

September 19, 20, 21 UT (Sat., Sun., Mon.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	357°55.0	147°18.0	S18°32.6	241°17.1	N22°00.7	217°56.5	N16°10.5	345°22.3	N02°27.1					Alpheratz	357°33.0	29°14.4	
1	12°57.5	162°19.4	33.3	256°18.0	00.5	232°58.5	10.3	0°24.9	27.1					Ankaa	353°05.3	-42°09.4	
2	28°00.0	177°20.9	34.0	271°18.8	00.2	248°00.4	10.2	15°27.6	27.0					Schedar	349°28.9	56°41.1	
3	43°02.4	192°22.3	· · 34.7	286°19.7	22°00.0	263°02.4	· · 10.1	30°30.2	· · 26.9					Diphda	348°45.6	-17°50.2	
4	58°04.9	207°23.7	35.4	301°20.5	21°59.8	278°04.4	09.9	45°32.8	26.8					Achernar	335°18.6	-57°05.8	
5	73°07.3	222°25.2	36.1	316°21.4	59.5	293°06.4	09.8	60°35.5	26.8					Hamal	327°49.3	23°35.4	
6	88°09.8	237°26.6	S18°36.8	331°22.2	N21°59.3	308°08.4	N16°09.6	75°38.1	N02°26.7					Polaris	313°00.0	89°22.4	
7	103°12.3	252°28.0	37.5	346°23.1	59.1	323°10.3	09.5	90°40.7	26.6					Acamar	315°10.4	-40°11.5	
8	118°14.7	267°29.5	38.2	1°23.9	58.8	338°12.3	09.3	105°43.4	26.5					Menkar	314°04.5	4°11.8	
9	133°17.2	282°30.9	· · 38.9	16°24.8	· · 58.6	353°14.3	· · 09.2	120°46.0	· · 26.5					Mirfak	308°25.9	49°57.3	
10	148°19.7	297°32.4	39.5	31°25.7	58.4	8°16.3	09.1	135°48.6	26.4					Aldebaran	290°37.9	16°33.8	
11	163°22.1	312°33.8	40.2	46°26.5	58.1	23°18.3	08.9	150°51.3	26.3					Rigel	281°02.5	-8°10.0	
12	178°24.6	327°35.3	S18°40.9	61°27.4	N21°57.9	38°20.3	N16°08.8	165°53.9	N02°26.2					Capella	280°19.7	46°01.3	
13	193°27.1	342°36.7	41.6	76°28.2	57.7	53°22.2	08.6	180°56.5	26.2					Bellatrix	278°21.3	6°22.5	
14	208°29.5	357°38.2	42.3	91°29.1	57.4	68°24.2	08.5	195°59.2	26.1					Elnath	278°00.1	28°37.8	
15	223°32.0	12°39.7	· · 43.0	106°29.9	· · 57.2	83°26.2	· · 08.3	211°01.8	· · 26.0					Alnilam	275°36.3	-1°10.9	
16	238°34.5	27°41.1	43.6	121°30.8	57.0	98°28.2	08.2	226°04.4	25.9					Betelgeuse	270°50.6	7°24.8	
17	253°36.9	42°42.6	44.3	136°31.6	56.7	113°30.2	08.1	241°07.1	25.9					Canopus	263°51.9	-52°42.2	
18	268°39.4	57°44.1	S18°45.0	151°32.5	N21°56.5	128°32.2	N16°07.9	256°09.7	N02°25.8					Sirius	258°25.1	-16°44.9	
19	283°41.8	72°45.5	45.7	166°33.3	56.3	143°34.1	07.8	271°12.3	25.7					Adhara	255°04.9	-29°00.2	
20	298°44.3	87°47.0	46.3	181°34.2	56.0	158°36.1	07.6	286°15.0	25.6					Procyon	244°49.5	5°09.5	
21	313°46.8	102°48.5	· · 47.0	196°35.1	· · 55.8	173°38.1	· · 07.5	301°17.6	· · 25.5					Pollux	243°15.8	27°57.7	
22	328°49.2	117°50.0	47.7	211°35.9	55.6	188°40.1	07.4	316°20.2	25.5					Avior	234°14.6	-59°35.4	
23	343°51.7	132°51.5	48.4	226°36.8	55.3	203°42.1	07.2	331°22.9	25.4					Suhail	222°45.6	-43°32.2	
Mer.pass. 00:08			ν 1.4' d 0.7' m -4.80	ν 0.9' d -0.2' m 1.17	ν 2.0' d -0.1' m -1.84	ν 2.6' d -0.1' m 0.40											

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	358°54.2	147°52.9	S18°49.0	241°37.6	N21°55.1	218°44.1	N16°07.1	346°25.5	N02°25.3		
1	13°56.6	162°54.4	49.7	256°38.5	54.9	233°46.0	06.9	1°28.1	25.2		
2	28°59.1	177°55.9	50.4	271°39.3	54.6	248°48.0	06.8	16°30.8	25.2		
3	44°01.6	192°57.4	· · 51.0	286°40.2	· · 54.4	263°50.0	· · 06.6	31°33.4	· · 25.1		
4	59°04.0	207°58.9	51.7	301°41.1	54.2	278°52.0	06.5	46°36.0	25.0		
5	74°06.5	223°00.4	52.4	316°41.9	53.9	293°54.0	06.4	61°38.7	24.9		
6	89°08.9	238°01.9	S18°53.0	331°42.8	N21°53.7	308°56.0	N16°06.2	76°41.3	N02°24.9		
7	104°11.4	253°03.4	53.7	346°43.6	53.5	323°58.0	06.1	91°43.9	24.8		
8	119°13.9	268°04.9	54.3	1°44.5	53.2	338°59.9	05.9	106°46.6	24.7		
9	134°16.3	283°06.4	· · 55.0	16°45.4	· · 53.0	354°01.9	· · 05.8	121°49.2	· · 24.6		
10	149°18.8	298°07.9	55.7	31°46.2	52.7	9°03.9	05.7	136°51.8	24.6		
11	164°21.3	313°09.4	56.3	46°47.1	52.5	24°05.9	05.5	151°54.5	24.5		
12	179°23.7	328°11.0	S18°57.0	61°47.9	N21°52.3	39°07.9	N16°05.4	166°57.1	N02°24.4		
13	194°26.2	343°12.5	57.6	76°48.8	52.0	54°09.9	05.2	181°59.7	24.3		
14	209°28.7	358°14.0	58.3	91°49.7	51.8	69°11.9	05.1	197°02.4	24.3		
15	224°31.1	13°15.5	· · 58.9	106°50.5	· · 51.6	84°13.8	· · 04.9	212°05.0	· · 24.2		
16	239°33.6	28°17.1	18°59.6	121°51.4	51.3	99°15.8	04.8	227°07.6	24.1		
17	254°36.1	43°18.6	19°00.2	136°52.3	51.1	114°17.8	04.7	242°10.3	24.0		
18	269°38.5	58°20.1	S19°00.9	151°53.1	N21°50.8	129°19.8	N16°04.5	257°12.9	N02°24.0		
19	284°41.0	73°21.7	01.5	166°54.0	50.6	144°21.8	04.4	272°15.5	23.9		
20	299°43.4	88°23.2	02.2	181°54.8	50.4	159°23.8	04.2	287°18.2	23.8		
21	314°45.9	103°24.7	· · 02.8	196°55.7	· · 50.1	174°25.8	· · 04.1	302°20.8	· · 23.7		
22	329°48.4	118°26.3	03.5	211°56.6	49.9	189°27.7	04.0	317°23.4	23.6		
23	344°50.8	133°27.8	04.1	226°57.4	49.7	204°29.7	03.8	332°26.1	23.6		
Mer.pass. 00:04			ν 1.5' d 0.7' m -4.80	ν 0.9' d -0.2' m 1.17	ν 2.0' d -0.1' m -1.84	ν 2.6' d -0.1' m 0.40					

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	359°53.3	148°29.4	S19°04.8	241°58.3	N21°49.4	219°31.7	N16°03.7	347°28.7	N02°23.5		
1	14°55.8	163°30.9	05.4	256°59.2	49.2	234°33.7	03.5	2°31.3	23.4		
2	29°58.2	178°32.5	06.0	272°00.0	48.9	249°35.7	03.4	17°34.0	23.3		
3	45°00.7	193°34.0	· · 06.7	287°00.9	· · 48.7	264°37.7	· · 03.3	32°36.6	· · 23.3		
4	60°03.2	208°35.6	07.3	302°01.8	48.4	279°39.7	03.1	47°39.2	23.2		
5	75°05.6	223°37.2	07.9	317°02.6	48.2	294°41.7	03.0	62°41.9	23.1		
6	90°08.1	238°38.7	S19°08.6	332°03.5	N21°48.0	309°43.6	N16°02.8	77°44.5	N02°23.0		
7	105°10.6	253°40.3	09.2	347°04.4	47.7	324°45.6	02.7	92°47.1	23.0		
8	120°13.0	268°41.9	09.8	2°05.2	47.5	339°47.6	02.5	107°49.8	22.9		
9	135°15.5	283°43.4	· · 10.5	17°06.1	· · 47.2	354°49.6	· · 02.4	122°52.4	· · 22.8		
10	150°17.9	298°45.0	11.1	32°07.0	47.0	9°51.6	02.3	137°55.0	22.7		
11	165°20.4	313°46.6	11.7	47°07.8	46.8	24°53.6	02.1	152°57.7	22.7		
12	180°22.9	328°48.2	S19°12.4	62°08.7	N21°46.5	39°55.6	N16°02.0	168°00.3	N02°22.6		
13	195°25.3	343°49.8	13.0	77°09.6	46.3	54°57.6	01.8	183°03.0	22.5		
14	210°27.8	358°51.3	13.6	92°10.4	46.0	69°59.6	01.7	198°05.6	22.4		
15	225°30.3	13°52.9	· · 14.2	107°11.3	· · 45.8	85°01.5	· · 01.6	213°08.2	· · 22.3		
16	240°32.7	28°54.5	14.8	122°12.2	45.5	100°03.5	01.4	228°10.9	22.3		
17	255°35.2	43°56.1	15.5	137°13.0	45.3	115°05.5	01.3	243°13.5	22.2		
18	270°37.7	58°57.7	S19°16.1	152°13.9	N21°45.1	130°07.5	N16°01.1	258°16.1	N02°22.1		
19	285°40.1	73°59.3	16.7	167°14.8	44.8	145°09.5	01.0	273°18.8	22.0		
20	300°42.6	89°00.9	17.3	182°15.6	44.6	160°11.5	00.9	288°21.4	22.0		
21	315°45.0	104°02.5	· · 17.9	197°16.5	· · 44.3	175°13.5	· · 00.7	303°24.0	· · 21.9		
22	330°47.5	119°04.1	18.6	212°17.4	44.1	190°15.5	00.6	318°26.7	21.8		
23	345°50.0	134°05.7	19.2	227°18.3	43.8	205°17.5	00.4	333°29.3	21.7		
Mer.pass. 23:57			ν 1.6' d 0.6' m -4.81	ν 0.9' d -0.2' m 1.16	ν 2.0' d -0.1' m -1.84	ν 2.6' d -0.1' m 0.39					

