7	8.9 - 8.4	14.9 - 14.0
30	14°07.5	14°09.8	13°28.9	3.0 - 2.8	9.0 - 8.5	15.0 - 14.1
31	14°07.7	14°10.1	13°29.1	3.1 - 2.9	9.1 - 8.6	15.1 - 14.2
32	14°08.0	14°10.3	13°29.4	3.2 - 3.0	9.2 - 8.7	15.2 - 14.3
33	14°08.2	14°10.6	13°29.6	3.3 - 3.1	9.3 - 8.8	15.3 - 14.4
34	14°08.5	14°10.8	13°29.8	3.4 - 3.2	9.4 - 8.9	15.4 - 14.5
35	14°08.8	14°11.1	13°30.1	3.5 - 3.3	9.5 - 8.9	15.5 - 14.6
36	14°09.0	14°11.3	13°30.3	3.6 - 3.4	9.6 - 9.0	15.6 - 14.7
37	14°09.3	14°11.6	13°30.6	3.7 - 3.5	9.7 - 9.1	15.7 - 14.8
38	14°09.5	14°11.8	13°30.8	3.8 - 3.6	9.8 - 9.2	15.8 - 14.9
39	14°09.7	14°12.1	13°31.0	3.9 - 3.7	9.9 - 9.3	15.9 - 15.0
40	14°10.0	14°12.3	13°31.3	4.0 - 3.8	10.0 - 9.4	16.0 - 15.1
41	14°10.2	14°12.6	13°31.5	4.1 - 3.9	10.1 - 9.5	16.1 - 15.2
42	14°10.5	14°12.8	13°31.8	4.2 - 4.0	10.2 - 9.6	16.2 - 15.3
43	14°10.8	14°13.1	13°32.0	4.3 - 4.0	10.3 - 9.7	16.3 - 15.3
44	14°11.0	14°13.3	13°32.2	4.4 - 4.1	10.4 - 9.8	16.4 - 15.4
45	14°11.3	14°13.6	13°32.5	4.5 - 4.2	10.5 - 9.9	16.5 - 15.5
46	14°11.5	14°13.8	13°32.7	4.6 - 4.3	10.6 - 10.0	16.6 - 15.6
47	14°11.7	14°14.1	13°32.9	4.7 - 4.4	10.7 - 10.1	16.7 - 15.7
48	14°12.0	14°14.3	13°33.2	4.8 - 4.5	10.8 - 10.2	16.8 - 15.8
49	14°12.3	14°14.6	13°33.4	4.9 - 4.6	10.9 - 10.3	16.9 - 15.9
50	14°12.5	14°14.8	13°33.7	5.0 - 4.7	11.0 - 10.4	17.0 - 16.0
51	14°12.8	14°15.1	13°33.9	5.1 - 4.8	11.1 - 10.5	17.1 - 16.1
52	14°13.0	14°15.3	13°34.1	5.2 - 4.9	11.2 - 10.5	17.2 - 16.2
53	14°13.2	14°15.6	13°34.4	5.3 - 5.0	11.3 - 10.6	17.3 - 16.3
54	14°13.5	14°15.8	13°34.6	5.4 - 5.1	11.4 - 10.7	17.4 - 16.4
55	14°13.7	14°16.1	13°34.9	5.5 - 5.2	11.5 - 10.8	17.5 - 16.5
56	14°14.0	14°16.3	13°35.1	5.6 - 5.3	11.6 - 10.9	17.6 - 16.6
57	14°14.3	14°16.6	13°35.3	5.7 - 5.4	11.7 - 11.0	17.7 - 16.7
58	14°14.5	14°16.8	13°35.6	5.8 - 5.5	11.8 - 11.1	17.8 - 16.8
59	14°14.8	14°17.1	13°35.8	5.9 - 5.6	11.9 - 11.2	17.9 - 16.9

Increments and Corrections

m	Sun Plan.	Aries	Moon	v and d corr		
57						
0	14°15.0	14°17.3	13°36.0	0.0 - 0.0	6.0 - 5.8	12.0 - 11.5
1	14°15.2	14°17.6	13°36.3	0.1 - 0.1	6.1 - 5.8	12.1 - 11.6
2	14°15.5	14°17.8	13°36.5	0.2 - 0.2	6.2 - 5.9	12.2 - 11.7
3	14°15.7	14°18.1	13°36.8	0.3 - 0.3	6.3 - 6.0	12.3 - 11.8
4	14°16.0	14°18.3	13°37.0	0.4 - 0.4	6.4 - 6.1	12.4 - 11.9
5	14°16.3	14°18.6	13°37.2	0.5 - 0.5	6.5 - 6.2	12.5 - 12.0
6	14°16.5	14°18.8	13°37.5	0.6 - 0.6	6.6 - 6.3	12.6 - 12.1
7	14°16.8	14°19.1	13°37.7	0.7 - 0.7	6.7 - 6.4	12.7 - 12.2
8	14°17.0	14°19.3	13°38.0	0.8 - 0.8	6.8 - 6.5	12.8 - 12.3
9	14°17.2	14°19.6	13°38.2	0.9 - 0.9	6.9 - 6.6	12.9 - 12.4
10	14°17.5	14°19.8	13°38.4	1.0 - 1.0	7.0 - 6.7	13.0 - 12.5
11	14°17.7	14°20.1	13°38.7	1.1 - 1.1	7.1 - 6.8	13.1 - 12.6
12	14°18.0	14°20.3	13°38.9	1.2 - 1.2	7.2 - 6.9	13.2 - 12.7
13	14°18.3	14°20.6	13°39.2	1.3 - 1.2	7.3 - 7.0	13.3 - 12.7
14	14°18.5	14°20.8	13°39.4	1.4 - 1.3	7.4 - 7.1	13.4 - 12.8
15	14°18.8	14°21.1	13°39.6	1.5 - 1.4	7.5 - 7.2	13.5 - 12.9
16	14°19.0	14°21.3	13°39.9	1.6 - 1.5	7.6 - 7.3	13.6 - 13.0
17	14°19.2	14°21.6	13°40.1	1.7 - 1.6	7.7 - 7.4	13.7 - 13.1
18	14°19.5	14°21.8	13°40.3	1.8 - 1.7	7.8 - 7.5	13.8 - 13.2
19	14°19.8	14°22.1	13°40.6	1.9 - 1.8	7.9 - 7.6	13.9 - 13.3
20	14°20.0	14°22.4	13°40.8	2.0 - 1.9	8.0 - 7.7	14.0 - 13.4
21	14°20.3	14°22.6	13°41.1	2.1 - 2.0	8.1 - 7.8	14.1 - 13.5
22	14°20.5	14°22.9	13°41.3	2.2 - 2.1	8.2 - 7.9	14.2 - 13.6
23	14°20.7	14°23.1	13°41.5	2.3 - 2.2	8.3 - 8.0	14.3 - 13.7
24	14°21.0	14°23.4	13°41.8	2.4 - 2.3	8.4 - 8.1	14.4 - 13.8
25	14°21.2	14°23.6	13°42.0	2.5 - 2.4	8.5 - 8.1	14.5 - 13.9
26	14°21.5	14°23.9	13°42.3	2.6 - 2.5	8.6 - 8.2	14.6 - 14.0
27	14°21.8	14°24.1	13°42.5	2.7 - 2.6	8.7 - 8.3	14.7 - 14.1
28	14°22.0	14°24.4	13°42.7	2.8 - 2.7	8.8 - 8.4	14.8 - 14.2
29	14°22.3	14°24.6	13°43.0	2.9 - 2.8	8.9 - 8.5	14.9 - 14.3
30	14°22.5	14°24.9	13°43.2	3.0 - 2.9	9.0 - 8.6	15.0 - 14.4
31	14°22.7	14°25.1	13°43.4	3.1 - 3.0	9.1 - 8.7	15.1 - 14.5
32	14°23.0	14°25.4	13°43.7	3.2 - 3.1	9.2 - 8.8	15.2 - 14.6
33	14°23.2	14°25.6	13°43.9	3.3 - 3.2	9.3 - 8.9	15.3 - 14.7
34	14°23.5	14°25.9	13°44.2	3.4 - 3.3	9.4 - 9.0	15.4 - 14.8
35	14°23.8	14°26.1	13°44.4	3.5 - 3.4	9.5 - 9.1	15.5 - 14.9
36	14°24.0	14°26.4	13°44.6	3.6 - 3.5	9.6 - 9.2	15.6 - 15.0
37	14°24.3	14°26.6	13°44.9	3.7 - 3.5	9.7 - 9.3	15.7 - 15.0
38	14°24.5	14°26.9	13°45.1	3.8 - 3.6	9.8 - 9.4	15.8 - 15.1
39	14°24.7	14°27.1	13°45.4	3.9 - 3.7	9.9 - 9.5	15.9 - 15.2
40	14°25.0	14°27.4	13°45.6	4.0 - 3.8	10.0 - 9.6	16.0 - 15.3
41	14°25.2	14°27.6	13°45.8	4.1 - 3.9	10.1 - 9.7	16.1 - 15.4
42	14°25.5	14°27.9	13°46.1	4.2 - 4.0	10.2 - 9.8	16.2 - 15.5
43	14°25.8	14°28.1	13°46.3	4.3 - 4.1	10.3 - 9.9	16.3 - 15.6
44	14°26.0	14°28.4	13°46.5	4.4 - 4.2	10.4 - 10.0	16.4 - 15.7
45	14°26.3	14°28.6	13°46.8	4.5 - 4.3	10.5 - 10.1	16.5 - 15.8
46	14°26.5	14°28.9	13°47.0	4.6 - 4.4	10.6 - 10.2	16.6 - 15.9
47	14°26.7	14°29.1	13°47.3	4.7 - 4.5	10.7 - 10.3	16.7 - 16.0
48	14°27.0	14°29.4	13°47.5	4.8 - 4.6	10.8 - 10.4	16.8 - 16.1
49	14°27.3	14°29.6	13°47.7	4.9 - 4.7	10.9 - 10.4	16.9 - 16.2
50	14°27.5	14°29.9	13°48.0	5.0 - 4.8	11.0 - 10.5	17.0 - 16.3
51	14°27.8	14°30.1	13°48.2	5.1 - 4.9	11.1 - 10.6	17.1 - 16.4
52	14°28.0	14°30.4	13°48.5	5.2 - 5.0	11.2 - 10.7	17.2 - 16.5
53	14°28.2	14°30.6	13°48.7	5.3 - 5.1	11.3 - 10.8	17.3 - 16.6
54	14°28.5	14°30.9	13°48.9	5.4 - 5.2	11.4 - 10.9	17.4 - 16.7
55	14°28.7	14°31.1	13°49.2	5.5 - 5.3	11.5 - 11.0	17.5 - 16.8
56	14°29.0	14°31.4	13°49.4	5.6 - 5.4	11.6 - 11.1	17.6 - 16.9
57	14°29.3	14°31.6	13°49.7	5.7 - 5.5	11.7 - 11.2	17.7 - 17.0
58	14°29.5	14°31.9	13°49.9	5.8 - 5.6	11.8 - 11.3	17.8 - 17.1
59	14°29.8	14°32.1	13°50.1	5.9 - 5.7	11.9 - 11.4	17.9 - 17.2

m	Sun Plan.	Aries	Moon	v and d corr		
58						
0	14°30.0	14°32.4	13°50.4	0.0 - 0.0	6.0 - 5.8	12.0 - 11.7
1	14°30.2	14°32.6	13°50.6	0.1 - 0.1	6.1 - 5.9	12.1 - 11.8
2	14°30.5	14°32.9	13°50.8	0.2 - 0.2	6.2 - 6.0	12.2 - 11.9
3	14°30.7	14°33.1	13°51.1	0.3 - 0.3	6.3 - 6.1	12.3 - 12.0
4	14°31.0	14°33.4	13°51.3	0.4 - 0.4	6.4 - 6.2	12.4 - 12.1
5	14°31.3	14°33.6	13°51.6	0.5 - 0.5	6.5 - 6.3	12.5 - 12.2
6	14°31.5	14°33.9	13°51.8	0.6 - 0.6	6.6 - 6.4	12.6 - 12.3
7	14°31.8	14°34.1	13°52.0	0.7 - 0.7	6.7 - 6.5	12.7 - 12.4
8	14°32.0	14°34.4	13°52.3	0.8 - 0.8	6.8 - 6.6	12.8 - 12.5
9	14°32.2	14°34.6	13°52.5	0.9 - 0.9	6.9 - 6.7	12.9 - 12.6
10	14°32.5	14°34.9	13°52.8	1.0 - 1.0	7.0 - 6.8	13.0 - 12.7
11	14°32.7	14°35.1	13°53.0	1.1 - 1.1	7.1 - 6.9	13.1 - 12.8
12	14°33.0	14°35.4	13°53.2	1.2 - 1.2	7.2 - 7.0	13.2 - 12.9
13	14°33.3	14°35.6	13°53.5	1.3 - 1.3	7.3 - 7.1	13.3 - 13.0
14	14°33.5	14°35.9	13°53.7	1.4 - 1.4	7.4 - 7.2	13.4 - 13.1
15	14°33.8	14°36.1	13°53.9	1.5 - 1.5	7.5 - 7.3	13.5 - 13.2
16	14°34.0	14°36.4	13°54.2	1.6 - 1.6	7.6 - 7.4	13.6 - 13.3
17	14°34.2	14°36.6	13°54.4	1.7 - 1.7	7.7 - 7.5	13.7 - 13.4
18	14°34.5	14°36.9	13°54.7	1.8 - 1.8	7.8 - 7.6	13.8 - 13.5
19	14°34.8	14°37.1	13°54.9	1.9 - 1.9	7.9 - 7.7	13.9 - 13.6
20	14°35.0	14°37.4	13°55.1	2.0 - 1.9	8.0 - 7.8	14.0 - 13.7
21	14°35.3	14°37.6	13°55.4	2.1 - 2.0	8.1 - 7.9	14.1 - 13.7
22	14°35.5	14°37.9	13°55.6	2.2 - 2.1	8.2 - 8.0	14.2 - 13.8
23	14°35.7	14°38.1	13°55.9	2.3 - 2.2	8.3 - 8.1	14.3 - 13.9
24	14°36.0	14°38.4	13°56.1	2.4 - 2.3	8.4 - 8.2	14.4 - 14.0
25	14°36.2	14°38.6	13°56.3	2.5 - 2.4	8.5 - 8.3	14.5 - 14.1
26	14°36.5	14°38.9	13°56.6	2.6 - 2.5	8.6 - 8.4	14.6 - 14.2
27	14°36.8	14°39.1	13°56.8	2.7 - 2.6	8.7 - 8.5	14.7 - 14.3
28	14°37.0	14°39.4	13°57.0	2.8 - 2.7	8.8 - 8.6	14.8 - 14.4
29	14°37.3	14°39.6	13°57.3	2.9 - 2.8	8.9 - 8.7	14.9 - 14.5
30	14°37.5	14°39.9	13°57.5	3.0 - 2.9	9.0 - 8.8	15.0 - 14.6
31	14°37.7	14°40.1	13°57.8	3.1 - 3.0	9.1 - 8.9	15.1 - 14.7
32	14°38.0	14°40.4	13°58.0	3.2 - 3.1	9.2 - 9.0	15.2 - 14.8
33	14°38.2	14°40.7	13°58.2	3.3 - 3.2	9.3 - 9.1	15.3 - 14.9
34	14°38.5	14°40.9	13°58.5	3.4 - 3.3	9.4 - 9.2	15.4 - 15.0
35	14°38.8	14°41.2	13°58.7	3.5 - 3.4	9.5 - 9.3	15.5 - 15.1
36	14°39.0	14°41.4	13°59.0	3.6 - 3.5	9.6 - 9.4	15.6 - 15.2
37	14°39.3	14°41.7	13°59.2	3.7 - 3.6	9.7 - 9.5	15.7 - 15.3
38	14°39.5	14°41.9	13°59.4	3.8 - 3.7	9.8 - 9.6	15.8 - 15.4
39	14°39.7	14°42.2	13°59.7	3.9 - 3.8	9.9 - 9.7	15.9 - 15.5
40	14°40.0	14°42.4	13°59.9	4.0 - 3.9	10.0 - 9.8	16.0 - 15.6
41	14°40.2	14°42.7	14°00.1	4.1 - 4.0	10.1 - 9.8	16.1 - 15.7
42	14°40.5	14°42.9	14°00.4	4.2 - 4.1	10.2 - 9.9	16.2 - 15.8
43	14°40.8	14°43.2	14°00.6	4.3 - 4.2	10.3 - 10.0	16.3 - 15.9
44	14°41.0	14°43.4	14°00.9	4.4 - 4.3	10.4 - 10.1	16.4 - 16.0
45	14°41.3	14°43.7	14°01.1	4.5 - 4.4	10.5 - 10.2	16.5 - 16.1
46	14°41.5	14°43.9	14°01.3	4.6 - 4.5	10.6 - 10.3	16.6 - 16.2
47	14°41.7	14°44.2	14°01.6	4.7 - 4.6	10.7 - 10.4	16.7 - 16.3
48	14°42.0	14°44.4	14°01.8	4.8 - 4.7	10.8 - 10.5	16.8 - 16.4
49	14°42.3	14°44.7	14°02.1	4.9 - 4.8	10.9 - 10.6	16.9 - 16.5
50	14°42.5	14°44.9	14°02.3	5.0 - 4.9	11.0 - 10.7	17.0 - 16.6
51	14°42.8	14°45.2	14°02.5	5.1 - 5.0	11.1 - 10.8	17.1 - 16.7
52	14°43.0	14°45.4	14°02.8	5.2 - 5.1	11.2 - 10.9	17.2 - 16.8
53	14°43.2	14°45.7	14°03.0	5.3 - 5.2	11.3 - 11.0	17.3 - 16.9
54	14°43.5	14°45.9	14°03.3	5.4 - 5.3	11.4 - 11.1	17.4 - 17.0
55	14°43.7	14°46.2	14°03.5	5.5 - 5.4	11.5 - 11.2	17.5 - 17.1
56	14°44.0	14°46.4	14°03.7	5.6 - 5.5	11.6 - 11.3	17.6 - 17.2
57	14°44.3	14°46.7	14°04.0	5.7 - 5.6	11.7 - 11.4	17.7 - 17.3
58	14°44.5	14°46.9	14°04.2	5.8 - 5.7	11.8 - 11.5	17.8 - 17.4
59	14°44.8	14°47.2	14°04.4	5.9 - 5.8	11.9 - 11.6	17.9 - 17.5

