

August 03, 04, 05 UT (Mon., Tue., Wed.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	311°35.5	135°13.4	N01°21.8	227°40.7	N23°26.4	181°39.2	N18°53.0	297°04.2	N03°27.4					Alpheratz	357°33.2 29°14.2		
1	326°38.0	150°13.6		242°41.3	26.5	196°41.1	52.9	312°06.7	27.4					Ankaa	353°05.6 -42°09.4		
2	341°40.4	165°13.8		257°42.0	26.6	211°43.0	52.7	327°09.2	27.4					Schedar	349°29.2 56°40.9		
3	356°42.9	180°14.0	•• 18.1	272°42.6	•• 26.7	226°44.9	•• 52.6	342°11.7	•• 27.3					Diphda	348°45.8 -17°50.2		
4	11°45.4	195°14.2		287°43.2	26.8	241°46.8	52.4	357°14.2	27.3					Achernar	335°19.1 -57°05.7		
5	26°47.8	210°14.4		302°43.9	26.9	256°48.7	52.3	12°16.7	27.3					Hamal	327°49.7 23°35.3		
6	41°50.3	225°14.6	N01°14.4	317°44.5	N23°27.0	271°50.6	N18°52.2	27°19.2	N03°27.3					Polaris	313°24.9 89°22.2		
7	56°52.8	240°14.8		332°45.1	27.1	286°52.5	52.0	42°21.7	27.2					Acamar	315°10.8 -40°11.5		
8	71°55.2	255°15.0		347°45.8	27.2	301°54.4	51.9	57°24.2	27.2					Menkar	314°04.8 4°11.8		
9	86°57.7	270°15.2	•• 10.7	2°46.4	•• 27.3	316°56.3	•• 51.8	72°26.6	•• 27.2					Mirfak	308°26.5 49°57.2		
10	102°00.1	285°15.4		17°47.0	27.4	331°58.2	51.6	87°29.1	27.2					Aldebaran	290°38.3 16°33.8		
11	117°02.6	300°15.5		32°47.7	27.5	347°00.1	51.5	102°31.6	27.2					Rigel	281°02.8 -8°10.1		
12	132°05.1	315°15.7	N01°07.1	47°48.3	N23°27.6	2°02.0	N18°51.3	117°34.1	N03°27.1					Capella	280°20.3 46°01.3		
13	147°07.5	330°15.9		62°48.9	27.8	17°03.9	51.2	132°36.6	27.1					Bellatrix	278°21.7 6°22.5		
14	162°10.0	345°16.1		77°49.6	27.9	32°05.8	51.1	147°39.1	27.1					Elnath	278°00.5 28°37.7		
15	177°12.5	0°16.3	•• 03.4	92°50.2	•• 28.0	47°07.7	•• 50.9	162°41.6	•• 27.1					Alnilam	275°36.6 -1°11.0		
16	192°14.9	15°16.5		107°50.8	28.0	62°09.6	50.8	177°44.1	27.0					Betelgeuse	270°50.9 7°24.8		
17	207°17.4	30°16.7	01°00.9	122°51.5	28.1	77°11.5	50.6	192°46.6	27.0					Canopus	263°52.3 -52°42.3		
18	222°19.9	45°16.9	N00°59.7	137°52.1	N23°28.2	92°13.4	N18°50.5	207°49.1	N03°27.0					Sirius	258°25.4 -16°45.0		
19	237°22.3	60°17.1		152°52.7	28.3	107°15.3	50.4	222°51.5	27.0					Adhara	255°05.2 -29°00.3		
20	252°24.8	75°17.4		167°53.4	28.4	122°17.2	50.2	237°54.0	26.9					Procyon	244°49.8 5°09.5		
21	267°27.3	90°17.6	•• 56.0	182°54.0	•• 28.5	137°19.1	•• 50.1	252°56.5	•• 26.9					Pollux	243°16.1 27°57.7		
22	282°29.7	105°17.8		197°54.6	28.6	152°21.0	50.0	267°59.0	26.9					Avior	234°14.9 -59°35.6		
23	297°32.2	120°18.0		212°55.3	28.7	167°22.9	49.8	283°01.5	26.9					Suhail	222°45.8 -43°32.4		
Mer.pass. 03:13			ν 0.2' d -1.2' m -4.29			ν 0.6' d 0.1' m 1.30			ν 1.9' d -0.1' m -1.78			ν 2.5' d -0.0' m 0.62					

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	312°34.6	135°18.2	N00°52.4	227°55.9	N23°28.8	182°24.8	N18°49.7	298°04.0	N03°26.9					
1	327°37.1	150°18.4	51.1	242°56.5	28.9	197°26.7	49.5	313°06.5	26.8					
2	342°39.6	165°18.6	49.9	257°57.2	29.0	212°28.6	49.4	328°09.0	26.8					
3	357°42.0	180°18.8	•• 48.7	272°57.8	•• 29.1	227°30.5	•• 49.3	343°11.5	•• 26.8					
4	12°44.5	195°19.0	47.5	287°58.4	29.2	242°32.4	49.1	358°14.0	26.8					
5	27°47.0	210°19.2	46.2	302°59.1	29.3	257°34.3	49.0	13°16.5	26.7					
6	42°49.4	225°19.4	N00°45.0	317°59.7	N23°29.4	272°36.2	N18°48.9	28°19.0	N03°26.7					
7	57°51.9	240°19.6	43.8	333°00.4	29.5	287°38.0	48.7	43°21.4	26.7					
8	72°54.4	255°19.8	42.6	348°01.0	29.6	302°39.9	48.6	58°23.9	26.7					
9	87°56.8	270°20.0	•• 41.3	3°01.6	•• 29.7	317°41.8	•• 48.4	73°26.4	•• 26.6					
10	102°59.3	285°20.2	40.1	18°02.3	29.8	332°43.7	48.3	88°28.9	26.6					
11	118°01.7	300°20.5	38.9	33°02.9	29.9	347°45.6	48.2	103°31.4	26.6					
12	133°04.2	315°20.7	N00°37.7	48°03.5	N23°30.0	2°47.5	N18°48.0	118°33.9	N03°26.6					
13	148°06.7	330°20.9	36.4	63°04.2	30.1	17°49.4	47.9	133°36.4	26.5					
14	163°09.1	345°21.1	35.2	78°04.8	30.1	32°51.3	47.7	148°38.9	26.5					
15	178°11.6	0°21.3	•• 34.0	93°05.4	•• 30.2	47°53.2	•• 47.6	163°41.4	•• 26.5					
16	193°14.1	15°21.5	32.8	108°06.1	30.3	62°55.1	47.5	178°43.9	26.5					
17	208°16.5	30°21.7	31.5	123°06.7	30.4	77°57.0	47.3	193°46.4	26.4					
18	223°19.0	45°21.9	N00°30.3	138°07.3	N23°30.5	92°58.9	N18°47.2	208°48.9	N03°26.4					
19	238°21.5	60°22.2	29.1	153°08.0	30.6	108°00.8	47.0	223°51.4	26.4					
20	253°23.9	75°22.4	27.9	168°08.6	30.7	123°02.7	46.9	238°53.9	26.4					
21	268°26.4	90°22.6	•• 26.6	183°09.3	•• 30.8	138°04.6	•• 46.8	253°56.4	•• 26.3					
22	283°28.9	105°22.8	25.4	198°09.9	30.9	153°06.5	46.6	268°58.9	26.3					
23	298°31.3	120°23.0	24.2	213°10.5	31.0	168°08.4	46.5	284°01.4	26.3					
Mer.pass. 03:09			ν 0.2' d -1.2' m -4.30			ν 0.6' d 0.1' m 1.30			ν 1.9' d -0.1' m -1.78			ν 2.5' d -0.0' m 0.62		

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	313°33.8	135°23.2	N00°23.0	228°11.2	N23°31.0	183°10.3	N18°46.4	299°03.9	N03°26.3					
1	328°36.2	150°23.5	21.8	243°11.8	31.1	198°12.2	46.2	314°06.3	26.2					
2	343°38.7	165°23.7	20.5	258°12.4	31.2	213°14.1	46.1	329°08.8	26.2					
3	358°41.2	180°23.9	•• 19.3	273°13.1	•• 31.3	228°16.0	•• 45.9	344°11.3	•• 26.2					
4	13°43.6	195°24.1	18.1	288°13.7	31.4	243°17.9	45.8	359°13.8	26.2					
5	28°46.1	210°24.3	16.9	303°14.4	31.5	258°19.8	45.7	14°16.3	26.1					
6	43°48.6	225°24.6	N00°15.6	318°15.0	N23°31.6	273°21.7	N18°45.5	29°18.8	N03°26.1					
7	58°51.0	240°24.8	14.4	333°15.6	31.7	288°23.6	45.4	44°21.3	26.1					
8	73°53.5	255°25.0	13.2	348°16.3	31.7	303°25.5	45.2	59°23.8	26.1					
9	88°56.0	270°25.2	•• 12.0	3°16.9	•• 31.8	318°27.4	•• 45.1	74°26.3	•• 26.0					
10	103°58.4	285°25.5	10.7	18°17.5	31.9	333°29.3	45.0	89°28.8	26.0					
11	119°00.9	300°25.7	09.5	33°18.2	32.0	348°31.2	44.8	104°31.3	26.0					
12	134°03.3	315°25.9	N00°08.3	48°18.8	N23°32.1	3°33.1	N18°44.7	119°33.8	N03°26.0					
13	149°05.8	330°26.1	07.1	63°19.5	32.2	18°35.0	44.5	134°36.3	25.9					
14	164°08.3	345°26.4	05.8	78°20.1	32.2	33°36.9	44.4	149°38.8	25.9					
15	179°10.7	0°26.6	•• 04.6	93°20.7	•• 32.3	48°38.8	•• 44.3	164°41.3	•• 25.9					
16	194°13.2	15°26.8	03.4	108°21.4	32.4	63°40.7	44.1	179°43.8	25.8					
17	209°15.7	30°27.0	02.2	123°22.0	32.5	78°42.6	44.0	194°46.3	25.8					
18	224°18.1	45°27.3	N00°00.9	138°22.7	N23°32.6	93°44.5	N18°43.9	209°48.8	N03°25.8					
19	239°20.6	60°27.5	S00°00.3	153°23.3	32.7	108°46.4	43.7	224°51.3	25.8					
20	254°23.1	75°27.7	01.5	168°23.9	32.7	123°48.3	43.6	239°53.8	25.7					
21	269°25.5	90°28.0	•• 02.7	183°24.6	•• 32.8	138°50.2	•• 43.4	254°56.3	•• 25.7					
22	284°28.0	105°28.2	03.9	198°25.2	32.9	153°52.1	43.3	269°58.8	25.7					
23	299°30.5	120°28.4	05.2	213°25.8	33.0	168°54.0	43.2	285°01.3	25.7					
Mer.pass. 03:05			ν 0.2' d -1.2' m -4.31			ν 0.6' d 0.1' m 1.30			ν 1.9' d -0.1' m -1.78			ν 2.5' d -0.0' m 0.61		

Aug 03 Mon			SHA	Mer.pass
Venus			183°37.9	14:59
Mars			276°05.2	08:49
Jupiter			230°03.7	11:52
Saturn			345°28.7	04:11

Aug 04 Tue			SHA	Mer.pass
Venus			182°43.5	14:59
Mars			275°21.3	08:48
Jupiter			229°50.1	11:49
Saturn			345°29.4	04:07

Aug 05 Wed			SHA	Mer.pass
Venus			181°49.5	14:58
Mars			274°37.4	08:47
Jupiter			229°36.6	11:46
Saturn			345°30.1	04:03

h	Sun			Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.3	N17°33.0	311°00.8	14.5'	N03°17.6	15.3'	56.9'
1	193°26.3	32.4	325°34.2	14.4'	03°33.0	15.3'	56.9'
2	208°26.4	31.7	340°07.6	14.4'	03°48.3	15.3'	56.9'
3	223°26.4	· · 31.1	354°41.0	14.3'	04°03.6	15.3'	56.9'
4	238°26.5	30.4	9°14.4	14.3'	04°18.9	15.3'	56.9'
5	253°26.5	29.8	23°47.7	14.3'	04°34.2	15.3'	57.0'
6	268°26.6	N17°29.1	38°21.0	14.2'	N04°49.6	15.3'	57.0'
7	283°26.6	28.5	52°54.2	14.2'	05°04.8	15.3'	57.0'
8	298°26.7	27.8	67°27.4	14.1'	05°20.1	15.3'	57.0'
9	313°26.7	· · 27.2	82°00.5	14.1'	05°35.4	15.3'	57.1'
10	328°26.8	26.5	96°33.6	14.0'	05°50.7	15.2'	57.1
11	343°26.8	25.8	111°06.6	14.0'	06°05.9	15.2'	57.1
12	358°26.9	N17°25.2	125°39.6	13.9'	N06°21.1	15.2'	57.1
13	13°26.9	24.5	140°12.5	13.9'	06°36.4	15.2'	57.2'
14	28°27.0	23.9	154°45.4	13.8'	06°51.6	15.2'	57.2'
15	43°27.0	· · 23.2	169°18.2	13.8'	07°06.7	15.2'	57.2'
16	58°27.1	22.6	183°51.0	13.7'	07°21.9	15.1'	57.2'
17	73°27.1	21.9	198°23.7	13.7'	07°37.0	15.1'	57.3'
18	88°27.2	N17°21.2	212°56.4	13.6'	N07°52.1	15.1'	57.3'
19	103°27.2	20.6	227°29.0	13.5'	08°07.2	15.1'	57.3'
20	118°27.3	19.9	242°01.5	13.5'	08°22.3	15.0'	57.3'
21	133°27.4	· · 19.3	256°34.0	13.4'	08°37.3	15.0'	57.4'
22	148°27.4	18.6	271°06.4	13.3'	08°52.4	15.0'	57.4'
23	163°27.5	17.9	285°38.7	13.3'	09°07.3	15.0'	57.4'
	SD = 15.8'	$d = -0.7'$	SD = 15.5'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.5	N17°17.3	300°11.0	13.2'	N09°22.3	14.9'	57.4'
1	193°27.6	16.6	314°43.2	13.1'	09°37.2	14.9'	57.4'
2	208°27.6	15.9	329°15.4	13.1'	09°52.1	14.9'	57.5'
3	223°27.7	· · 15.3	343°47.5	13.0'	10°07.0	14.8'	57.5'
4	238°27.7	14.6	358°19.5	12.9'	10°21.8	14.8'	57.5'
5	253°27.8	13.9	12°51.4	12.9'	10°36.6	14.8'	57.5'
6	268°27.9	N17°13.3	27°23.3	12.8'	N10°51.3	14.7'	57.6'
7	283°27.9	12.6	41°55.0	12.7'	11°06.1	14.7'	57.6'
8	298°28.0	12.0	56°26.8	12.6'	11°20.7	14.6'	57.6'
9	313°28.0	· · 11.3	70°58.4	12.6'	11°35.4	14.6'	57.6'
10	328°28.1	10.6	85°29.9	12.5'	11°50.0	14.5'	57.7'
11	343°28.2	10.0	100°01.4	12.4'	12°04.5	14.5'	57.7'
12	358°28.2	N17°09.3	114°32.8	12.3'	N12°19.0	14.5'	57.7'
13	13°28.3	08.6	129°04.1	12.2'	12°33.4	14.4'	57.7'
14	28°28.3	07.9	143°35.4	12.1'	12°47.8	14.4'	57.8'
15	43°28.4	· · 07.3	158°06.5	12.1'	13°02.2	14.3'	57.8'
16	58°28.4	06.6	172°37.6	12.0'	13°16.5	14.2'	57.8'
17	73°28.5	05.9	187°08.5	11.9'	13°30.8	14.2'	57.8'
18	88°28.6	N17°05.3	201°39.4	11.8'	N13°44.9	14.1'	57.9'
19	103°28.6	04.6	216°10.2	11.7'	13°59.1	14.1'	57.9'
20	118°28.7	03.9	230°40.9	11.6'	14°13.2	14.0'	57.9'
21	133°28.8	· · 03.2	245°11.5	11.5'	14°27.2	14.0'	57.9'
22	148°28.8	02.6	259°42.0	11.4'	14°41.2	13.9'	58.0'
23	163°28.9	01.9	274°12.5	11.3'	14°55.1	13.8'	58.0'
	SD = 15.8'	$d = -0.7'$	SD = 15.7'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.9	N17°01.2	288°42.8	11.2'	N15°08.9	13.8'	58.0'
1	193°29.0	17°00.6	303°13.0	11.1'	15°22.7	13.7'	58.0'
2	208°29.1	16°59.9	317°43.2	11.0'	15°36.4	13.6'	58.1'
3	223°29.1	· · 59.2	332°13.2	10.9'	15°50.0	13.6'	58.1'
4	238°29.2	58.5	346°43.1	10.8'	16°03.6	13.5'	58.1'
5	253°29.2	57.9	1°13.0	10.7'	16°17.1	13.4'	58.1'
6	268°29.3	N16°57.2	15°42.7	10.6'	N16°30.5	13.4'	58.2'
7	283°29.4	56.5	30°12.3	10.5'	16°43.9	13.3'	58.2'
8	298°29.4	55.8	44°41.9	10.4'	16°57.2	13.2'	58.2'
9	313°29.5	· · 55.1	59°11.3	10.3'	17°10.4	13.1'	58.2'
10	328°29.6	54.5	73°40.6	10.2'	17°23.5	13.0'	58.3'
11	343°29.6	53.8	88°09.8	10.1'	17°36.5	13.0'	58.3'
12	358°29.7	N16°53.1	102°38.9	10.0'	N17°49.5	12.9'	58.3'
13	13°29.8	52.4	117°07.9	9.9'	18°02.3	12.8'	58.3'
14	28°29.8	51.7	131°36.8	9.8'	18°15.1	12.7'	58.4'
15	43°29.9	· · 51.1	146°05.6	9.7'	18°27.8	12.6'	58.4'
16	58°30.0	50.4	160°34.2	9.6'	18°40.5	12.5'	58.4'
17	73°30.0	49.7	175°02.8	9.4'	18°53.0	12.4'	58.4'
18	88°30.1	N16°49.0	189°31.2	9.3'	N19°05.4	12.3'	58.5'
19	103°30.2	48.3	203°59.6	9.2'	19°17.7	12.2'	58.5'
20	118°30.2	47.6	218°27.8	9.1'	19°30.0	12.1'	58.5'
21	133°30.3	· · 47.0	232°55.9	9.0'	19°42.1	12.0'	58.5'
22	148°30.4	46.3	247°23.8	8.9'	19°54.2	11.9'	58.6'
23	163°30.4	45.6	261°51.7	8.7'	20°06.1	11.8'	58.6'
	SD = 15.8'	$d = -0.7'$	SD = 15.8'				

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

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

August 06, 07, 08 UT (Thu., Fri., Sat.)