Sep 19 Sat	SHA	Mer.pass
Venus	149°23.0	14:09
Mars	243°22.1	07:54
Jupiter	220°01.5	09:27
Saturn	347°27.3	00:58

Sep 20 Sun	SHA	Mer.pass
Venus	148°58.8	14:07
Mars	242°43.5	07:53
Jupiter	219°49.9	09:24
Saturn	347°31.3	00:54

Sep 21 Mon	SHA	Mer.pass
Venus	148°36.1	14:05
Mars	242°05.0	07:52
Jupiter	219°38.4	09:21
Saturn	347°35.4	00:50

Horizontal parallax		
Venus:	0.4	
Mars:	0.1	

Sun				Moon				
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	181°30.5	N01°33.3		90°39.6	10.0'	S28°02.1	-0.8'	54.2'
1	196°30.7	32.3		105°08.5	10.0'	28°01.4	-0.9'	54.2'
2	211°30.9	31.4		119°37.5	10.0'	28°00.5	-1.0'	54.2'
3	226°31.1	· · 30.4		134°06.5	10.0'	27°59.4	-1.2'	54.2'
4	241°31.4	29.4		148°35.5	10.0'	27°58.2	-1.3'	54.2'
5	256°31.6	28.5		163°04.5	10.0'	27°56.9	-1.4'	54.2'
6	271°31.8	N01°27.5		177°33.5	10.0'	S27°55.5	-1.6'	54.2'
7	286°32.0	26.5		192°02.5	10.0'	27°53.9	-1.7'	54.2'
8	301°32.2	25.6		206°31.5	10.1'	27°52.2	-1.9'	54.2'
9	316°32.5	· · 24.6		221°00.6	10.1'	27°50.3	-2.0'	54.2'
10	331°32.7	23.6		235°29.6	10.1'	27°48.3	-2.1'	54.2'
11	346°32.9	22.6		249°58.7	10.1'	27°46.2	-2.3'	54.2'
12	1°33.1	N01°21.7		264°27.8	10.1'	S27°44.0	-2.4'	54.2'
13	16°33.4	20.7		278°57.0	10.1'	27°41.6	-2.5'	54.2'
14	31°33.6	19.7		293°26.1	10.2'	27°39.0	-2.7'	54.2'
15	46°33.8	· · 18.8		307°55.3	10.2'	27°36.4	-2.8'	54.2'
16	61°34.0	17.8		322°24.5	10.2'	27°33.6	-2.9'	54.2'
17	76°34.3	16.8		336°53.7	10.2'	27°30.7	-3.1'	54.2'
18	91°34.5	N01°15.9		351°22.9	10.3'	S27°27.6	-3.2'	54.2'
19	106°34.7	14.9		5°52.2	10.3'	27°24.5	-3.3'	54.2'
20	121°34.9	13.9		20°21.5	10.3'	27°21.1	-3.4'	54.2'
21	136°35.1	· · 12.9		34°50.8	10.3'	27°17.7	-3.6'	54.2'
22	151°35.4	12.0		49°20.1	10.4'	27°14.1	-3.7'	54.2'
23	166°35.6	11.0		63°49.5	10.4'	27°10.4	-3.8'	54.2'
	SD = 15.9'	$d = -1.0'$				SD = 14.8'		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181° 35.8	N01° 10.0	78° 18.9	10.4'	S27° 06.6	-4.0'	54.2'
1	196° 36.0	09.1	92° 48.3	10.5'	27° 02.6	-4.1'	54.2'
2	211° 36.3	08.1	107° 17.8	10.5'	26° 58.5	-4.2'	54.3'
3	226° 36.5	· · 07.1	121° 47.3	10.5'	26° 54.3	-4.4'	54.3'
4	241° 36.7	06.2	136° 16.8	10.6'	26° 49.9	-4.5'	54.3'
5	256° 36.9	05.2	150° 46.4	10.6'	26° 45.4	-4.6'	54.3'
6	271° 37.1	N01° 04.2	165° 15.9	10.6'	S26° 40.8	-4.7'	54.3'
7	286° 37.4	03.2	179° 45.6	10.7'	26° 36.1	-4.9'	54.3'
8	301° 37.6	02.3	194° 15.2	10.7'	26° 31.2	-5.0'	54.3'
9	316° 37.8	· · 01.3	208° 44.9	10.7'	26° 26.2	-5.1'	54.3'
10	331° 38.0	01° 00.3	223° 14.6	10.8'	26° 21.1	-5.2'	54.3'
11	346° 38.3	00° 59.4	237° 44.4	10.8'	26° 15.9	-5.4'	54.3'
12	1° 38.5	N00° 58.4	252° 14.2	10.8'	S26° 10.5	-5.5'	54.3'
13	16° 38.7	57.4	266° 44.0	10.9'	26° 05.0	-5.6'	54.3'
14	31° 38.9	56.4	281° 13.9	10.9'	25° 59.4	-5.7'	54.4'
15	46° 39.1	· · 55.5	295° 43.8	11.0'	25° 53.6	-5.9'	54.4'
16	61° 39.4	54.5	310° 13.8	11.0'	25° 47.8	-6.0'	54.4'
17	76° 39.6	53.5	324° 43.8	11.0'	25° 41.8	-6.1'	54.4'
18	91° 39.8	N00° 52.6	339° 13.8	11.1'	S25° 35.7	-6.2'	54.4'
19	106° 40.0	51.6	353° 43.9	11.1'	25° 29.4	-6.4'	54.4'
20	121° 40.3	50.6	8° 14.0	11.2'	25° 23.1	-6.5'	54.4'
21	136° 40.5	· · 49.7	22° 44.1	11.2'	25° 16.6	-6.6'	54.4'
22	151° 40.7	48.7	37° 14.3	11.2'	25° 10.0	-6.7'	54.4'
23	166° 40.9	47.7	51° 44.6	11.3'	25° 03.3	-6.8'	54.5'
	SD = 15.9'	$d = -1.0'$			SD = 14.8'		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°41.1	N00°46.7	66°14.8	11.3'	S24°56.5	-7.0'	54.5'
1	196°41.4	45.8	80°45.2	11.4'	24°49.5	-7.1'	54.5'
2	211°41.6	44.8	95°15.5	11.4'	24°42.4	-7.2'	54.5'
3	226°41.8	· · 43.8	109°45.9	11.5'	24°35.2	-7.3'	54.5'
4	241°42.0	42.9	124°16.4	11.5'	24°27.9	-7.4'	54.5'
5	256°42.3	41.9	138°46.9	11.5'	24°20.5	-7.5'	54.5'
6	271°42.5	N00°40.9	153°17.4	11.6'	S24°13.0	-7.7'	54.6'
7	286°42.7	39.9	167°48.0	11.6'	24°05.3	-7.8'	54.6'
8	301°42.9	39.0	182°18.6	11.7'	23°57.6	-7.9'	54.6'
9	316°43.1	· · 38.0	196°49.3	11.7'	23°49.7	-8.0'	54.6'
10	331°43.4	37.0	211°20.0	11.8'	23°41.7	-8.1'	54.6'
11	346°43.6	36.1	225°50.8	11.8'	23°33.6	-8.2'	54.6'
12	1°43.8	N00°35.1	240°21.6	11.8'	S23°25.3	-8.3'	54.6'
13	16°44.0	34.1	254°52.4	11.9'	23°17.0	-8.4'	54.7'
14	31°44.3	33.1	269°23.3	11.9'	23°08.6	-8.6'	54.7'
15	46°44.5	· · 32.2	283°54.2	12.0'	23°00.0	-8.7'	54.7'
16	61°44.7	31.2	298°25.2	12.0'	22°51.3	-8.8'	54.7'
17	76°44.9	30.2	312°56.3	12.1'	22°42.6	-8.9'	54.7'
18	91°45.1	N00°29.3	327°27.3	12.1'	S22°33.7	-9.0'	54.7'
19	106°45.4	28.3	341°58.5	12.2'	22°24.7	-9.1'	54.8'
20	121°45.6	27.3	356°29.6	12.2'	22°15.6	-9.2'	54.8'
21	136°45.8	· · 26.3	11°00.8	12.3'	22°06.4	-9.3'	54.8'
22	151°46.0	25.4	25°32.1	12.3'	21°57.1	-9.4'	54.8'
23	166°46.3	24.4	40°03.4	12.3'	21°47.7	-9.5'	54.8'
	SD = 15.9'	$d = -1.0'$			SD = 14.9'		