m	Sun Plan.	Aries	Moon	v and d corr		
59						
0	14°45.0	14°47.4	14°04.7	0.0 - 0.0	6.0 - 6.0	12.0 - 11.9
1	14°45.2	14°47.7	14°04.9	0.1 - 0.1	6.1 - 6.0	12.1 - 12.0
2	14°45.5	14°47.9	14°05.2	0.2 - 0.2	6.2 - 6.1	12.2 - 12.1
3	14°45.7	14°48.2	14°05.4	0.3 - 0.3	6.3 - 6.2	12.3 - 12.2
4	14°46.0	14°48.4	14°05.6	0.4 - 0.4	6.4 - 6.3	12.4 - 12.3
5	14°46.3	14°48.7	14°05.9	0.5 - 0.5	6.5 - 6.4	12.5 - 12.4
6	14°46.5	14°48.9	14°06.1	0.6 - 0.6	6.6 - 6.5	12.6 - 12.5
7	14°46.8	14°49.2	14°06.4	0.7 - 0.7	6.7 - 6.6	12.7 - 12.6
8	14°47.0	14°49.4	14°06.6	0.8 - 0.8	6.8 - 6.7	12.8 - 12.7
9	14°47.2	14°49.7	14°06.8	0.9 - 0.9	6.9 - 6.8	12.9 - 12.8
10	14°47.5	14°49.9	14°07.1	1.0 - 1.0	7.0 - 6.9	13.0 - 12.9
11	14°47.7	14°50.2	14°07.3	1.1 - 1.1	7.1 - 7.0	13.1 - 13.0
12	14°48.0	14°50.4	14°07.5	1.2 - 1.2	7.2 - 7.1	13.2 - 13.1
13	14°48.3	14°50.7	14°07.8	1.3 - 1.3	7.3 - 7.2	13.3 - 13.2
14	14°48.5	14°50.9	14°08.0	1.4 - 1.4	7.4 - 7.3	13.4 - 13.3
15	14°48.8	14°51.2	14°08.3	1.5 - 1.5	7.5 - 7.4	13.5 - 13.4
16	14°49.0	14°51.4	14°08.5	1.6 - 1.6	7.6 - 7.5	13.6 - 13.5
17	14°49.2	14°51.7	14°08.7	1.7 - 1.7	7.7 - 7.6	13.7 - 13.6
18	14°49.5	14°51.9	14°09.0	1.8 - 1.8	7.8 - 7.7	13.8 - 13.7
19	14°49.8	14°52.2	14°09.2	1.9 - 1.9	7.9 - 7.8	13.9 - 13.8
20	14°50.0	14°52.4	14°09.5	2.0 - 2.0	8.0 - 7.9	14.0 - 13.9
21	14°50.3	14°52.7	14°09.7	2.1 - 2.1	8.1 - 8.0	14.1 - 14.0
22	14°50.5	14°52.9	14°09.9	2.2 - 2.2	8.2 - 8.1	14.2 - 14.1
23	14°50.7	14°53.2	14°10.2	2.3 - 2.3	8.3 - 8.2	14.3 - 14.2
24	14°51.0	14°53.4	14°10.4	2.4 - 2.4	8.4 - 8.3	14.4 - 14.3
25	14°51.2	14°53.7	14°10.6	2.5 - 2.5	8.5 - 8.4	14.5 - 14.4
26	14°51.5	14°53.9	14°10.9	2.6 - 2.6	8.6 - 8.5	14.6 - 14.5
27	14°51.8	14°54.2	14°11.1	2.7 - 2.7	8.7 - 8.6	14.7 - 14.6
28	14°52.0	14°54.4	14°11.4	2.8 - 2.8	8.8 - 8.7	14.8 - 14.7
29	14°52.3	14°54.7	14°11.6	2.9 - 2.9	8.9 - 8.8	14.9 - 14.8
30	14°52.5	14°54.9	14°11.8	3.0 - 3.0	9.0 - 8.9	15.0 - 14.9
31	14°52.7	14°55.2	14°12.1	3.1 - 3.1	9.1 - 9.0	15.1 - 15.0
32	14°53.0	14°55.4	14°12.3	3.2 - 3.2	9.2 - 9.1	15.2 - 15.1
33	14°53.2	14°55.7	14°12.6	3.3 - 3.3	9.3 - 9.2	15.3 - 15.2
34	14°53.5	14°55.9	14°12.8	3.4 - 3.4	9.4 - 9.3	15.4 - 15.3
35	14°53.8	14°56.2	14°13.0	3.5 - 3.5	9.5 - 9.4	15.5 - 15.4
36	14°54.0	14°56.4	14°13.3	3.6 - 3.6	9.6 - 9.5	15.6 - 15.5
37	14°54.3	14°56.7	14°13.5	3.7 - 3.7	9.7 - 9.6	15.7 - 15.6
38	14°54.5	14°56.9	14°13.8	3.8 - 3.8	9.8 - 9.7	15.8 - 15.7
39	14°54.7	14°57.2	14°14.0	3.9 - 3.9	9.9 - 9.8	15.9 - 15.8
40	14°55.0	14°57.4	14°14.2	4.0 - 4.0	10.0 - 9.9	16.0 - 15.9
41	14°55.2	14°57.7	14°14.5	4.1 - 4.1	10.1 - 10.0	16.1 - 16.0
42	14°55.5	14°57.9	14°14.7	4.2 - 4.2	10.2 - 10.1	16.2 - 16.1
43	14°55.8	14°58.2	14°14.9	4.3 - 4.3	10.3 - 10.2	16.3 - 16.2
44	14°56.0	14°58.4	14°15.2	4.4 - 4.4	10.4 - 10.3	16.4 - 16.3
45	14°56.3	14°58.7	14°15.4	4.5 - 4.5	10.5 - 10.4	16.5 - 16.4
46	14°56.5	14°59.0	14°15.7	4.6 - 4.6	10.6 - 10.5	16.6 - 16.5
47	14°56.7	14°59.2	14°15.9	4.7 - 4.7	10.7 - 10.6	16.7 - 16.6
48	14°57.0	14°59.5	14°16.1	4.8 - 4.8	10.8 - 10.7	16.8 - 16.7
49	14°57.3	14°59.7	14°16.4	4.9 - 4.9	10.9 - 10.8	16.9 - 16.8
50	14°57.5	15°00.0	14°16.6	5.0 - 5.0	11.0 - 10.9	17.0 - 16.9
51	14°57.8	15°00.2	14°16.9	5.1 - 5.1	11.1 - 11.0	17.1 - 17.0
52	14°58.0	15°00.5	14°17.1	5.2 - 5.2	11.2 - 11.1	17.2 - 17.1
53	14°58.2	15°00.7	14°17.3	5.3 - 5.3	11.3 - 11.2	17.3 - 17.2
54	14°58.5	15°01.0	14°17.6	5.4 - 5.4	11.4 - 11.3	17.4 - 17.3
55	14°58.7	15°01.2	14°17.8	5.5 - 5.5	11.5 - 11.4	17.5 - 17.4
56	14°59.0	15°01.5	14°18.0	5.6 - 5.6	11.6 - 11.5	17.6 - 17.5
57	14°59.3	15°01.7	14°18.3	5.7 - 5.7	11.7 - 11.6	17.7 - 17.6
58	14°59.5	15°02.0	14°18.5	5.8 - 5.8	11.8 - 11.7	17.8 - 17.7
59	14°59.8	15°02.2	14°18.8	5.9 - 5.9	11.9 - 11.8	17.9 - 17.8

Altitude Correction Tables for 10° to 90° — Sun, Stars, Planets

SUN
October – March

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 33	+10.8	– 21.5
9 45	+10.9	– 21.4
9 56	+11.0	– 21.3
10 08	+11.1	– 21.2
10 20	+11.2	– 21.1
10 33	+11.3	– 21.0
10 46	+11.4	– 20.9
11 00	+11.5	– 20.8
11 15	+11.6	– 20.7
11 30	+11.7	– 20.6
11 45	+11.8	– 20.5
12 01	+11.9	– 20.4
12 18	+12.0	– 20.3
12 36	+12.1	– 20.2
12 54	+12.2	– 20.1
13 14	+12.3	– 20.0
13 34	+12.4	– 19.9
13 55	+12.5	– 19.8
14 17	+12.6	– 19.7
14 41	+12.7	– 19.6
15 05	+12.8	– 19.5
15 31	+12.9	– 19.4
15 59	+13.0	– 19.3
16 27	+13.1	– 19.2
16 58	+13.2	– 19.1
17 30	+13.3	– 19.0
18 05	+13.4	– 18.9
18 41	+13.5	– 18.8
19 20	+13.6	– 18.7
20 02	+13.7	– 18.6
20 46	+13.8	– 18.5
21 34	+13.9	– 18.4
22 25	+14.0	– 18.3
23 20	+14.1	– 18.2
24 20	+14.2	– 18.1
25 24	+14.3	– 18.0
26 34	+14.4	– 17.9
27 50	+14.5	– 17.8
29 13	+14.6	– 17.7
30 44	+14.7	– 17.6
32 24	+14.8	– 17.5
34 15	+14.9	– 17.4
36 17	+15.0	– 17.3
38 34	+15.1	– 17.2
41 06	+15.2	– 17.1
43 56	+15.3	– 17.0
47 07	+15.4	– 16.9
50 43	+15.5	– 16.8
54 46	+15.6	– 16.7
59 21	+15.7	– 16.6
64 28	+15.8	– 16.5
70 10	+15.9	– 16.4
76 24	+16.0	– 16.3
83 05	+16.1	– 16.2
90 00		

SUN
April – September

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 39	+10.6	– 21.2
9 50	+10.7	– 21.1
10 02	+10.8	– 21.0
10 14	+10.9	– 20.9
10 27	+11.0	– 20.8
10 40	+11.1	– 20.7
10 53	+11.2	– 20.6
11 07	+11.3	– 20.5
11 22	+11.4	– 20.4
11 37	+11.5	– 20.3
11 53	+11.6	– 20.2
12 10	+11.7	– 20.1
12 27	+11.8	– 20.0
14 45	+11.9	– 19.9
13 04	+12.0	– 19.8
13 24	+12.1	– 19.7
13 44	+12.2	– 19.6
14 06	+12.3	– 19.5
14 29	+12.4	– 19.4
14 53	+12.5	– 19.3
15 18	+12.6	– 19.2
15 45	+12.7	– 19.1
16 13	+12.8	– 19.0
16 43	+12.9	– 18.9
17 14	+13.0	– 18.8
17 47	+13.1	– 18.7
18 23	+13.2	– 18.6
19 00	+13.3	– 18.5
19 41	+13.4	– 18.4
20 24	+13.5	– 18.3
21 10	+13.6	– 18.2
21 59	+13.7	– 18.1
22 52	+13.8	– 18.0
23 49	+13.9	– 17.9
24 51	+14.0	– 17.8
25 58	+14.1	– 17.7
27 11	+14.2	– 17.6
28 31	+14.3	– 17.5
29 58	+14.4	– 17.4
31 33	+14.5	– 17.3
33 18	+14.6	– 17.2
35 15	+14.7	– 17.1
37 24	+14.8	– 17.0
39 48	+14.9	– 16.9
42 28	+15.0	– 16.8
45 29	+15.1	– 16.7
48 52	+15.2	– 16.6
51 41	+15.3	– 16.5
56 59	+15.4	– 16.4
61 50	+15.5	– 16.3
67 15	+15.6	– 16.2
73 14	+15.7	– 16.1
79 42	+15.8	– 16.0
86 21	+15.9	– 15.9
90 00		

Stars & Planets

App. Alt.	Corr
° ′	′
9 55	– 5.3
10 07	– 5.2
10 20	– 5.1
10 32	– 5.0
10 46	– 4.9
10 59	– 4.8
11 14	– 4.7
11 29	– 4.6
11 44	– 4.5
12 00	– 4.4
12 17	– 4.3
12 35	– 4.2
12 53	– 4.1
13 12	– 4.0
13 32	– 3.9
13 53	– 3.8
14 16	– 3.7
14 39	– 3.6
15 03	– 3.5
15 29	– 3.4
15 56	– 3.3
16 25	– 3.2
16 55	– 3.1
17 27	– 3.0
18 01	– 2.9
18 37	– 2.8
19 16	– 2.7
19 56	– 2.6
20 40	– 2.5
21 27	– 2.4
22 17	– 2.3
23 11	– 2.2
24 09	– 2.1
25 12	– 2.0
26 20	– 1.9
27 34	– 1.8
28 54	– 1.7
30 22	– 1.6
31 58	– 1.5
33 43	– 1.4
35 38	– 1.3
37 45	– 1.2
40 06	– 1.1
42 42	– 1.0
45 34	– 0.9
48 45	– 0.8
52 16	– 0.7
56 09	– 0.6
60 26	– 0.5
65 06	– 0.4
70 09	– 0.3
75 32	– 0.2
81 12	– 0.1
87 03	0.0
90 00	

Additional Altitude Correction for Mars & Venus

A small additional altitude correction for Mars & Venus can be obtained in the Daily Pages of The Nautical Almanac for the day of the observation.

Find the correction in the block labeled **Horizontal parallax**.

The figure will cover the range of 3 days found on that Daily Page.

The correction is to be added to Apparent Altitude.