Aries				Venus				Mars				Jupiter				Saturn				Stars					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	SHA	Dec	SHA	Dec		
0	314°32.9	135°28.7	S00°06.4	228°26.5	N23°33.1	183°55.9	N18°43.0	300°03.8	N03°25.6	Alpheratz	357°33.2	29°14.3													
1	329°35.4	150°28.9	07.6	243°27.1	33.1	198°57.8	42.9	315°06.3	25.6	Ankaa	353°05.6	-42°09.4													
2	344°37.8	165°29.1	08.8	258°27.8	33.2	213°59.7	42.7	330°08.8	25.6	Schedar	349°29.2	56°40.9													
3	359°40.3	180°29.4	•• 10.1	273°28.4	•• 33.3	229°01.6	•• 42.6	345°11.3	•• 25.6	Diphda	348°45.8	-17°50.2													
4	14°42.8	195°29.6	11.3	288°29.0	33.4	244°03.5	42.5	0°13.8	25.5	Achernar	335°19.0	-57°05.7													
5	29°45.2	210°29.8	12.5	303°29.7	33.4	259°05.4	42.3	15°16.3	25.5	Hamal	327°49.6	23°35.3													
6	44°47.7	225°30.1	S00°13.7	318°30.3	N23°33.5	274°07.3	N18°42.2	30°18.8	N03°25.5	Polaris	313°23.1	89°22.2													
7	59°50.2	240°30.3	15.0	333°31.0	33.6	289°09.2	42.0	45°21.3	25.4	Acamar	315°10.8	-40°11.5													
8	74°52.6	255°30.5	16.2	348°31.6	33.7	304°11.1	41.9	60°23.8	25.4	Menkar	314°04.8	4°11.8													
9	89°55.1	270°30.8	•• 17.4	3°32.2	•• 33.8	319°13.0	•• 41.8	75°26.3	•• 25.4	Mirfak	308°26.4	49°57.2													
10	104°57.6	285°31.0	18.6	18°32.9	33.8	334°14.9	41.6	90°28.8	25.4	Aldebaran	290°38.3	16°33.8													
11	120°00.0	300°31.2	19.9	33°33.5	33.9	349°16.8	41.5	105°31.3	25.3	Rigel	281°02.8	-8°10.1													
12	135°02.5	315°31.5	S00°21.1	48°34.2	N23°34.0	4°18.7	N18°41.3	120°33.8	N03°25.3	Capella	280°20.2	46°01.3													
13	150°05.0	330°31.7	22.3	63°34.8	34.1	19°20.6	41.2	135°36.3	25.3	Bellatrix	278°21.7	6°22.5													
14	165°07.4	345°32.0	23.5	78°35.4	34.1	34°22.5	41.1	150°38.8	25.3	Elnath	278°00.4	28°37.7													
15	180°09.9	0°32.2	•• 24.7	93°36.1	•• 34.2	49°24.4	•• 40.9	165°41.3	•• 25.2	Alnilam	275°36.6	-1°11.0													
16	195°12.3	15°32.4	26.0	108°36.7	34.3	64°26.3	40.8	180°43.8	25.2	Betelgeuse	270°50.9	7°24.8													
17	210°14.8	30°32.7	27.2	123°37.4	34.4	79°28.2	40.6	195°46.3	25.2	Canopus	263°52.2	-52°42.3													
18	225°17.3	45°32.9	S00°28.4	138°38.0	N23°34.4	94°30.1	N18°40.5	210°48.8	N03°25.1	Sirius	258°25.4	-16°45.0													
19	240°19.7	60°33.2	29.6	153°38.7	34.5	109°32.0	40.4	225°51.3	25.1	Adhara	255°05.2	-29°00.3													
20	255°22.2	75°33.4	30.9	168°39.3	34.6	124°33.9	40.2	240°53.8	25.1	Procyon	244°49.8	5°09.5													
21	270°24.7	90°33.7	•• 32.1	183°39.9	•• 34.6	139°35.8	•• 40.1	255°56.3	•• 25.1	Pollux	243°16.1	27°57.7													
22	285°27.1	105°33.9	33.3	198°40.6	34.7	154°37.7	39.9	270°58.8	25.0	Avior	234°14.8	-59°35.6													
23	300°29.6	120°34.1	34.5	213°41.2	34.8	169°39.6	39.8	286°01.3	25.0	Suhail	222°45.8	-43°32.4													
Mer.pass. 03:01				ν 0.2' d 1.2' m -4.32				ν 0.6' d 0.1' m 1.30				ν 1.9' d -0.1' m -1.78				ν 2.5' d -0.0' m 0.61									
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	SHA	Dec	SHA	Dec		
0	315°32.1	135°34.4	S00°35.7	228°41.9	N23°34.9	184°41.5	N18°39.7	301°03.8	N03°25.0	Dubhe	193°40.0	61°36.6													
1	330°34.5	150°34.6	37.0	243°42.5	34.9	199°43.4	39.5	316°06.3	24.9	Denebola	182°23.8	14°25.5													
2	345°37.0	165°34.9	38.2	258°43.1	35.0	214°45.3	39.4	331°08.8	24.9	Gienah	175°42.4	-17°41.4													
3	0°39.5	180°35.1	•• 39.4	273°43.8	•• 35.1	229°47.2	•• 39.2	346°11.3	•• 24.9	Acrux	172°59.0	-63°15.0													
4	15°41.9	195°35.4	40.6	288°44.4	35.1	244°49.1	39.1	1°13.8	24.9	Gacrux	171°50.5	-57°16.0													
5	30°44.0	210°35.6	41.9	303°45.1	35.2	259°51.0	39.0	16°16.4	24.8	Alioth	166°12.1	55°49.2													
6	45°46.8	225°35.9	S00°43.1	318°45.7	N23°35.3	274°52.9	N18°38.8	31°18.9	N03°24.8	Spica	158°21.0	-11°18.0													
7	60°49.3	240°36.1	44.3	333°46.4	35.3	289°54.8	38.7	46°21.4	24.8	Alkaid	152°51.1	49°11.1													
8	75°51.8	255°36.4	45.5	348°47.0	35.4	304°56.7	38.5	61°23.9	24.7	Hadar	148°34.3	-60°30.3													
9	90°54.2	270°36.6	•• 46.7	3°47.6	•• 35.5	319°58.6	•• 38.4	76°26.4	•• 24.7	Menkent	147°56.1	-36°30.2													
10	105°56.7	285°36.9	48.0	18°48.3	35.6	335°00.5	38.3	91°28.9	24.7	Arcturus	145°46.8	19°02.8													
11	120°59.2	300°37.1	49.2	33°48.9	35.6	350°02.4	38.1	106°31.4	24.7	Rigel Kent.	139°38.5	-60°57.0													
12	136°01.6	315°37.4	S00°50.4	48°49.6	N23°35.7	5°04.3	N18°38.0	121°33.9	N03°24.6	Kochab	137°19.8	74°03.0													
13	151°04.1	330°37.6	51.6	63°50.2	35.8	20°06.2	37.8	136°36.4	24.6	Zuben'ubi	136°54.6	-16°09.2													
14	166°06.6	345°37.9	52.8	78°50.9	35.8	35°08.1	37.7	151°38.9	24.6	Alphecca	126°02.6	26°37.7													
15	181°09.0	0°38.1	•• 54.1	93°51.5	•• 35.9	50°10.0	•• 37.6	166°41.4	•• 24.5	Antares	112°14.1	-26°29.5													
16	196°11.5	15°38.4	55.3	108°52.1	35.9	65°11.9	37.4	181°43.9	24.5	Atria	107°06.8	-69°04.7													
17	211°13.9	30°38.7	56.5	123°52.8	36.0	80°13.8	37.3	196°46.4	24.5	Sabik	102°01.1	-15°45.5													
18	226°16.4	45°38.9	S00°57.7	138°53.4	N23°36.1	95°15.7	N18°37.1	211°48.9	N03°24.4	Shaula	96°08.3	-37°07.4													
19	241°18.9	60°39.2	00°58.9	153°54.1	36.1	110°17.6	37.0	226°51.4	24.4	Rasalhague	95°57.1	12°32.6													
20	256°21.3	75°39.4	01°00.2	168°54.7	36.2	125°19.6	36.9	241°53.9	24.4	Eltanin	90°41.2	51°29.3													
21	271°23.8	90°39.7	•• 01.4	183°55.4	•• 36.3	140°21.5	•• 36.7	256°56.4	•• 24.4	Kaus Aust.	83°30.4	-34°22.3													
22	286°26.3	105°39.9	02.6	198°56.0	36.3	155°23.4	36.6	271°58.9	24.3	Vega	80°32.0	38°48.7													
23	301°28.7	120°40.2	03.8	213°56.7	36.4	170°25.3	36.4	287°01.5	24.3	Nunki	75°45.8	-26°15.8													
Mer.pass. 02:57				ν 0.2' d 1.2' m -4.33				ν 0.6' d 0.1' m 1.29				ν 1.9' d -0.1' m -1.78				ν 2.5' d -0.0' m 0.60									
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	SHA	Dec	SHA	Dec		
0	316°31.2	135°40.5	S01°05.1	228°57.3	N23°36.5	185°27.2	N18°36.3	302°04.0	N03°24.3	Fomalhaut	15°12.7	-29°28.7													
1	331°33.7	150°40.7	06.3	243°57.9	36.5	200°29.1	36.2	317°06.5	24.2	Scheat	13°43.6	28°13.7													
2	346°36.1	165°41.0	07.5	258°58.6	36.6	215°31.0	36.0	332°09.0	24.2	Markab	13°28.3	15°21.0													
3	1°38.6	180°41.2	•• 08.7	273°59.2	•• 36.6	230°32.9	•• 35.9	347°11.5	•• 24.2																
4	16°41.1	195°41.5	09.9	288°59.9	36.7	245°34.8	35.7	2°14.0	24.1																
5	31°43.5	210°41.8	11.2	304°00.5	36.8	260°36.7	35.6	17°16.5	24.1																
6	46°46.0	225°42.0	S01°12.4	319°01.2	N23°36.8	275°38.6	N18°35.5	32°19.0	N03°24.1																
7	61°48.4	240°42.3	13.6	334°01.8	36.9	290°40.5	35.3	47°21.5	24.1																
8	76°50.9	255°42.5	14.8	349°02.5	37.0	305°42.4	35.2	62°24.0	24.0																
9	91°53.4	270°42.8	•• 16.0	4°03.1	•• 37.0	320°44.3	•• 35.0	77°26.5	•• 24.0																
10	106°55.8	285°43.1	17.3	19°03.8	37.1	335°46.2	34.9	92°29.0	24.0																
11	121°58.3	300°43.3	18.5	34°04.4	37.1	350°48.1	34.8	107°31.6	23.9																
12	137°00.8	315°43.6	S01°19.7	49°05.0	N23°37.2	5°50.0	N18°34.6	122°34.1	N03°23.9																
13	152°03.2	330°43.9	20.9	64°05.7	37.2	20°51.9	34.5	137°36.6	23.9																
14	167°05.7	345°44.1	22.1	79°06.3	37.3	35°53.8	34.3	152°39.1	23.8																
15	182°08.2	0°44.4	•• 23.3	94°07.0	•• 37.4	50°55.7	•• 34.2	167°41.6	•• 23.8																
16	197°10.6	15°44.7	24.6	109°07.6	37.4	65°57.6																			

h		Sun			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.5	N16°44.9	276°19.5	8.6'	N20°17.9	11.7'	58.6'
1	193°30.6	44.2	290°47.1	8.5'	20°29.7	11.6'	58.6'
2	208°30.6	43.5	305°14.6	8.4'	20°41.3	11.5'	58.7'
3	223°30.7	· · 42.8	319°42.0	8.3'	20°52.8	11.4'	58.7'
4	238°30.8	42.2	334°09.3	8.2'	21°04.2	11.3'	58.7'
5	253°30.8	41.5	348°36.4	8.0'	21°15.5	11.2'	58.7'
6	268°30.9	N16°40.8	3°03.5	7.9'	N21°26.7	11.1'	58.8'
7	283°31.0	40.1	17°30.4	7.8'	21°37.8	11.0'	58.8'
8	298°31.0	39.4	31°57.2	7.7'	21°48.7	10.8'	58.8'
9	313°31.1	· · 38.7	46°23.9	7.6'	21°59.6	10.7'	58.8'
10	328°31.2	38.0	60°50.4	7.4'	22°10.3	10.6'	58.8'
11	343°31.3	37.3	75°16.9	7.3'	22°20.9	10.5'	58.9'
12	358°31.3	N16°36.6	89°43.2	7.2'	N22°31.3	10.3'	58.9'
13	13°31.4	36.0	104°09.4	7.1'	22°41.7	10.2'	58.9'
14	28°31.5	35.3	118°35.5	7.0'	22°51.9	10.1'	58.9'
15	43°31.5	· · 34.6	133°01.4	6.8'	23°02.0	9.9'	59.0'
16	58°31.6	33.9	147°27.3	6.7'	23°11.9	9.8'	59.0'
17	73°31.7	33.2	161°53.0	6.6'	23°21.7	9.7'	59.0'
18	88°31.8	N16°32.5	176°18.6	6.5'	N23°31.4	9.5'	59.0'
19	103°31.8	31.8	190°44.1	6.4'	23°40.9	9.4'	59.1'
20	118°31.9	31.1	205°09.4	6.2'	23°50.4	9.3'	59.1'
21	133°32.0	· · 30.4	219°34.7	6.1'	23°59.6	9.1'	59.1'
22	148°32.1	29.7	233°59.8	6.0'	24°08.7	9.0'	59.1'
23	163°32.1	29.0	248°24.8	5.9'	24°17.7	8.8'	59.2'
SD = 15.8'		$d = -0.7'$	SD = 16.0'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.2	N16°28.3	262°49.7	5.8'	N24°26.5	8.7'	59.2'
1	193°32.3	27.6	277°14.5	5.7'	24°35.2	8.5'	59.2'
2	208°32.3	26.9	291°39.1	5.5'	24°43.7	8.4'	59.2'
3	223°32.4	· · 26.2	306°03.6	5.4'	24°52.1	8.2'	59.2'
4	238°32.5	25.5	320°28.1	5.3'	25°00.3	8.1'	59.3'
5	253°32.6	24.8	334°52.4	5.2'	25°08.4	7.9'	59.3'
6	268°32.6	N16°24.1	349°16.6	5.1'	N25°16.3	7.8'	59.3'
7	283°32.7	23.4	3°40.6	5.0'	25°24.1	7.6'	59.3'
8	298°32.8	22.7	18°04.6	4.9'	25°31.7	7.4'	59.4'
9	313°32.9	· · 22.0	32°28.5	4.8'	25°39.1	7.3'	59.4'
10	328°33.0	21.3	46°52.2	4.6'	25°46.3	7.1'	59.4'
11	343°33.0	20.6	61°15.9	4.5'	25°53.4	6.9'	59.4'
12	358°33.1	N16°19.9	75°39.4	4.4'	N26°00.4	6.8'	59.4'
13	13°33.2	19.2	90°02.9	4.3'	26°07.1	6.6'	59.5'
14	28°33.3	18.5	104°26.2	4.2'	26°13.7	6.4'	59.5'
15	43°33.3	· · 17.8	118°49.4	4.1'	26°20.1	6.2'	59.5'
16	58°33.4	17.1	133°12.5	4.0'	26°26.4	6.1'	59.5'
17	73°33.5	16.4	147°35.6	3.9'	26°32.5	5.9'	59.5'
18	88°33.6	N16°15.7	161°58.5	3.8'	N26°38.4	5.7'	59.6'
19	103°33.6	15.0	176°21.3	3.7'	26°44.1	5.5'	59.6'
20	118°33.7	14.3	190°44.1	3.7'	26°49.6	5.4'	59.6'
21	133°33.8	· · 13.6	205°06.7	3.6'	26°55.0	5.2'	59.6'
22	148°33.9	12.9	219°29.3	3.5'	27°00.1	5.0'	59.6'
23	163°34.0	12.2	233°51.8	3.4'	27°05.1	4.8'	59.7'
SD = 15.8'		$d = -0.7'$	SD = 16.1'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.0	N16°11.5	248°14.2	3.3'	N27°09.9	4.6'	59.7'
1	193°34.1	10.8	262°36.5	3.2'	27°14.5	4.4'	59.7'
2	208°34.2	10.0	276°58.7	3.1'	27°18.9	4.2'	59.7'
3	223°34.3	· · 09.3	291°20.8	3.1'	27°23.2	4.0'	59.7'
4	238°34.4	08.6	305°42.9	3.0'	27°27.2	3.9'	59.7'
5	253°34.4	07.9	320°04.9	2.9'	27°31.1	3.7'	59.8'
6	268°34.5	N16°07.2	334°26.8	2.8'	N27°34.7	3.5'	59.8'
7	283°34.6	06.5	348°48.7	2.8'	27°38.2	3.3'	59.8'
8	298°34.7	05.8	3°10.5	2.7'	27°41.5	3.1'	59.8'
9	313°34.8	· · 05.1	17°32.2	2.7'	27°44.5	2.9'	59.8'
10	328°34.9	04.4	31°53.8	2.6'	27°47.4	2.7'	59.8'
11	343°34.9	03.6	46°15.4	2.5'	27°50.1	2.5'	59.9'
12	358°35.0	N16°02.9	60°37.0	2.5'	N27°52.6	2.3'	59.9'
13	13°35.1	02.2	74°58.4	2.4'	27°54.8	2.1'	59.9'
14	28°35.2	01.5	89°19.9	2.4'	27°56.9	1.9'	59.9'
15	43°35.3	· · 00.8	103°41.3	2.3'	27°58.8	1.7'	59.9'
16	58°35.4	16°00.1	118°02.6	2.3'	28°00.5	1.5'	59.9'
17	73°35.4	15°59.4	132°23.9	2.3'	28°01.9	1.3'	60.0'
18	88°35.5	N15°58.6	146°45.1	2.2'	N28°03.2	1.1'	60.0'
19	103°35.6	57.9	161°06.4	2.2'	28°04.3	0.9'	60.0'
20	118°35.7	57.2	175°27.5	2.2'	28°05.1	0.6'	60.0'
21	133°35.8	· · 56.5	189°48.7	2.1'	28°05.8	0.4'	60.0'
22	148°35.9	55.8	204°09.8	2.1'	28°06.2	0.2'	60.0'
23	163°35.9	55.1	218°30.9	2.1'	28°06.4	0.0'	60.0'
SD = 15.8'		$d = -0.7'$	SD = 16.3'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 23-25 51-29%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
06	05:58	05:55	12:06	05:47	18:15	
07	05:51	05:48	12:06	06:45	19:15	
08	05:44	05:40	12:06	07:47	20:19	