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

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	■	■	■	■	■	■
N 70°	■	■	■	■	■	■
68°	■	■	■	■	■	■
66°	■	■	18:47	■	■	21:56
64°	■	18:42	18:06	■	■	22:36
62°	17:50	17:42	17:37	19:26	21:18	23:04
60°	16:52	17:08	17:15	20:23	21:51	23:25
N 58°	16:19	16:44	16:57	20:56	22:16	23:42
56°	15:54	16:24	16:42	21:21	22:35	23:56
54°	15:34	16:07	16:29	21:40	22:52	· · ·
52°	15:18	15:53	16:18	21:57	23:05	· · ·
50°	15:03	15:40	16:08	22:11	23:18	· · ·
45°	14:34	15:14	15:46	22:40	23:43	· · ·
N 40°	14:12	14:54	15:29	23:02	· · ·	00:03
35°	13:53	14:36	15:14	23:21	· · ·	00:19
30°	13:36	14:22	15:02	23:37	· · ·	00:34
20°	13:09	13:56	14:40	· · ·	00:03	00:58
N 10°	12:45	13:34	14:21	· · ·	00:27	01:18
0°	12:23	13:14	14:03	· · ·	00:48	01:38
S 10°	12:01	12:53	13:45	00:19	01:09	01:57
20°	11:38	12:31	13:26	00:43	01:32	02:18
30°	11:10	12:06	13:04	01:11	01:59	02:41
35°	10:54	11:51	12:51	01:27	02:14	02:5

September 22, 23, 24 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	0°52.4	149°07.4	S19°19.8	242°19.1	N21°43.6	220°19.4	N16°00.3	348°31.9	N02°21.7					Alpheratz	357°33.0	29°14.5	
1	15°54.9	164°09.0	20.4	257°20.0	43.4	235°21.4	00.2	3°34.6	21.6					Ankaa	353°05.3	-42°09.5	
2	30°57.4	179°10.6	21.0	272°20.9	43.1	250°23.4	16°00.0	18°37.2	21.5					Schedar	349°28.9	56°41.1	
3	45°59.8	194°12.2	· · 21.6	287°21.7	· · 42.9	265°25.4	15°59.9	33°39.9	· · 21.4					Diphda	348°45.6	-17°50.2	
4	61°02.3	209°13.8	22.2	302°22.6	42.6	280°27.4	59.7	48°42.5	21.4					Achernar	335°18.6	-57°05.8	
5	76°04.8	224°15.5	22.8	317°23.5	42.4	295°29.4	59.6	63°45.1	21.3					Hamal	327°49.3	23°35.4	
6	91°07.2	239°17.1	S19°23.4	332°24.4	N21°42.1	310°31.4	N15°59.5	78°47.8	N02°21.2					Polaris	312°58.7	89°22.4	
7	106°09.7	254°18.7	24.0	347°25.2	41.9	325°33.4	59.3	93°50.4	21.1					Acamar	315°10.4	-40°11.5	
8	121°12.2	269°20.4	24.6	2°26.1	41.6	340°35.4	59.2	108°53.0	21.0					Menkar	314°04.4	4°11.8	
9	136°14.6	284°22.0	· · 25.2	17°27.0	· · 41.4	355°37.4	· · 59.0	123°55.7	· · 21.0					Mirfak	308°25.9	49°57.3	
10	151°17.1	299°23.7	25.8	32°27.9	41.1	10°39.4	58.9	138°58.3	20.9					Aldebaran	290°37.9	16°33.8	
11	166°19.5	314°25.3	26.4	47°28.7	40.9	25°41.4	58.7	154°00.9	20.8					Rigel	281°02.4	-8°10.0	
12	181°22.0	329°27.0	S19°27.0	62°29.6	N21°40.6	40°43.3	N15°58.6	169°03.6	N02°20.7					Capella	280°19.7	46°01.3	
13	196°24.5	344°28.6	27.6	77°30.5	40.4	55°45.3	58.5	184°06.2	20.7					Bellatrix	278°21.3	6°22.5	
14	211°26.9	359°30.3	28.2	92°31.4	40.2	70°47.3	58.3	199°08.9	20.6					Elnath	278°00.0	28°37.8	
15	226°29.4	14°31.9	· · 28.8	107°32.2	· · 39.9	85°49.3	· · 58.2	214°11.5	· · 20.5					Alnilam	275°36.3	-1°10.9	
16	241°31.9	29°33.6	29.4	122°33.1	39.7	100°51.3	58.0	229°14.1	20.4					Betelgeuse	270°50.6	7°24.8	
17	256°34.3	44°35.2	30.0	137°34.0	39.4	115°53.3	57.9	244°16.8	20.4					Canopus	263°51.8	-52°42.2	
18	271°36.8	59°36.9	S19°30.6	152°34.9	N21°39.2	130°55.3	N15°57.8	259°19.4	N02°20.3					Sirius	258°25.1	-16°44.9	
19	286°39.3	74°38.6	31.2	167°35.7	38.9	145°57.3	57.6	274°22.0	20.2					Adhara	255°04.8	-29°00.2	
20	301°41.7	89°40.2	31.7	182°36.6	38.7	160°59.3	57.5	289°24.7	20.1					Procyon	244°49.5	5°09.5	
21	316°44.2	104°41.9	· · 32.3	197°37.5	· · 38.4	176°01.3	· · 57.3	304°27.3	· · 20.0					Pollux	243°15.7	27°57.6	
22	331°46.7	119°43.6	32.9	212°38.4	38.2	191°03.3	57.2	319°30.0	20.0					Avior	234°14.5	-59°35.4	
23	346°49.1	134°45.3	33.5	227°39.2	37.9	206°05.3	57.1	334°32.6	19.9					Suhail	222°45.6	-43°32.2	
Mer.pass. 23:53			ν 1.6' d 0.6' m -4.81			ν 0.9' d -0.2' m 1.16			ν 2.0' d -0.1' m -1.85			ν 2.6' d -0.1' m 0.39					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	1°51.6	149°47.0	S19°34.1	242°40.1	N21°37.7	221°07.3	N15°56.9	349°35.2	N02°19.8					Denebola	182°23.8	14°25.4	
1	16°54.0	164°48.7	34.7	257°41.0	37.4	236°09.3	56.8	4°37.9	19.7					Gienah	175°42.5	-17°41.4	
2	31°56.5	179°50.3	35.2	272°41.9	37.2	251°11.2	56.6	19°40.5	19.7					Acrux	172°59.2	-63°14.9	
3	46°59.0	194°52.0	· · 35.8	287°42.8	· · 36.9	266°13.2	· · 56.5	34°43.1	· · 19.6					Gacrux	171°50.7	-57°15.8	
4	62°01.4	209°53.7	36.4	302°43.6	36.7	281°15.2	56.4	49°45.8	19.5					Alioth	166°12.3	55°49.0	
5	77°03.9	224°55.4	37.0	317°44.5	36.4	296°17.2	56.2	64°48.4	19.4					Spica	158°21.1	-11°18.0	
6	92°06.4	239°57.1	S19°37.5	332°45.4	N21°36.2	311°19.2	N15°56.1	79°51.1	N02°19.4					Alkaid	152°51.3	49°10.9	
7	107°08.8	254°58.8	38.1	347°46.3	35.9	326°21.2	55.9	94°53.7	19.3					Hadar	148°34.5	-60°30.2	
8	122°11.3	270°00.5	38.7	2°47.2	35.7	341°23.2	55.8	109°56.3	19.2					Menkent	147°56.3	-36°30.1	
9	137°13.8	285°02.2	· · 39.2	17°48.0	· · 35.4	356°25.2	· · 55.7	124°59.0	· · 19.1					Arcturus	145°46.9	19°02.7	
10	152°16.2	300°04.0	39.8	32°48.9	35.2	11°27.2	55.5	140°01.6	19.0					Rigel Kent.	139°38.9	-60°56.9	
11	167°18.7	315°05.7	40.4	47°49.8	34.9	26°29.2	55.4	155°04.2	19.0					Kochab	137°20.7	74°02.9	
12	182°21.1	330°07.4	S19°40.9	62°50.7	N21°34.7	41°31.2	N15°55.2	170°06.9	N02°18.9					Zuben'ubi	136°54.7	-16°09.1	
13	197°23.6	345°09.1	41.5	77°51.6	34.4	56°33.2	55.1	185°09.5	18.8					Alphecca	126°02.8	26°37.7	
14	212°26.1	0°10.8	42.1	92°52.4	34.2	71°35.2	55.0	200°12.2	18.7					Antares	112°14.2	-26°29.5	
15	227°28.5	15°12.6	· · 42.6	107°53.3	· · 33.9	86°37.2	· · 54.8	215°14.8	· · 18.7					Atria	107°07.3	-69°04.7	
16	242°31.0	30°14.3	43.2	122°54.2	33.7	101°39.2	54.7	230°17.4	18.6					Sabik	102°01.2	-15°45.4	
17	257°33.5	45°16.0	43.8	137°55.1	33.4	116°41.2	54.5	245°20.1	18.5					Shaula	96°08.5	-37°07.5	
18	272°35.9	60°17.8	S19°44.3	152°56.0	N21°33.1	131°43.2	N15°54.4	260°22.7	N02°18.4					Rasalhague	95°57.3	12°32.6	
19	287°38.4	75°19.5	44.9	167°56.9	32.9	146°45.2	54.3	275°25.3	18.4					Eltanin	90°41.5	51°29.4	
20	302°40.9	90°21.3	45.4	182°57.7	32.6	161°47.2	54.1	290°28.0	18.3					Kaus Aust.	83°30.6	-34°22.4	
21	317°43.3	105°23.0	· · 46.0	197°58.6	· · 32.4	176°49.2	· · 54.0	305°30.6	· · 18.2					Vega	80°32.2	38°48.8	
22	332°45.8	120°24.7	46.5	212°59.5	32.1	191°51.1	53.9	320°33.3	18.1					Nunki	75°45.9	-26°15.8	
23	347°48.3	135°26.5	47.1	228°00.4	31.9	206°53.1	53.7	335°35.9	18.0					Altair	61°58.4	8°56.5	
Mer.pass. 23:49			ν 1.7' d 0.6' m -4.81			ν 0.9' d -0.2' m 1.15			ν 2.0' d -0.1' m -1.85			ν 2.6' d -0.1' m 0.38					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	2°50.7	150°28.3	S19°47.6	243°01.3	N21°31.6	221°55.1	N15°53.6	350°38.5	N02°18.0					Sep 22 Tue	SHA	Mer.pass	
1	17°53.2	165°30.0	48.2	258°02.2	31.4	236°57.1	53.4	5°41.2	17.9					Venus	148°14.9	14:02	
2	32°55.6	180°31.8	48.7	273°03.1	31.1	251°59.1	53.3	20°43.8	17.8					Mars	241°26.7	07:50	
3	47°58.1	195°33.5	· · 49.3	288°03.9	· · 30.9	267°01.1	· · 53.2	35°46.4	· · 17.7					Jupiter	219°27.0	09:17	
4	63°00.6	210°35.3	49.8	303°04.8	30.6	282°03.1	53.0	50°49.1	17.7					Saturn	347°39.5	00:46	
5	78°03.0	225°37.1	50.3	318°05.7	30.4	297°05.1	52.9	65°51.7	17.6								
6	93°05.5	240°38.8	S19°50.9	333°06.6	N21°30.1	312°07.1	N15°52.7	80°54.4	N02°17.5								
7	108°08.0	255°40.6	51.4	348°07.5	29.8	327°09.1	52.6	95°57.0	17.4								
8	123°10.4	270°42.4	52.0	3°08.4	29.6	342°11.1	52.5	110°59.6	17.4								
9	138°12.9	285°44.2	· · 52.5	18°09.3	· · 29.3	357°13.1	· · 52.3	126°02.3	· · 17.3								
10	153°15.4	300°46.0	53.0	33°10.1	29.1	12°15.1	52.2	141°04.9	17.2								
11	168°17.8	315°47.8	53.6	48°11.0	28.8	27°17.1	52.0	156°07.6	17.1								
12	183°20.3	330°49.5	S19°54.1	63°11.9	N21°28.6	42°19.1	N15°51.9	171°10.2	N02°17.0								
13	198°22.8	345°51.3	54.6	78°12.8	28.3	57°21.1	51.8	186°12.									