Refraction

App. Alt.	Corr
°	′
5.5	– 9.1
6.0	– 8.5
6.5	– 7.9
7.0	– 7.5
7.5	– 7.0
8.0	– 6.6
8.5	– 6.3
9.0	– 5.9
9.5	– 5.7
10.0	– 5.4
10.5	– 5.1
11.0	– 4.9
11.5	– 4.7
12.0	– 4.5
12.5	– 4.4
13.0	– 4.2
13.5	– 4.0
14.0	– 3.9
14.5	– 3.8
15.0	– 3.6
15.5	– 3.5
16.0	– 3.4
16.5	– 3.3
17.0	– 3.2
17.5	– 3.1
18.0	– 3.0
18.5	– 2.9
19.0	– 2.9
19.5	– 2.8
20.0	– 2.7
21.0	– 2.6
22.0	– 2.4
23.0	– 2.3
24.0	– 2.2
25.0	– 2.1
26.0	– 2.0
27.0	– 1.9
28.0	– 1.9
29.0	– 1.8
30.0	– 1.7
31.0	– 1.7
32.0	– 1.6
33.0	– 1.5
34.0	– 1.5
35.0	– 1.4
36.0	– 1.4
37.0	– 1.3
38.0	– 1.3
39.0	– 1.2
40.0	– 1.2
45.0	– 1.0
50.0	– 0.8
55.0	– 0.7
60.0	– 0.6
65.0	– 0.5
70.0	– 0.4
75.0	– 0.3
80.0	– 0.2
85.0	– 0.1

DIP
always subtracted from Hs

Ht. of Eye	Corr	Ht. of Eye	Ht. of Eye	Corr
meters	′	**feet**	**meters**	′
2.4	**– 2.8**	8.0	1.0	**– 1.8**
2.6	**– 2.9**	8.6	1.5	**– 2.2**
2.8	**– 3.0**	9.2	2.0	**– 2.5**
3.0	**– 3.1**	9.8	2.5	**– 2.8**
3.2	**– 3.2**	10.5	3.0	**– 3.0**
3.4	**– 3.3**	11.2	See table ←	
3.6	**– 3.4**	11.9		
3.8	**– 3.5**	12.6	**meters**	
4.0	**– 3.6**	13.3	20	**– 7.9**
4.3	**– 3.7**	14.1	22	**– 8.3**
4.5	**– 3.8**	14.9	24	**– 8.6**
4.7	**– 3.9**	15.7	26	**– 9.0**
5.0	**– 4.0**	16.5	28	**– 9.3**
5.2	**– 4.1**	17.4		
5.5	**– 4.2**	18.3	30	**– 9.6**
5.8	**– 4.3**	19.1	32	**– 10.0**
6.1	**– 4.4**	20.1	34	**– 10.3**
6.3	**– 4.5**	21.0	36	**– 10.6**
6.6	**– 4.6**	22.0	38	**– 10.8**
6.9	**– 4.7**	22.9		
7.2	**– 4.8**	23.9	40	**– 11.1**
7.5	**– 4.9**	24.9	42	**– 11.4**
7.9	**– 5.0**	26.0	44	**– 11.7**
8.2	**– 5.1**	27.1	46	**– 11.9**
8.5	**– 5.2**	28.1	48	**– 12.2**
8.8	**– 5.3**	29.2	**feet**	′
9.2	**– 5.4**	30.4	2	**– 1.4**
9.5	**– 5.5**	31.5	4	**– 1.9**
9.9	**– 5.6**	32.7	6	**– 2.4**
10.3	**– 5.7**	33.9	8	**– 2.7**
10.6	**– 5.8**	35.1	10	**– 3.1**
11.0	**– 5.9**	36.3	See table ←	
11.4	**– 6.0**	37.6		
11.8	**– 6.1**	38.9	**feet**	′
12.2	**– 6.2**	40.1	70	**– 8.1**
12.6	**– 6.3**	41.5	75	**– 8.4**
13.0	**– 6.4**	42.8	80	**– 8.7**
13.4	**– 6.5**	44.2	85	**– 8.9**
13.8	**– 6.6**	45.5	90	**– 9.2**
14.2	**– 6.7**	46.9	95	**9.5**
14.7	**– 6.8**	48.4		
15.1	**– 6.9**	49.8	100	**– 9.7**
15.5	**– 7.0**	51.3	105	**– 9.9**
16.0	**– 7.1**	52.8	110	**– 10.2**
16.5	**– 7.2**	54.3	115	**– 10.4**
16.9	**– 7.3**	55.8	120	**– 10.6**
17.4	**– 7.4**	57.4	125	**– 10.8**
17.9	**– 7.5**	58.9	130	**– 11.1**
18.4	**– 7.6**	60.5	135	**– 11.3**
18.8	**– 7.7**	62.1	140	**– 11.5**
19.3	**– 7.8**	63.8	145	**– 11.7**
19.8	**– 7.9**	65.4	150	**– 11.9**
20.4	**– 8.0**	67.1	155	**– 12.1**
20.9	**– 8.1**	68.8		
21.4		70.5		

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

Altitude Correction Tables for 0° to 10° — Sun, Stars, Planets

App. Alt.	Sun October – March Lower Limb	Sun October – March Upper Limb	Sun April – September Lower Limb	Sun April – September Upper Limb	Stars & Planets
° ′	′	′	′	′	′
0 00	– 17.5	– 49.8	– 17.8	– 49.6	– 33.8
0 03	16.9	49.2	17.2	49.0	33.2
0 06	16.3	48.6	16.6	48.4	32.6
0 09	15.7	48.0	16.0	47.8	32.0
0 12	15.2	47.5	15.4	47.2	31.5
0 15	14.6	46.9	14.8	46.6	30.9
0 18	– 14.1	– 46.4	– 14.3	– 46.1	– 30.4
0 21	13.5	45.8	13.8	33.8	29.8
0 24	13.0	45.3	13.3	45.1	29.3
0 27	12.5	44.8	12.8	44.6	28.8
0 30	12.0	44.3	12.3	44.1	28.3
0 33	11.6	43.9	11.8	43.6	27.9
0 36	– 11.1	– 10.0	– 11.3	– 43.1	– 27.4
0 39	10.6	42.9	10.9	42.7	26.9
0 42	10.2	42.5	10.5	42.3	26.5
0 45	9.8	42.1	10.0	41.8	26.1
0 48	9.4	41.7	9.6	41.4	25.7
0 51	9.0	41.3	9.2	41.0	25.3
0 54	– 8.6	– 40.9	– 8.8	– 40.6	– 24.9
0 57	8.2	40.5	8.4	40.2	24.5
1 00	7.8	40.1	8.0	39.8	24.1
1 03	7.4	39.7	7.7	39.5	23.7
1 06	7.1	39.4	7.3	39.1	23.4
1 09	6.7	39.0	7.0	38.8	23.0
1 12	– 6.4	– 38.7	– 6.6	– 38.4	– 22.7
1 15	6.0	38.3	6.3	38.1	22.3
1 18	5.7	38.0	6.0	37.8	22.0
1 21	5.4	37.7	5.7	37.5	21.7
1 24	5.1	37.4	5.3	37.1	21.4
1 27	4.8	37.1	5.0	33.8	21.1
1 30	– 4.5	– 36.8	– 4.7	– 36.5	– 20.8
1 35	4.0	36.3	4.3	36.1	20.3
1 40	3.6	35.9	3.8	35.6	19.9
1 45	3.1	35.4	3.4	35.2	19.4
1 50	2.7	35.0	2.9	34.7	19.0
1 55	2.3	34.6	2.5	34.3	18.6
2 00	– 1.9	– 34.2	– 2.1	– 33.9	– 18.2
2 05	1.5	33.8	1.7	33.5	17.8
2 10	1.1	33.4	1.4	33.2	17.4
2 15	0.8	33.1	1.0	32.8	17.1
2 20	0.4	32.7	0.7	32.5	16.7
2 25	– 0.1	32.4	– 0.3	32.1	16.4
2 30	+ 0.2	– 32.1	0.0	– 31.8	– 16.1
2 35	0.5	31.8	+ 0.3	31.5	15.8
2 40	0.8	31.5	0.6	31.2	15.4
2 45	1.1	31.2	0.9	30.9	15.2
2 50	1.4	30.9	1.2	30.6	14.9
2 55	1.7	30.6	1.4	30.4	14.9
3 00	+ 2.0	– 30.3	+ 1.7	– 30.1	– 14.3
3 05	2.2	30.1	2.0	29.8	14.1
3 10	2.5	29.8	2.2	29.6	13.8
3 15	2.7	29.6	2.5	29.3	13.6
3 20	2.9	29.4	2.7	29.1	13.4
3 25	3.2	29.1	2.9	28.9	13.4
3 30	3.4	– 28.9	+ 3.1	– 28.7	– 12.9

App. Alt.	Sun October – March Lower Limb	Sun October – March Upper Limb	Sun April – September Lower Limb	Sun April – September Upper Limb	Stars & Planets
° ′	′	′	′	′	′
3 30	+ 3.4	– 28.9	+ 3.1	– 28.7	– 12.9
3 35	3.6	28.7	3.3	28.5	12.7
3 40	3.8	28.5	3.6	28.2	12.5
3 45	4.0	28.3	3.8	28.0	12.3
3 50	4.2	28.1	4.0	27.8	12.1
3 55	4.4	27.9	4.1	27.7	11.9
4 00	+ 4.6	– 27.7	+ 4.3	– 27.5	– 11.7
4 05	4.8	27.5	4.5	27.3	11.5
4 10	4.9	27.4	4.7	27.1	11.4
4 15	5.1	27.2	4.9	26.9	11.2
4 20	5.3	27.0	5.0	26.8	11.0
4 25	5.4	26.9	5.2	26.6	10.9
4 30	+ 5.6	– 26.7	+ 5.3	– 26.5	– 10.7
4 35	5.7	26.6	5.5	26.3	10.6
4 40	5.9	26.4	5.6	26.2	10.4
4 45	6.0	26.3	5.8	26.0	10.3
4 50	6.2	26.1	5.9	25.9	10.1
4 55	6.3	26.0	6.1	25.7	10.0
5 00	+ 6.4	– 25.9	+ 6.2	– 25.6	– 9.9
5 05	6.6	25.7	6.3	25.5	9.7
5 10	6.7	25.6	6.5	25.3	9.6
5 15	6.8	25.5	6.6	25.2	9.5
5 20	7.0	25.3	6.7	25.1	9.3
5 25	7.1	25.2	6.8	25.0	9.2
5 30	+ 7.2	– 25.1	+ 6.9	– 24.9	– 9.1
5 35	7.3	25.0	7.1	24.7	9.0
5 40	7.4	24.9	7.2	24.6	8.9
5 45	7.5	24.8	7.3	24.5	8.8
5 50	7.6	24.7	7.4	24.4	8.7
5 55	7.7	24.6	7.5	24.3	8.6
6 00	+ 7.8	– 24.5	+ 7.6	– 24.2	– 8.5
6 10	8.0	24.3	7.8	24.0	8.3
6 20	8.2	24.1	8.0	23.8	8.1
6 30	8.4	23.9	8.2	23.6	7.9
6 40	8.6	23.7	8.3	23.5	7.7
6 50	8.7	23.6	8.5	23.3	7.6
7 00	+ 8.9	– 23.4	+ 8.7	– 23.1	– 7.4
7 10	9.1	23.2	8.8	23.0	7.2
7 20	9.2	23.1	9.0	22.8	7.1
7 30	9.3	23.0	9.1	22.7	6.9
7 40	9.5	22.8	9.2	22.6	6.8
7 50	9.6	22.7	9.4	22.4	6.7
8 00	+ 9.7	– 22.6	+ 9.5	– 22.3	– 6.6
8 10	9.9	22.4	9.6	22.2	6.4
8 20	10.0	22.3	9.7	22.1	6.3
8 30	10.1	22.2	9.9	21.9	6.2
8 40	10.2	22.1	10.0	21.8	6.1
8 50	10.3	22.0	10.1	21.7	6.0
9 00	+ 10.4	– 21.9	+ 10.2	– 21.6	– 5.9
9 10	10.5	21.8	10.3	21.5	5.8
9 20	10.6	21.7	10.4	21.4	5.7
9 30	10.7	21.6	10.5	21.3	5.6
9 40	10.8	21.5	10.6	21.2	5.5
9 50	10.9	21.4	10.6	21.2	5.4
10 00	+ 11.0	– 21.3	+ 10.7	– 21.1	– 5.3

For bubble sextant observations- ignore dip and use star corrections for the Sun, planets and stars.

ALTITUDE CORRECTION TABLES 0° – 35° — MOON

App. Alt.	0° – 4°		5° – 9°		10° – 14°		15° – 19°		20° – 24°		25° – 29°		30° – 34°		App. Alt.
	Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		
'	'		'		'		'		'		'		'		'
	0°		5°		10°		15°		20°		25°		30°		
00	34.5		58.2		62.1		62.8		62.2		60.8		58.9		00
10	36.5		58.5		62.2		62.8		62.2		60.8		58.8		10
20	38.3		58.7		62.2		62.8		62.1		60.7		58.8		20
30	40.0		58.9		62.3		62.8		62.1		60.7		58.7		30
40	41.5		59.1		62.3		62.8		62.0		60.6		58.6		40
50	42.9		59.3		62.4		62.7		62.0		60.6		58.5		50
	1°		6°		11°		16°		21°		26°		31°		
00	44.2		59.5		62.4		62.7		62.0		60.5		58.5		00
10	45.4		59.7		62.4		62.7		61.9		60.4		58.4		10
20	46.5		59.9		62.5		62.7		61.9		60.4		58.3		20
30	47.5		60.0		62.5		62.7		61.9		60.3		58.2		30
40	48.4		60.2		62.5		62.7		61.8		60.3		58.2		40
50	49.3		60.3		62.6		62.7		61.8		60.2		58.1		50
	2°		7°		12°		17°		22°		27°		32°		
00	50.1		60.5		62.6		62.7		61.7		60.1		58.0		00
10	50.8		60.6		62.6		62.6		61.7		60.1		57.9		10
20	51.5		60.7		62.6		62.6		61.6		60.0		57.8		20
30	52.2		60.9		62.7		62.6		61.6		59.9		57.8		30
40	52.8		61.0		62.7		62.6		61.6		59.9		57.7		40
50	53.4		61.1		62.7		62.6		61.5		59.8		57.6		50
	3°		8°		13°		18°		23°		28°		33°		
00	53.9		61.2		62.7		62.5		61.5		59.7		57.5		00
10	54.4		61.3		62.7		62.5		61.4		59.7		57.4		10
20	54.9		61.4		62.7		62.5		61.4		59.6		57.4		20
30	55.3		61.5		62.8		62.5		61.3		59.5		57.3		30
40	55.7		61.6		62.8		62.4		61.3		59.5		57.2		40
50	56.1		61.6		62.8		62.4		61.2		59.4		57.1		50
	4°		9°		14°		19°		24°		29°		34°		
00	56.4		61.7		62.8		62.4		61.2		59.3		57.0		00
10	56.8		61.8		62.8		62.4		61.1		59.3		56.9		10
20	57.1		61.9		62.8		62.3		61.1		59.2		56.9		20
30	57.4		61.9		62.8		62.3		61.0		59.1		56.8		30
40	57.7		62.0		62.8		62.3		61.0		59.1		56.7		40
50	58.0		62.1		62.8		62.2		60.9		59.0		56.6		50
HP	L	U	L	U	L	U	L	U	L	U	L	U	L	U	HP
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
54.0	0.3	0.9	0.3	0.9	0.4	1.0	0.5	1.1	0.6	1.2	0.7	1.3	0.9	1.5	54.0
54.3	0.7	1.1	0.7	1.2	0.8	1.2	0.8	1.3	0.9	1.4	1.1	1.5	1.2	1.7	54.3
54.6	1.1	1.4	1.1	1.4	1.1	1.4	1.2	1.5	1.3	1.6	1.4	1.7	1.5	1.8	54.6
54.9	1.4	1.6	1.4	1.6	1.5	1.6	1.6	1.7	1.6	1.8	1.8	1.9	1.9	2.0	54.9
55.2	1.8	1.8	1.8	1.8	1.9	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	55.2
55.5	2.2	2.0	2.2	2.0	2.3	2.1	2.3	2.1	2.4	2.2	2.4	2.3	2.5	2.4	55.5
55.8	2.6	2.2	2.6	2.2	2.6	2.3	2.7	2.3	2.7	2.4	2.8	2.4	2.9	2.5	55.8
56.1	3.0	2.4	3.0	2.5	3.0	2.5	3.0	2.5	3.1	2.6	3.1	2.6	3.2	2.7	56.1
56.4	3.3	2.7	3.3	2.7	3.4	2.7	3.4	2.7	3.4	2.8	3.5	2.8	3.5	2.9	56.4
56.7	3.7	2.9	3.7	2.9	3.8	2.9	3.8	2.9	3.8	3.0	3.8	3.0	3.9	3.0	56.7
57.0	4.1	3.1	4.1	3.1	4.1	3.1	4.1	3.1	4.2	3.2	4.2	3.2	4.2	3.2	57.0
57.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.4	4.6	3.4	57.3
57.6	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.6	57.6
57.9	5.3	3.8	5.3	3.8	5.2	3.8	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	57.9
58.2	5.6	4.0	5.6	4.0	5.6	4.0	5.6	4.0	5.6	3.9	5.6	3.9	5.6	3.9	58.2
58.5	6.0	4.2	6.0	4.2	6.0	4.2	6.0	4.2	6.0	4.1	5.9	4.1	5.9	4.1	58.5
58.8	6.4	4.4	6.4	4.4	6.4	4.4	6.3	4.4	6.3	4.3	6.3	4.3	6.2	4.2	58.8
59.1	6.8	4.6	6.8	4.6	6.7	4.6	6.7	4.6	6.7	4.5	6.6	4.5	6.6	4.4	59.1
59.4	7.2	4.8	7.1	4.8	7.1	4.8	7.1	4.8	7.0	4.7	7.0	4.7	6.9	4.6	59.4
59.7	7.5	5.1	7.5	5.0	7.5	5.0	7.5	5.0	7.4	4.9	7.3	4.8	7.2	4.8	59.7
60.0	7.9	5.3	7.9	5.3	7.9	5.2	7.8	5.2	7.8	5.1	7.7	5.0	7.6	4.9	60.0
60.3	8.3	5.5	8.3	5.5	8.2	5.4	8.2	5.4	8.1	5.3	8.0	5.2	7.9	5.1	60.3
60.6	8.7	5.7	8.7	5.7	8.6	5.7	8.6	5.6	8.5	5.5	8.4	5.4	8.2	5.3	60.6
60.9	9.1	5.9	9.0	5.9	9.0	5.9	8.9	5.8	8.8	5.7	8.7	5.6	8.6	5.4	60.9
61.2	9.5	6.2	9.4	6.1	9.4	6.1	9.3	6.0	9.2	5.9	9.1	5.8	8.9	5.6	61.2
61.5	9.8	6.4	9.8	6.3	9.7	6.3	9.7	6.2	9.5	6.1	9.4	5.9	9.2	5.8	61.5