August 09, 10, 11 UT (Sun., Mon., Tue.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	317°30.3	135°46.8	S01°34.3	229°12.8	N23°37.9	186°12.8	N18°32.9	303°04.2	N03°23.5					Alpheratz	357°33.1	29°14.3	
1	332°32.8	150°47.1	35.5	244°13.5	37.9	201°14.7	32.8	318°06.7	23.5					Ankaa	353°05.6	-42°09.4	
2	347°35.3	165°47.4	36.7	259°14.1	38.0	216°16.6	32.6	333°09.2	23.5					Schedar	349°29.2	56°40.9	
3	2°37.7	180°47.7	· · 38.0	274°14.7	· · 38.0	231°18.5	· · 32.5	348°11.7	· · 23.4					Diphda	348°45.8	-17°50.2	
4	17°40.2	195°47.9	39.2	289°15.4	38.1	246°20.4	32.4	3°14.2	23.4					Achernar	335°19.0	-57°05.7	
5	32°42.7	210°48.2	40.4	304°16.0	38.1	261°22.3	32.2	18°16.7	23.4					Hamal	327°49.6	23°35.3	
6	47°45.1	225°48.5	S01°41.6	319°16.7	N23°38.2	276°24.2	N18°32.1	33°19.3	N03°23.3					Polaris	313°21.2	89°22.2	
7	62°47.6	240°48.8	42.8	334°17.3	38.2	291°26.1	31.9	48°21.8	23.3					Acamar	315°10.8	-40°11.5	
8	77°50.1	255°49.0	44.1	349°18.0	38.3	306°28.0	31.8	63°24.3	23.3					Menkar	314°04.8	4°11.8	
9	92°52.5	270°49.3	· · 45.3	4°18.6	· · 38.3	321°29.9	· · 31.7	78°26.8	· · 23.2					Mirfak	308°26.4	49°57.2	
10	107°55.0	285°49.6	46.5	19°19.3	38.4	336°31.8	31.5	93°29.3	23.2					Aldebaran	290°38.2	16°33.8	
11	122°57.4	300°49.9	47.7	34°19.9	38.4	351°33.7	31.4	108°31.8	23.2					Rigel	281°02.8	-8°10.1	
12	137°59.9	315°50.2	S01°48.9	49°20.6	N23°38.5	6°35.6	N18°31.2	123°34.3	N03°23.1					Capella	280°20.2	46°01.3	
13	153°02.4	330°50.4	50.1	64°21.2	38.5	21°37.5	31.1	138°36.8	23.1					Bellatrix	278°21.6	6°22.5	
14	168°04.8	345°50.7	51.4	79°21.9	38.6	36°39.4	31.0	153°39.4	23.1					Elnath	278°00.4	28°37.7	
15	183°07.3	0°51.0	· · 52.6	94°22.5	· · 38.6	51°41.3	· · 30.8	168°41.9	· · 23.0					Alnilam	275°36.6	-1°11.0	
16	198°09.8	15°51.3	53.8	109°23.2	38.7	66°43.2	30.7	183°44.4	23.0					Betelgeuse	270°50.9	7°24.8	
17	213°12.2	30°51.6	55.0	124°23.8	38.7	81°45.1	30.5	198°46.9	23.0					Canopus	263°52.2	-52°42.3	
18	228°14.7	45°51.9	S01°56.2	139°24.5	N23°38.8	96°47.0	N18°30.4	213°49.4	N03°23.0					Sirius	258°25.3	-16°45.0	
19	243°17.2	60°52.1	57.4	154°25.1	38.8	111°49.0	30.2	228°51.9	22.9					Adhara	255°05.1	-29°00.3	
20	258°19.6	75°52.4	58.7	169°25.8	38.9	126°50.9	30.1	243°54.4	22.9					Procyon	244°49.7	5°09.5	
21	273°22.1	90°52.7	01°59.9	184°26.4	· · 38.9	141°52.8	· · 30.0	258°57.0	· · 22.9					Pollux	243°16.0	27°57.7	
22	288°24.6	105°53.0	02°01.1	199°27.1	39.0	156°54.7	29.8	273°59.5	22.8					Avior	234°14.8	-59°35.6	
23	303°27.0	120°53.3	02.3	214°27.7	39.0	171°56.6	29.7	289°02.0	22.8					Suhail	222°45.8	-43°32.4	
Mer.pass. 02:50			ν 0.3' d 1.2' m -4.35	ν 0.6' d 0.1' m 1.29	ν 1.9' d -0.1' m -1.78	ν 2.5' d -0.0' m 0.59											

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	318°29.5	135°53.6	S02°03.5	229°28.4	N23°39.1	186°58.5	N18°29.5	304°04.5	N03°22.8				
1	333°31.9	150°53.8	04.7	244°29.0	39.1	202°00.4	29.4	319°07.0	22.7				
2	348°34.4	165°54.1	05.9	259°29.7	39.2	217°02.3	29.3	334°09.5	22.7				
3	3°36.9	180°54.4	· · 07.2	274°30.3	· · 39.2	232°04.2	· · 29.1	349°12.1	· · 22.7				
4	18°39.3	195°54.7	08.4	289°31.0	39.3	247°06.1	29.0	4°14.6	22.6				
5	33°41.8	210°55.0	09.6	304°31.6	39.3	262°08.0	28.8	19°17.1	22.6				
6	48°44.3	225°55.3	S02°10.8	319°32.3	N23°39.3	277°09.9	N18°28.7	34°19.6	N03°22.6				
7	63°46.7	240°55.6	12.0	334°32.9	39.4	292°11.8	28.5	49°22.1	22.5				
8	78°49.2	255°55.9	13.2	349°33.6	39.4	307°13.7	28.4	64°24.6	22.5				
9	93°51.7	270°56.2	· · 14.5	4°34.2	· · 39.5	322°15.6	· · 28.3	79°27.1	· · 22.5				
10	108°54.1	285°56.5	15.7	19°34.9	39.5	337°17.5	28.1	94°29.7	22.4				
11	123°56.6	300°56.8	16.9	34°35.5	39.6	352°19.4	28.0	109°32.2	22.4				
12	138°59.1	315°57.0	S02°18.1	49°36.2	N23°39.6	7°21.3	N18°27.8	124°34.7	N03°22.4				
13	154°01.5	330°57.3	19.3	64°36.8	39.6	22°23.2	27.7	139°37.2	22.3				
14	169°04.0	345°57.6	20.5	79°37.5	39.7	37°25.1	27.6	154°39.7	22.3				
15	184°06.4	0°57.9	· · 21.7	94°38.1	· · 39.7	52°27.0	· · 27.4	169°42.3	· · 22.3				
16	199°08.9	15°58.2	23.0	109°38.8	39.8	67°28.9	27.3	184°44.8	22.2				
17	214°11.4	30°58.5	24.2	124°39.5	39.8	82°30.8	27.1	199°47.3	22.2				
18	229°13.8	45°58.8	S02°25.4	139°40.1	N23°39.8	97°32.7	N18°27.0	214°49.8	N03°22.1				
19	244°16.3	60°59.1	26.6	154°40.8	39.9	112°34.6	26.8	229°52.3	22.1				
20	259°18.8	75°59.4	27.8	169°41.4	39.9	127°36.5	26.7	244°54.8	22.1				
21	274°21.2	90°59.7	· · 29.0	184°42.1	· · 40.0	142°38.4	· · 26.6	259°57.4	· · 22.0				
22	289°23.7	106°00.0	30.2	199°42.7	40.0	157°40.3	26.4	274°59.9	22.0				
23	304°26.2	121°00.3	31.4	214°43.4	40.0	172°42.3	26.3	290°02.4	22.0				
Mer.pass. 02:46			ν 0.3' d 1.2' m -4.36	ν 0.7' d 0.0' m 1.29	ν 1.9' d -0.1' m -1.78	ν 2.5' d -0.0' m 0.59							

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	319°28.6	136°00.6	S02°32.7	229°44.0	N23°40.1	187°44.2	N18°26.1	305°04.9	N03°21.9				
1	334°31.1	151°00.9	33.9	244°44.7	40.1	202°46.1	26.0	320°07.4	21.9				
2	349°33.6	166°01.2	35.1	259°45.3	40.2	217°48.0	25.9	335°10.0	21.9				
3	4°36.0	181°01.5	· · 36.3	274°46.0	· · 40.2	232°49.9	· · 25.7	350°12.5	· · 21.8				
4	19°38.5	196°01.8	37.5	289°46.6	40.2	247°51.8	25.6	5°15.0	21.8				
5	34°40.9	211°02.1	38.7	304°47.3	40.3	262°53.7	25.4	20°17.5	21.8				
6	49°43.4	226°02.4	S02°39.9	319°47.9	N23°40.3	277°55.6	N18°25.3	35°20.0	N03°21.7				
7	64°45.9	241°02.7	41.1	334°48.6	40.3	292°57.5	25.1	50°22.6	21.7				
8	79°48.3	256°03.0	42.3	349°49.3	40.4	307°59.4	25.0	65°25.1	21.7				
9	94°50.8	271°03.3	· · 43.6	4°49.9	· · 40.4	323°01.3	· · 24.9	80°27.6	· · 21.6				
10	109°53.3	286°03.7	44.8	19°50.6	40.4	338°03.2	24.7	95°30.1	21.6				
11	124°55.7	301°04.0	46.0	34°51.2	40.5	353°05.1	24.6	110°32.6	21.6				
12	139°58.2	316°04.3	S02°47.2	49°51.9	N23°40.5	8°07.0	N18°24.4	125°35.2	N03°21.5				
13	155°00.7	331°04.6	48.4	64°52.5	40.5	23°08.9	24.3	140°37.7	21.5				
14	170°03.1	346°04.9	49.6	79°53.2	40.6	38°10.8	24.2	155°40.2	21.5				
15	185°05.6	1°05.2	· · 50.8	94°53.8	· · 40.6	53°12.7	· · 24.0	170°42.7	· · 21.4				
16	200°08.0	16°05.5	52.0	109°54.5	40.6	68°14.6	23.9	185°45.2	21.4				
17	215°10.5	31°05.8	53.2	124°55.2	40.7	83°16.5	23.7	200°47.8	21.3				
18	230°13.0	46°06.1	S02°54.5	139°55.8	N23°40.7	98°18.4	N18°23.6	215°50.3	N03°21.3				
19	245°15.4	61°06.4	55.7	154°56.5	40.7	113°20.3	23.4	230°52.8	21.3				
20	260°17.9	76°06.7	56.9	169°57.1	40.8	128°22.2	23.3	245°55.3	21.2				
21	275°20.4	91°07.1	· · 58.1	184°57.8	· · 40.8	143°24.2	· · 23.2	260°57.8	· · 21.2				
22	290°22.8	106°07.4	02°59.3	199°58.4	40.8	158°26.1	23.0	276°00.4	21.2				
23	305°25.3	121°07.7	03°00.5	214°59.1	40.9	173°28.0	22.9	291°02.9	21.1				
Mer.pass. 02:42			ν 0.3' d 1.2' m -4.37	ν 0.7' d 0.0' m 1.29	ν 1.9' d -0.1' m -1.79	ν 2.5' d -0.0' m 0.58							

Aug 09 Sun	SHA	Mer.pass
Venus	178°16.5	14:57
Mars	271°42.5	08:43
Jupiter	228°42.5	11:34
Saturn	345°33.8	03:47

Aug 10 Mon	SHA	Mer.pass
Venus	177°24.1	14:56
Mars	270°58.9	08:42
Jupiter	228°29.0	11:31
Saturn	345°35.0	03:43

Aug 11 Tue	SHA	Mer.pass
Venus	176°32.0	14:56
Mars	270°15.4	08:41
Jupiter	228°15.5	11:28
Saturn	345°36.3	03:39

Horizontal parallax		
Venus:		0.2
Mars:		0.1

h	Sun			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°36.0	N15°54.3	232°52.0	2.1'	N28°06.5	-0.2'	60.1'
1	193°36.1	53.6	247°13.0	2.0'	28°06.3	-0.4'	60.1'
2	208°36.2	52.9	261°34.1	2.0'	28°05.9	-0.6'	60.1'
3	223°36.3	· · 52.2	275°55.1	2.0'	28°05.3	-0.8'	60.1'
4	238°36.4	51.5	290°16.1	2.0'	28°04.5	-1.0'	60.1'
5	253°36.5	50.7	304°37.1	2.0'	28°03.5	-1.2'	60.1'
6	268°36.6	N15°50.0	318°58.1	2.0'	N28°02.3	-1.4'	60.1'
7	283°36.6	49.3	333°19.1	2.0'	28°00.9	-1.6'	60.1'
8	298°36.7	48.6	347°40.2	2.0'	27°59.2	-1.8'	60.1'
9	313°36.8	· · 47.9	2°01.2	2.0'	27°57.4	-2.0'	60.2'
10	328°36.9	47.1	16°22.2	2.0'	27°55.3	-2.3'	60.2'
11	343°37.0	46.4	30°43.2	2.0'	27°53.1	-2.5'	60.2'
12	358°37.1	N15°45.7	45°04.3	2.1'	N27°50.6	-2.7'	60.2'
13	13°37.2	45.0	59°25.3	2.1'	27°47.9	-2.9'	60.2'
14	28°37.3	44.2	73°46.4	2.1'	27°45.1	-3.1'	60.2'
15	43°37.4	· · 43.5	88°07.5	2.1'	27°42.0	-3.3'	60.2'
16	58°37.4	42.8	102°28.7	2.2'	27°38.7	-3.5'	60.2'
17	73°37.5	42.1	116°49.8	2.2'	27°35.2	-3.7'	60.2'
18	88°37.6	N15°41.3	131°11.0	2.2'	N27°31.5	-3.9'	60.2'
19	103°37.7	40.6	145°32.3	2.3'	27°27.6	-4.1'	60.2'
20	118°37.8	39.9	159°53.5	2.3'	27°23.5	-4.3'	60.2'
21	133°37.9	· · 39.1	174°14.9	2.4'	27°19.2	-4.5'	60.2'
22	148°38.0	38.4	188°36.2	2.4'	27°14.7	-4.7'	60.3'
23	163°38.1	37.7	202°57.6	2.5'	27°09.9	-4.9'	60.3'
SD = 15.8'			SD = 16.4'				
$d = -0.7'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.2	N15°37.0	217°19.1	2.5'	N27°05.0	-5.1'	60.3'
1	193°38.3	36.2	231°40.6	2.6'	26°59.9	-5.3'	60.3'
2	208°38.4	35.5	246°02.2	2.6'	26°54.6	-5.5'	60.3'
3	223°38.4	· · 34.8	260°23.8	2.7'	26°49.1	-5.7'	60.3'
4	238°38.5	34.0	274°45.5	2.7'	26°43.4	-5.9'	60.3'
5	253°38.6	33.3	289°07.2	2.8'	26°37.5	-6.1'	60.3'
6	268°38.7	N15°32.6	303°29.0	2.9'	N26°31.4	-6.3'	60.3'
7	283°38.8	31.8	317°50.9	2.9'	26°25.1	-6.5'	60.3'
8	298°38.9	31.1	332°12.8	3.0'	26°18.6	-6.7'	60.3'
9	313°39.0	· · 30.4	346°34.9	3.1'	26°12.0	-6.9'	60.3'
10	328°39.1	29.6	0°56.9	3.2'	26°05.1	-7.0'	60.3'
11	343°39.2	28.9	15°19.1	3.2'	25°58.1	-7.2'	60.3'
12	358°39.3	N15°28.2	29°41.4	3.3'	N25°50.8	-7.4'	60.3'
13	13°39.4	27.4	44°03.7	3.4'	25°43.4	-7.6'	60.3'
14	28°39.5	26.7	58°26.1	3.5'	25°35.8	-7.8'	60.3'
15	43°39.6	· · 26.0	72°48.6	3.6'	25°28.1	-8.0'	60.3'
16	58°39.7	25.2	87°11.2	3.7'	25°20.1	-8.1'	60.3'
17	73°39.8	24.5	101°33.9	3.8'	25°12.0	-8.3'	60.3'
18	88°39.9	N15°23.8	115°56.6	3.9'	N25°03.6	-8.5'	60.3'
19	103°40.0	23.0	130°19.5	3.9'	24°55.1	-8.7'	60.3'
20	118°40.0	22.3	144°42.4	4.0'	24°46.5	-8.8'	60.3'
21	133°40.1	· · 21.6	159°05.5	4.1'	24°37.7	-9.0'	60.3'
22	148°40.2	20.8	173°28.6	4.2'	24°28.6	-9.2'	60.3'
23	163°40.3	20.1	187°51.8	4.3'	24°19.5	-9.3'	60.3'
SD = 15.8'			SD = 16.4'				
$d = -0.7'$							

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.4	N15°19.3	202°15.2	4.4'	N24°10.1	-9.5'	60.3'
1	193°40.5	18.6	216°38.6	4.5'	24°00.6	-9.7'	60.2'
2	208°40.6	17.9	231°02.2	4.6'	23°51.0	-9.8'	60.2'
3	223°40.7	· · 17.1	245°25.8	4.7'	23°41.1	-10.0'	60.2'
4	238°40.8	16.4	259°49.6	4.9'	23°31.1	-10.1'	60.2'
5	253°40.9	15.6	274°13.4	5.0'	23°21.0	-10.3'	60.2'
6	268°41.0	N15°14.9	288°37.4	5.1'	N23°10.7	-10.5'	60.2'
7	283°41.1	14.1	303°01.4	5.2'	23°00.2	-10.6'	60.2'
8	298°41.2	13.4	317°25.6	5.3'	22°49.6	-10.8'	60.2'
9	313°41.3	· · 12.7	331°49.9	5.4'	22°38.9	-10.9'	60.2'
10	328°41.4	11.9	346°14.3	5.5'	22°28.0	-11.0'	60.2'
11	343°41.5	11.2	0°38.8	5.6'	22°16.9	-11.2'	60.2'
12	358°41.6	N15°10.4	15°03.4	5.7'	N22°05.7	-11.3'	60.2'
13	13°41.7	09.7	29°28.2	5.8'	21°54.4	-11.5'	60.1'
14	28°41.8	08.9	43°53.0	6.0'	21°42.9	-11.6'	60.1'
15	43°41.9	· · 08.2	58°18.0	6.1'	21°31.3	-11.7'	60.1'
16	58°42.0	07.4	72°43.0	6.2'	21°19.6	-11.9'	60.1'
17	73°42.1	06.7	87°08.2	6.3'	21°07.7	-12.0'	60.1'
18	88°42.2	N15°06.0	101°33.5	6.4'	N20°55.7	-12.1'	60.1'
19	103°42.3	05.2	115°58.9	6.5'	20°43.5	-12.3'	60.1'
20	118°42.4	04.5	130°24.4	6.6'	20°31.3	-12.4'	60.1'
21	133°42.5	· · 03.7	144°50.1	6.8'	20°18.9	-12.5'	60.0'
22	148°42.6	03.0	159°15.8	6.9'	20°06.4	-12.6'	60.0'
23	163°42.7	02.2	173°41.7	7.0'	19°53.7	-12.8'	60.0'
SD = 15.8'			SD = 16.4'				
$d = -0.7'$							

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn. of Time	12 ^h		Mer. Pass.		
	00 ^h	mm:ss	hh:mm	Upper	Lower	26-28
		mm:ss		hh:mm	hh:mm	19-4%
09	05:36	05:32	12:06	08:52	21:24	
10	05:27	05:23	12:05	09:56	22:27	
11	05:18	05:13	12:05	10:57	23:26	

August 12, 13, 14 UT (Wed., Thu., Fri.)