Sun							Moon								
Tue	GHA	Dec	GHA	ν	Dec	d	HP	Lat.	Twilight		Sunrise	Sunset	Twilight		
									Naut.	Civil			Civil	Naut.	
0	181°46.5	N00°23.4	54°34.7	12.4'	S21°38.2	-9.6'	54.9'	N 72°	03:04	04:34	05:43	17:59	19:07	20:36	
1	196°46.7	22.4	69°06.1	12.4'	21°28.5	-9.7'	54.9'	N 70°	03:24	04:42	05:44	17:59	19:00	20:17	
2	211°46.9	21.5	83°37.6	12.5'	21°18.8	-9.8'	54.9'	68°	03:38	04:48	05:44	17:58	18:54	20:03	
3	226°47.1	· · 20.5	98°09.0	12.5'	21°09.0	-9.9'	54.9'	66°	03:50	04:54	05:45	17:58	18:49	19:52	
4	241°47.4	19.5	112°40.6	12.6'	20°59.1	-10.0'	54.9'	64°	04:00	04:58	05:46	17:57	18:45	19:43	
5	256°47.6	18.6	127°12.1	12.6'	20°49.0	-10.1'	55.0'	62°	04:08	05:02	05:46	17:57	18:41	19:35	
6	271°47.8	N00°17.6	141°43.8	12.7'	S20°38.9	-10.2'	55.0'	60°	04:15	05:05	05:46	17:57	18:38	19:28	
7	286°48.0	16.6	156°15.4	12.7'	20°28.7	-10.3'	55.0'	N 58°	04:21	05:08	05:47	17:57	18:36	19:22	
8	301°48.2	15.6	170°47.1	12.7'	20°18.3	-10.4'	55.0'	56°	04:26	05:10	05:47	17:57	18:34	19:18	
9	316°48.5	· · 14.7	185°18.8	12.8'	20°07.9	-10.5'	55.0'	54°	04:30	05:12	05:47	17:56	18:32	19:13	
10	331°48.7	13.7	199°50.6	12.8'	19°57.4	-10.6'	55.1'	52°	04:34	05:14	05:48	17:56	18:30	19:10	
11	346°48.9	12.7	214°22.5	12.9'	19°46.8	-10.7'	55.1'	50°	04:37	05:15	05:48	17:56	18:28	19:06	
12	1°49.1	N00°11.8	228°54.3	12.9'	S19°36.1	-10.8'	55.1'	45°	04:44	05:19	05:48	17:56	18:25	18:59	
13	16°49.3	10.8	243°26.2	13.0'	19°25.3	-10.9'	55.1'	N 40°	04:50	05:21	05:48	17:56	18:23	18:54	
14	31°49.6	09.8	257°58.2	13.0'	19°14.4	-11.0'	55.1'	35°	04:54	05:23	05:49	17:56	18:21	18:50	
15	46°49.8	· · 08.8	272°30.2	13.0'	19°03.4	-11.1'	55.2'	30°	04:57	05:25	05:49	17:55	18:19	18:47	
16	61°50.0	07.9	287°02.2	13.1'	18°52.3	-11.2'	55.2'	20°	05:01	05:27	05:49	17:55	18:17	18:43	
17	76°50.2	06.9	301°34.3	13.1'	18°41.1	-11.3'	55.2'	N 10°	05:04	05:28	05:49	17:55	18:16	18:41	
18	91°50.5	N00°05.9	316°06.4	13.2'	S18°29.8	-11.4'	55.2'	0°	05:04	05:28	05:49	17:56	18:16	18:40	
19	106°50.7	04.9	330°38.6	13.2'	18°18.4	-11.5'	55.3'	S 10°	05:04	05:28	05:49	17:56	18:17	18:41	
20	121°50.9	04.0	345°10.8	13.2'	18°07.0	-11.5'	55.3'	20°	05:01	05:27	05:49	17:56	18:18	18:44	
21	136°51.1	· · 03.0	359°43.0	13.3'	17°55.4	-11.6'	55.3'	30°	04:57	05:25	05:48	17:57	18:21	18:49	
22	151°51.3	02.0	14°15.3	13.3'	17°43.8	-11.7'	55.3'	35°	04:53	05:23	05:48	17:57	18:22	18:52	
23	166°51.6	01.1	28°47.6	13.3'	17°32.1	-11.8'	55.3'	40°	04:49	05:21	05:48	17:58	18:25	18:56	
SD = 15.9'			$d = -1.0'$		SD = 15.0'				45°	04:44	05:18	05:47	17:58	18:27	19:02
Wed	GHA	Dec	GHA	ν	Dec	d	HP	S 50°	04:37	05:15	05:47	17:59	18:31	19:09	
0	181°51.8	N00°00.1	43°19.9	13.4'	S17°20.3	-11.9'	55.4'	52°	04:33	05:13	05:47	17:59	18:33	19:13	
1	196°52.0	S00°00.9	57°52.3	13.4'	17°08.4	-12.0'	55.4'	54°	04:29	05:11	05:46	18:00	18:35	19:17	
2	211°52.2	01.9	72°24.7	13.5'	16°56.4	-12.1'	55.4'	56°	04:25	05:09	05:46	18:00	18:37	19:22	
3	226°52.4	· · 02.8	86°57.2	13.5'	16°44.4	-12.1'	55.4'	58°	04:20	05:06	05:46	18:00	18:40	19:27	
4	241°52.7	03.8	101°29.7	13.5'	16°32.2	-12.2'	55.5'	S 60°	04:14	05:04	05:45	18:01	18:43	19:33	
5	256°52.9	04.8	116°02.2	13.6'	16°20.0	-12.3'	55.5'	Lat.	Moonrise			Moonset			
6	271°53.1	S00°05.8	130°34.7	13.6'	S16°07.7	-12.4'	55.5'	Tue	Wed	Thu	Tue	Wed	Thu		
7	286°53.3	06.7	145°07.3	13.6'	15°55.3	-12.5'	55.5'	N 72°	■	18:51	18:06	■	■	01:08	
8	301°53.5	07.7	159°39.9	13.7'	15°42.8	-12.5'	55.6'	N 70°	19:21	18:27	17:54	23:01	· · ·	01:30	
9	316°53.8	· · 08.7	174°12.6	13.7'	15°30.3	-12.6'	55.6'	68°	18:40	18:08	17:45	23:41	· · ·	01:47	
10	331°54.0	09.6	188°45.3	13.7'	15°17.6	-12.7'	55.6'	66°	18:12	17:52	17:37	· · ·	00:08	02:01	
11	346°54.2	10.6	203°18.0	13.7'	15°04.9	-12.8'	55.6'	64°	17:50	17:39	17:30	· · ·	00:28	02:12	
12	1°54.4	S00°11.6	217°50.7	13.8'	S14°52.2	-12.9'	55.7'	62°	17:33	17:29	17:25	· · ·	00:45	02:22	
13	16°54.6	12.6	232°23.5	13.8'	14°39.3	-12.9'	55.7'	60°	17:18	17:19	17:19	· · ·	00:58	02:30	
14	31°54.9	13.5	246°56.3	13.8'	14°26.4	-13.0'	55.7'	N 58°	17:06	17:11	17:15	· · ·	01:10	02:37	
15	46°55.1	· · 14.5	261°29.2	13.9'	14°13.4	-13.1'	55.7'	56°	16:55	17:04	17:11	· · ·	01:20	02:43	
16	61°55.3	15.5	276°02.0	13.9'	14°00.3	-13.2'	55.8'	54°	16:45	16:57	17:07	00:09	01:29	02:49	
17	76°55.5	16.5	290°34.9	13.9'	13°47.1	-13.2'	55.8'	52°	16:37	16:52	17:04	00:20	01:37	02:54	
18	91°55.7	S00°17.4	305°07.8	13.9'	S13°33.9	-13.3'	55.8'	50°	16:29	16:46	17:01	00:30	01:44	02:59	
19	106°56.0	18.4	319°40.8	14.0'	13°20.6	-13.4'	55.8'	45°	16:13	16:35	16:54	00:50	01:59	03:08	
20	121°56.2	19.4	334°13.7	14.0'	13°07.2	-13.4'	55.9'	N 40°	15:59	16:25	16:49	01:06	02:11	03:16	
21	136°56.4	· · 20.3	348°46.7	14.0'	12°53.8	-13.5'	55.9'	35°	15:48	16:17	16:44	01:20	02:21	03:23	
22	151°56.6	21.3	3°19.7	14.0'	12°40.3	-13.6'	55.9'	30°	15:37	16:10	16:40	01:32	02:31	03:29	
23	166°56.8	22.3	17°52.7	14.1'	12°26.7	-13.6'	55.9'	20°	15:20	15:57	16:33	01:52	02:46	03:40	
SD = 15.9'			$d = -1.0'$		SD = 15.1'				N 10°	15:05	15:46	16:26	02:10	03:00	03:49
Thu	GHA	Dec	GHA	ν	Dec	d	HP	0°	14:50	15:36	16:20	02:26	03:12	03:57	
0	181°57.1	S00°23.3	32°25.8	14.1'	S12°13.1	-13.7'	56.0'	S 10°	14:36	15:25	16:14	02:42	03:25	04:05	
1	196°57.3	24.2	46°58.9	14.1'	11°59.4	-13.8'	56.0'	20°	14:20	15:14	16:07	02:59	03:38	04:14	
2	211°57.5	25.2	61°32.0	14.1'	11°45.6	-13.8'	56.0'	30°	14:02	15:01	16:00	03:19	03:53	04:24	
3	226°57.7	· · 26.2	76°05.1	14.1'	11°31.8	-13.9'	56.1'	35°	13:52	14:53	15:55	03:30	04:02	04:30	
4	241°57.9	27.2	90°38.2	14.1'	11°17.9	-14.0'	56.1'	40°	13:40	14:45	15:50	03:43	04:11	04:36	
5	256°58.1	28.1	105°11.3	14.2'	11°03.9	-14.0'	56.1'	45°	13:25	14:35	15:45	03:59	04:23	04:43	
6	271°58.4	S00°29.1	119°44.5	14.2'	S10°49.9	-14.1'	56.1'	S 50°	13:08	14:23	15:38	04:18	04:37	04:52	
7	286°58.6	30.1	134°17.7	14.2'	10°35.8	-14.1'	56.2'	52°	13:00	14:17	15:35	04:26	04:43	04:56	
8	301°58.8	31.0	148°50.9	14.2'	10°21.7	-14.2'	56.2'	54°	12:50	14:11	15:31	04:36	04:50	05:01	
9	316°59.0	· · 32.0	163°24.1	14.2'	10°07.5	-14.3'	56.2'	56°	12:40	14:04	15:27	04:47	04:58	05:06	
10	331°59.2	33.0	177°57.3	14.2'	09°53.2	-14.3'	56.2'	58°	12:28	13:56	15:23	05:00	05:07	05:11	
11	346°59.5	34.0	192°30.5	14.2'	09°38.9	-14.4'	56.3'	S 60°	12:14	13:46	15:18	05:15	05:17	05:17	
12	1°59.7	S00°34.9	207°03.8	14.3'	S09°24.5	-14.4'	56.3'	Day	Sun			Moon			
13	16°59.9	35.9	221°37.0	14.3'	09°10.1	-14.5'	56.3'	Eqn.of Time	Mer.		Mer.Pass.	Age			
14	32°00.1	36.9	236°10.3	14.3'	08°55.6	-14.5'	56.4'	00 ^h	Pass		Upper	Lower	11-13		
15	47°00.3	· · 37.9	250°43.6	14.3'	08°41.1	-14.6'	56.4'	mm:ss	hh:mm		hh:mm	hh:mm	78-92%		
16	62°00.6	38.8	265°16.9	14.3'	08°26.5	-14.6'	56.4'	22	07:06	07:17	11:53	21:01	08:38		
17	77°00.8	39.8	279°50.1	14.3'											