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ	Ht. of Eye
m	'	ft	m	'	ft
2.4	-2.8	7.9	9.5	-5.5	31.2
2.6	-2.9	8.5	9.9	-5.6	32.5
2.8	-3.0	9.2	10.3	-5.7	33.8
3.0	-3.1	9.8	10.6	-5.8	34.8
3.2	-3.2	10.5	11.0	-5.9	36.1
3.4	-3.3	11.2	11.4	-6.0	37.4
3.6	-3.4	11.8	11.8	-6.1	38.7
3.8	-3.5	12.5	12.2	-6.2	40.0
4.0	-3.6	13.1	12.6	-6.3	41.3
4.3	-3.7	14.1	13.0	-6.4	42.7
4.5	-3.8	14.8	13.4	-6.5	44.0
4.7	-3.9	15.4	13.8	-6.6	45.3
5.0	-4.0	16.4	14.2	-6.7	46.6
5.2	-4.1	17.1	14.7	-6.8	48.2
5.5	-4.2	18.0	15.1	-6.9	49.5
5.8	-4.3	19.0	15.5	-7.0	50.9
6.1	-4.4	20.0	16.0	-7.1	52.5
6.3	-4.5	20.7	16.5	-7.2	54.1
6.6	-4.6	21.7	16.9	-7.3	55.4
6.9	-4.7	22.6	17.4	-7.4	57.1
7.2	-4.8	23.6	17.9	-7.5	58.7
7.5	-4.9	24.6	18.4	-7.6	60.4
7.9	-5.0	25.9	18.8	-7.7	61.7
8.2	-5.1	26.9	19.3	-7.8	63.3
8.5	-5.2	27.9	19.8	-7.9	65.0
8.8	-5.3	28.9	20.4	-8.0	66.9
9.2	-5.4	30.2	20.9	-8.1	68.6
9.5		31.2	21.4		70.2

MOON CORRECTION TABLE

The correction is in two parts; the first correction is taken from the upper part of the table with argument apparent altitude, and the second from the lower part, with argument HP, in the same column as that from which the first correction was taken. Separate corrections are given in the lower part for lower (L) and upper (U) limbs. All corrections are to be **added** to apparent altitude, *but* 30' *is to be subtracted from the altitude of the upper limb.*

For corrections for pressure and temperature see page A4.

For bubble sextant observations ignore dip, take the mean of upper and lower limb corrections and subtract 15' from the altitude.

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

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ALTITUDE CORRECTION TABLES 35° – 90° — MOON

App. Alt.	35° – 39°		40° – 44°		45° – 49°		50° – 54°		55° – 59°		60° – 64°		65° – 69°		70° – 74°		75° – 79°		80° – 84°		85° – 89°		App. Alt.
	Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		
'	35°	'	40°	'	45°	'	50°	'	55°	'	60°	'	65°	'	70°	'	75°	'	80°	'	85°	'	'
00		56.5		53.7		50.5		46.9		43.1		38.9		34.6		30.0		25.3		20.5		15.6	00
10		56.4		53.6		50.4		46.8		42.9		38.8		34.4		29.9		25.2		20.4		15.5	10
20		56.3		53.5		50.2		46.7		42.8		38.7		34.3		29.7		25.0		20.2		15.3	20
30		56.2		53.4		50.1		46.5		42.7		38.5		34.1		29.6		24.9		20.0		15.1	30
40		56.2		53.3		50.0		46.4		42.5		38.4		34.0		29.4		24.7		19.9		15.0	40
50		56.1		53.2		49.9		46.3		42.4		38.2		33.8		29.3		24.5		19.7		14.8	50
	36°		41°		46°		51°		56°		61°		66°		71°		76°		81°		86°		
00		56.0		53.1		49.8		46.2		42.3		38.1		33.7		29.1		24.4		19.6		14.6	00
10		55.9		53.0		49.7		46.0		42.1		37.9		33.5		29.0		24.2		19.4		14.5	10
20		55.8		52.9		49.5		45.9		42.0		37.8		33.4		28.8		24.1		19.2		14.3	20
30		55.7		52.8		49.4		45.8		41.9		37.7		33.2		28.7		23.9		19.1		14.2	30
40		55.6		52.6		49.3		45.7		41.7		37.5		33.1		28.5		23.8		18.9		14.0	40
50		55.5		52.5		49.2		45.5		41.6		37.4		32.9		28.3		23.6		18.7		13.8	50
	37°		42°		47°		52°		57°		62°		67°		72°		77°		82°		87°		
00		55.4		52.4		49.1		45.4		41.4		37.2		32.8		28.2		23.4		18.6		13.7	00
10		55.3		52.3		49.0		45.3		41.3		37.1		32.6		28.0		23.3		18.4		13.5	10
20		55.2		52.2		48.8		45.2		41.2		36.9		32.5		27.9		23.1		18.2		13.3	20
30		55.1		52.1		48.7		45.0		41.0		36.8		32.3		27.7		22.9		18.1		13.2	30
40		55.0		52.0		48.6		44.9		40.9		36.6		32.2		27.6		22.8		17.9		13.0	40
50		55.0		51.9		48.5		44.8		40.8		36.5		32.0		27.4		22.6		17.8		12.8	50
	38°		43°		48°		53°		58°		63°		68°		73°		78°		83°		88°		
00		54.9		51.8		48.4		44.6		40.6		36.4		31.9		27.2		22.5		17.6		12.7	00
10		54.8		51.7		48.3		44.5		40.5		36.2		31.7		27.1		22.3		17.4		12.5	10
20		54.7		51.6		48.1		44.4		40.3		36.1		31.6		26.9		22.1		17.3		12.3	20
30		54.6		51.5		48.0		44.2		40.2		35.9		31.4		26.8		22.0		17.1		12.2	30
40		54.5		51.4		47.9		44.1		40.1		35.8		31.3		26.6		21.8		16.9		12.0	40
50		54.4		51.2		47.8		44.0		39.9		35.6		31.1		26.5		21.7		16.8		11.8	50
	39°		44°		49°		54°		59°		64°		69°		74°		79°		84°		89°		
00		54.3		51.1		47.7		43.9		39.8		35.5		31.0		26.3		21.5		16.6		11.7	00
10		54.2		51.0		47.5		43.7		39.6		35.3		30.8		26.1		21.3		16.4		11.5	10
20		54.1		50.9		47.4		43.6		39.5		35.2		30.7		26.0		21.2		16.3		11.4	20
30		54.0		50.8		47.3		43.5		39.4		35.0		30.5		25.8		21.0		16.1		11.2	30
40		53.9		50.7		47.2		43.3		39.2		34.9		30.4		25.7		20.9		16.0		11.0	40
50		53.8		50.6		47.0		43.2		39.1		34.7		30.2		25.5		20.7		15.8		10.9	50
HP	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	HP
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
54.0	1.1	1.7	1.3	1.9	1.5	2.1	1.7	2.4	2.0	2.6	2.3	2.9	2.6	3.2	2.9	3.5	3.2	3.8	3.5	4.1	3.8	4.5	54.0
54.3	1.4	1.8	1.6	2.0	1.8	2.2	2.0	2.5	2.2	2.7	2.5	3.0	2.8	3.2	3.1	3.5	3.3	3.8	3.6	4.1	3.9	4.4	54.3
54.6	1.7	2.0	1.9	2.2	2.1	2.4	2.3	2.6	2.5	2.8	2.7	3.0	3.0	3.3	3.2	3.5	3.5	3.8	3.8	4.0	4.0	4.3	54.6
54.9	2.0	2.2	2.2	2.3	2.4	2.5	2.5	2.7	2.7	2.9	2.9	3.1	3.2	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.3	54.9
55.2	2.3	2.3	2.5	2.4	2.6	2.6	2.8	2.8	3.0	2.9	3.2	3.1	3.4	3.3	3.6	3.5	3.8	3.7	4.0	4.0	4.2	4.2	55.2
55.5	2.7	2.5	2.8	2.6	2.9	2.7	3.1	2.9	3.2	3.0	3.4	3.2	3.6	3.4	3.7	3.5	3.9	3.7	4.1	3.9	4.3	4.1	55.5
55.8	3.0	2.6	3.1	2.7	3.2	2.8	3.3	3.0	3.5	3.1	3.6	3.3	3.8	3.4	3.9	3.6	4.1	3.7	4.2	3.9	4.4	4.0	55.8
56.1	3.3	2.8	3.4	2.9	3.5	3.0	3.6	3.1	3.7	3.2	3.8	3.3	4.0	3.4	4.1	3.6	4.2	3.7	4.4	3.8	4.5	4.0	56.1
56.4	3.6	2.9	3.7	3.0	3.8	3.1	3.9	3.2	3.9	3.3	4.0	3.4	4.1	3.5	4.3	3.6	4.4	3.7	4.5	3.8	4.6	3.9	56.4
56.7	3.9	3.1	4.0	3.1	4.1	3.2	4.1	3.3	4.2	3.3	4.3	3.4	4.3	3.5	4.4	3.6	4.5	3.7	4.6	3.8	4.7	3.8	56.7
57.0	4.3	3.2	4.3	3.3	4.3	3.3	4.4	3.4	4.4	3.4	4.5	3.5	4.5	3.5	4.6	3.6	4.7	3.6	4.7	3.7	4.8	3.8	57.0
57.3	4.6	3.4	4.6	3.4	4.6	3.4	4.6	3.5	4.7	3.5	4.7	3.5	4.7	3.6	4.8	3.6	4.8	3.6	4.8	3.7	4.9	3.7	57.3
57.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	5.0	3.6	5.0	3.6	5.0	3.6	57.6
57.9	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	57.9
58.2	5.5	3.9	5.5	3.8	5.5	3.8	5.4	3.8	5.4	3.7	5.4	3.7	5.3	3.7	5.3	3.6	5.2	3.6	5.2	3.5	5.2	3.5	58.2
58.5	5.9	4.0	5.8	4.0	5.8	3.9	5.7	3.9	5.6	3.8	5.6	3.8	5.5	3.7	5.5	3.6	5.4	3.6	5.3	3.5	5.3	3.4	58.5
58.8	6.2	4.2	6.1	4.1	6.0	4.1	6.0	4.0	5.9	3.9	5.8	3.8	5.7	3.7	5.6	3.6	5.5	3.5	5.4	3.5	5.3	3.4	58.8
59.1	6.5	4.3	6.4	4.3	6.3	4.2	6.2	4.1	6.1	4.0	6.0	3.9	5.9	3.8	5.8	3.6	5.7	3.5	5.6	3.4	5.4	3.3	59.1
59.4	6.8	4.5	6.7	4.4	6.6	4.3	6.5	4.2	6.4	4.1	6.2	3.9	6.1	3.8	6.0	3.7	5.8	3.5	5.7	3.4	5.5	3.2	59.4
59.7	7.1	4.7	7.0	4.5	6.9	4.4	6.8	4.3	6.6	4.1	6.5	4.0	6.3	3.8	6.1	3.7	6.0	3.5	5.8	3.3	5.6	3.2	59.7
60.0	7.5	4.8	7.3	4.7	7.2	4.5	7.0	4.4	6.9	4.2	6.7	4.0	6.5	3.9	6.3	3.7	6.1	3.5	5.9	3.3	5.7	3.1	60.0
60.3	7.8	5.0	7.6	4.8	7.5	4.7	7.3	4.5	7.1	4.3	6.9	4.1	6.7	3.9	6.5	3.7	6.3	3.5	6.0	3.2	5.8	3.0	60.3
60.6	8.1	5.1	7.9	5.0	7.7	4.8	7.6	4.6	7.3	4.4	7.1	4.2	6.9	3.9	6.7	3.7	6.4	3.4	6.2	3.2	5.9	2.9	60.6
60.9	8.4	5.3	8.2	5.1	8.0	4.9	7.8	4.7	7.6	4.5	7.3	4.2	7.1	4.0	6.8	3.7	6.6	3.4	6.3	3.2	6.0	2.9	60.9
61.2	8.7	5.4	8.5	5.2	8.3	5.0	8.1	4.8	7.8	4.5	7.6	4.3	7.3	4.0	7.0	3.7	6.7	3.4	6.4	3.1	6.1	2.8	61.2
61.5	9.1	5.6	8.8	5.4	8.6	5.1	8.3	4.9	8.1	4.6	7.8	4.3	7.5	4.0	7.2	3.7	6.9	3.4	6.5	3.1	6.2	2.7	61.5

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POLARIS (POLE STAR) TABLE, 2027
For Determining The Latitude From a Sextant Altitude

LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q
359°	-25'	**30°**	-36'	**60°**	-37'	**90°**	-27'	**120°**	-11'	**150°**	+9'	**180°**	+26'	**210°**	+36'	**240°**	+37'	**270°**	+27'	**300°**	+11'	**330°**	-9'
1°	-26'	31°	-36'	61°	-36'	91°	-27'	121°	-10'	151°	+9'	181°	+26'	211°	+36'	241°	+36'	271°	+27'	301°	+10'	331°	-9'
2°	-27'	32°	-36'	62°	-36'	92°	-26'	122°	-10'	152°	+10'	182°	+27'	212°	+36'	242°	+36'	272°	+26'	302°	+10'	332°	-10'
3°	-27'	33°	-36'	63°	-36'	93°	-26'	123°	-9'	153°	+10'	183°	+27'	213°	+36'	243°	+36'	273°	+26'	303°	+9'	333°	-10'
4°	-28'	34°	-37'	64°	-36'	94°	-25'	124°	-8'	154°	+11'	184°	+28'	214°	+37'	244°	+36'	274°	+25'	304°	+8'	334°	-11'
5°	-28'	35°	-37'	65°	-36'	95°	-25'	125°	-8'	155°	+12'	185°	+28'	215°	+37'	245°	+36'	275°	+25'	305°	+8'	335°	-12'
6°	-28'	36°	-37'	66°	-35'	96°	-24'	126°	-7'	156°	+12'	186°	+28'	216°	+37'	246°	+35'	276°	+24'	306°	+7'	336°	-12'
7°	-29'	37°	-37'	67°	-35'	97°	-24'	127°	-6'	157°	+13'	187°	+29'	217°	+37'	247°	+35'	277°	+24'	307°	+6'	337°	-13'
8°	-29'	38°	-37'	68°	-35'	98°	-23'	128°	-6'	158°	+14'	188°	+29'	218°	+37'	248°	+35'	278°	+23'	308°	+6'	338°	-14'
9°	-30'	39°	-37'	69°	-35'	99°	-23'	129°	-5'	159°	+14'	189°	+30'	219°	+37'	249°	+35'	279°	+23'	309°	+5'	339°	-14'
10°	-30'	**40°**	-37'	**70°**	-34'	**100°**	-22'	**130°**	-4'	**160°**	+15'	**190°**	+30'	**220°**	+37'	**250°**	+34'	**280°**	+22'	**310°**	+4'	**340°**	-15'
11°	-30'	41°	-37'	71°	-34'	101°	-22'	131°	-4'	161°	+15'	191°	+30'	221°	+37'	251°	+34'	281°	+22'	311°	+4'	341°	-15'
12°	-31'	42°	-37'	72°	-34'	102°	-21'	132°	-3'	162°	+16'	192°	+31'	222°	+37'	252°	+34'	282°	+21'	312°	+3'	342°	-16'
13°	-31'	43°	-37'	73°	-34'	103°	-21'	133°	-2'	163°	+17'	193°	+31'	223°	+37'	253°	+34'	283°	+21'	313°	+2'	343°	-17'
14°	-32'	44°	-37'	74°	-33'	104°	-20'	134°	-2'	164°	+17'	194°	+32'	224°	+37'	254°	+33'	284°	+20'	314°	+2'	344°	-17'
15°	-32'	45°	-37'	75°	-33'	105°	-20'	135°	-1'	165°	+18'	195°	+32'	225°	+37'	255°	+33'	285°	+20'	315°	+1'	345°	-18'
16°	-32'	46°	-37'	76°	-33'	106°	-19'	136°	-0'	166°	+18'	196°	+32'	226°	+37'	256°	+33'	286°	+19'	316°	+0'	346°	-18'
17°	-33'	47°	-37'	77°	-32'	107°	-19'	137°	+0'	167°	+19'	197°	+33'	227°	+37'	257°	+32'	287°	+19'	317°	-0'	347°	-19'
18°	-33'	48°	-37'	78°	-32'	108°	-18'	138°	+1'	168°	+19'	198°	+33'	228°	+37'	258°	+32'	288°	+18'	318°	-1'	348°	-19'
19°	-33'	49°	-37'	79°	-32'	109°	-17'	139°	+1'	169°	+20'	199°	+33'	229°	+37'	259°	+32'	289°	+17'	319°	-1'	349°	-20'
20°	-33'	**50°**	-37'	**80°**	-31'	**110°**	-17'	**140°**	+2'	**170°**	+21'	**200°**	+33'	**230°**	+37'	**260°**	+31'	**290°**	+17'	**320°**	-2'	**350°**	-21'
21°	-34'	51°	-37'	81°	-31'	111°	-16'	141°	+3'	171°	+21'	201°	+34'	231°	+37'	261°	+31'	291°	+16'	321°	-3'	351°	-21'
22°	-34'	52°	-37'	82°	-31'	112°	-16'	142°	+3'	172°	+22'	202°	+34'	232°	+37'	262°	+31'	292°	+16'	322°	-3'	352°	-22'
23°	-34'	53°	-37'	83°	-30'	113°	-15'	143°	+4'	173°	+22'	203°	+34'	233°	+37'	263°	+30'	293°	+15'	323°	-4'	353°	-22'
24°	-35'	54°	-37'	84°	-30'	114°	-14'	144°	+5'	174°	+23'	204°	+35'	234°	+37'	264°	+30'	294°	+14'	324°	-5'	354°	-23'
25°	-35'	55°	-37'	85°	-29'	115°	-14'	145°	+5'	175°	+23'	205°	+35'	235°	+37'	265°	+29'	295°	+14'	325°	-5'	355°	-23'
26°	-35'	56°	-37'	86°	-29'	116°	-13'	146°	+6'	176°	+24'	206°	+35'	236°	+37'	266°	+29'	296°	+13'	326°	-6'	356°	-24'
27°	-35'	57°	-37'	87°	-29'	117°	-13'	147°	+7'	177°	+24'	207°	+35'	237°	+37'	267°	+29'	297°	+13'	327°	-7'	357°	-24'
28°	-36'	58°	-37'	88°	-28'	118°	-12'	148°	+7'	178°	+25'	208°	+36'	238°	+37'	268°	+28'	298°	+12'	328°	-7'	358°	-25'
29°	-36'	59°	-37'	89°	-28'	119°	-11'	149°	+8'	179°	+25'	209°	+36'	239°	+37'	269°	+28'	299°	+11'	329°	-8'	359°	-25'
																						360°	-26'

In critical cases, ascend
Q, which does not include refraction, is to be applied to the corrected sextant altitude of Polaris
Polaris, Mag. 2.0 SHA 313° 15.6', Dec N 89° 22.5'

Azimuth of Polaris- 2027

LHA Aries	Latitude							LHA Aries	Latitude						
	0	30°	50°	55°	60°	65°	70°		0	30°	50°	55°	60°	65°	70°
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	0.5	0.5	0.7	0.8	0.9	1.1	1.3	**180**	359.5	359.5	359.3	359.2	359.1	358.9	358.7
10	0.4	0.4	0.6	0.7	0.7	0.9	1.1	**190**	359.6	359.6	359.4	359.3	359.3	359.1	358.9
20	0.3	0.3	0.4	0.5	0.6	0.7	0.8	**200**	359.7	359.7	359.6	359.5	359.4	359.3	359.2
30	0.2	0.2	0.3	0.3	0.4	0.4	0.5	**210**	359.8	359.8	359.7	359.7	359.6	359.6	359.5
40	0.1	0.1	0.1	0.1	0.1	0.2	0.2	**220**	359.9	359.9	359.9	359.9	359.9	359.8	359.8
50	360.0	360.0	359.9	359.9	359.9	359.9	359.9	**230**	0.0	0.0	0.1	0.1	0.1	0.1	0.1
60	359.9	359.8	359.8	359.8	359.7	359.7	359.6	**240**	0.1	0.2	0.2	0.2	0.3	0.3	0.4
70	359.8	359.7	359.6	359.6	359.5	359.4	359.3	**250**	0.2	0.3	0.4	0.4	0.5	0.6	0.7
80	359.7	359.6	359.5	359.4	359.3	359.2	359.0	**260**	0.3	0.4	0.5	0.6	0.7	0.8	1.0
90	359.6	359.5	359.3	359.3	359.1	359.0	358.7	**270**	0.4	0.5	0.7	0.7	0.9	1.0	1.3
100	359.5	359.4	359.2	359.1	359.0	358.8	358.5	**280**	0.5	0.6	0.8	0.9	1.0	1.2	1.5
110	359.4	359.4	359.1	359.0	358.9	358.7	358.4	**290**	0.6	0.6	0.9	1.0	1.1	1.3	1.6
120	359.4	359.3	359.1	359.0	358.8	358.6	358.3	**300**	0.6	0.7	0.9	1.0	1.2	1.4	1.7
130	359.4	359.3	359.0	358.9	358.8	358.5	358.2	**310**	0.6	0.7	1.0	1.1	1.2	1.5	1.8
140	359.4	359.3	359.0	358.9	358.8	358.5	358.2	**320**	0.6	0.7	1.0	1.1	1.2	1.5	1.8
150	359.4	359.3	359.1	358.9	358.8	358.6	358.2	**330**	0.6	0.7	0.9	1.1	1.2	1.4	1.8
160	359.4	359.3	359.1	359.0	358.9	358.6	358.3	**340**	0.6	0.7	0.9	1.0	1.1	1.4	1.7
170	359.5	359.4	359.2	359.1	359.0	358.8	358.5	**350**	0.5	0.6	0.8	0.9	1.0	1.2	1.5
180	359.5	359.5	359.3	359.2	359.1	358.9	358.7	**360**	0.5	0.5	0.7	0.8	0.9	1.1	1.3

When Cassiopeia is left (right), Polaris is west (east)

Total Solar Eclipse of 2027 Aug 02

Geocentric Conjunction = 10:00:49.5 UT J.D. = 2461619.917240
Greatest Eclipse = 10:06:28.6 UT J.D. = 2461619.921164

Eclipse Magnitude = 1.0790 Gamma = 0.1419

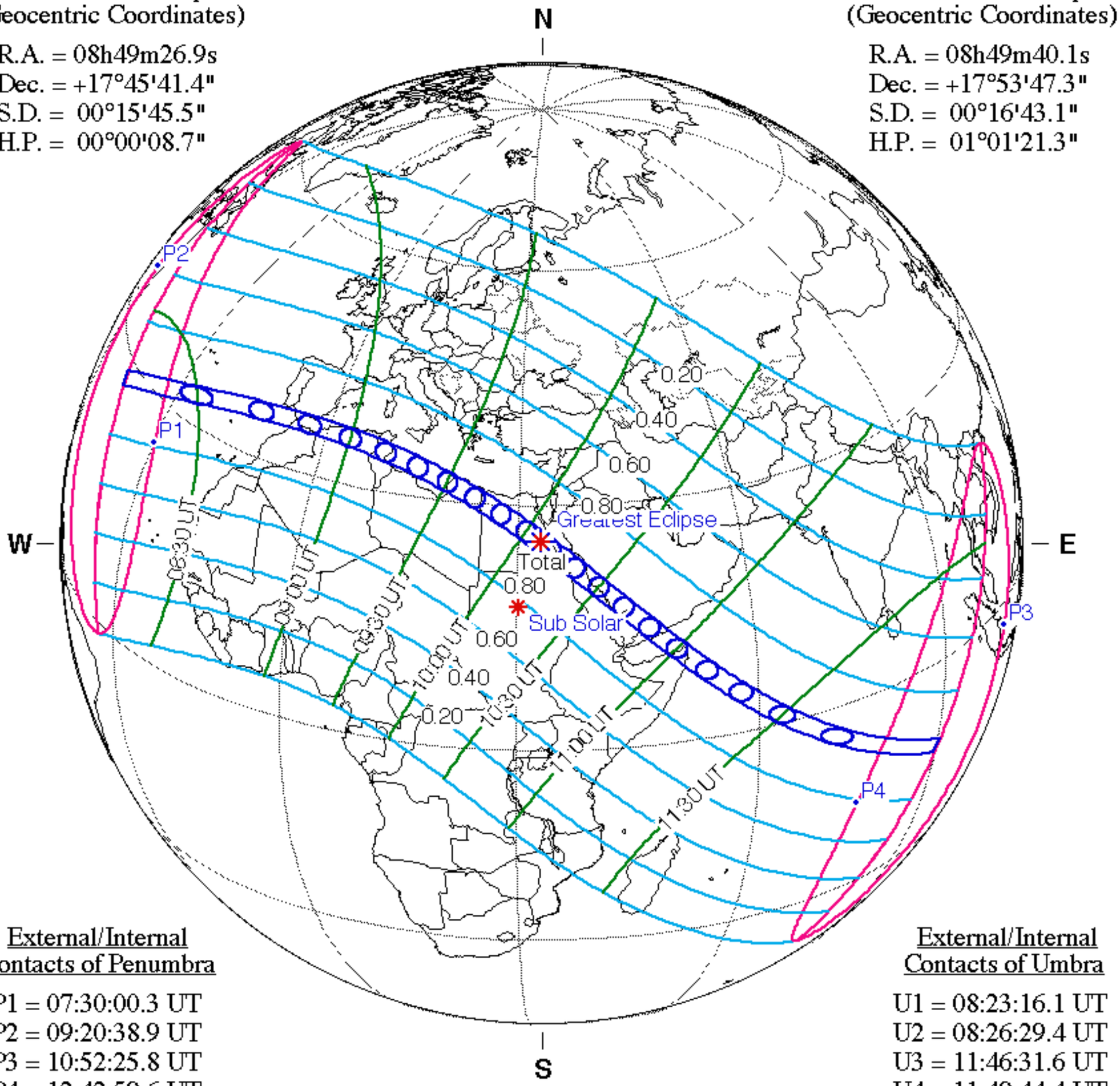
Saros Series = 136 Member = 38 of 71

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 08h49m26.9s
Dec. = +17°45'41.4"
S.D. = 00°15'45.5"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 08h49m40.1s
Dec. = +17°53'47.3"
S.D. = 00°16'43.1"
H.P. = 01°01'21.3"



External/Internal Contacts of Penumbra

P1 = 07:30:00.3 UT
P2 = 09:20:38.9 UT
P3 = 10:52:25.8 UT
P4 = 12:42:59.6 UT

External/Internal Contacts of Umbra

U1 = 08:23:16.1 UT
U2 = 08:26:29.4 UT
U3 = 11:46:31.6 UT
U4 = 11:49:44.4 UT

Local Circumstances at Greatest Eclipse

Lat. = 25°29.6'N Sun Alt. = 81.7°
Long. = 033°13.2'E Sun Azm. = 202.0°
Path Width = 257.7 km Duration = 06m22.6s

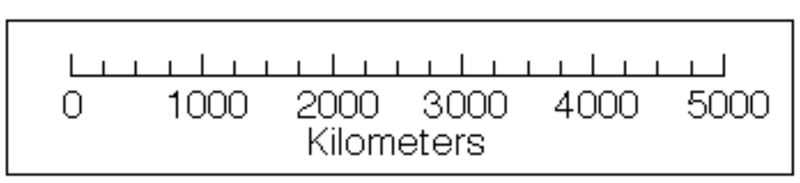
Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 84.8 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

Geocentric Libration
(Optical + Physical)

l = 0.45°
b = -0.18°
c = 14.05°

Brown Lun. No. = 1294



F. Espenak, NASA's GSFC - Fri, Jul 2,

sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Annular Solar Eclipse of 2027 Feb 06

Geocentric Conjunction = 15:44:15.0 UT J.D. = 2461443.155730
Greatest Eclipse = 15:59:24.2 UT J.D. = 2461443.166253

Eclipse Magnitude = 0.9281 Gamma = -0.2950

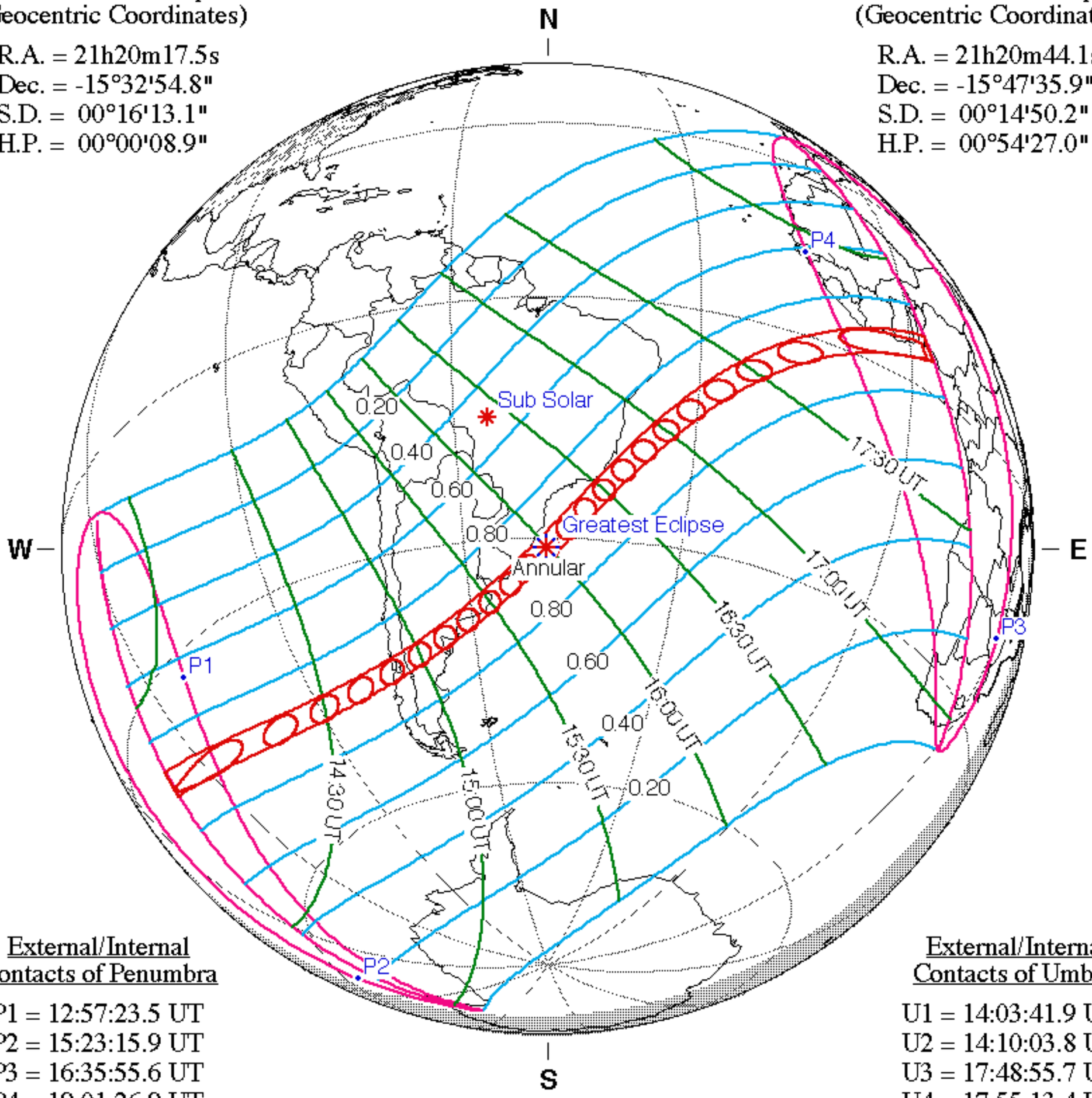
Saros Series = 131 Member = 52 of 71

<u>Sun at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 21h20m17.5s
Dec. = -15°32'54.8"
S.D. = 00°16'13.1"
H.P. = 00°00'08.9"