Aries		Venus		Mars		Jupiter		Saturn		Stars			
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	320°27.8	136°08.0	S03°01.7	229°59.7	N23°40.9	188°29.9	N18°22.7	306°05.4	N03°21.1	Alpheratz	357°33.1	29°14.3	
1	335°30.2	151°08.3	02.9	245°00.4	40.9	203°31.8	22.6	321°07.9	21.1	Ankaa	353°05.5	-42°09.4	
2	350°32.7	166°08.6	04.1	260°01.1	40.9	218°33.7	22.4	336°10.5	21.0	Schedar	349°29.1	56°40.9	
3	5°35.2	181°09.0	· · 05.3	275°01.7	· · 41.0	233°35.6	· · 22.3	351°13.0	· · 21.0	Diphda	348°45.7	-17°50.2	
4	20°37.6	196°09.3	06.5	290°02.4	41.0	248°37.5	22.2	6°15.5	21.0	Achernar	335°18.9	-57°05.7	
5	35°40.1	211°09.6	07.8	305°03.0	41.0	263°39.4	22.0	21°18.0	20.9	Hamal	327°49.6	23°35.3	
6	50°42.5	226°09.9	S03°09.0	320°03.7	N23°41.1	278°41.3	N18°21.9	36°20.6	N03°20.9	Polaris	313°19.6	89°22.3	
7	65°45.0	241°10.2	10.2	335°04.3	41.1	293°43.2	21.7	51°23.1	20.8	Acamar	315°10.7	-40°11.5	
8	80°47.5	256°10.5	11.4	350°05.0	41.1	308°45.1	21.6	66°25.6	20.8	Menkar	314°04.7	4°11.8	
9	95°49.9	271°10.9	· · 12.6	5°05.7	· · 41.1	323°47.0	· · 21.5	81°28.1	· · 20.8	Mirfak	308°26.4	49°57.2	
10	110°52.4	286°11.2	13.8	20°06.3	41.2	338°48.9	21.3	96°30.7	20.7	Aldebaran	290°38.2	16°33.8	
11	125°54.9	301°11.5	15.0	35°07.0	41.2	353°50.8	21.2	111°33.2	20.7	Rigel	281°02.7	-8°10.1	
12	140°57.3	316°11.8	S03°16.2	50°07.6	N23°41.2	8°52.7	N18°21.0	126°35.7	N03°20.7	Capella	280°20.1	46°01.3	
13	155°59.8	331°12.2	17.4	65°08.3	41.2	23°54.6	20.9	141°38.2	20.6	Bellatrix	278°21.6	6°22.5	
14	171°02.3	346°12.5	18.6	80°09.0	41.3	38°56.5	20.7	156°40.7	20.6	Elnath	278°00.4	28°37.7	
15	186°04.7	1°12.8	· · 19.8	95°09.6	· · 41.3	53°58.5	· · 20.6	171°43.3	· · 20.5	Alnilam	275°36.6	-1°11.0	
16	201°07.2	16°13.1	21.0	110°10.3	41.3	69°00.4	20.5	186°45.8	20.5	Betelgeuse	270°50.8	7°24.8	
17	216°09.7	31°13.4	22.2	125°10.9	41.3	84°02.3	20.3	201°48.3	20.5	Canopus	263°52.2	-52°42.3	
18	231°12.1	46°13.8	S03°23.4	140°11.6	N23°41.4	99°04.2	N18°20.2	216°50.9	N03°20.4	Sirius	258°25.3	-16°45.0	
19	246°14.6	61°14.1	24.7	155°12.2	41.4	114°06.1	20.0	231°53.4	20.4	Adhara	255°05.1	-29°00.3	
20	261°17.0	76°14.4	25.9	170°12.9	41.4	129°08.0	19.9	246°55.9	20.4	Procyon	244°49.7	5°09.5	
21	276°19.5	91°14.8	· · 27.1	185°13.6	· · 41.4	144°09.9	· · 19.7	261°58.4	· · 20.3	Pollux	243°16.0	27°57.7	
22	291°22.0	106°15.1	28.3	200°14.2	41.5	159°11.8	19.6	277°01.0	20.3	Avior	234°14.8	-59°35.6	
23	306°24.4	121°15.4	29.5	215°14.9	41.5	174°13.7	19.5	292°03.5	20.2	Suhail	222°45.8	-43°32.3	
Mer.pass. 02:38		ν 0.3' d 1.2' m -4.38		ν 0.7' d 0.0' m 1.29		ν 1.9' d -0.1' m -1.79		ν 2.5' d -0.0' m 0.58		Miaplacidus	221°39.0	-69°49.5	
											Alphard	217°46.8	-8°46.4
											Regulus	207°33.3	11°50.3
											Dubhe	193°40.0	61°36.6
											Denebola	182°23.8	14°25.5
											Gienah	175°42.4	-17°41.4
											Acrux	172°59.1	-63°15.0
											Gacrux	171°50.5	-57°15.9
											Alioth	166°12.1	55°49.1
											Spica	158°21.0	-11°18.0
											Alkaid	152°51.1	49°11.0
											Hadar	148°34.3	-60°30.3
											Menkent	147°56.1	-36°30.2
											Arcturus	145°46.8	19°02.8
											Rigil Kent.	139°38.6	-60°57.0
											Kochab	137°19.9	74°03.0
											Zuben'ubi	136°54.6	-16°09.2
											Alphecca	126°02.6	26°37.7
											Antares	112°14.1	-26°29.5
											Atria	107°06.8	-69°04.7
											Sabik	102°01.1	-15°45.5
											Shaula	96°08.3	-37°07.4
											Rasalhague	95°57.1	12°32.6
											Eltanin	90°41.2	51°29.3
											Kaus Aust.	83°30.4	-34°22.3
											Vega	80°32.0	38°48.7
											Nunki	75°45.8	-26°15.8
											Altair	61°58.3	8°56.5
											Peacock	53°03.0	-56°38.9
											Deneb	49°24.4	45°22.6
											Enif	33°37.2	10°00.0
											Al Na'ir	27°30.8	-46°49.7
											Fomalhaut	15°12.7	-29°28.6
											Scheat	13°43.6	28°13.7
											Markab	13°28.3	15°21.0
											Aug 12 Wed	SHA	Mer.pass
											Venus	175°40.2	14:55
											Mars	269°32.0	08:40
											Jupiter	228°02.1	11:25
											Saturn	345°37.7	03:35
											Aug 13 Thu	SHA	Mer.pass
											Venus	174°48.8	14:55
											Mars	268°48.6	08:39
											Jupiter	227°48.7	11:22
											Saturn	345°39.1	03:31
											Aug 14 Fri	SHA	Mer.pass
											Venus	173°57.8	14:54
											Mars	268°05.4	08:38
											Jupiter	227°35.3	11:18
											Saturn	345°40.7	03:27
											Horizontal parallax		
											Venus:	0.2	
											Mars:	0.1	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	322°26.0	136°23.8	S03°59.5	230°31.4	N23°41.9	190°01.4	N18°15.9	308°06.7	N03°19.3
1	337°28.5	151°24.2	04°00.7	245°32.1	41.9	205°03.3	15.7	323°09.2	19.3
2	352°31.0	166°24.5	01.9	260°32.8	41.9	220°05.2	15.6	338°11.8	19.2
3	7°33.4	181°24.9	· · 03.1	275°33.4	· · 42.0	235°07.1	· · 15.5	353°14.3	· · 19.2
4	22°35.9	196°25.2	04.3	290°34.1	42.0	250°09.0	15.3	8°16.8	19.1
5	37°38.4	211°25.5	05.5	305°34.7	42.0	265°10.9	15.2	23°19.3	19.1
6	52°40.8	226°25.9	S04°06.7	320°35.4	N23°42.0	280°12.8	N18°15.0	38°21.9	N03°19.1
7	67°43.3	241°26.2	07.39	335°36.1	42.0	295°14.7	14.9	53°24.4	19.0
8	82°45.8	256°26.6	09.1	350°36.7	42.0	310°16.6	14.7	68°26.9	19.0
9	97°48.2	271°26.9	· · 10.3	5°37.4	· · 42.0	325°18.5	· · 14.6	83°29.5	· · 18.9
10	112°50.7	286°27.3	11.5	20°38.1	42.0	340°20.4	14.5	98°32.0	18.9
11	127°53.1	301°27.6	12.7	35°38.7	42.0	355°22.4	14.3	113°34.5	18.9
12	142°55.6	316°28.0	S04°13.9	50°39.4	N23°42.1	10°24.3	N18°14.2	128°37.1	N03°18.8
13	157°58.1	331°28.3	15.1	65°40.1	42.1	25°26.2	14.0	143°39.6	18.8
14	173°00.5	346°28.7	16.3	80°40.7	42.1	40°28.1	13.9	158°42.1	18.7
15	188°03.0	1°29.0	· · 17.5	95°41.4	· · 42.1	55°30.0	· · 13.7	173°44.7	· · 18.7
16	203°05.5	16°29.4	18.7	110°42.1	42.1	70°31.9	13.6	188°47.2	18.7
17	218°07.9	31°29.8	19.9	125°42.7	42.1	85°33.8	13.5	203°49.7	18.6
18	233°10.4	46°30.1	S04°21.1	140°43.4	N23°42.1	100°35.7	N18°13.3	218°52.3	N03°18.6
19	248°12.9	61°30.5	22.3	155°44.1	42.1	115°37.6	13.2	233°54.8	18.5
20	263°15.3	76°30.8	23.5	170°44.7	42.1	130°39.5	13.0	248°57.3	18.5
21	278°17.8	91°31.2	· · 24.7	185°45.4	· · 42.1	145°41.4	· · 12.9	263°59.9	· · 18.5
22	293°20.2	106°31.5	25.9	200°46.1	42.1	160°43.3	12.7	279°02.4	18.4
23	308°22.7	121°31.9	27.1	215°46.7	42.1	175°45.3	12.6	294°04.9	18.4
Mer.pass. 02:30		ν 0.3' d 1.2' m -4.41		ν 0.7' d 0.0' m 1.28		ν 1.9' d -0.1' m -1.79		ν 2.5' d -0.0' m 0.57	

h	Sun			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°42.9	N15°01.5	188°07.7	7.1'	N19°41.0	-12.9'	60.0'
1	193°43.0	00.7	202°33.8	7.2'	19°28.1	-13.0'	60.0'
2	208°43.1	15°00.0	217°00.0	7.3'	19°15.1	-13.1'	60.0'
3	223°43.2	14°59.2	231°26.3	7.4'	19°02.0	-13.2'	60.0'
4	238°43.3	58.5	245°52.8	7.6'	18°48.8	-13.3'	59.9'
5	253°43.4	57.7	260°19.3	7.7'	18°35.5	-13.4'	59.9'
6	268°43.5	N14°57.0	274°46.0	7.8'	N18°22.1	-13.5'	59.9'
7	283°43.6	56.2	289°12.8	7.9'	18°08.6	-13.6'	59.9'
8	298°43.7	55.4	303°39.7	8.0'	17°54.9	-13.7'	59.9'
9	313°43.8	· · 54.7	318°06.7	8.1'	17°41.2	-13.8'	59.9'
10	328°43.9	53.9	332°33.8	8.2'	17°27.4	-13.9'	59.8'
11	343°44.0	53.2	347°01.0	8.3'	17°13.5	-14.0'	59.8'
12	358°44.1	N14°52.4	1°28.4	8.5'	N16°59.5	-14.1'	59.8'
13	13°44.2	51.7	15°55.8	8.6'	16°45.4	-14.2'	59.8'
14	28°44.3	50.9	30°23.4	8.7'	16°31.2	-14.3'	59.8'
15	43°44.4	· · 50.2	44°51.1	8.8'	16°16.9	-14.4'	59.7'
16	58°44.5	49.4	59°18.8	8.9'	16°02.5	-14.4'	59.7'
17	73°44.6	48.7	73°46.7	9.0'	15°48.1	-14.5'	59.7'
18	88°44.8	N14°47.9	88°14.7	9.1'	N15°33.6	-14.6'	59.7'
19	103°44.9	47.1	102°42.8	9.2'	15°19.0	-14.7'	59.6'
20	118°45.0	46.4	117°11.0	9.3'	15°04.3	-14.8'	59.6'
21	133°45.1	· · 45.6	131°39.3	9.4'	14°49.5	-14.8'	59.6'
22	148°45.2	44.9	146°07.8	9.5'	14°34.7	-14.9'	59.6'
23	163°45.3	44.1	160°36.3	9.6'	14°19.8	-15.0'	59.6'
SD = 15.8'			SD = 16.4'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°45.4	N14°43.3	175°04.9	9.7'	N14°04.9	-15.0'	59.5'
1	193°45.5	42.6	189°33.6	9.8'	13°49.8	-15.1'	59.5'
2	208°45.6	41.8	204°02.4	9.9'	13°34.7	-15.2'	59.5'
3	223°45.7	· · 41.1	218°31.4	10.0'	13°19.6	-15.2'	59.5'
4	238°45.8	40.3	233°00.4	10.1'	13°04.4	-15.3'	59.4'
5	253°46.0	39.5	247°29.5	10.2'	12°49.1	-15.3'	59.4'
6	268°46.1	N14°38.8	261°58.7	10.3'	N12°33.8	-15.4'	59.4'
7	283°46.2	38.0	276°28.0	10.4'	12°18.4	-15.4'	59.4'
8	298°46.3	37.3	290°57.4	10.5'	12°02.9	-15.5'	59.3'
9	313°46.4	· · 36.5	305°26.9	10.6'	11°47.4	-15.5'	59.3'
10	328°46.5	35.7	319°56.5	10.7'	11°31.9	-15.6'	59.3'
11	343°46.6	35.0	334°26.2	10.8'	11°16.3	-15.6'	59.3'
12	358°46.7	N14°34.2	348°56.0	10.9'	N11°00.7	-15.7'	59.2'
13	13°46.8	33.4	3°25.9	11.0'	10°45.0	-15.7'	59.2'
14	28°47.0	32.7	17°55.8	11.0'	10°29.3	-15.8'	59.2'
15	43°47.1	· · 31.9	32°25.8	11.1'	10°13.5	-15.8'	59.1'
16	58°47.2	31.1	46°56.0	11.2'	09°57.8	-15.8'	59.1'
17	73°47.3	30.4	61°26.2	11.3'	09°41.9	-15.9'	59.1'
18	88°47.4	N14°29.6	75°56.5	11.4'	N09°26.1	-15.9'	59.1'
19	103°47.5	28.8	90°26.8	11.5'	09°10.2	-15.9'	59.0'
20	118°47.6	28.1	104°57.3	11.5'	08°54.2	-16.0'	59.0'
21	133°47.7	· · 27.3	119°27.8	11.6'	08°38.3	-16.0'	59.0'
22	148°47.9	26.5	133°58.4	11.7'	08°22.3	-16.0'	58.9'
23	163°48.0	25.8	148°29.1	11.8'	08°06.3	-16.0'	58.9'
SD = 15.8'			SD = 16.2'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.1	N14°25.0	162°59.9	11.8'	N07°50.3	-16.1'	58.9'
1	193°48.2	24.2	177°30.7	11.9'	07°34.2	-16.1'	58.8'
2	208°48.3	23.5	192°01.7	12.0'	07°18.2	-16.1'	58.8'
3	223°48.4	· · 22.7	206°32.6	12.1'	07°02.1	-16.1'	58.8'
4	238°48.6	21.9	221°03.7	12.1'	06°46.0	-16.1'	58.7'
5	253°48.7	21.1	235°34.8	12.2'	06°29.8	-16.1'	58.7'
6	268°48.8	N14°20.4	250°06.0	12.3'	N06°13.7	-16.2'	58.7'
7	283°48.9	19.6	264°37.3	12.3'	05°57.5	-16.2'	58.7'
8	298°49.0	18.8	279°08.6	12.4'	05°41.4	-16.2'	58.6'
9	313°49.1	· · 18.1	293°40.0	12.5'	05°25.2	-16.2'	58.6'
10	328°49.3	17.3	308°11.5	12.5'	05°09.0	-16.2'	58.6'
11	343°49.4	16.5	322°43.0	12.6'	04°52.8	-16.2'	58.5'
12	358°49.5	N14°15.7	337°14.6	12.6'	N04°36.7	-16.2'	58.5'
13	13°49.6	15.0	351°46.2	12.7'	04°20.5	-16.2'	58.5'
14	28°49.7	14.2	6°17.9	12.8'	04°04.3	-16.2'	58.4'
15	43°49.8	· · 13.4	20°49.7	12.8'	03°48.1	-16.2'	58.4'
16	58°50.0	12.6	35°21.5	12.9'	03°31.9	-16.2'	58.4'
17	73°50.1	11.9	49°53.4	12.9'	03°15.7	-16.2'	58.3'
18	88°50.2	N14°11.1	64°25.3	13.0'	N02°59.5	-16.2'	58.3'
19	103°50.3	10.3	78°57.3	13.0'	02°43.3	-16.2'	58.3'
20	118°50.4	09.5	93°29.3	13.1'	02°27.1	-16.2'	58.2'
21	133°50.6	· · 08.8	108°01.4	13.1'	02°11.0	-16.2'	58.2'
22	148°50.7	08.0	122°33.5	13.2'	01°54.8	-16.1'	58.2'
23	163°50.8	07.2	137°05.7	13.2'	01°38.7	-16.1'	58.1'
SD = 15.8'			SD = 16.1'				