September 25, 26, 27 UT (Fri., Sat., Sun.)

Aries		Venus		Mars		Jupiter		Saturn		Stars										
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec									
0	3°49.9	151°11.3	S20°00.4	243°22.6	N21°25.5	222°43.1	N15°50.2	351°41.9	N02°16.1	Alpheratz	357°33.0 29°14.5									
1	18°52.3	166°13.1	00.9	258°23.5	25.2	237°45.1	50.1	6°44.5	16.0	Ankaa	353°05.3 -42°09.5									
2	33°54.8	181°15.0	01.4	273°24.4	25.0	252°47.1	50.0	21°47.1	16.0	Schedar	349°28.9 56°41.1									
3	48°57.2	196°16.8	· · 01.9	288°25.3	· · 24.7	267°49.1	· · 49.8	36°49.8	· · 15.9	Diphda	348°45.6 -17°50.2									
4	63°59.7	211°18.6	02.4	303°26.2	24.4	282°51.1	49.7	51°52.4	15.8	Achernar	335°18.6 -57°05.8									
5	79°02.2	226°20.5	02.9	318°27.1	24.2	297°53.1	49.5	66°55.1	15.7	Hamal	327°49.3 23°35.4									
6	94°04.6	241°22.3	S20°03.4	333°28.0	N21°23.9	312°55.1	N15°49.4	81°57.7	N02°15.6	Polaris	312°57.6 89°22.4									
7	109°07.1	256°24.2	03.9	348°28.9	23.7	327°57.1	49.3	97°00.3	15.6	Acamar	315°10.4 -40°11.5									
8	124°09.6	271°26.0	04.4	3°29.8	23.4	342°59.1	49.1	112°03.0	15.5	Menkar	314°04.4 4°11.8									
9	139°12.0	286°27.9	· · 04.9	18°30.6	· · 23.1	358°01.1	· · 49.0	127°05.6	· · 15.4	Mirfak	308°25.9 49°57.3									
10	154°14.5	301°29.7	05.4	33°31.5	22.9	13°03.1	48.8	142°08.3	15.3	Aldebaran	290°37.9 16°33.8									
11	169°17.0	316°31.6	05.9	48°32.4	22.6	28°05.1	48.7	157°10.9	15.3	Rigel	281°02.4 -8°10.0									
12	184°19.4	331°33.5	S20°06.4	63°33.3	N21°22.4	43°07.1	N15°48.6	172°13.5	N02°15.2	Capella	280°19.7 46°01.4									
13	199°21.9	346°35.3	06.9	78°34.2	22.1	58°09.1	48.4	187°16.2	15.1	Bellatrix	278°21.3 6°22.5									
14	214°24.4	1°37.2	07.4	93°35.1	21.8	73°11.1	48.3	202°18.8	15.0	Elnath	278°00.0 28°37.8									
15	229°26.8	16°39.1	· · 07.9	108°36.0	· · 21.6	88°13.1	· · 48.2	217°21.5	· · 15.0	Alnilam	275°36.2 -1°10.9									
16	244°29.3	31°41.0	08.4	123°36.9	21.3	103°15.1	48.0	232°24.1	14.9	Betelgeuse	270°50.5 7°24.8									
17	259°31.7	46°42.9	08.9	138°37.8	21.0	118°17.1	47.9	247°26.7	14.8	Canopus	263°51.8 -52°42.2									
18	274°34.2	61°44.7	S20°09.4	153°38.7	N21°20.8	133°19.1	N15°47.7	262°29.4	N02°14.7	Sirius	258°25.0 -16°44.9									
19	289°36.7	76°46.6	09.9	168°39.6	20.5	148°21.1	47.6	277°32.0	14.6	Adhara	255°04.8 -29°00.2									
20	304°39.1	91°48.5	10.4	183°40.5	20.3	163°23.1	47.5	292°34.7	14.6	Procyon	244°49.5 5°09.5									
21	319°41.6	106°50.4	· · 10.9	198°41.4	· · 20.0	178°25.1	· · 47.3	307°37.3	· · 14.5	Pollux	243°15.7 27°57.6									
22	334°44.1	121°52.3	11.3	213°42.3	19.7	193°27.1	47.2	322°39.9	14.4	Avior	234°14.5 -59°35.4									
23	349°46.5	136°54.2	11.8	228°43.2	19.5	208°29.1	47.0	337°42.6	14.3	Suhail	222°45.6 -43°32.2									
Mer.pass. 23:41		ν 1.8' d 0.5' m -4.82		ν 0.9' d -0.3' m 1.14		ν 2.0' d -0.1' m -1.86		ν 2.6' d -0.1' m 0.38		Miaplacidus	221°38.7 -69°49.3									
											Alphard	217°46.6 -8°46.3								
											Regulus	207°33.2 11°50.2								
											Dubhe	193°39.9 61°36.3								
											Denebola	182°23.8 14°25.4								
											Gienah	175°42.5 -17°41.4								
											Acrux	172°59.2 -63°14.8								
											Gacrux	171°50.7 -57°15.8								
											Alioth	166°12.3 55°48.9								
											Spica	158°21.1 -11°18.0								
											Alkaid	152°51.3 -49°10.9								
											Hadar	148°34.6 -60°30.2								
											Menkent	147°56.3 -36°30.1								
											Arcturus	145°46.9 19°02.7								
											Rigel Kent.	139°38.9 -60°56.9								
											Kochab	137°20.7 74°02.9								
											Zuben'ubi	136°54.7 -16°09.1								
											Alphecca	126°02.8 26°37.7								
											Antares	112°14.3 -26°29.5								
											Atria	107°07.4 -69°04.7								
											Sabik	102°01.2 -15°45.4								
											Shaula	96°08.5 -37°07.5								
											Rasalhague	95°57.3 12°32.6								
											Eltanin	90°41.6 51°29.4								
											Kaus Aust.	83°30.6 -34°22.4								
											Vega	80°32.2 38°48.8								
											Nunki	75°45.9 -26°15.8								
											Altair	61°58.5 8°56.5								
											Peacock	53°03.2 -56°39.0								
											Deneb	49°24.6 45°22.8								
											Enif	33°37.2 10°00.1								
											Al Na'ir	27°30.7 -46°49.9								
											Fomalhaut	15°12.6 -29°28.7								
											Scheat	13°43.5 28°13.9								
											Markab	13°28.2 15°21.2								
											Sep 25 Fri	SHA Mer.pass								
											Venus	147°21.4 13:54								
											Mars	239°32.8 07:46								
											Jupiter	218°53.2 09:08								
											Saturn	347°52.0 00:33								
											Sep 26 Sat	SHA Mer.pass								
											Venus	147°07.1 13:50								
											Mars	238°55.1 07:45								
											Jupiter	218°42.2 09:05								
											Saturn	347°56.2 00:29								
											Sep 27 Sun	SHA Mer.pass								
											Venus	146°54.7 13:47								
											Mars	238°17.6 07:43								
											Jupiter	218°31.1 09:02								
											Saturn	348°00.5 00:25								
											Horizontal parallax									
											Venus:	0.4								
											Mars:	0.1								