<u>Moon at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 21h20m44.1s
Dec. = -15°47'35.9"
S.D. = 00°14'50.2"
H.P. = 00°54'27.0"



<u>External/Internal Contacts of Penumbra</u>

P1 = 12:57:23.5 UT
P2 = 15:23:15.9 UT
P3 = 16:35:55.6 UT
P4 = 19:01:26.9 UT

<u>External/Internal Contacts of Umbra</u>

U1 = 14:03:41.9 UT
U2 = 14:10:03.8 UT
U3 = 17:48:55.7 UT
U4 = 17:55:13.4 UT

<u>Local Circumstances at Greatest Eclipse</u>

Lat. = 31°17.8'S Sun Alt. = 72.7°
Long. = 048°25.3'W Sun Azm. = 333.5°
Path Width = 281.6 km Duration = 07m51.0s

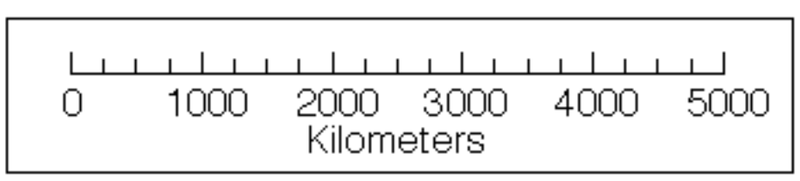
<u>Ephemeris & Constants</u>

Eph. = Newcomb/ILE
ΔT = 84.3 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

<u>Geocentric Libration</u>
(Optical + Physical)

l = -2.83°
b = 0.38°
c = -16.24°

Brown Lun. No. = 1288



F. Espenak, NASA's GSFC - Fri, Jul 2,

sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Penumbral Lunar Eclipse of 2027 Aug 17

Ecliptic Conjunction = 07:29:51.2 TD (= 07:28:35.2 UT)
Greatest Eclipse = 07:14:59.3 TD (= 07:13:43.3 UT)

Penumbral Magnitude = 0.5456 P. Radius = 1.1769° Gamma = 1.2797
Umbral Magnitude = -0.5254 U. Radius = 0.6503° Axis = 1.1544°

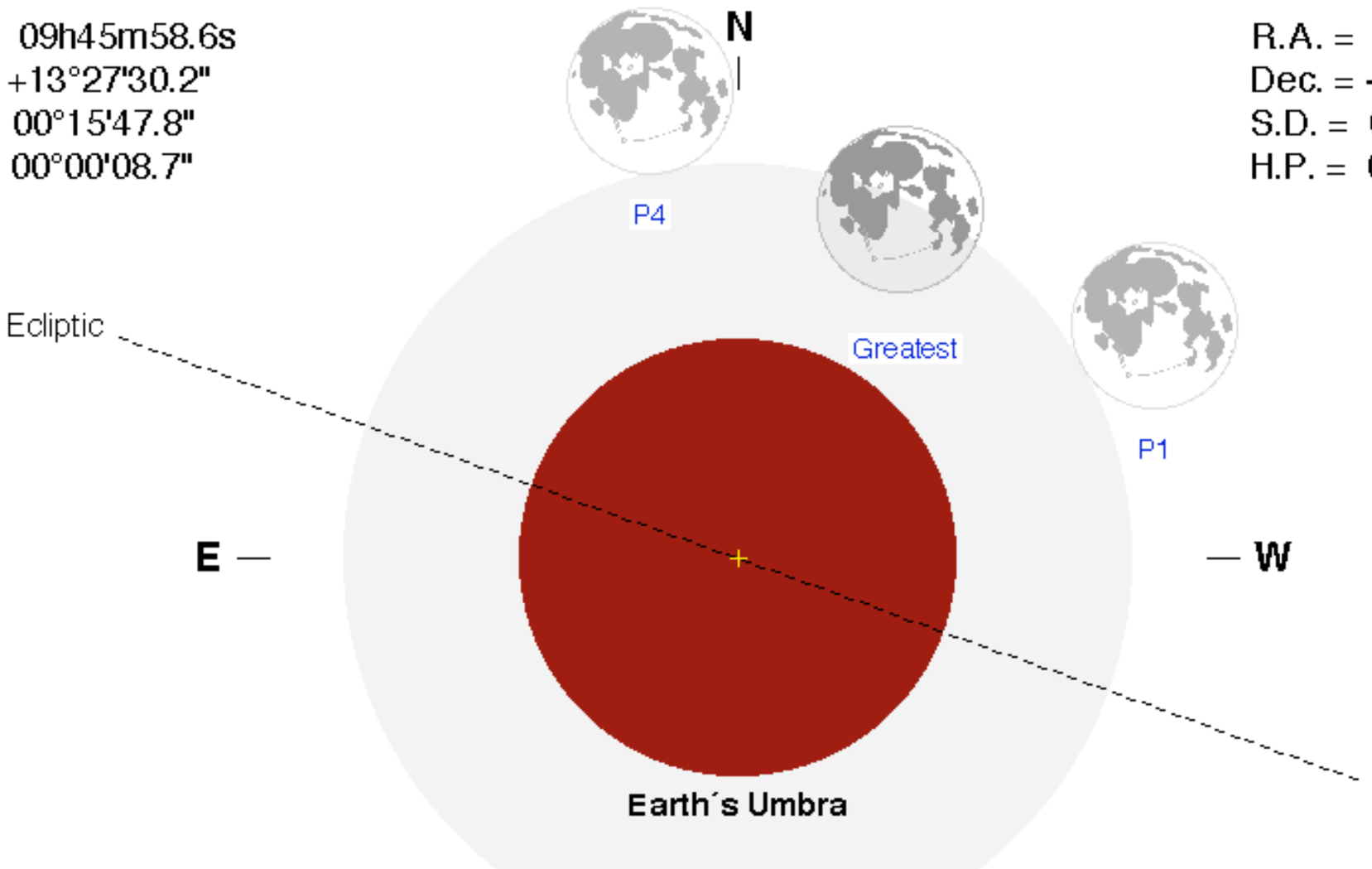
Saros Series = 148 Member = 4 of 71

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 09h45m58.6s
Dec. = +13°27'30.2"
S.D. = 00°15'47.8"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 21h43m58.8s
Dec. = -12°24'40.6"
S.D. = 00°14'44.9"
H.P. = 00°54'07.8"



Eclipse Durations

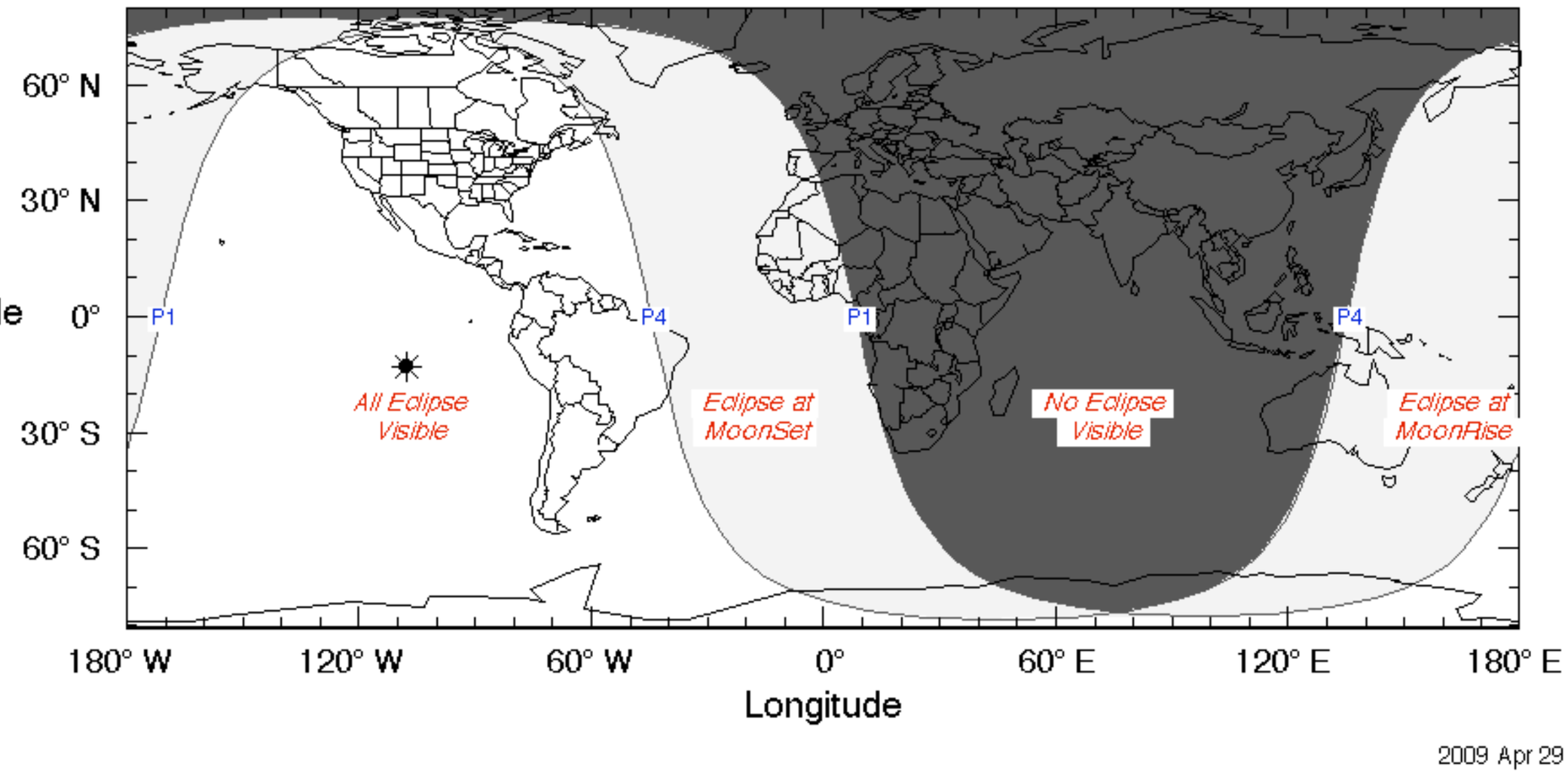
Penumbral = 03h38m35s

Eclipse Contacts

P1 = 05:24:29 UT
P4 = 09:03:03 UT

ΔT = 76 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



2009 Apr 29

Penumbral Lunar Eclipse of 2027 Feb 20

Ecliptic Conjunction = 23:24:48.4 TD (= 23:23:32.7 UT)
Greatest Eclipse = 23:14:06.2 TD (= 23:12:50.5 UT)

Penumbral Magnitude = 0.9266 P. Radius = 1.2881° Gamma = -1.0480
Umbral Magnitude = -0.0569 U. Radius = 0.7489° Axis = 1.0542°

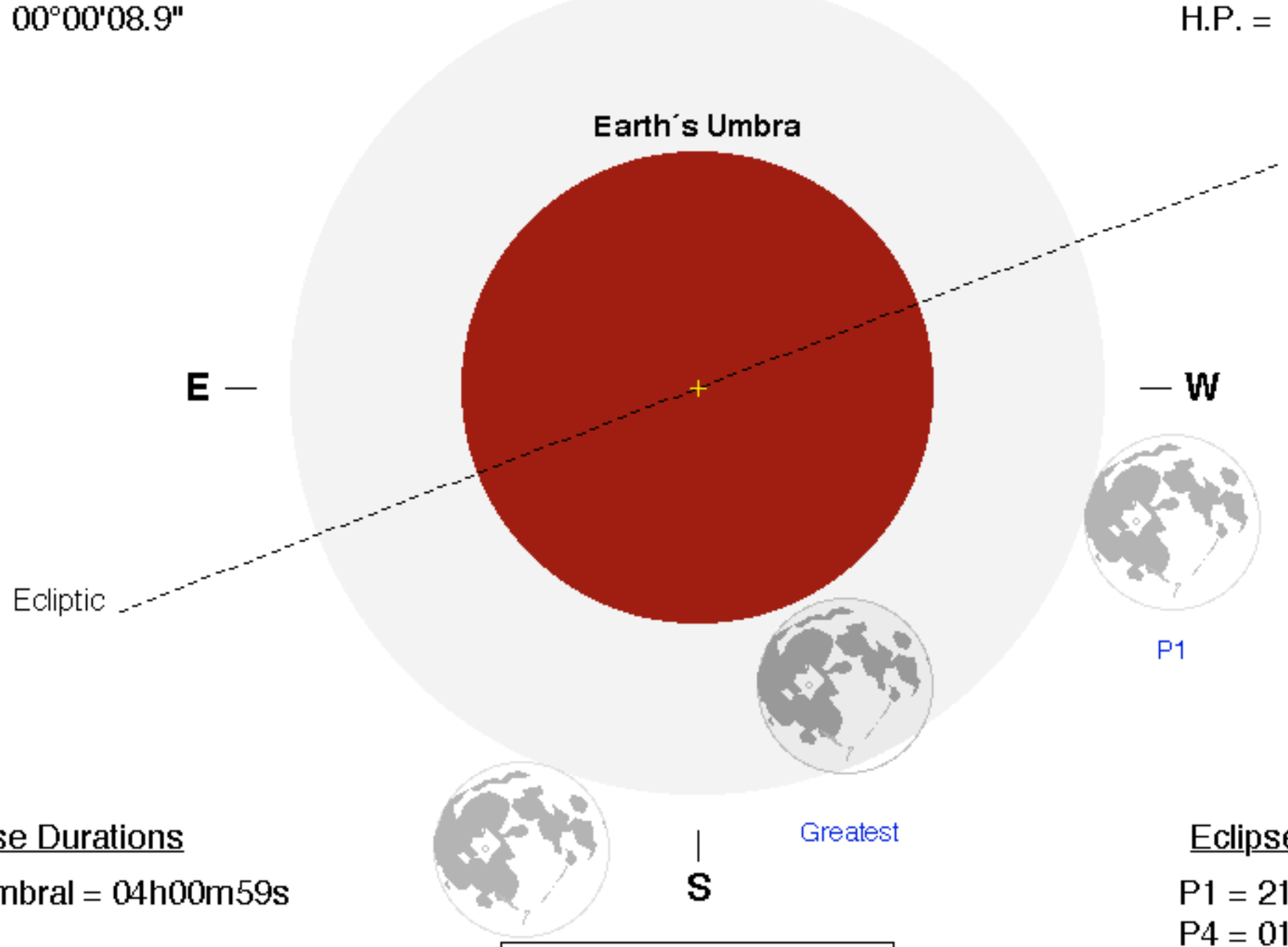
Saros Series = 143 Member = 19 of 73

<u>Sun at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 22h16m18.3s
Dec. = -10°43'53.8"
S.D. = 00°16'10.5"
H.P. = 00°00'08.9"

<u>Moon at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 10h14m23.8s
Dec. = +09°47'16.3"
S.D. = 00°16'26.8"
H.P. = 01°00'21.5"