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

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

Day	Sun		Mer.	Moon		Age
	Eqn.of Time	12 ^h	Pass	Mer.Pass.	Lower	0-2
	00 ^h	mm:ss	hh:mm	Upper	hh:mm	1-2%
12	05:09	05:04	12:05	11:54	—:—	
13	04:58	04:53	12:05	12:46	00:20	
14	04:48	04:42	12:05	13:34	01:10	

August 15, 16, 17 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	323°25.2	136°32.3	S04°28.3	230°47.4	N23°42.1	190°47.2	N18°12.5	309°07.5	N03°18.3	Alpheratz	357°33.1 29°14.3
1	338°27.6	151°32.6	29.5	245°48.1	42.1	205°49.1	12.3	324°10.0	18.3	Ankaa	353°05.5 -42°09.4
2	353°30.1	166°33.0	30.7	260°48.7	42.2	220°51.0	12.2	339°12.5	18.3	Schedar	349°29.1 56°40.9
3	8°32.6	181°33.3	· · 31.9	275°49.4	· · 42.2	235°52.9	· · 12.0	354°15.1	· · 18.2	Diphda	348°45.7 -17°50.2
4	23°35.0	196°33.7	33.1	290°50.1	42.2	250°54.8	11.9	9°17.6	18.2	Achernar	335°18.9 -57°05.7
5	38°37.5	211°34.1	34.3	305°50.7	42.2	265°56.7	11.7	24°20.1	18.1	Hamal	327°49.6 23°35.3
6	53°40.0	226°34.4	S04°35.5	320°51.4	N23°42.2	280°58.6	N18°11.6	39°22.7	N03°18.1	Polaris	313°18.2 89°22.3
7	68°42.4	241°34.8	36.7	335°52.1	42.2	296°00.5	11.5	54°25.2	18.0	Acamar	315°10.7 -40°11.5
8	83°44.9	256°35.1	37.9	350°52.7	42.2	311°02.4	11.3	69°27.7	18.0	Menkar	314°04.7 4°11.8
9	98°47.4	271°35.5	· · 39.0	5°53.4	· · 42.2	326°04.3	· · 11.2	84°30.3	· · 18.0	Mirfak	308°26.3 49°57.2
10	113°49.8	286°35.9	40.2	20°54.1	42.2	341°06.3	11.0	99°32.8	17.9	Aldebaran	290°38.2 16°33.8
11	128°52.3	301°36.2	41.4	35°54.7	42.2	356°08.2	10.9	114°35.3	17.9	Rigel	281°02.7 -8°10.1
12	143°54.7	316°36.6	S04°42.6	50°55.4	N23°42.2	11°10.1	N18°10.7	129°37.9	N03°17.8	Capella	280°20.1 46°01.3
13	158°57.2	331°37.0	43.8	65°56.1	42.2	26°12.0	10.6	144°40.4	17.8	Bellatrix	278°21.6 6°22.5
14	173°59.7	346°37.3	45.0	80°56.8	42.2	41°13.9	10.4	159°43.0	17.8	Elnath	278°00.4 28°37.7
15	189°02.1	1°37.7	· · 46.2	95°57.4	· · 42.2	56°15.8	· · 10.3	174°45.5	· · 17.7	Alnilam	275°36.5 -1°11.0
16	204°04.6	16°38.1	47.4	110°58.1	42.2	71°17.7	10.2	189°48.0	17.7	Betelgeuse	270°50.8 7°24.8
17	219°07.1	31°38.5	48.6	125°58.8	42.2	86°19.6	10.0	204°50.6	17.6	Canopus	263°52.2 -52°42.3
18	234°09.5	46°38.8	S04°49.8	140°59.4	N23°42.2	101°21.5	N18°09.9	219°53.1	N03°17.6	Sirius	258°25.3 -16°45.0
19	249°12.0	61°39.2	51.0	156°00.1	42.2	116°23.4	09.7	234°55.6	17.6	Adhara	255°05.1 -29°00.3
20	264°14.5	76°39.6	52.2	171°00.8	42.2	131°25.3	09.6	249°58.2	17.5	Procyon	244°49.7 5°09.5
21	279°16.9	91°39.9	· · 53.4	186°01.4	· · 42.2	146°27.3	· · 09.4	265°00.7	· · 17.5	Pollux	243°16.0 27°57.7
22	294°19.4	106°40.3	54.5	201°02.1	42.2	161°29.2	09.3	280°03.2	17.4	Avior	234°14.8 -59°35.5
23	309°21.8	121°40.7	55.7	216°02.8	42.2	176°31.1	09.2	295°05.8	17.4	Suhail	222°45.8 -43°32.3
Mer.pass. 02:26		ν 0.4' d 1.2' m -4.42		ν 0.7' d 0.0' m 1.28		ν 1.9' d -0.1' m -1.79		ν 2.5' d -0.0' m 0.56		Miaplacidus	221°39.0 -69°49.5
										Alphard	217°46.8 -8°46.4
										Regulus	207°33.3 11°50.3
										Dubhe	193°40.0 61°36.6
										Denebola	182°23.9 14°25.5
										Gienah	175°42.5 -17°41.4
										Acrux	172°59.1 -63°15.0
										Gacrux	171°50.6 -57°15.9
										Alioth	166°12.1 55°49.1
										Spica	158°21.0 -11°18.0
										Alkaid	152°51.1 49°11.0
										Hadar	148°34.3 -60°30.3
										Menkent	147°56.2 -36°30.2
										Arcturus	145°46.8 19°02.8
										Rigil Kent.	139°38.6 -60°57.0
										Kochab	137°20.0 74°03.0
										Zuben'ubi	136°54.6 -16°09.2
										Alphecca	126°02.6 26°37.7
										Antares	112°14.1 -26°29.5
										Atria	107°06.9 -69°04.7
										Sabik	102°01.1 -15°45.5
										Shaula	96°08.3 -37°07.4
										Rasalhague	95°57.1 12°32.6
										Eltanin	90°41.2 51°29.3
										Kaus Aust.	83°30.5 -34°22.3
										Vega	80°32.0 38°48.7
										Nunki	75°45.8 -26°15.8
										Altair	61°58.4 8°56.5
										Peacock	53°03.0 -56°38.9
										Deneb	49°24.4 45°22.6
										Enif	33°37.2 10°00.0
										Al Na'ir	27°30.8 -46°49.7
										Fomalhaut	15°12.7 -29°28.7
										Scheat	13°43.6 28°13.7
										Markab	13°28.3 15°21.0
										Aug 15 Sat	SHA Mer.pass
										Venus	173°07.1 14:53
										Mars	267°22.2 08:36
										Jupiter	227°22.0 11:15
										Saturn	345°42.3 03:23
										Aug 16 Sun	SHA Mer.pass
										Venus	172°16.7 14:53
										Mars	266°39.1 08:35
										Jupiter	227°08.7 11:12
										Saturn	345°44.0 03:19
										Aug 17 Mon	SHA Mer.pass
										Venus	171°26.8 14:52
										Mars	265°56.1 08:34
										Jupiter	226°55.4 11:09
										Saturn	345°45.8 03:15
										Horizontal parallax	
										Venus:	0.2
										Mars:	0.1

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.9	N14°06.4	151°37.9	13.3'	N01°22.5	-16.1'	58.1'
1	193°51.0	05.6	166°10.1	13.3'	01°06.4	-16.1'	58.1'
2	208°51.2	04.9	180°42.4	13.3'	00°50.3	-16.1'	58.0'
3	223°51.3	· · 04.1	195°14.8	13.4'	00°34.2	-16.1'	58.0'
4	238°51.4	03.3	209°47.2	13.4'	00°18.2	-16.1'	57.9'
5	253°51.5	02.5	224°19.6	13.5'	N00°02.1	-16.0'	57.9'
6	268°51.6	N14°01.7	238°52.1	13.5'	S00°13.9	16.0'	57.9'
7	283°51.8	01.0	253°24.6	13.5'	00°29.9	16.0'	57.8'
8	298°51.9	14°00.2	267°57.1	13.6'	00°45.9	16.0'	57.8'
9	313°52.0	13°59.4	282°29.7	13.6'	01°01.9	15.9'	57.8'
10	328°52.1	58.6	297°02.3	13.6'	01°17.8	15.9'	57.7'
11	343°52.3	57.8	311°34.9	13.7'	01°33.7	15.9'	57.7'
12	358°52.4	N13°57.1	326°07.6	13.7'	S01°49.6	15.9'	57.7'
13	13°52.5	56.3	340°40.3	13.7'	02°05.5	15.8'	57.6'
14	28°52.6	55.5	355°13.0	13.8'	02°21.3	15.8'	57.6'
15	43°52.8	· · 54.7	9°45.8	13.8'	02°37.1	15.8'	57.6'
16	58°52.9	53.9	24°18.5	13.8'	02°52.9	15.7'	57.5'
17	73°53.0	53.1	38°51.3	13.8'	03°08.6	15.7'	57.5'
18	88°53.1	N13°52.3	53°24.2	13.8'	S03°24.3	15.7'	57.5'
19	103°53.3	51.6	67°57.0	13.9'	03°39.9	15.6'	57.4'
20	118°53.4	50.8	82°29.9	13.9'	03°55.6	15.6'	57.4'
21	133°53.5	· · 50.0	97°02.8	13.9'	04°11.2	15.5'	57.4'
22	148°53.6	49.2	111°35.7	13.9'	04°26.7	15.5'	57.3'
23	163°53.8	48.4	126°08.6	13.9'	04°42.2	15.5'	57.3'
SD = 15.8'			SD = 15.8'				
$d = -0.8'$							

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.9	N13°47.6	140°41.6	14.0'	S04°57.7	15.4'	57.2'
1	193°54.0	46.8	155°14.5	14.0'	05°13.1	15.4'	57.2'
2	208°54.1	46.0	169°47.5	14.0'	05°28.5	15.3'	57.2'
3	223°54.3	· · 45.3	184°20.5	14.0'	05°43.8	15.3'	57.1'
4	238°54.4	44.5	198°53.5	14.0'	05°59.1	15.2'	57.1'
5	253°54.5	43.7	213°26.5	14.0'	06°14.4	15.2'	57.1'
6	268°54.6	N13°42.9	227°59.5	14.0'	S06°29.6	15.2'	57.0'
7	283°54.8	42.1	242°32.5	14.0'	06°44.7	15.1'	57.0'
8	298°54.9	41.3	257°05.6	14.0'	06°59.8	15.1'	57.0'
9	313°55.0	· · 40.5	271°38.6	14.0'	07°14.9	15.0'	56.9'
10	328°55.2	39.7	286°11.7	14.1'	07°29.9	15.0'	56.9'
11	343°55.3	38.9	300°44.7	14.1'	07°44.8	14.9'	56.9'
12	358°55.4	N13°38.1	315°17.8	14.1'	S07°59.7	14.8'	56.8'
13	13°55.5	37.3	329°50.8	14.1'	08°14.6	14.8'	56.8'
14	28°55.7	36.6	344°23.9	14.1'	08°29.3	14.7'	56.8'
15	43°55.8	· · 35.8	358°56.9	14.1'	08°44.1	14.7'	56.7'
16	58°55.9	35.0	13°30.0	14.1'	08°58.8	14.6'	56.7'
17	73°56.1	34.2	28°03.1	14.1'	09°13.4	14.6'	56.7'
18	88°56.2	N13°33.4	42°36.1	14.0'	S09°27.9	14.5'	56.6'
19	103°56.3	32.6	57°09.2	14.0'	09°42.4	14.4'	56.6'
20	118°56.5	31.8	71°42.2	14.0'	09°56.9	14.4'	56.6'
21	133°56.6	· · 31.0	86°15.2	14.0'	10°11.3	14.3'	56.5'
22	148°56.7	30.2	100°48.3	14.0'	10°25.6	14.3'	56.5'
23	163°56.9	29.4	115°21.3	14.0'	10°39.8	14.2'	56.5'
SD = 15.8'			SD = 15.6'				
$d = -0.8'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.0	N13°28.6	129°54.3	14.0'	S10°54.0	14.1'	56.4'
1	193°57.1	27.8	144°27.3	14.0'	11°08.2	14.1'	56.4'
2	208°57.2	27.0	159°00.3	14.0'	11°22.2	14.0'	56.4'
3	223°57.4	· · 26.2	173°33.3	14.0'	11°36.2	13.9'	56.3'
4	238°57.5	25.4	188°06.2	14.0'	11°50.1	13.9'	56.3'
5	253°57.6	24.6	202°39.2	13.9'	12°04.0	13.8'	56.3'
6	268°57.8	N13°23.8	217°12.1	13.9'	S12°17.8	13.7'	56.2'
7	283°57.9	23.0	231°45.1	13.9'	12°31.5	13.7'	56.2'
8	298°58.0	22.2	246°18.0	13.9'	12°45.2	13.6'	56.2'
9	313°58.2	· · 21.4	260°50.9	13.9'	12°58.8	13.5'	56.1'
10	328°58.3	20.6	275°23.7	13.9'	13°12.3	13.4'	56.1'
11	343°58.4	19.8	289°56.6	13.8'	13°25.7	13.4'	56.1'
12	358°58.6	N13°19.0	304°29.4	13.8'	S13°39.1	13.3'	56.0'
13	13°58.7	18.2	319°02.2	13.8'	13°52.4	13.2'	56.0'
14	28°58.9	17.4	333°35.0	13.8'	14°05.6	13.1'	56.0'
15	43°59.0	· · 16.6	348°07.8	13.7'	14°18.7	13.1'	55.9'
16	58°59.1	15.8	2°40.5	13.7'	14°31.8	13.0'	55.9'
17	73°59.3	15.0	17°13.2	13.7'	14°44.7	12.9'	55.9'
18	88°59.4	N13°14.2	31°45.9	13.7'	S14°57.7	12.8'	55.9'
19	103°59.5	13.4	46°18.6	13.6'	15°10.5	12.7'	55.8'
20	118°59.7	12.6	60°51.3	13.6'	15°23.2	12.7'	55.8'
21	133°59.8	· · 11.8	75°23.9	13.6'	15°35.9	12.6'	55.8'
22	148°59.9	11.0	89°56.5	13.6'	15°48.5	12.5'	55.7'
23	164°00.1	10.2	104°29.0	13.5'	16°01.0	12.4'	55.7'
SD = 15.8'			SD = 15.4'				
$d = -0.8'$							

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.	Age	
	00 ^h	12 ^h	Pass	Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-5 7-21%
15	04:36	04:30	12:05	14:20	01:57	
16	04:24	04:18	12:04	15:04	02:42	
17	04:12	04:06	12:04	15:49	03:27	