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°48.1	152°42.8	S20°23.4	244°05.8	N21°12.8	224°19.3	N15°43.6	353°48.6	N02°12.4
1	20°50.6	167°44.8	23.8	259°06.7	12.6	239°21.3	43.5	8°51.2	12.3
2	35°53.1	182°46.8	24.3	274°07.6	12.3	254°23.3	43.3	23°53.9	12.2
3	50°55.5	197°48.8	· · 24.7	289°08.5	· · 12.0	269°25.3	· · 43.2	38°56.5	· · 12.2
4	65°58.0	212°50.8	25.1	304°09.4	11.8	284°27.3	43.1	53°59.2	12.1
5	81°00.4	227°52.8	25.6	319°10.3	11.5	299°29.3	42.9	69°01.8	12.0
6	96°02.9	242°54.8	S20°26.0	334°11.2	N21°11.2	314°31.3	N15°42.8	84°04.5	N02°11.9
7	111°05.4	257°56.8	26.4	349°12.1	11.0	329°33.3	42.6	99°07.1	11.8
8	126°07.8	272°58.8	26.9	4°13.0	10.7	344°35.3	42.5	114°09.7	11.8
9	141°10.3	288°00.8	· · 27.3	19°13.9	· · 10.4	359°37.3	· · 42.4	129°12.4	· · 11.7
10	156°12.8	303°02.9	27.7	34°14.8	10.2	14°39.3	42.2	144°15.0	11.6
11	171°15.2	318°04.9	28.2	49°15.8	09.9	29°41.4	42.1	159°17.7	11.5
12	186°17.7	333°06.9	S20°28.6	64°16.7	N21°09.6	44°43.4	N15°42.0	174°20.3	N02°11.5
13	201°20.2	348°08.9	29.0	79°17.6	09.4	59°45.4	41.8	189°22.9	11.4
14	216°22.6	3°11.0	29.4	94°18.5	09.1	74°47.4	41.7	204°25.6	11.3
15	231°25.1	18°13.0	· · 29.8	109°19.4	· · 08.8	89°49.4	· · 41.5	219°28.2	· · 11.2
16	246°27.6	33°15.0	30.3	124°20.3	08.5</				

h	Sun			Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°02.3	S00°46.6	21°43.2	14.3'	S06°28.1	-15.0'	56.6'
1	197°02.5	47.6	36°16.5	14.3'	06°13.1	-15.0'	56.7'
2	212°02.7	48.6	50°49.8	14.3'	05°58.0	-15.1'	56.7'
3	227°02.9	· · 49.5	65°23.1	14.3'	05°43.0	-15.1'	56.7'
4	242°03.2	50.5	79°56.4	14.3'	05°27.8	-15.2'	56.7'
5	257°03.4	51.5	94°29.7	14.3'	05°12.7	-15.2'	56.8'
6	272°03.6	S00°52.5	109°03.0	14.3'	S04°57.5	-15.2'	56.8'
7	287°03.8	53.4	123°36.3	14.3'	04°42.2	-15.3'	56.8'
8	302°04.0	54.4	138°09.6	14.3'	04°26.9	-15.3'	56.8'
9	317°04.3	· · 55.4	152°42.8	14.2'	04°11.6	-15.3'	56.9'
10	332°04.5	56.3	167°16.1	14.2'	03°56.3	-15.4'	56.9'
11	347°04.7	57.3	181°49.3	14.2'	03°40.9	-15.4'	56.9'
12	2°04.9	S00°58.3	196°22.5	14.2'	S03°25.5	-15.4'	57.0'
13	17°05.1	00°59.3	210°55.7	14.2'	03°10.1	-15.5'	57.0'
14	32°05.3	01°00.2	225°28.9	14.2'	02°54.6	-15.5'	57.0'
15	47°05.6	· · 01.2	240°02.1	14.2'	02°39.1	-15.5'	57.0'
16	62°05.8	02.2	254°35.3	14.1'	02°23.6	-15.5'	57.1'
17	77°06.0	03.2	269°08.4	14.1'	02°08.1	-15.6'	57.1'
18	92°06.2	S01°04.1	283°41.5	14.1'	S01°52.5	-15.6'	57.1'
19	107°06.4	05.1	298°14.6	14.1'	01°36.9	-15.6'	57.1'
20	122°06.6	06.1	312°47.7	14.1'	01°21.3	-15.6'	57.2'
21	137°06.9	· · 07.1	327°20.8	14.0'	01°05.6	-15.7'	57.2'
22	152°07.1	08.0	341°53.8	14.0'	00°50.0	-15.7'	57.2'
23	167°07.3	09.0	356°26.8	14.0'	00°34.3	-15.7'	57.3'
SD = 15.9'			SD = 15.4'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°07.5	S01°10.0	10°59.8	14.0'	S00°18.6	-15.7'	57.3'
1	197°07.7	10.9	25°32.8	13.9'	S00°02.9	-15.7'	57.3'
2	212°07.9	11.9	40°05.7	13.9'	N00°12.8	15.7'	57.3'
3	227°08.1	· · 12.9	54°38.6	13.9'	N00°28.5	15.7'	57.4'
4	242°08.4	13.9	69°11.5	13.8'	00°44.3	15.8'	57.4'
5	257°08.6	14.8	83°44.3	13.8'	01°00.0	15.8'	57.4'
6	272°08.8	S01°15.8	98°17.1	13.8'	N01°15.8	15.8'	57.4'
7	287°09.0	16.8	112°49.9	13.7'	01°31.6	15.8'	57.5'
8	302°09.2	17.8	127°22.7	13.7'	01°47.4	15.8'	57.5'
9	317°09.4	· · 18.7	141°55.4	13.7'	02°03.2	15.8'	57.5'
10	332°09.7	19.7	156°28.0	13.6'	02°19.0	15.8'	57.5'
11	347°09.9	20.7	171°00.7	13.6'	02°34.8	15.8'	57.6'
12	2°10.1	S01°21.6	185°33.3	13.6'	N02°50.6	15.8'	57.6'
13	17°10.3	22.6	200°05.8	13.5'	03°06.4	15.8'	57.6'
14	32°10.5	23.6	214°38.3	13.5'	03°22.2	15.8'	57.6'
15	47°10.7	· · 24.6	229°10.8	13.4'	03°38.0	15.8'	57.7'
16	62°10.9	25.5	243°43.2	13.4'	03°53.8	15.8'	57.7'
17	77°11.2	26.5	258°15.6	13.3'	04°09.6	15.8'	57.7'
18	92°11.4	S01°27.5	272°47.9	13.3'	N04°25.3	15.8'	57.7'
19	107°11.6	28.5	287°20.2	13.2'	04°41.1	15.8'	57.8'
20	122°11.8	29.4	301°52.5	13.2'	04°56.9	15.8'	57.8'
21	137°12.0	· · 30.4	316°24.7	13.1'	05°12.7	15.8'	57.8'
22	152°12.2	31.4	330°56.8	13.1'	05°28.4	15.7'	57.8'
23	167°12.4	32.3	345°28.9	13.0'	05°44.1	15.7'	57.9'
SD = 15.9'			SD = 15.6'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°12.7	S01°33.3	0°00.9	13.0'	N05°59.9	15.7'	57.9'
1	197°12.9	34.3	14°32.9	12.9'	06°15.6	15.7'	57.9'
2	212°13.1	35.3	29°04.8	12.9'	06°31.3	15.7'	57.9'
3	227°13.3	· · 36.2	43°36.7	12.8'	06°46.9	15.7'	58.0'
4	242°13.5	37.2	58°08.5	12.8'	07°02.6	15.6'	58.0'
5	257°13.7	38.2	72°40.2	12.7'	07°18.2	15.6'	58.0'
6	272°13.9	S01°39.2	87°11.9	12.6'	N07°33.8	15.6'	58.0'
7	287°14.2	40.1	101°43.6	12.6'	07°49.4	15.6'	58.1'
8	302°14.4	41.1	116°15.1	12.5'	08°05.0	15.5'	58.1'
9	317°14.6	· · 42.1	130°46.6	12.4'	08°20.5	15.5'	58.1'
10	332°14.8	43.0	145°18.1	12.4'	08°36.0	15.5'	58.1'
11	347°15.0	44.0	159°49.5	12.3'	08°51.5	15.4'	58.1'
12	2°15.2	S01°45.0	174°20.8	12.2'	N09°06.9	15.4'	58.2'
13	17°15.4	46.0	188°52.0	12.2'	09°22.3	15.4'	58.2'
14	32°15.6	46.9	203°23.2	12.1'	09°37.7	15.3'	58.2'
15	47°15.9	· · 47.9	217°54.3	12.0'	09°53.0	15.3'	58.2'
16	62°16.1	48.9	232°25.3	12.0'	10°08.3	15.3'	58.3'
17	77°16.3	49.9	246°56.3	11.9'	10°23.6	15.2'	58.3'
18	92°16.5	S01°50.8	261°27.2	11.8'	N10°38.8	15.2'	58.3'
19	107°16.7	51.8	275°58.0	11.7'	10°54.0	15.1'	58.3'
20	122°16.9	52.8	290°28.7	11.7'	11°09.1	15.1'	58.3'
21	137°17.1	· · 53.7	304°59.4	11.6'	11°24.2	15.0'	58.4'
22	152°17.3	54.7	319°30.0	11.5'	11°39.2	15.0'	58.4'
23	167°17.6	55.7	334°00.5	11.4'	11°54.2	14.9'	58.4'
SD = 15.9'			SD = 15.8'				

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

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

Day	Sun			Moon		Age 14-16 97-100%
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	
25	08:09	08:20	11:52	23:15	10:52	
26	08:30	08:40	11:51	—:—	11:37	
27	08:51	09:01	11:51	00:00	12:23	