<u>Eclipse Durations</u>

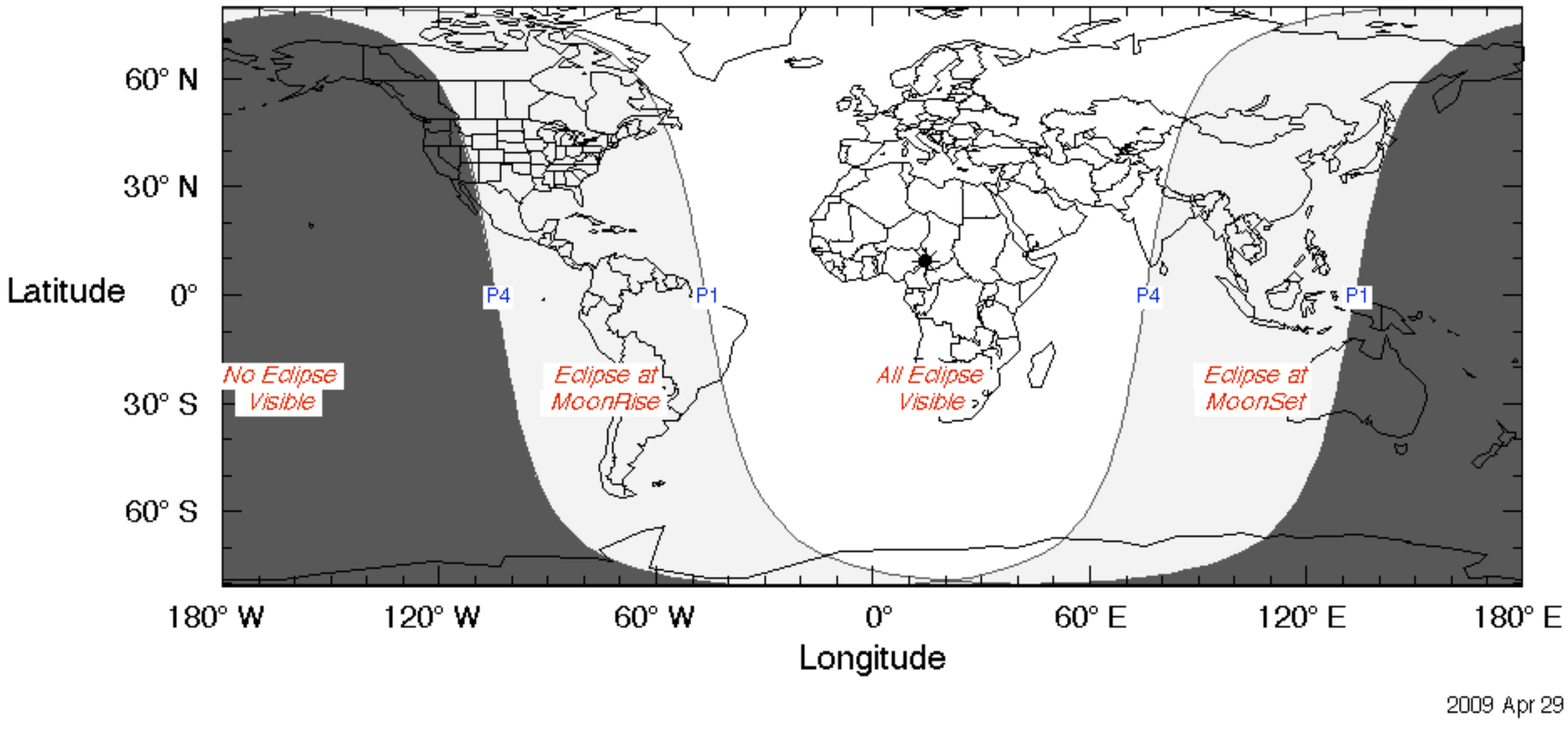
Penumbral = 04h00m59s

<u>Eclipse Contacts</u>

P1 = 21:12:20 UT
P4 = 01:13:19 UT

ΔT = 76 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



2009 Apr 29

Penumbral Lunar Eclipse of 2027 Jul 18

Ecliptic Conjunction = 15:46:04.5 TD (= 15:44:48.6 UT)
Greatest Eclipse = 16:04:08.6 TD (= 16:02:52.6 UT)

Penumbral Magnitude = 0.0014 P. Radius = 1.1739° Gamma = -1.5758
Umbral Magnitude = -1.0680 U. Radius = 0.6493° Axis = 1.4184°

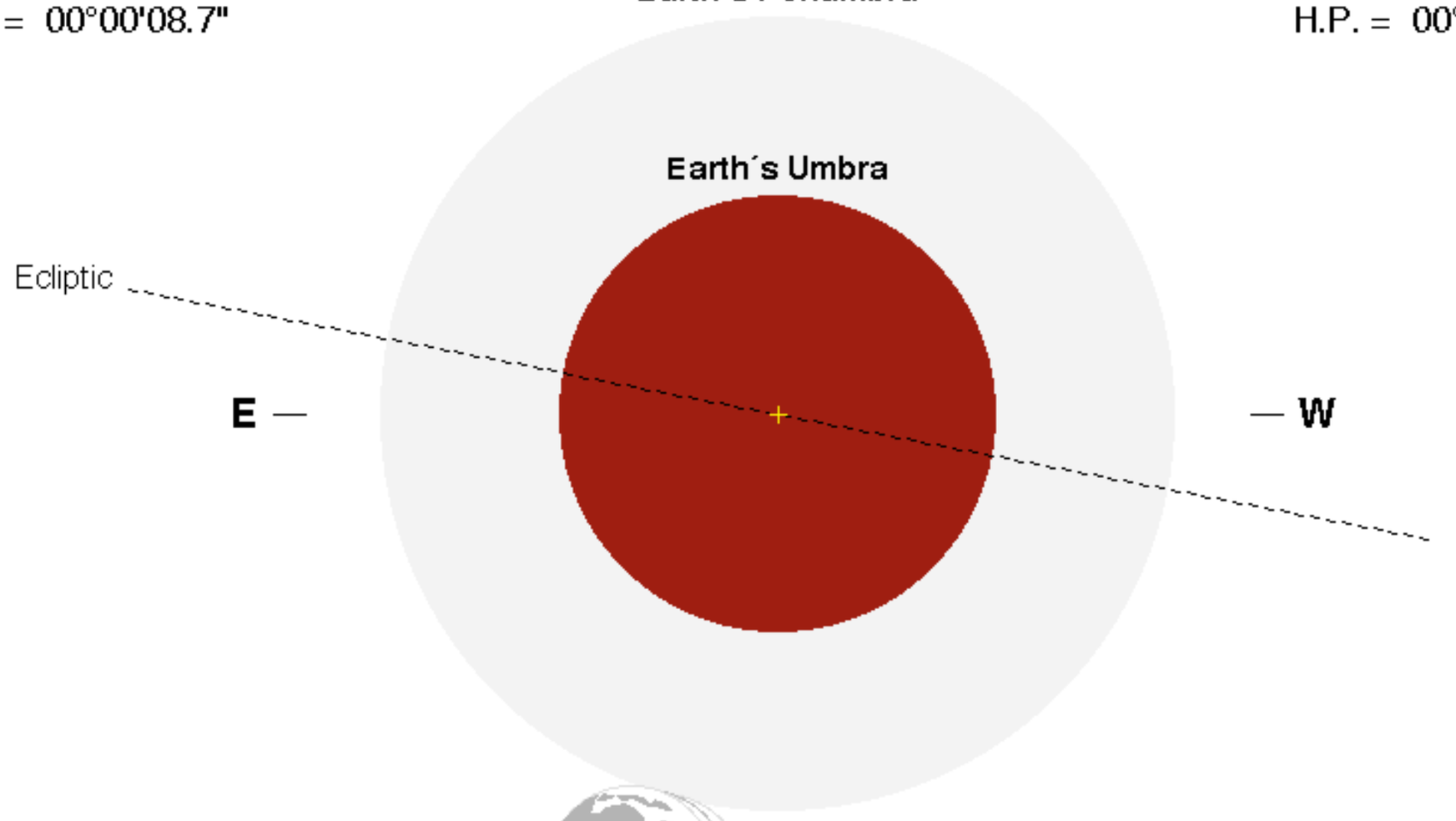
Saros Series = 110 Member = 72 of 72

<u>Sun at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 07h51m14.4s
Dec. = +20°58'43.5"
S.D. = 00°15'44.3"
H.P. = 00°00'08.7"

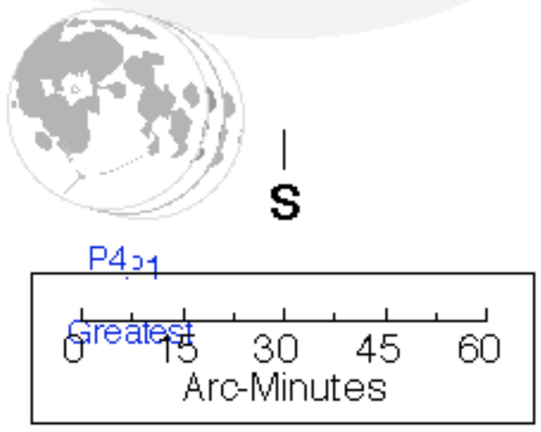
<u>Moon at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 19h52m57.1s
Dec. = -22°20'25.5"
S.D. = 00°14'43.0"
H.P. = 00°54'00.6"