August 18, 19, 20 UT (Tue., Wed., Thu.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	326°22.6	136°59.8	S05°53.8	231°35.8	N23°41.7	193°04.7	N18°02.1	312°10.3	N03°15.3					Alpheratz	357°33.1	29°14.3	
1	341°25.1	152°00.2	55.0	246°36.5	41.6	208°06.6	02.0	327°12.9	15.2					Ankaa	353°05.5	-42°09.4	
2	356°27.5	167°00.6	56.1	261°37.2	41.6	223°08.5	01.8	342°15.4	15.2					Schedar	349°29.1	56°40.9	
3	11°30.0	182°01.0	· · 57.3	276°37.9	· · 41.6	238°10.5	· · 01.7	357°17.9	· · 15.1					Diphda	348°45.7	-17°50.2	
4	26°32.4	197°01.4	58.5	291°38.6	41.6	253°12.4	01.5	12°20.5	15.1					Achernar	335°18.9	-57°05.7	
5	41°34.9	212°01.8	05°59.7	306°39.2	41.6	268°14.3	01.4	27°23.0	15.0					Hamal	327°49.5	23°35.3	
6	56°37.4	227°02.2	S06°00.8	321°39.9	N23°41.5	283°16.2	N18°01.2	42°25.6	N03°15.0					Polaris	313°16.5	89°22.3	
7	71°39.8	242°02.6	02.0	336°40.6	41.5	298°18.1	01.1	57°28.1	14.9					Acamar	315°10.7	-40°11.5	
8	86°42.3	257°03.1	03.2	351°41.3	41.5	313°20.0	00.9	72°30.7	14.9					Menkar	314°04.7	4°11.8	
9	101°44.8	272°03.5	· · 04.4	6°42.0	· · 41.5	328°21.9	· · 00.8	87°33.2	· · 14.9					Mirfak	308°26.3	49°57.2	
10	116°47.2	287°03.9	05.5	21°42.6	41.5	343°23.8	00.7	102°35.8	14.8					Aldebaran	290°38.2	16°33.8	
11	131°49.7	302°04.3	06.7	36°43.3	41.4	358°25.8	00.5	117°38.3	14.8					Rigel	281°02.7	-8°10.1	
12	146°52.2	317°04.7	S06°07.9	51°44.0	N23°41.4	13°27.7	N18°00.4	132°40.9	N03°14.7					Capella	280°20.1	46°01.3	
13	161°54.6	332°05.1	09.1	66°44.7	41.4	28°29.6	00.2	147°43.4	14.7					Bellatrix	278°21.6	6°22.5	
14	176°57.1	347°05.5	10.2	81°45.4	41.4	43°31.5	18°00.1	162°45.9	14.6					Elnath	278°00.3	28°37.7	
15	191°59.6	2°06.0	· · 11.4	96°46.0	· · 41.4	58°33.4	17°59.9	177°48.5	· · 14.6					Alnilam	275°36.5	-1°11.0	
16	207°02.0	17°06.4	12.6	111°46.7	41.3	73°35.3	59.8	192°51.0	14.5					Betelgeuse	270°50.8	7°24.8	
17	222°04.5	32°06.8	13.8	126°47.4	41.3	88°37.2	59.6	207°53.6	14.5					Canopus	263°52.2	-52°42.3	
18	237°06.9	47°07.2	S06°14.9	141°48.1	N23°41.3	103°39.2	N17°59.5	222°56.1	N03°14.4					Sirius	258°25.3	-16°45.0	
19	252°09.4	62°07.6	16.1	156°48.8	41.3	118°41.1	59.4	237°58.7	14.4					Adhara	255°05.1	-29°00.3	
20	267°11.9	77°08.0	17.3	171°49.4	41.2	133°43.0	59.2	253°01.2	14.4					Procyon	244°49.7	5°09.5	
21	282°14.3	92°08.5	· · 18.4	186°50.1	· · 41.2	148°44.9	· · 59.1	268°03.8	· · 14.3					Pollux	243°16.0	27°57.7	
22	297°16.8	107°08.9	19.6	201°50.8	41.2	163°46.8	58.9	283°06.3	14.3					Avior	234°14.8	-59°35.5	
23	312°19.3	122°09.3	20.8	216°51.5	41.2	178°48.7	58.8	298°08.9	14.2					Suhail	222°45.8	-43°32.3	
Mer.pass. 02:14			ν 0.4' d 1.2' m -4.45			ν 0.7' d -0.0' m 1.28			ν 1.9' d -0.1' m -1.79			ν 2.5' d -0.0' m 0.55					

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec								
0	327°21.7	137°09.7	S06°22.0	231°52.2	N23°41.1	193°50.6	N17°58.6	313°11.4	N03°14.2					Denebola	182°23.9	14°25.5	
1	342°24.2	152°10.2	23.1	246°52.9	41.1	208°52.5	58.5	328°14.0	14.1					Gienah	175°42.5	-17°41.4	
2	357°26.7	167°10.6	24.3	261°53.5	41.1	223°54.5	58.3	343°16.5	14.1					Acrux	172°59.1	-63°15.0	
3	12°29.1	182°11.0	· · 25.5	276°54.2	· · 41.0	238°56.4	· · 58.2	358°19.1	· · 14.0					Gacrux	171°50.6	-57°15.9	
4	27°31.6	197°11.4	26.6	291°54.9	41.0	253°58.3	58.1	13°21.6	14.0					Alioth	166°12.2	55°49.1	
5	42°34.0	212°11.9	27.8	306°55.6	41.0	269°00.2	57.9	28°24.2	13.9					Spica	158°21.1	-11°18.0	
6	57°36.5	227°12.3	S06°29.0	321°56.3	N23°41.0	284°02.1	N17°57.8	43°26.7	N03°13.9					Alkaid	152°51.2	49°11.0	
7	72°39.0	242°12.7	30.2	336°57.0	40.9	299°04.0	57.6	58°29.3	13.8					Hadar	148°34.3	-60°30.3	
8	87°41.4	257°13.1	31.3	351°57.6	40.9	314°05.9	57.5	73°31.8	13.8					Menkent	147°56.2	-36°30.2	
9	102°43.9	272°13.6	· · 32.5	6°58.3	· · 40.9	329°07.9	· · 57.3	88°34.4	· · 13.8					Arcturus	145°46.8	19°02.8	
10	117°46.4	287°14.0	33.7	21°59.0	40.8	344°09.8	57.2	103°36.9	13.7					Rigil Kent.	139°38.6	-60°57.0	
11	132°48.8	302°14.4	34.8	36°59.7	40.8	359°11.7	57.0	118°39.5	13.7					Kochab	137°20.1	74°03.0	
12	147°51.3	317°14.9	S06°36.0	52°00.4	N23°40.8	14°13.6	N17°56.9	133°42.0	N03°13.6					Zuben'ubi	136°54.6	-16°09.2	
13	162°53.8	332°15.3	37.2	67°01.1	40.8	29°15.5	56.7	148°44.6	13.6					Alphecca	126°02.6	26°37.7	
14	177°56.2	347°15.7	38.3	82°01.7	40.7	44°17.4	56.6	163°47.1	13.5					Antares	112°14.1	-26°29.5	
15	192°58.7	2°16.2	· · 39.5	97°02.4	· · 40.7	59°19.4	· · 56.5	178°49.7	· · 13.5					Atria	107°06.9	-69°47.1	
16	208°01.2	17°16.6	40.7	112°03.1	40.7	74°21.3	56.3	193°52.2	13.4					Sabik	102°01.1	-15°45.4	
17	223°03.6	32°17.0	41.8	127°03.8	40.6	89°23.2	56.2	208°54.8	13.4					Shaula	96°08.3	-37°07.4	
18	238°06.1	47°17.5	S06°43.0	142°04.5	N23°40.6	104°25.1	N17°56.0	223°57.3	N03°13.3					Rasalhague	95°57.1	12°32.6	
19	253°08.5	62°17.9	44.2	157°05.2	40.6	119°27.0	55.9	238°59.9	13.3					Eltanin	90°41.3	51°29.3	
20	268°11.0	77°18.3	45.3	172°05.9	40.5	134°28.9	55.7	254°02.4	13.2					Kaus Aust.	83°30.5	-34°22.3	
21	283°13.5	92°18.8	· · 46.5	187°06.5	· · 40.5	149°30.8	· · 55.6	269°05.0	· · 13.2					Vega	80°32.0	38°48.7	
22	298°15.9	107°19.2	47.7	202°07.2	40.5	164°32.8	55.4	284°07.5	13.1					Nunki	75°45.8	-26°15.8	
23	313°18.4	122°19.6	48.8	217°07.9	40.4	179°34.7	55.3	299°10.1	13.1					Altair	61°58.4	8°56.5	
Mer.pass. 02:10			ν 0.4' d 1.2' m -4.46			ν 0.7' d -0.0' m 1.28			ν 1.9' d -0.1' m -1.79			ν 2.5' d -0.0' m 0.54					

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec								
0	328°20.9	137°20.1	S06°50.0	232°08.6	N23°40.4	194°36.6	N17°55.2	314°12.6	N03°13.0					Aug 18 Tue	SHA	Mer.pass	
1	343°23.3	152°20.5	51.2	247°09.3	40.4	209°38.5	55.0	329°15.2	13.0					Venus	170°37.2	14:52	
2	358°25.8	167°21.0	52.3	262°10.0	40.3	224°40.4	54.9	344°17.7	13.0					Mars	265°13.3	08:33	
3	13°28.3	182°21.4	· · 53.5	277°10.7	· · 40.3	239°42.3	· · 54.7	359°20.3	· · 12.9					Jupiter	226°42.1	11:06	
4	28°30.7	197°21.8	54.6	292°11.4	40.3	254°44.2	54.6	14°22.8	12.9					Saturn	345°47.7	03:11	
5	43°33.2	212°22.3	55.8	307°12.0	40.2	269°46.2	54.4	29°25.4	12.8								
6	58°35.7	227°22.7	S06°57.0	322°12.7	N23°40.2	284°48.1	N17°54.3	44°27.9	N03°12.8								
7	73°38.1	242°23.2	58.1	337°13.4	40.2	299°50.0	54.1	59°30.5	12.7								
8	88°40.6	257°23.6	06°59.3	352°14.1	40.1	314°51.9	54.0	74°33.1	12.7								
9</																	

h	Sun			Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°00.2	N13°09.4	119°01.6	13.5'	S16°13.4	12.3'	55.7'
1	194°00.4	08.6	133°34.1	13.5'	16°25.7	12.3'	55.6'
2	209°00.5	07.8	148°06.5	13.4'	16°38.0	12.2'	55.6'
3	224°00.6	· · 07.0	162°39.0	13.4'	16°50.2	12.1'	55.6'
4	239°00.8	06.2	177°11.4	13.4'	17°02.2	12.0'	55.6'
5	254°00.9	05.3	191°43.7	13.3'	17°14.2	11.9'	55.5'
6	269°01.0	N13°04.5	206°16.1	13.3'	S17°26.1	11.8'	55.5'
7	284°01.2	03.7	220°48.4	13.3'	17°38.0	11.7'	55.5'
8	299°01.3	02.9	235°20.7	13.2'	17°49.7	11.6'	55.5'
9	314°01.5	· · 02.1	249°52.9	13.2'	18°01.3	11.6'	55.4'
10	329°01.6	01.3	264°25.1	13.2'	18°12.9	11.5'	55.4'
11	344°01.7	13°00.5	278°57.3	13.1'	18°24.3	11.4'	55.4'
12	359°01.9	N12°59.7	293°29.4	13.1'	S18°35.7	11.3'	55.3'
13	14°02.0	58.9	308°01.5	13.1'	18°47.0	11.2'	55.3'
14	29°02.2	58.1	322°33.6	13.0'	18°58.2	11.1'	55.3'
15	44°02.3	· · 57.3	337°05.6	13.0'	19°09.3	11.0'	55.3'
16	59°02.4	56.4	351°37.6	12.9'	19°20.3	10.9'	55.2'
17	74°02.6	55.6	6°09.5	12.9'	19°31.2	10.8'	55.2'
18	89°02.7	N12°54.8	20°41.4	12.9'	S19°42.0	10.7'	55.2'
19	104°02.9	54.0	35°13.3	12.8'	19°52.7	10.6'	55.2'
20	119°03.0	53.2	49°45.1	12.8'	20°03.3	10.5'	55.1'
21	134°03.1	· · 52.4	64°16.9	12.7'	20°13.8	10.4'	55.1'
22	149°03.4	51.6	78°48.6	12.7'	20°24.2	10.3'	55.1'
23	164°03.4	50.8	93°20.3	12.7'	20°34.5	10.2'	55.1'
SD = 15.8'			SD = 15.2'				
$d = -0.8'$							

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°03.6	N12°49.9	107°51.9	12.6'	S20°44.7	10.1'	55.1'
1	194°03.7	49.1	122°23.6	12.6'	20°54.9	10.0'	55.0'
2	209°03.9	48.3	136°55.1	12.5'	21°04.9	9.9'	55.0'
3	224°04.0	· · 47.5	151°26.7	12.5'	21°14.8	9.8'	55.0'
4	239°04.1	46.7	165°58.1	12.4'	21°24.6	9.7'	55.0'
5	254°04.3	45.9	180°29.6	12.4'	21°34.3	9.6'	54.9'
6	269°04.4	N12°45.0	195°01.0	12.4'	S21°43.9	9.5'	54.9'
7	284°04.6	44.2	209°32.3	12.3'	21°53.4	9.4'	54.9'
8	299°04.7	43.4	224°03.6	12.3'	22°02.8	9.3'	54.9'
9	314°04.9	· · 42.6	238°34.9	12.2'	22°12.1	9.2'	54.9'
10	329°05.0	41.8	253°06.1	12.2'	22°21.3	9.1'	54.8'
11	344°05.2	41.0	267°37.3	12.1'	22°30.4	9.0'	54.8'
12	359°05.3	N12°40.1	282°08.4	12.1'	S22°39.3	8.9'	54.8'
13	14°05.4	39.3	296°39.5	12.0'	22°48.2	8.8'	54.8'
14	29°05.6	38.5	311°10.6	12.0'	22°56.9	8.6'	54.8'
15	44°05.7	· · 37.7	325°41.6	12.0'	23°05.6	8.5'	54.7'
16	59°05.9	36.9	340°12.5	11.9'	23°14.1	8.4'	54.7'
17	74°06.0	36.1	354°43.4	11.9'	23°22.5	8.3'	54.7'
18	89°06.2	N12°35.2	9°14.3	11.8'	S23°30.8	8.2'	54.7'
19	104°06.3	34.4	23°45.1	11.8'	23°39.0	8.1'	54.7'
20	119°06.5	33.6	38°15.9	11.7'	23°47.1	8.0'	54.6'
21	134°06.6	· · 32.8	52°46.6	11.7'	23°55.1	7.9'	54.6'
22	149°06.8	31.9	67°17.3	11.6'	24°02.9	7.7'	54.6'
23	164°06.9	31.1	81°48.0	11.6'	24°10.7	7.6'	54.6'
SD = 15.8'			SD = 15.0'				
$d = -0.8'$							

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°07.1	N12°30.3	96°18.6	11.6'	S24°18.3	7.5'	54.6'
1	194°07.2	29.5	110°49.1	11.5'	24°25.8	7.4'	54.6'
2	209°07.4	28.7	125°19.6	11.5'	24°33.2	7.3'	54.5'
3	224°07.5	· · 27.8	139°50.1	11.4'	24°40.5	7.2'	54.5'
4	239°07.7	27.0	154°20.5	11.4'	24°47.7	7.0'	54.5'
5	254°07.8	26.2	168°50.9	11.3'	24°54.7	6.9'	54.5'
6	269°08.0	N12°25.4	183°21.2	11.3'	S25°01.6	6.8'	54.5'
7	284°08.1	24.5	197°51.5	11.3'	25°08.4	6.7'	54.5'
8	299°08.3	23.7	212°21.8	11.2'	25°15.1	6.6'	54.5'
9	314°08.4	· · 22.9	226°52.0	11.2'	25°21.7	6.4'	54.4'
10	329°08.6	22.1	241°22.2	11.1'	25°28.1	6.3'	54.4'
11	344°08.7	21.2	255°52.3	11.1'	25°34.5	6.2'	54.4'
12	359°08.9	N12°20.4	270°22.4	11.0'	S25°40.7	6.1'	54.4'
13	14°09.0	19.6	284°52.4	11.0'	25°46.8	6.0'	54.4'
14	29°09.2	18.8	299°22.4	11.0'	25°52.7	5.8'	54.4'
15	44°09.3	· · 17.9	313°52.4	10.9'	25°58.6	5.7'	54.4'
16	59°09.5	17.1	328°22.3	10.9'	26°04.3	5.6'	54.4'
17	74°09.6	16.3	342°52.2	10.8'	26°09.9	5.5'	54.3'
18	89°09.8	N12°15.4	357°22.0	10.8'	S26°15.3	5.3'	54.3'
19	104°09.9	14.6	11°51.8	10.8'	26°20.7	5.2'	54.3'
20	119°10.1	13.8	26°21.6	10.7'	26°25.9	5.1'	54.3'
21	134°10.2	· · 13.0	40°51.3	10.7'	26°31.0	5.0'	54.3'
22	149°10.4	12.1	55°21.0	10.7'	26°35.9	4.8'	54.3'
23	164°10.5	11.3	69°50.7	10.6'	26°40.8	4.7'	54.3'
SD = 15.8'			SD = 14.9'				
$d = -0.8'$							

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn. of Time	12 ^h		Mer. Pass.		
	00 ^h	mm:ss	hh:mm	Upper	Lower	6-8
		mm:ss		hh:mm	hh:mm	30-49%
18	03:59	03:52	12:04	16:35	04:12	
19	03:46	03:39	12:04	17:22	04:58	
20	03:32	03:25	12:03	18:11	05:46	

August 21, 22, 23 UT (Fri., Sat., Sun.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Fri	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	329°20.0	137°30.8	S07°17.8	232°25.1	N23°39.5	195°22.6	N17°51.7	315°13.9	N03°11.9				Alpheratz	357°33.1	29°14.3		
1	344°22.5	152°31.3	19.0	247°25.8	39.5	210°24.5	51.5	330°16.5	11.8				Ankaa	353°05.5	-42°09.4		
2	359°24.9	167°31.8	20.1	262°26.5	39.4	225°26.4	51.4	345°19.0	11.8				Schedar	349°29.1	56°40.9		
3	14°27.4	182°32.2	· · 21.3	277°27.2	· · 39.4	240°28.3	· · 51.2	0°21.6	· · 11.7				Diphda	348°45.7	-17°50.2		
4	29°29.9	197°32.7	22.5	292°27.9	39.3	255°30.2	51.1	15°24.1	11.7				Achernar	335°18.9	-57°05.7		
5	44°32.3	212°33.1	23.6	307°28.6	39.3	270°32.2	51.0	30°26.7	11.7				Hamal	327°49.5	23°35.3		
6	59°34.8	227°33.6	S07°24.8	322°29.3	N23°39.2	285°34.1	N17°50.8	45°29.3	N03°11.6				Polaris	313°14.7	89°22.3		
7	74°37.3	242°34.1	25.9	337°30.0	39.2	300°36.0	50.7	60°31.8	11.6				Acamar	315°10.7	-40°11.5		
8	89°39.7	257°34.5	27.1	352°30.7	39.2	315°37.9	50.5	75°34.4	11.5				Menkar	314°04.7	4°11.8		
9	104°42.2	272°35.0	· · 28.2	7°31.4	· · 39.1	330°39.8	· · 50.4	90°36.9	· · 11.5				Mirfak	308°26.3	49°57.2		
10	119°44.6	287°35.5	29.4	22°32.1	39.1	345°41.7	50.2	105°39.5	11.4				Aldebaran	290°38.1	16°33.8		
11	134°47.1	302°35.9	30.5	37°32.7	39.0	0°43.7	50.1	120°42.0	11.4				Rigel	281°02.7	-8°10.1		
12	149°49.6	317°36.4	S07°31.7	52°33.4	N23°39.0	15°45.6	N17°49.9	135°44.6	N03°11.3				Capella	280°20.1	46°01.3		
13	164°52.0	332°36.9	32.8	67°34.1	38.9	30°47.5	49.8	150°47.2	11.3				Bellatrix	278°21.6	6°22.5		
14	179°54.5	347°37.3	34.0	82°34.8	38.9	45°49.4	49.6	165°49.7	11.2				Elnath	278°00.3	28°37.7		
15	194°57.0	2°37.8	· · 35.1	97°35.5	· · 38.8	60°51.3	· · 49.5	180°52.3	· · 11.2				Alnilam	275°36.5	-1°11.0		
16	209°59.4	17°38.3	36.3	112°36.2	38.8	75°53.2	49.4	195°54.8	11.1				Betelgeuse	270°50.8	7°24.8		
17	225°01.9	32°38.7	37.4	127°36.9	38.7	90°55.2	49.2	210°57.4	11.1				Canopus	263°52.1	-52°42.3		
18	240°04.4	47°39.2	S07°38.6	142°37.6	N23°38.7	105°57.1	N17°49.1	225°59.9	N03°11.0				Sirius	258°25.3	-16°45.0		
19	255°06.8	62°39.7	39.7	157°38.3	38.6	120°59.0	48.9	241°02.5	11.0				Adhara	255°05.1	-29°00.3		
20	270°09.3	77°40.1	40.9	172°39.0	38.6	136°00.9	48.8	256°05.1	10.9				Procyon	244°49.7	5°09.5		
21	285°11.8	92°40.6	· · 42.0	187°39.7	· · 38.6	151°02.8	· · 48.6	271°07.6	· · 10.9				Pollux	243°16.0	27°57.7		
22	300°14.2	107°41.1	43.2	202°40.4	38.5	166°04.8	48.5	286°10.2	10.8				Avior	234°14.8	-59°35.5		
23	315°16.7	122°41.6	44.3	217°41.1	38.5	181°06.7	48.3	301°12.7	10.8				Suhail	222°45.8	-43°32.3		
Mer.pass. 02:02			ν 0.5' d 1.2' m -4.49			ν 0.7' d -0.0' m 1.27			ν 1.9' d -0.1' m -1.79			ν 2.6' d -0.0' m 0.53					