September 28, 29, 30 UT (Mon., Tue., Wed.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	6°47.3	153°31.5	S20°33.5	244°27.6	N21°06.4	225°07.5	N15°40.3	354°52.0	N02°10.5	Alpheratz	357°33.0 29°14.5
1	21°49.7	168°33.5	34.0	259°28.5	06.1	240°09.5	40.2	9°54.6	10.4	Ankaa	353°05.3 -42°09.5
2	36°52.2	183°35.6	34.4	274°29.4	05.8	255°11.5	40.0	24°57.3	10.4	Schedar	349°28.9 56°41.2
3	51°54.7	198°37.7	· · 34.8	289°30.3	· · 05.6	270°13.5	· · 39.9	39°59.9	· · 10.3	Diphda	348°45.5 -17°50.2
4	66°57.1	213°39.8	35.2	304°31.3	05.3	285°15.5	39.8	55°02.6	10.2	Achernar	335°18.6 -57°05.8
5	81°59.6	228°41.9	35.6	319°32.2	05.0	300°17.5	39.6	70°05.2	10.1	Hamal	327°49.3 23°35.4
6	97°02.0	243°43.9	S20°35.9	334°33.1	N21°04.7	315°19.5	N15°39.5	85°07.9	N02°10.1	Polaris	312°56.4 89°22.4
7	112°04.5	258°46.0	36.3	349°34.0	04.5	330°21.6	39.4	100°10.5	10.0	Acamar	315°10.4 -40°11.6
8	127°07.0	273°48.1	36.7	4°34.9	04.2	345°23.6	39.2	115°13.1	09.9	Menkar	314°04.4 4°11.8
9	142°09.4	288°50.2	· · 37.1	19°35.8	· · 03.9	0°25.6	· · 39.1	130°15.8	· · 09.8	Mirfak	308°25.9 49°57.3
10	157°11.9	303°52.3	37.5	34°36.8	03.7	15°27.6	38.9	145°18.4	09.7	Aldebaran	290°37.8 16°33.8
11	172°14.4	318°54.4	37.9	49°37.7	03.4	30°29.6	38.8	160°21.1	09.7	Rigel	281°02.4 -8°10.0
12	187°16.8	333°56.5	S20°38.3	64°38.6	N21°03.1	45°31.6	N15°38.7	175°23.7	N02°09.6	Capella	280°19.7 46°01.4
13	202°19.3	348°58.6	38.7	79°39.5	02.8	60°33.6	38.5	190°26.4	09.5	Bellatrix	278°21.3 6°22.5
14	217°21.8	4°00.8	39.1	94°40.4	02.6	75°35.6	38.4	205°29.0	09.4	Elnath	278°00.0 28°37.8
15	232°24.2	19°02.9	· · 39.4	109°41.3	· · 02.3	90°37.6	· · 38.3	220°31.6	· · 09.4	Alnilam	275°36.2 -1°10.9
16	247°26.7	34°05.0	39.8	124°42.3	02.0	105°39.7	38.1	235°34.3	09.3	Betelgeuse	270°50.5 7°24.8
17	262°29.2	49°07.1	40.2	139°43.2	01.7	120°41.7	38.0	250°36.9	09.2	Canopus	263°51.8 -52°42.2
18	277°31.6	64°09.2	S20°40.6	154°44.1	N21°01.5	135°43.7	N15°37.9	265°39.6	N02°09.1	Sirius	258°25.0 -16°44.9
19	292°34.1	79°11.4	40.9	169°45.0	01.2	150°45.7	37.7	280°42.2	09.0	Adhara	255°04.8 -29°00.2
20	307°36.5	94°13.5	41.3	184°45.9	00.9	165°47.7	37.6	295°44.8	09.0	Procyon	244°49.5 5°09.5
21	322°39.0	109°15.7	· · 41.7	199°46.9	· · 00.6	180°49.7	· · 37.4	310°47.5	· · 08.9	Pollux	243°15.7 27°57.6
22	337°41.5	124°17.8	42.1	214°47.8	00.4	195°51.7	37.3	325°50.1	08.8	Avior	234°14.5 -59°35.4
23	352°43.9	139°19.9	42.4	229°48.7	00.1	210°53.8	37.2	340°52.8	08.7	Suhail	222°45.6 -43°32.2
Mer.pass. 23:29		ν 2.1' d 0.4' m -4.81		ν 0.9' d -0.3' m 1.13		ν 2.0' d -0.1' m -1.86		ν 2.6' d -0.1' m 0.36		Miaplacidus	221°38.6 -69°49.3
Alphard 217°46.6 -8°46.3 Regulus 207°33.2 11°50.2 Dubhe 193°39.9 61°36.3 Denebola 182°23.8 14°25.4 Gienah 175°42.5 -17°41.3 Acrux 172°59.2 -63°14.8 Gacrux 171°50.7 -57°15.8 Alioth 166°12.3 55°48.9 Spica 158°21.1 -11°18.0 Alkaid 152°51.3 49°10.9 Hadar 148°34.6 -60°30.2 Menkent 147°56.3 -36°30.1 Arcturus 145°46.9 19°02.7 Rigel Kent. 139°38.9 -60°56.9 Kochab 137°20.7 74°02.8 Zuben'ubi 136°54.7 -16°09.1 Alphecca 126°02.8 26°37.6 Antares 112°14.3 -26°29.5 Atria 107°07.4 -69°04.7 Sabik 102°01.3 -15°45.4 Shaula 96°08.5 -37°07.5 Rasalhague 95°57.3 12°32.6 Eltanin 90°41.6 51°29.4 Kaus Aust. 83°30.6 -34°22.4 Vega 80°32.3 38°48.8 Nunki 75°46.0 -26°15.8 Altair 61°58.5 8°56.5 Peacock 53°03.2 -56°39.0 Deneb 49°24.6 45°22.8 Enif 33°37.2 10°00.1 Al Na'ir 27°30.8 -46°49.9 Fomalhaut 15°12.6 -29°28.7 Scheat 13°43.5 28°13.9 Markab 13°28.2 15°21.2											
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	7°46.4	154°22.1	S20°42.8	244°49.6	N20°59.8	225°55.8	N15°37.0	355°55.4	N02°08.7		
1	22°48.9	169°24.2	43.2	259°50.5	59.5	240°57.8	36.9	10°58.1	08.6		
2	37°51.3	184°26.4	43.5	274°51.5	59.3	255°59.8	36.8	26°00.7	08.5		
3	52°53.8	199°28.6	· · 43.9	289°52.4	· · 59.0	271°01.8	· · 36.6	41°03.3	· · 08.4		
4	67°56.3	214°30.7	44.2	304°53.3	58.7	286°03.8	36.5	56°06.0	08.3		
5	82°58.7	229°32.9	44.6	319°54.2	58.4	301°05.8	36.4	71°08.6	08.3		
6	98°01.2	244°35.1	S20°45.0	334°55.1	N20°58.1	316°07.9	N15°36.2	86°11.3	N02°08.2		
7	113°03.7	259°37.2	45.3	349°56.1	57.9	331°09.9	36.1	101°13.9	08.1		
8	128°06.1	274°39.4	45.7	4°57.0	57.6	346°11.9	35.9	116°16.6	08.0		
9	143°08.6	289°41.6	· · 46.0	19°57.9	· · 57.3	1°13.9	· · 35.8	131°19.2	· · 08.0		
10	158°11.0	304°43.8	46.4	34°58.8	57.0	16°15.9	35.7	146°21.8	07.9		
11	173°13.5	319°46.0	46.7	49°59.8	56.8	31°17.9	35.5	161°24.5	07.8		
12	188°16.0	334°48.2	S20°47.1	65°00.7	N20°56.5	46°19.9	N15°35.4	176°27.1	N02°07.7		
13	203°18.4	349°50.4	47.4	80°01.6	56.2	61°22.0	35.3	191°29.8	07.6		
14	218°20.9	4°52.6	47.7	95°02.5	55.9	76°24.0	35.1	206°32.4	07.6		
15	233°23.4	19°54.8	· · 48.1	110°03.5	· · 55.6	91°26.0	· · 35.0	221°35.1	· · 07.5		
16	248°25.8	34°57.0	48.4	125°04.4	55.4	106°28.0	34.9	236°37.7	07.4		
17	263°28.3	49°59.2	48.8	140°05.3	55.1	121°30.0	34.7	251°40.3	07.3		
18	278°30.8	65°01.4	S20°49.1	155°06.2	N20°54.8	136°32.0	N15°34.6	266°43.0	N02°07.3		
19	293°33.2	80°03.6	49.4	170°07.2	54.5	151°34.1	34.5	281°45.6	07.2		
20	308°35.7	95°05.8	49.8	185°08.1	54.3	166°36.1	34.3	296°48.3	07.1		
21	323°38.1	110°08.0	· · 50.1	200°09.0	· · 54.0	181°38.1	· · 34.2	311°50.9	· · 07.0		
22	338°40.6	125°10.3	50.4	215°09.9	53.7	196°40.1	34.0	326°53.6	06.9		
23	353°43.1	140°12.5	50.7	230°10.9	53.4	211°42.1	33.9	341°56.2	06.9		
Mer.pass. 23:25		ν 2.2' d 0.4' m -4.80		ν 0.9' d -0.3' m 1.12		ν 2.0' d -0.1' m -1.87		ν 2.6' d -0.1' m 0.36			
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	8°45.5	155°14.7	S20°51.1	245°11.8	N20°53.1	226°44.1	N15°33.8	356°58.9	N02°06.8		
1	23°48.0	170°17.0	51.4	260°12.7	52.9	241°46.2	33.6	12°01.5	06.7		
2	38°50.5	185°19.2	51.7	275°13.6	52.6	256°48.2	33.5	27°04.1	06.6		
3	53°52.9	200°21.5	· · 52.0	290°14.6	· · 52.3	271°50.2	· · 33.4	42°06.8	· · 06.6		
4	68°55.4	215°23.7	52.3	305°15.5	52.0	286°52.2	33.2	57°09.4	06.5		
5	83°57.9	230°26.0	52.7	320°16.4	51.7	301°54.2	33.1	72°12.1	06.4		
6	99°00.3	245°28.2	S20°53.0	335°17.4	N20°51.5	316°56.2	N15°33.0	87°14.7	N02°06.3		
7	114°02.8	260°30.5	53.3	350°18.3	51.2	331°58.3	32.8	102°17.4	06.2		
8	129°05.3	275°32.7	53.6	5°19.2	50.9	347°00.3	32.7	117°20.0	06.2		
9	144°07.7	290°35.0	· · 53.9	20°20.2	· · 50.6	2°02.3	· · 32.6	132°22.6	· · 06.1		
10	159°10.2	305°37.3	54.2	35°21.1	50.3	17°04.3	32.4	147°25.3	06.0		
11	174°12.6	320°39.6	54.5	50°22.0	50.0	32°06.3	32.3	162°27.9	05.9		
12	189°15.1	335°41.8	S20°54.8	65°22.9	N20°49.8	47°08.4	N15°32.2	177°30.6	N02°05.9		
13	204°17.6	350°44.1	55.1	80°23.9	49.5	62°10.4	32.0	192°33.2	05.8		
14	219°20.0	5°46.4	55.4	95°24.8	49.2	77°12.4	31.9	207°35.9	05.7		
15	234°22.5	20°48.7	· · 55.7	110°25.7	· · 48.9	92°14.4	· · 31.7	222°38.5	· · 05.6		
16	249°25.0	35°51.0	56.0	125°26.7	48.6	107°16.4	31.6	237°41.1	05.5		
17	264°27.4	50°53.3	56.3	140°27.6	48.4	122°18.5	31.5	252°43.8	05.5		
18	279°29.9	65°55.6	S20°56.6	155°28.5	N20°48.1	137°20.5	N15°31.3	267°46.4	N02°05.4		
19	294°32.4	80°57.9	56.9	170°29.5	47.8	152°22.5	31.2	282°49.1	05.3		
20	309°34.8	96°00.2	57.2	185°30.4	47.5	167°24.5	31.1	297°51.7	05.2		
21	324°37.3	111°02.5	· · 57.5	200°31.3	· · 47.2	182°26.5	· · 30.9	312°54.4	· · 05.2		
22	339°39.8	126°04.8	57.8	215°32.3	46.9	197°28.6	30.8	327°57.0	05.1		
23	354°42.2	141°07.1	58.0	230°33.2	46.7	212°30.6	30.7	342°59.7	05.0		
Mer.pass. 23:21		ν 2.2' d 0.3' m -4.79		ν 0.9' d -0.3' m 1.12		ν 2.0' d -0.1' m -1.87		ν 2.6' d -0.1' m 0.35			
Horizontal parallax Venus: 0.4 Mars: 0.1											