<u>Eclipse Durations</u>

Penumbral = 00h11m47s

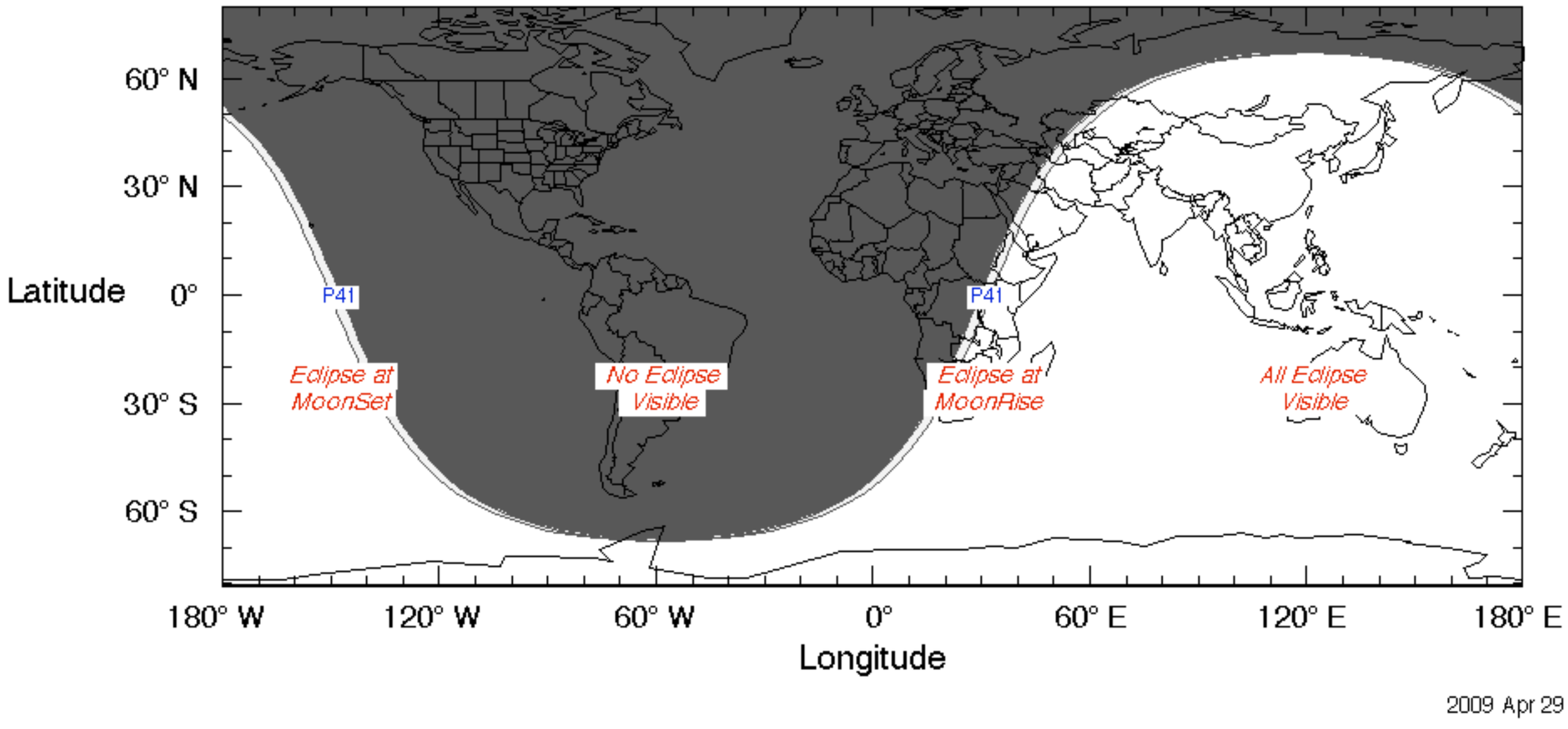


<u>Eclipse Contacts</u>

P1 = 15:56:57 UT
P4 = 16:08:45 UT

ΔT = 76 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



2009 Apr 29

Equation of Time
for the Sun

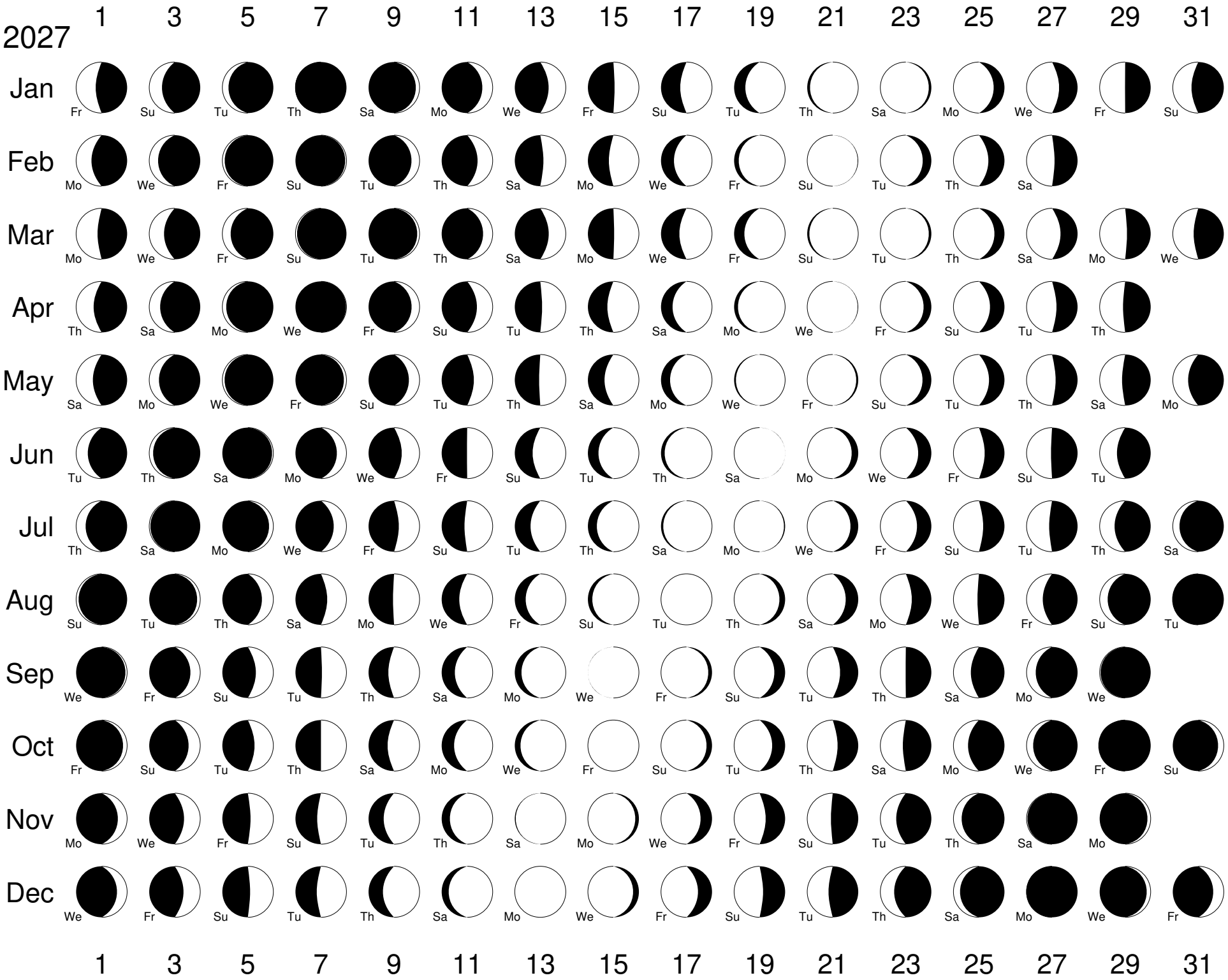


www.TheNauticalAlmanac.com

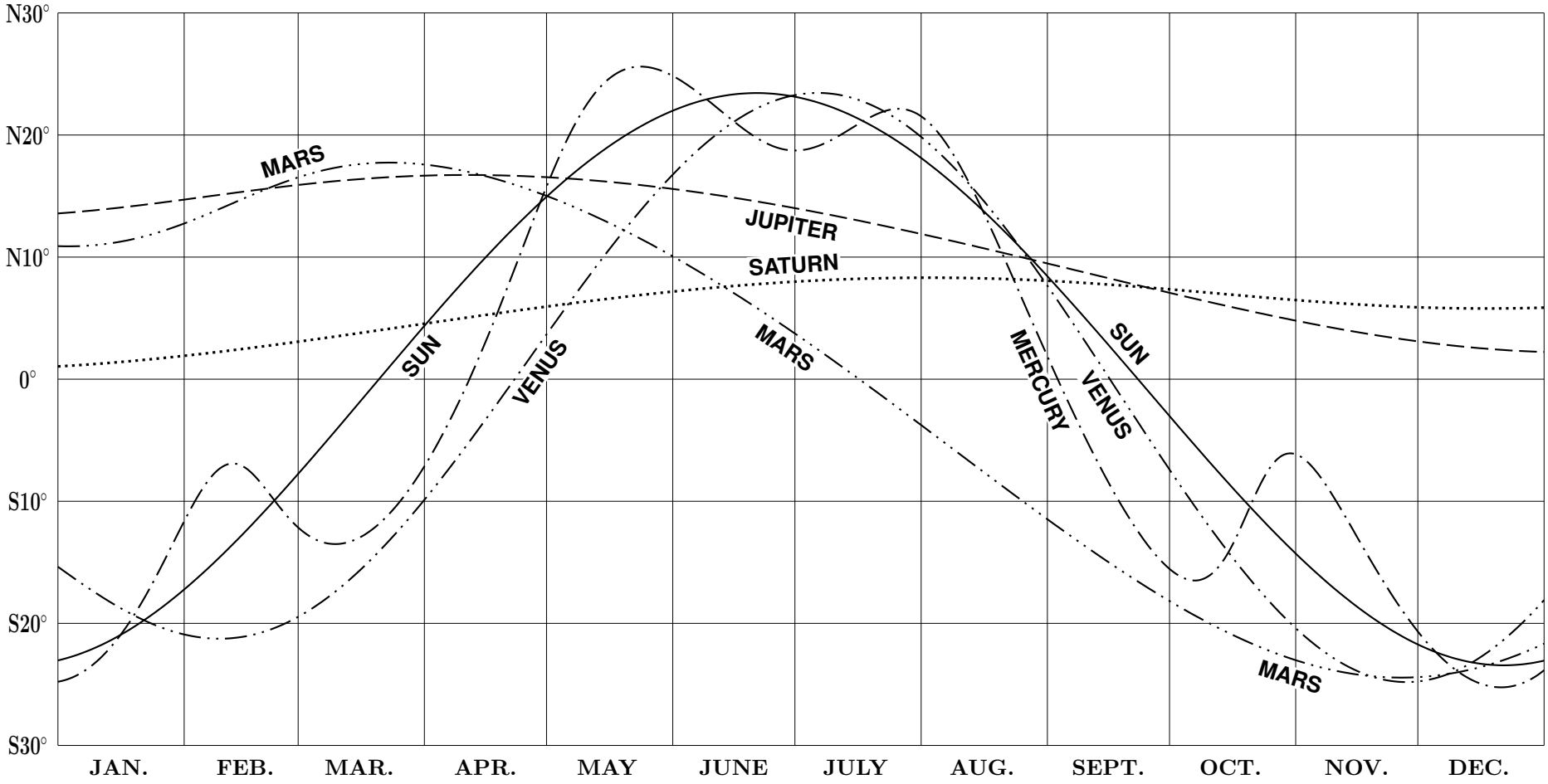
Equation_of_Time_Curve.odt

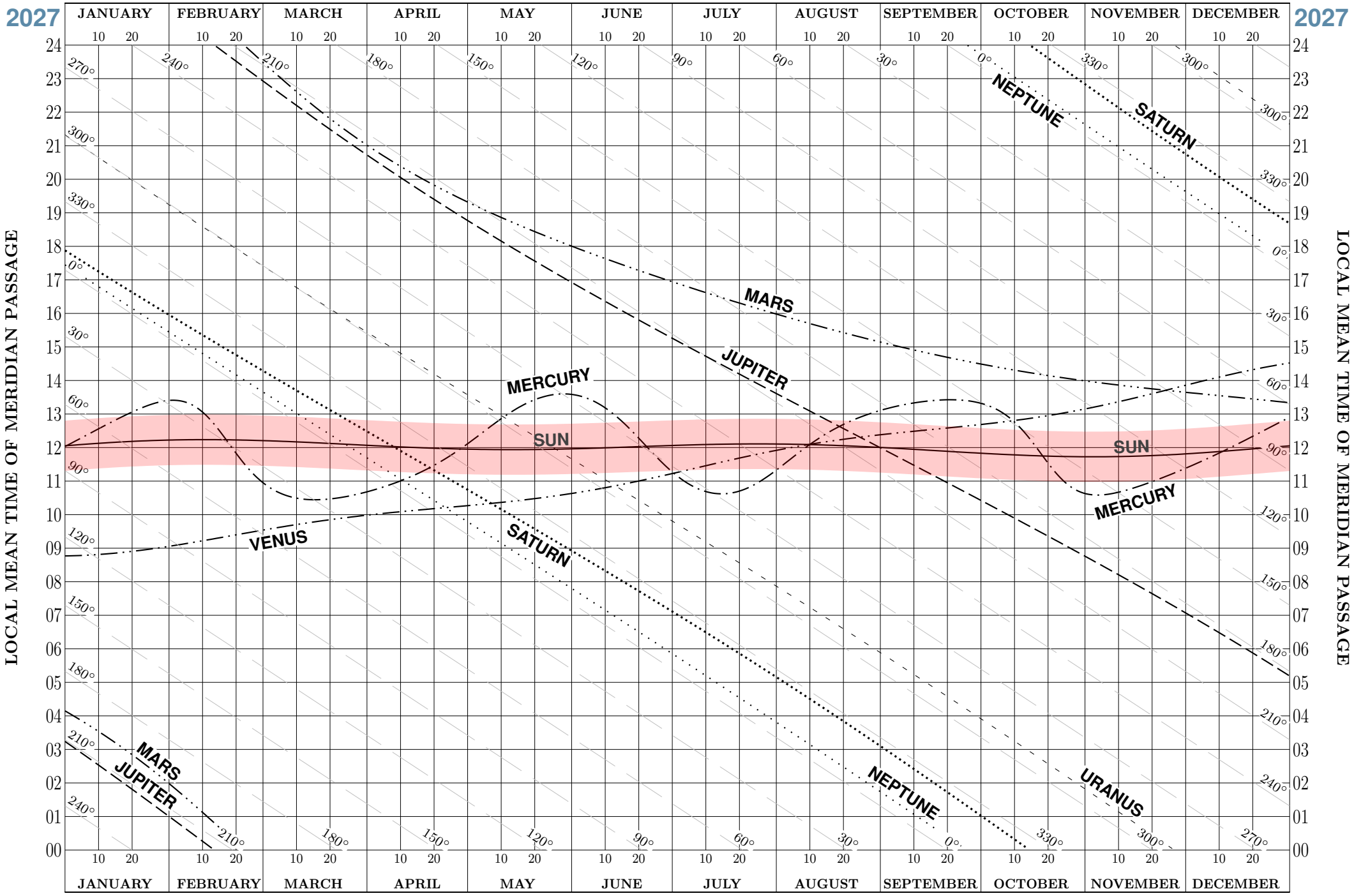
2027

Date and Time (Universal Time)			
New Moon	**First Quarter**	**Full Moon**	**Last Quarter**
2027 Jan 7 20:24	2027 Jan 15 20:34	2027 Jan 22 12:17	2027 Jan 29 10:55
2027 Feb 6 15:56	2027 Feb 14 07:58	2027 Feb 20 23:23	2027 Feb 28 05:16
2027 Mar 8 09:29	2027 Mar 15 16:25	2027 Mar 22 10:44	2027 Mar 30 00:54
2027 Apr 6 23:51	2027 Apr 13 22:56	2027 Apr 20 22:27	2027 Apr 28 20:18
2027 May 6 10:58	2027 May 13 04:44	2027 May 20 10:59	2027 May 28 13:58
2027 Jun 4 19:40	2027 Jun 11 10:56	2027 Jun 19 00:44	2027 Jun 27 04:54
2027 Jul 4 03:02	2027 Jul 10 18:39	2027 Jul 18 15:45	2027 Jul 26 16:55
2027 Aug 2 10:05	2027 Aug 9 04:54	2027 Aug 17 07:29	2027 Aug 25 02:27
2027 Aug 31 17:41	2027 Sep 7 18:31	2027 Sep 15 23:03	2027 Sep 23 10:20
2027 Sep 30 02:36	2027 Oct 7 11:47	2027 Oct 15 13:47	2027 Oct 22 17:29
2027 Oct 29 13:36	2027 Nov 6 08:00	2027 Nov 14 03:26	2027 Nov 21 00:48
2027 Nov 28 03:24	2027 Dec 6 05:22	2027 Dec 13 16:09	2027 Dec 20 09:11
2027 Dec 27 20:12	2028 Jan 5 01:40	--	--


2027
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
Jan Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Feb Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Mar Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We
Apr Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th
May Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Jun Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
Jul Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Aug Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
Sep We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We
Oct Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Nov Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Dec We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31

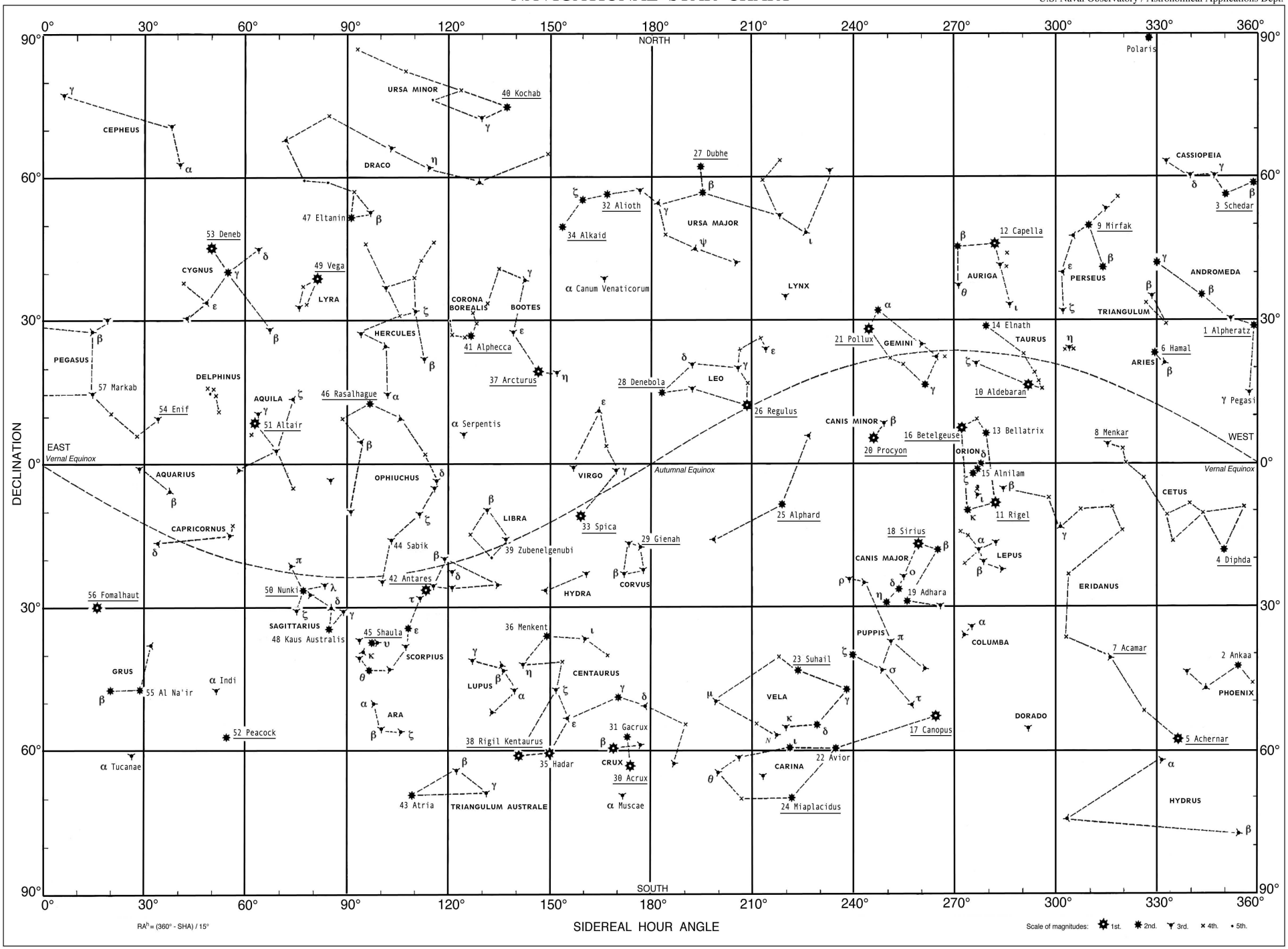
DECLINATION OF SUN AND PLANETS, 2027

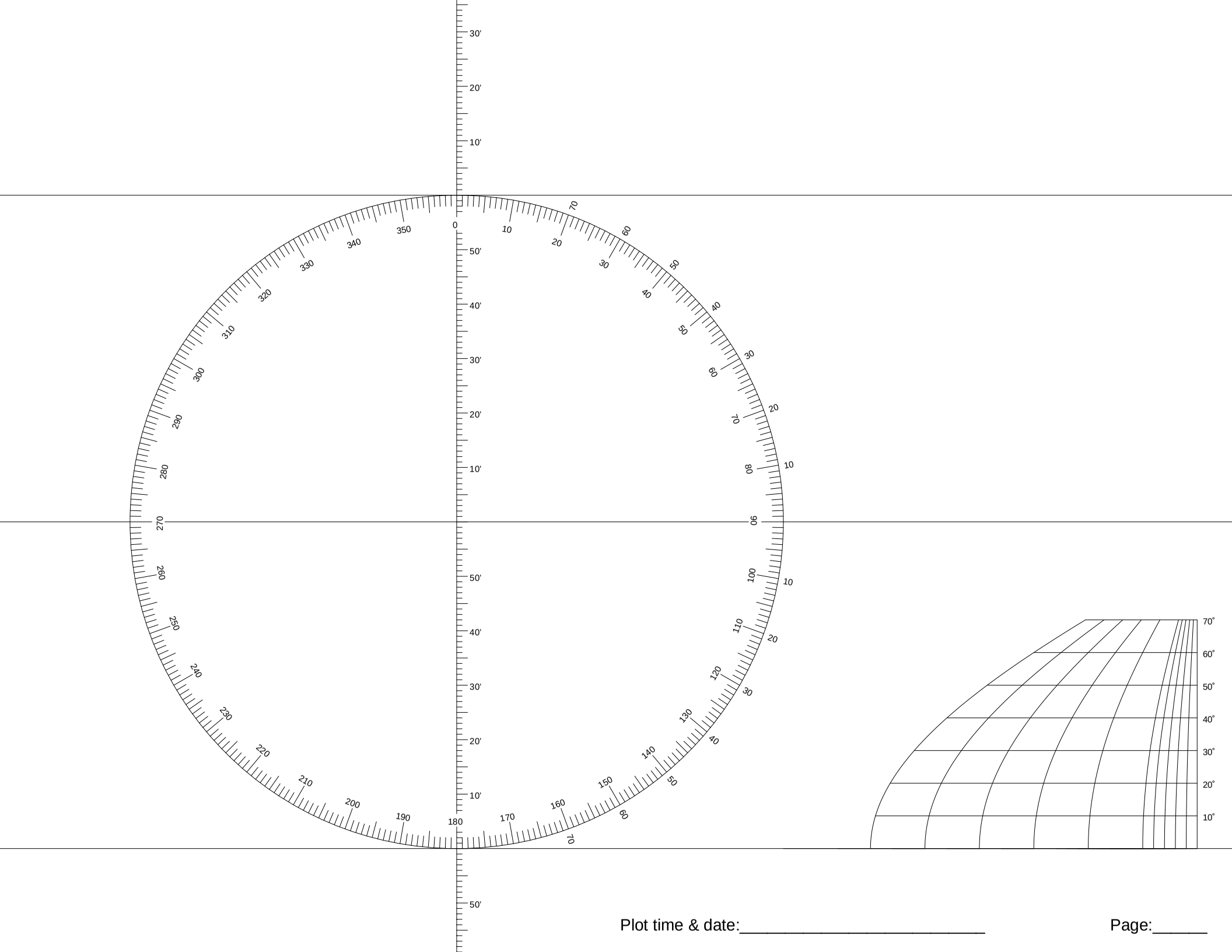



2027
2027
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
LOCAL MEAN TIME OF MERIDIAN PASSAGE
LOCAL MEAN TIME OF MERIDIAN PASSAGE
MARS
JUPITER
MERCURY
SUN
VENUS
SATURN
NEPTUNE
URANUS

NAVIGATIONAL STAR CHART

U.S. Naval Observatory / Astronomical Applications Dept.





Plot time & date:_____

Page:_____