Sat	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	330°19.1	137°42.0	S07°45.5	232°41.8	N23°38.4	196°08.6	N17°48.2	316°15.3	N03°10.7					
1	345°21.6	152°42.5	46.6	247°42.5	38.4	211°10.5	48.0	331°17.9	10.7					
2	0°24.1	167°43.0	47.8	262°43.2	38.3	226°12.4	47.9	346°20.4	10.6					
3	15°26.5	182°43.5	· · 48.9	277°43.9	· · 38.3	241°14.3	· · 47.8	1°23.0	· · 10.6					
4	30°29.0	197°44.0	50.1	292°44.6	38.2	256°16.3	47.6	16°25.5	10.5					
5	45°31.5	212°44.4	51.2	307°45.2	38.2	271°18.2	47.5	31°28.1	10.5					
6	60°33.9	227°44.9	S07°52.4	322°45.9	N23°38.1	286°20.1	N17°47.3	46°30.7	N03°10.4					
7	75°36.4	242°45.4	53.5	337°46.6	38.1	301°22.0	47.2	61°33.2	10.4					
8	90°38.9	257°45.9	54.7	352°47.3	38.0	316°23.9	47.0	76°35.8	10.3					
9	105°41.3	272°46.4	· · 55.8	7°48.0	· · 37.9	331°25.9	· · 46.9	91°38.3	· · 10.3					
10	120°43.8	287°46.8	57.0	22°48.7	37.9	346°27.8	46.7	106°40.9	10.2					
11	135°46.3	302°47.3	58.1	37°49.4	37.8	1°29.7	46.6	121°43.5	10.2					
12	150°48.7	317°47.8	S07°59.2	52°50.1	N23°37.8	16°31.6	N17°46.4	136°46.0	N03°10.1					
13	165°51.2	332°48.3	08°00.4	67°50.8	37.7	31°33.5	46.3	151°48.6	10.1					
14	180°53.6	347°48.8	01.5	82°51.5	37.7	46°35.5	46.2	166°51.1	10.0					
15	195°56.1	2°49.3	· · 02.7	97°52.2	· · 37.6	61°37.4	· · 46.0	181°53.7	· · 10.0					
16	210°58.6	17°49.8	03.8	112°52.9	37.6	76°39.3	45.9	196°56.3	09.9					
17	226°01.0	32°50.2	05.0	127°53.6	37.5	91°41.2	45.7	211°58.8	09.9					
18	241°03.5	47°50.7	S08°06.1	142°54.3	N23°37.5	106°43.1	N17°45.6	227°01.4	N03°09.8					
19	256°06.0	62°51.2	07.2	157°55.0	37.4	121°45.1	45.4	242°03.9	09.7					
20	271°08.4	77°51.7	08.4	172°55.7	37.4	136°47.0	45.3	257°06.5	09.7					
21	286°10.9	92°52.2	· · 09.5	187°56.4	· · 37.3	151°48.9	· · 45.1	272°09.1	· · 09.6					
22	301°13.4	107°52.7	10.7	202°57.1	37.2	166°50.8	45.0	287°11.6	09.6					
23	316°15.8	122°53.2	11.8	217°57.8	37.2	181°52.7	44.8	302°14.2	09.5					
Mer.pass. 01:58			ν 0.5' d 1.1' m -4.50			ν 0.7' d -0.0' m 1.27			ν 1.9' d -0.1' m -1.79			ν 2.6' d -0.1' m 0.53		

Sun	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	331°18.3	137°53.7	S08°12.9	232°58.5	N23°37.1	196°54.7	N17°44.7	317°16.8	N03°09.5					
1	346°20.7	152°54.2	14.1	247°59.2	37.1	211°56.6	44.6	332°19.3	09.4					
2	1°23.2	167°54.7	15.2	262°59.9	37.0	226°58.5	44.4	347°21.9	09.4					
3	16°25.7	182°55.2	· · 16.4	278°00.6	· · 37.0	242°00.4	· · 44.3	2°24.4	· · 09.3					
4	31°28.1	197°55.7	17.5	293°01.3	36.9	257°02.3	44.1	17°27.0	09.3					
5	46°30.6	212°56.2	18.6	308°02.0	36.8	272°04.3	44.0	32°29.6	09.2					
6	61°33.1	227°56.7	S08°19.8	323°02.7	N23°36.8	287°06.2	N17°43.8	47°32.1	N03°09.2					
7	76°35.5	242°57.2	20.9	338°03.4	36.7	302°08.1	43.7	62°34.7	09.1					
8	91°38.0	257°57.7	22.0	353°04.1	36.7	317°10.0	43.5	77°37.3	09.1					
9	106°40.5	272°58.2	· · 23.2	8°04.8	· · 36.6	332°11.9	· · 43.4	92°39.8	· · 09.0					
10	121°42.9	287°58.7	24.3	23°05.5	36.5	347°13.9	43.2	107°42.4	09.0					
11	136°45.4	302°59.2	25.4	38°06.2	36.5	2°15.8	43.1	122°44.9	08.9					
12	151°47.9	317°59.7	S08°26.6	53°06.9	N23°36.4	17°17.7	N17°43.0	137°47.5	N03°08.9					
13	166°50.3	333°00.2	27.7	68°07.6	36.4	32°19.6	42.8	152°50.1	08.8					
14	181°52.8	348°00.7	28.9	83°08.3	36.3	47°21.5	42.7	167°52.6	08.8					
15	196°55.2	3°01.2	· · 30.0	98°09.0	· · 36.2	62°23.5	· · 42.5	182°55.2	· · 08.7					
16	211°57.7	18°01.7	31.1	113°09.7	36.2	77°25.4	42.4	197°57.8	08.7					
17	227°00.2	33°02.2	32.3	128°10.4	36.1	92°27.3	42.2	213°00.3	08.6					
18	242°02.6	48°02.7	S08°33.4	143°11.1	N23°36.1	107°29.2	N17°42.1	228°02.9	N03°08.6					
19	257°05.1	63°03.2	34.5	158°11.8	36.0	122°31.1	41.9	243°05.5	08.5					
20	272°07.6	78°03.7	35.7	173°12.5	35.9	137°33.1	41.8	258°08.0	08.5					
21	287°10.0	93°04.2	· · 36.8	188°13.2	· · 35.9	152°35.0	· · 41.6	273°10.6	· · 08.4					
22	302°12.5	108°04.7	37.9	203°13.9	35.8	167°36.9	41.5	288°13.2	08.4					
23	317°15.0	123°05.3	39.0	218°14.6	35.7	182°38.8	41.4	303°15.7	08.3					
Mer.pass. 01:54			ν 0.5' d 1.1' m -4.51			ν 0.7' d -0.1' m 1.27			ν 1.9' d -0.1' m -1.79			ν 2.6' d -0.1' m 0.52		

Aug 21 Fri	SHA	Mer.pass
Venus	168°10.8	14:49
Mars	263°05.1	08:30
Jupiter	226°02.6	10:57
Saturn	345°53.9	02:59

Aug 22 Sat	SHA	Mer.pass
Venus	167°22.9	14:49
Mars	262°22.6	08:29
Jupiter	225°49.4	10:54
Saturn	345°56.2	02:54

Aug 23 Sun	SHA	Mer.pass
Venus	166°35.4	14:48
Mars	261°40.2	08:28
Jupiter	225°36.4	10:51
Saturn	345°58.5	02:50

Horizontal parallax		
Venus:	0.2	
Mars:	0.1	

h	Sun			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°10.7	N12°10.5	84°20.3	10.6'	S26°45.5	4.6'	54.3'
1	194°10.8	09.6	98°49.9	10.6'	26°50.1	4.5'	54.3'
2	209°11.0	08.8	113°19.5	10.5'	26°54.5	4.3'	54.2'
3	224°11.1	· · 08.0	127°49.0	10.5'	26°58.8	4.2'	54.2'
4	239°11.3	07.1	142°18.5	10.5'	27°03.0	4.1'	54.2'
5	254°11.4	06.3	156°48.0	10.4'	27°07.1	3.9'	54.2'
6	269°11.6	N12°05.5	171°17.4	10.4'	S27°11.0	3.8'	54.2'
7	284°11.8	04.6	185°46.8	10.4'	27°14.8	3.7'	54.2'
8	299°11.9	03.8	200°16.2	10.3'	27°18.5	3.5'	54.2'
9	314°12.1	· · 03.0	214°45.5	10.3'	27°22.0	3.4'	54.2'
10	329°12.2	02.1	229°14.8	10.3'	27°25.5	3.3'	54.2'
11	344°12.4	01.3	243°44.1	10.3'	27°28.7	3.2'	54.2'
12	359°12.5	N12°00.5	258°13.4	10.2'	S27°31.9	3.0'	54.2'
13	14°12.7	11°59.6	272°42.6	10.2'	27°34.9	2.9'	54.2'
14	29°12.8	58.8	287°11.8	10.2'	27°37.8	2.8'	54.2'
15	44°13.0	· · 58.0	301°41.0	10.2'	27°40.5	2.6'	54.2'
16	59°13.2	57.1	316°10.2	10.1'	27°43.2	2.5'	54.2'
17	74°13.3	56.3	330°39.3	10.1'	27°45.7	2.4'	54.2'
18	89°13.5	N11°55.5	345°08.4	10.1'	S27°48.0	2.2'	54.1'
19	104°13.6	54.6	359°37.5	10.1'	27°50.2	2.1'	54.1'
20	119°13.8	53.8	14°06.6	10.1'	27°52.3	2.0'	54.1'
21	134°13.9	· · 53.0	28°35.7	10.0'	27°54.3	1.8'	54.1'
22	149°14.1	52.1	43°04.7	10.0'	27°56.1	1.7'	54.1'
23	164°14.3	51.3	57°33.8	10.0'	27°57.8	1.5'	54.1'
SD = 15.8'			SD = 14.8'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.4	N11°50.4	72°02.8	10.0'	S27°59.3	1.4'	54.1'
1	194°14.6	49.6	86°31.8	10.0'	28°00.7	1.3'	54.1'
2	209°14.7	48.8	101°00.8	10.0'	28°02.0	1.1'	54.1'
3	224°14.9	· · 47.9	115°29.7	10.0'	28°03.1	1.0'	54.1'
4	239°15.0	47.1	129°58.7	10.0'	28°04.2	0.9'	54.1'
5	254°15.2	46.2	144°27.7	9.9'	28°05.0	0.7'	54.1'
6	269°15.4	N11°45.4	158°56.6	9.9'	S28°05.8	0.6'	54.1'
7	284°15.5	44.6	173°25.5	9.9'	28°06.4	0.5'	54.1'
8	299°15.7	43.7	187°54.5	9.9'	28°06.8	0.3'	54.1'
9	314°15.8	· · 42.9	202°23.4	9.9'	28°07.2	0.2'	54.1'
10	329°16.0	42.0	216°52.3	9.9'	28°07.3	0.1'	54.1'
11	344°16.2	41.2	231°21.2	9.9'	28°07.4	-0.1'	54.1'
12	359°16.3	N11°40.4	245°50.1	9.9'	S28°07.3	-0.2'	54.1'
13	14°16.5	39.5	260°19.1	9.9'	28°07.1	-0.4'	54.1'
14	29°16.6	38.7	274°48.0	9.9'	28°06.7	-0.5'	54.1'
15	44°16.8	· · 37.8	289°16.9	9.9'	28°06.3	-0.6'	54.1'
16	59°17.0	37.0	303°45.8	9.9'	28°05.6	-0.8'	54.1'
17	74°17.1	36.1	318°14.7	9.9'	28°04.9	-0.9'	54.1'
18	89°17.3	N11°35.3	332°43.6	9.9'	S28°04.0	-1.0'	54.1'
19	104°17.4	34.5	347°12.5	9.9'	28°02.9	-1.2'	54.1'
20	119°17.6	33.6	1°41.5	9.9'	28°01.8	-1.3'	54.1'
21	134°17.8	· · 32.8	16°10.4	9.9'	28°00.5	-1.4'	54.1'
22	149°17.9	31.9	30°39.3	9.9'	27°59.0	-1.6'	54.1'
23	164°18.1	31.1	45°08.3	10.0'	27°57.5	-1.7'	54.1'
SD = 15.8'			SD = 14.8'				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°18.3	N11°30.2	59°37.2	10.0'	S27°55.7	-1.8'	54.2'
1	194°18.4	29.4	74°06.2	10.0'	27°53.9	-2.0'	54.2'
2	209°18.6	28.5	88°35.2	10.0'	27°51.9	-2.1'	54.2'
3	224°18.7	· · 27.7	103°04.2	10.0'	27°49.8	-2.3'	54.2'
4	239°18.9	26.8	117°33.2	10.0'	27°47.5	-2.4'	54.2'
5	254°19.1	26.0	132°02.2	10.0'	27°45.1	-2.5'	54.2'
6	269°19.2	N11°25.2	146°31.2	10.1'	S27°42.6	-2.7'	54.2'
7	284°19.4	24.3	161°00.3	10.1'	27°40.0	-2.8'	54.2'
8	299°19.6	23.5	175°29.3	10.1'	27°37.2	-2.9'	54.2'
9	314°19.7	· · 22.6	189°58.4	10.1'	27°34.2	-3.1'	54.2'
10	329°19.9	21.8	204°27.5	10.1'	27°31.2	-3.2'	54.2'
11	344°20.1	20.9	218°56.7	10.2'	27°28.0	-3.3'	54.2'
12	359°20.2	N11°20.1	233°25.8	10.2'	S27°24.7	-3.5'	54.2'
13	14°20.4	19.2	247°55.0	10.2'	27°21.2	-3.6'	54.2'
14	29°20.6	18.4	262°24.2	10.2'	27°17.6	-3.7'	54.2'
15	44°20.7	· · 17.5	276°53.4	10.2'	27°13.9	-3.9'	54.2'
16	59°20.9	16.7	291°22.7	10.3'	27°10.0	-4.0'	54.3'
17	74°21.1	15.8	305°51.9	10.3'	27°06.0	-4.1'	54.3'
18	89°21.2	N11°15.0	320°21.2	10.3'	S27°01.9	-4.3'	54.3'
19	104°21.4	14.1	334°50.6	10.4'	26°57.7	-4.4'	54.3'
20	119°21.6	13.3	349°19.9	10.4'	26°53.3	-4.5'	54.3'
21	134°21.7	· · 12.4	3°49.3	10.4'	26°48.8	-4.6'	54.3'
22	149°21.9	11.6	18°18.7	10.4'	26°44.1	-4.8'	54.3'
23	164°22.1	10.7	32°48.2	10.5'	26°39.4	-4.9'	54.3'
SD = 15.8'			SD = 14.8'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 9-11 59-76%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
21	03:17	03:10	12:03	19:02	06:36	
22	03:02	02:55	12:03	19:53	07:27	
23	02:47	02:39	12:03	20:44	08:19	

August 24, 25, 26 UT (Mon., Tue., Wed.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	332°17.4	138°05.8	S08°40.2	233°15.3	N23°35.7	197°40.8	N17°41.2	318°18.3	N03°08.2					Alpheratz	357°33.1	29°14.3	
1	347°19.9	153°06.3	41.3	248°16.0	35.6	212°42.7	41.1	333°20.9	08.2					Ankaa	353°05.5	-42°09.4	
2	2°22.4	168°06.8	42.4	263°16.8	35.5	227°44.6	40.9	348°23.4	08.1					Schedar	349°29.0	56°41.0	
3	17°24.8	183°07.3	· · 43.6	278°17.5	· · 35.5	242°46.5	· · 40.8	3°26.0	· · 08.1					Diphda	348°45.7	-17°50.2	
4	32°27.3	198°07.8	44.7	293°18.2	35.4	257°48.4	40.6	18°28.6	08.0					Achernar	335°18.8	-57°05.7	
5	47°29.7	213°08.4	45.8	308°18.9	35.4	272°50.4	40.5	33°31.1	08.0					Hamal	327°49.5	23°35.4	
6	62°32.2	228°08.9	S08°47.0	323°19.6	N23°35.3	287°52.3	N17°40.3	48°33.7	N03°07.9					Polaris	313°13.0	89°22.3	
7	77°34.7	243°09.4	48.1	338°20.3	35.2	302°54.2	40.2	63°36.3	07.9					Acamar	315°10.6	-40°11.5	
8	92°37.1	258°09.9	49.2	353°21.0	35.2	317°56.1	40.0	78°38.8	07.8					Menkar	314°04.6	4°11.8	
9	107°39.6	273°10.4	· · 50.3	8°21.7	· · 35.1	332°58.0	· · 39.9	93°41.4	· · 07.8					Mirfak	308°26.2	49°57.2	
10	122°42.1	288°11.0	51.5	23°22.4	35.0	348°00.0	39.8	108°44.0	07.7					Aldebaran	290°38.1	16°33.8	
11	137°44.5	303°11.5	52.6	38°23.1	35.0	3°01.9	39.6	123°46.5	07.7					Rigel	281°02.7	-8°10.1	
12	152°47.0	318°12.0	S08°53.7	53°23.8	N23°34.9	18°03.8	N17°39.5	138°49.1	N03°07.6					Capella	280°20.0	46°01.3	
13	167°49.5	333°12.5	54.8	68°24.5	34.8	33°05.7	39.3	153°51.7	07.6					Bellatrix	278°21.5	6°22.5	
14	182°51.9	348°13.0	56.0	83°25.2	34.7	48°07.7	39.2	168°54.2	07.5					Elnath	278°00.3	28°37.7	
15	197°54.4	3°13.6	· · 57.1	98°25.9	· · 34.7	63°09.6	· · 39.0	183°56.8	· · 07.5					Alnilam	275°36.5	-1°11.0	
16	212°56.9	18°14.1	58.2	113°26.6	34.6	78°11.5	38.9	198°59.4	07.4					Betelgeuse	270°50.8	7°24.8	
17	227°59.3	33°14.6	08°59.3	128°27.3	34.5	93°13.4	38.7	214°01.9	07.3					Canopus	263°52.1	-52°42.3	
18	243°01.8	48°15.2	S09°00.5	143°28.0	N23°34.5	108°15.3	N17°38.6	229°04.5	N03°07.3					Sirius	258°25.3	-16°45.0	
19	258°04.2	63°15.7	01.6	158°28.8	34.4	123°17.3	38.4	244°07.1	07.2					Adhara	255°05.1	-29°00.3	
20	273°06.7	78°16.2	02.7	173°29.5	34.3	138°19.2	38.3	259°09.6	07.2					Procyon	244°49.7	5°09.5	
21	288°09.2	93°16.7	· · 03.8	188°30.2	· · 34.3	153°21.1	· · 38.1	274°12.2	· · 07.1					Pollux	243°15.9	27°57.7	
22	303°11.6	108°17.3	04.9	203°30.9	34.2	168°23.0	38.0	289°14.8	07.1					Avior	234°14.8	-59°35.5	
23	318°14.1	123°17.8	06.1	218°31.6	34.1	183°25.0	37.9	304°17.3	07.0					Suhail	222°45.7	-43°32.3	
Mer.pass. 01:51			ν 0.5' d 1.1' m -4.52	ν 0.7' d -0.1' m 1.26	ν 1.9' d -0.1' m -1.79	ν 2.6' d -0.1' m 0.52											

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	333°16.6	138°18.3	S09°07.2	233°32.3	N23°34.0	198°26.9	N17°37.7	319°19.9	N03°07.0				
1	348°19.0	153°18.9	08.3	248°33.0	34.0	213°28.8	37.6	334°22.5	06.9				
2	3°21.5	168°19.4	09.4	263°33.7	33.9	228°30.7	37.4	349°25.0	06.9				
3	18°24.0	183°19.9	· · 10.5	278°34.4	· · 33.8	243°32.7	· · 37.3	4°27.6	· · 06.8				
4	33°26.4	198°20.5	11.7	293°35.1	33.8	258°34.6	37.1	19°30.2	06.8				
5	48°28.9	213°21.0	12.8	308°35.8	33.7	273°36.5	37.0	34°32.7	06.7				
6	63°31.3	228°21.6	S09°13.9	323°36.5	N23°33.6	288°38.4	N17°36.8	49°35.3	N03°06.6				
7	78°33.8	243°22.1	15.0	338°37.3	33.5	303°40.4	36.7	64°37.9	06.6				
8	93°36.3	258°22.6	16.1	353°38.0	33.5	318°42.3	36.5	79°40.5	06.5				
9	108°38.7	273°23.2	· · 17.3	8°38.7	· · 33.4	333°44.2	· · 36.4	94°43.0	· · 06.5				
10	123°41.2	288°23.7	18.4	23°39.4	33.3	348°46.1	36.3	109°45.6	06.4				
11	138°43.7	303°24.3	19.5	38°40.1	33.2	3°48.0	36.1	124°48.2	06.4				
12	153°46.1	318°24.8	S09°20.6	53°40.8	N23°33.2	18°50.0	N17°36.0	139°50.7	N03°06.3				
13	168°48.6	333°25.4	21.7	68°41.5	33.1	33°51.9	35.8	154°53.3	06.3				
14	183°51.1	348°25.9	22.8	83°42.2	33.0	48°53.8	35.7	169°55.9	06.2				
15	198°53.5	3°26.4	· · 24.0	98°42.9	· · 32.9	63°55.7	· · 35.5	184°58.5	· · 06.2				
16	213°56.0	18°27.0	25.1	113°43.7	32.9	78°57.7	35.4	200°01.0	06.1				
17	228°58.5	33°27.5	26.2	128°44.4	32.8	93°59.6	35.2	215°03.6	06.0				
18	244°00.9	48°28.1	S09°27.3	143°45.1	N23°32.7	109°01.5	N17°35.1	230°06.2	N03°06.0				
19	259°03.4	63°28.6	28.4	158°45.8	32.6	124°03.4	34.9	245°08.7	05.9				
20	274°05.8	78°29.2	29.5	173°46.5	32.5	139°05.4	34.8	260°11.3	05.9				
21	289°08.3	93°29.7	· · 30.6	188°47.2	· · 32.5	154°07.3	· · 34.6	275°13.9	· · 05.8				
22	304°10.8	108°30.3	31.7	203°47.9	32.4	169°09.2	34.5	290°16.5	05.8				
23	319°13.2	123°30.8	32.9	218°48.6	32.3	184°11.1	34.4	305°19.0	05.7				
Mer.pass. 01:47			ν 0.5' d 1.1' m -4.53	ν 0.7' d -0.1' m 1.26	ν 1.9' d -0.1' m -1.80	ν 2.6' d -0.1' m 0.51							

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	334°15.7	138°31.4	S09°34.0	233°49.4	N23°32.2	199°13.1	N17°34.2	320°21.6	N03°05.7				
1	349°18.2	153°32.0	35.1	248°50.1	32.2	214°15.0	34.1	335°24.2	05.6				
2	4°20.6	168°32.5	36.2	263°50.8	32.1	229°16.9	33.9	350°26.7	05.6				
3	19°23.1	183°33.1	· · 37.3	278°51.5	· · 32.0	244°18.8	· · 33.8	5°29.3	· · 05.5				
4	34°25.6	198°33.6	38.4	293°52.2	31.9	259°20.8	33.6	20°31.9	05.4				
5	49°28.0	213°34.2	39.5	308°52.9	31.8	274°22.7	33.5	35°34.5	05.4				
6	64°30.5	228°34.7	S09°40.6	323°53.6	N23°31.8	289°24.6	N17°33.3	50°37.0	N03°05.3				
7	79°33.0	243°35.3	41.7	338°54.3	31.7	304°26.5	33.2	65°39.6	05.3				
8	94°35.4	258°35.9	42.8	353°55.1	31.6	319°28.5	33.0	80°42.2	05.2				
9	109°37.9	273°36.4	· · 43.9	8°55.8	· · 31.5	334°30.4	· · 32.9	95°44.8	· · 05.2				
10	124°40.3	288°37.0	45.0	23°56.5	31.4	349°32.3	32.7	110°47.3	05.1				
11	139°42.8	303°37.6	46.2	38°57.2	31.3	4°34.2	32.6	125°49.9	05.1				
12	154°45.3	318°38.1	S09°47.3	53°57.9	N23°31.3	19°36.2	N17°32.5	140°52.5	N03°05.0				
13	169°47.7	333°38.7	48.4	68°58.6	31.2	34°38.1	32.3	155°55.0	04.9				
14	184°50.2	348°39.2	49.5	83°59.4	31.1	49°40.0	32.2	170°57.6	04.9				
15	199°52.7	3°39.8	· · 50.6	99°00.1	· · 31.0	64°41.9	· · 32.0	186°00.2	· · 04.8				
16	214°55.1	18°40.4	51.7	114°00.8	30.9	79°43.9	31.9	201°02.8	04.8				
17	229°57.6	33°41.0	52.8	129°01.5	30.8	94°45.8	31.7	216°05.3	04.7				
18	245°00.1	48°41.5	S09°53.9	144°02.2	N23°30.8	109°47.7	N17°31.6	231°07.9	N03°04.7				
19	260°02.5	63°42.1	55.0	159°02.9	30.7	124°49.7	31.4	246°10.5	04.6				
20	275°05.0	78°42.7	56.1	174°03.7	30.6	139°51.6	31.3	261°13.1	04.5				
21	290°07.5	93°43.2	· · 57.2	189°04.4	· · 30.5	154°53.5	· · 31.0	276°15.6	· · 04.5				
22	305°09.9	108°43.8	58.3	204°05.1	30.4	169°55.4	31.0	291°18.2	04.4				
23	320°12.4	123°44.4	59.4	219°05.8	30.3	184°57.4	30.8	306°20.8	04.4				
Mer.pass. 01:43			ν 0.6' d 1.1' m -4.55	ν 0.7' d -0.1' m 1.26	ν 1.9' d -0.1' m -1.80	ν 2.6' d -0.1' m 0.51							

Aug 24 Mon	SHA	Mer.pass
Venus	165°48.4	14:47
Mars	260°57.9	08:27
Jupiter	225°23.3	10:48
Saturn	346°00.9	02:46

Aug 25 Tue	SHA	Mer.pass
Venus	165°01.8	14:46
Mars	260°15.7	08:25
Jupiter	225°10.3	10:45
Saturn	346°03.3	02:42

Aug 26 Wed	SHA	Mer.pass
Venus	164°15.7	14:45
Mars	259°33.6	08:24
Jupiter	224°57.4	10:42
Saturn	346°05.9	02:38

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = +0.0174 sec ΔT = TT-UT1 = +69.1666 sec

2026 August 24 to Aug. 26 UT

h Sun Moon						
Mon	GHA	Dec	GHA	ν	Dec	d HP
0	179°22.2	N11°09.8	47°17.6	10.5'	S26°34.5	-5.0' 54.3'
1	194°22.4	09.0	61°47.2	10.5'	26°29.4	-5.2' 54.3'
2	209°22.6	08.1	76°16.7	10.6'	26°24.3	-5.3' 54.3'
3	224°22.7	· · 07.3	90°46.3	10.6'	26°19.0	-5.4' 54.4'
4	239°22.9	06.4	105°15.9	10.7'	26°13.6	-5.5' 54.4'
5	254°23.1	05.6	119°45.6	10.7'	26°08.0	-5.7' 54.4'
6	269°23.2	N11°04.7	134°15.2	10.7'	S26°02.4	-5.8' 54.4'
7	284°23.4	03.9	148°45.0	10.8'	25°56.6	-5.9' 54.4'
8	299°23.6	03.0	163°14.7	10.8'	25°50.7	-6.0' 54.4'
9	314°23.7	· · 02.2	177°44.5	10.8'	25°44.6	-6.2' 54.4'
10	329°23.9	01.3	192°14.4	10.9'	25°38.4	-6.3' 54.4'
11	344°24.1	11°00.4	206°44.2	10.9'	25°32.1	-6.4' 54.4'
12	359°24.2	N10°59.6	221°14.2	11.0'	S25°25.7	-6.5' 54.5'
13	14°24.4	58.7	235°44.1	11.0'	25°19.2	-6.7' 54.5'
14	29°24.6	57.9	250°14.1	11.0'	25°12.5	-6.8' 54.5'
15	44°24.8	· · 57.0	264°44.2	11.1'	25°05.8	-6.9' 54.5'
16	59°24.9	56.2	279°14.2	11.1'	24°58.9	-7.0' 54.5'
17	74°25.1	55.3	293°44.4	11.2'	24°51.8	-7.1' 54.5'
18	89°25.3	N10°54.4	308°14.5	11.2'	S24°44.7	-7.3' 54.5'
19	104°25.4	53.6	322°44.7	11.3'	24°37.4	-7.4' 54.6'
20	119°25.6	52.7	337°15.0	11.3'	24°30.0	-7.5' 54.6'
21	134°25.8	· · 51.9	351°45.3	11.3'	24°22.5	-7.6' 54.6'
22	149°25.9	51.0	6°15.7	11.4'	24°14.9	-7.7' 54.6'
23	164°26.1	50.1	20°46.0	11.4'	24°07.2	-7.9' 54.6'
	SD = 15.8'	$d = -0.9'$			SD = 14.8'	
Tue	GHA	Dec	GHA	ν	Dec	d HP
0	179°26.3	N10°49.3	35°16.5	11.5'	S23°59.3	-8.0' 54.6'
1	194°26.5	48.4	49°47.0	11.5'	23°51.4	-8.1' 54.6'
2	209°26.6	47.6	64°17.5	11.6'	23°43.3	-8.2' 54.7'
3	224°26.8	· · 46.7	78°48.1	11.6'	23°35.1	-8.3' 54.7'
4	239°27.0	45.8	93°18.7	11.7'	23°26.8	-8.4' 54.7'
5	254°27.2	45.0	107°49.4	11.7'	23°18.4	-8.5' 54.7'
6	269°27.3	N10°44.1	122°20.1	11.8'	S23°09.8	-8.6' 54.7'
7	284°27.5	43.3	136°50.8	11.8'	23°01.2	-8.8' 54.7'
8	299°27.7	42.4	151°21.6	11.9'	22°52.4	-8.9' 54.7'
9	314°27.8	· · 41.5	165°52.5	11.9'	22°43.6	-9.0' 54.8'
10	329°28.0	40.7	180°23.4	12.0'	22°34.6	-9.1' 54.8'
11	344°28.2	39.8	194°54.3	12.0'	22°25.5	-9.2' 54.8'
12	359°28.4	N10°38.9	209°25.3	12.0'	S22°16.3	-9.3' 54.8'
13	14°28.5	38.1	223°56.4	12.1'	22°07.0	-9.4' 54.8'
14	29°28.7	37.2	238°27.5	12.1'	21°57.6	-9.5' 54.8'
15	44°28.9	· · 36.3	252°58.6	12.2'	21°48.1	-9.6' 54.9'
16	59°29.1	35.5	267°29.8	12.2'	21°38.5	-9.7' 54.9'
17	74°29.2	34.6	282°01.1	12.3'	21°28.8	-9.8' 54.9'
18	89°29.4	N10°33.7	296°32.3	12.3'	S21°18.9	-9.9' 54.9'
19	104°29.6	32.9	311°03.7	12.4'	21°09.0	-10.0' 54.9'
20	119°29.8	32.0	325°35.1	12.4'	20°59.0	-10.1' 54.9'
21	134°29.9	· · 31.1	340°06.5	12.5'	20°48.9	-10.2' 55.0'
22	149°30.1	30.3	354°38.0	12.5'	20°38.6	-10.3' 55.0'
23	164°30.3	29.4	9°09.5	12.6'	20°28.3	-10.4' 55.0'
	SD = 15.8'	$d = -0.9'$			SD = 14.9'	
Wed	GHA	Dec	GHA	ν	Dec	d HP
0	179°30.5	N10°28.5	23°41.1	12.6'	S20°17.9	-10.5' 55.0'
1	194°30.6	27.7	38°12.7	12.7'	20°07.3	-10.6' 55.0'
2	209°30.8	26.8	52°44.3	12.7'	19°56.7	-10.7' 55.1'
3	224°31.0	· · 25.9	67°16.1	12.8'	19°46.0	-10.8' 55.1'
4	239°31.2	25.1	81°47.8	12.8'	19°35.2	-10.9' 55.1'
5	254°31.4	24.2	96°19.6	12.9'	19°24.3	-11.0' 55.1'
6	269°31.5	N10°23.3	110°51.5	12.9'	S19°13.3	-11.1' 55.1'
7	284°31.7	22.5	125°23.4	12.9'	19°02.2	-11.2' 55.2'
8	299°31.9	21.6	139°55.3	13.0'	18°51.0	-11.3' 55.2'
9	314°32.1	· · 20.7	154°27.3	13.0'	18°39.7	-11.4' 55.2'
10	329°32.2	19.9	168°59.3	13.1'	18°28.4	-11.5' 55.2'
11	344°32.4	19.0	183°31.4	13.1'	18°16.9	-11.5' 55.2'
12	359°32.6	N10°18.1	198°03.5	13.2'	S18°05.3	-11.6' 55.2'
13	14°32.8	17.2	212°35.7	13.2'	17°53.7	-11.7' 55.3'
14	29°33.0	16.4	227°07.9	13.3'	17°42.0	-11.8' 55.3'
15	44°33.1	· · 15.5	241°40.2	13.3'	17°30.2	-11.9' 55.3'
16	59°33.3	14.6	256°12.4	13.3'	17°18.3	-12.0' 55.3'
17	74°33.5	13.8	270°44.8	13.4'	17°06.3	-12.1' 55.3'
18	89°33.7	N10°12.9	285°17.2	13.4'	S16°54.3	-12.1' 55.4'
19	104°33.8	12.0	299°49.6	13.5'	16°42.1	-12.2' 55.4'
20	119°34.0	11.1	314°22.0	13.5'	16°29.9	-12.3' 55.4'
21	134°34.2	· · 10.3	328°54.5	13.5'	16°17.6	-12.4' 55.4'
22	149°34.4	09.4	343°27.1	13.6'	16°05.2	-12.5' 55.5'
23	164°34.6	08.5	357°59.6	13.6'	15°52.7	-12.5' 55.5'
	SD = 15.8'	$d = -0.9'$			SD = 15.0'	

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 12-14 84-95%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
24	02:31	02:23	12:02	21:34	09:09	
25	02:15	02:07	12:02	22:22	09:58	
26	01:58	01:50	12:02	23:08	10:45	