2026 September 28 to Sep. 30 UT

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

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

Day	Sun			Moon		Age 17-19 98-87%
	Eqn. of Time		Mer.	Mer. Pass.		
	00 ^h	12 ^h	Pass	Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
28	09:11	09:21	11:51	00:48	13:13	
29	09:31	09:41	11:50	01:38	14:06	
30	09:51	10:01	11:50	02:34	15:03	

October 01, 02, 03 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	9°44.7	156°09.5	S20°58.3	245°34.1	N20°46.4	227°32.6	N15°30.5	358°02.3	N02°04.9	Alpheratz	357°32.9	29°14.5											
1	24°47.1	171°11.8	58.6	260°35.1	46.1	242°34.6	30.4	13°04.9	04.8	Ankaa	353°05.3	-42°09.5											
2	39°49.6	186°14.1	58.9	275°36.0	45.8	257°36.6	30.3	28°07.6	04.8	Schedar	349°28.8	56°41.2											
3	54°52.1	201°16.4	•• 59.2	290°37.0	•• 45.5	272°38.7	•• 30.1	43°10.2	•• 04.7	Diphda	348°45.5	-17°50.2											
4	69°54.5	216°18.8	59.4	305°37.9	45.2	287°40.7	30.0	58°12.9	04.6	Achernar	335°18.6	-57°05.9											
5	84°57.0	231°21.1	20°59.7	320°38.8	45.0	302°42.7	29.9	73°15.5	04.5	Hamal	327°49.3	23°35.5											
6	99°59.5	246°23.5	S21°00.0	335°39.8	N20°44.7	317°44.7	N15°29.7	88°18.2	N02°04.5	Polaris	312°54.9	89°22.4											
7	115°01.9	261°25.8	00.2	350°40.7	44.4	332°46.7	29.6	103°20.8	04.4	Acamar	315°10.4	-40°11.6											
8	130°04.4	276°28.2	00.5	5°41.6	44.1	347°48.8	29.5	118°23.4	04.3	Menkar	314°04.4	4°11.8											
9	145°06.9	291°30.5	•• 00.8	20°42.6	•• 43.8	2°50.8	•• 29.3	133°26.1	•• 04.2	Mirfak	308°25.8	49°57.3											
10	160°09.3	306°32.9	01.0	35°43.5	43.5	17°52.8	29.2	148°28.7	04.1	Aldebaran	290°37.8	16°33.8											
11	175°11.8	321°35.2	01.3	50°44.4	43.2	32°54.8	29.1	163°31.4	04.1	Rigel	281°02.4	-8°10.0											
12	190°14.3	336°37.6	S21°01.6	65°45.4	N20°43.0	47°56.9	N15°28.9	178°34.0	N02°04.0	Capella	280°19.6	46°01.4											
13	205°16.7	351°40.0	01.8	80°46.3	42.7	62°58.9	28.8	193°36.7	03.9	Bellatrix	278°21.3	6°22.5											
14	220°19.2	6°42.4	02.1	95°47.3	42.4	78°00.9	28.7	208°39.3	03.8	Elnath	278°00.0	28°37.8											
15	235°21.6	21°44.7	•• 02.3	110°48.2	•• 42.1	93°02.9	•• 28.5	223°42.0	•• 03.8	Alnilam	275°36.2	-1°10.9											
16	250°24.1	36°47.1	02.6	125°49.1	41.8	108°05.0	28.4	238°44.6	03.7	Betelgeuse	270°50.5	7°24.8											
17	265°26.6	51°49.5	02.8	140°50.1	41.5	123°07.0	28.3	253°47.2	03.6	Canopus	263°51.7	-52°42.2											
18	280°29.0	66°51.9	S21°03.1	155°51.0	N20°41.2	138°09.0	N15°28.1	268°49.9	N02°03.5	Sirius	258°25.0	-16°44.9											
19	295°31.5	81°54.3	03.3	170°52.0	41.0	153°11.0	28.0	283°52.5	03.5	Adhara	255°04.8	-29°00.2											
20	310°34.0	96°56.7	03.6	185°52.9	40.7	168°13.0	27.9	298°55.2	03.4	Procyon	244°49.4	5°09.5											
21	325°36.4	111°59.1	•• 03.8	200°53.8	•• 40.4	183°15.1	•• 27.7	313°57.8	•• 03.3	Pollux	243°15.7	27°57.6											
22	340°38.9	127°01.5	04.0	215°54.8	40.1	198°17.1	27.6	329°00.5	03.2	Avior	234°14.4	-59°35.4											
23	355°41.4	142°03.9	04.3	230°55.7	39.8	213°19.1	27.5	344°03.1	03.1	Suhail	222°45.5	-43°32.2											
Mer.pass. 23:17				ν 2.3' d 0.3' m -4.78	ν 0.9' d -0.3' m 1.11	ν 2.0' d -0.1' m -1.87	ν 2.6' d -0.1' m 0.35																

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	10°43.8	157°06.3	S21°04.5	245°56.7	N20°39.5	228°21.1	N15°27.3	359°05.8	N02°03.1	Denebola	182°23.8	14°25.4
1	25°46.3	172°08.7	04.8	260°57.6	39.2	243°23.2	27.2	14°08.4	03.0	Gienah	175°42.5	-17°41.3
2	40°48.7	187°11.1	05.0	275°58.6	38.9	258°25.2	27.0	29°11.0	02.9	Acrux	172°59.2	-63°14.8
3	55°51.2	202°13.6	•• 05.2	290°59.5	•• 38.7	273°27.2	•• 26.9	44°13.7	•• 02.8	Gacrux	171°50.6	-57°15.7
4	70°53.7	217°16.0	05.5	306°00.4	38.4	288°29.2	26.8	59°16.3	02.8	Alioth	166°12.3	55°48.9
5	85°56.1	232°18.4	05.7	321°01.4	38.1	303°31.3	26.6	74°19.0	02.7	Spica	158°21.1	-11°18.0
6	100°58.6	247°20.8	S21°05.9	336°02.3	N20°37.8	318°33.3	N15°26.5	89°21.6	N02°02.6	Alkaid	152°51.3	49°10.9
7	116°01.1	262°23.3	06.1	351°03.3	37.5	333°35.3	26.4	104°24.3	02.5	Hadar	148°34.6	-60°30.2
8	131°03.5	277°25.7	06.4	6°04.2	37.2	348°37.3	26.2	119°26.9	02.4	Menkent	147°56.3	-36°30.1
9	146°06.0	292°28.2	•• 06.6	21°05.2	•• 36.9	3°39.4	•• 26.1	134°29.5	•• 02.4	Arcturus	145°46.9	19°02.7
10	161°08.5	307°30.6	06.8	36°06.1	36.6	18°41.4	26.0	149°32.2	02.3	Rigel Kent.	139°38.9	-60°56.8
11	176°10.9	322°33.1	07.0	51°07.1	36.3	33°43.4	25.8	164°34.8	02.2	Kochab	137°20.8	74°02.8
12	191°13.4	337°35.5	S21°07.2	66°08.0	N20°36.1	48°45.5	N15°25.7	179°37.5	N02°02.1	Zuben'ubi	136°54.7	-16°09.1
13	206°15.9	352°38.0	07.4	81°09.0	35.8	63°47.5	25.6	194°40.1	02.1	Alphecca	126°02.8	26°37.6
14	221°18.3	7°40.4	07.6	96°09.9	35.5	78°49.5	25.4	209°42.8	02.0	Antares	112°14.3	-26°29.5
15	236°20.8	22°42.9	•• 07.9	111°10.8	•• 35.2	93°51.5	•• 25.3	224°45.4	•• 01.9	Atria	107°07.4	-69°04.7
16	251°23.2	37°45.4	08.1	126°11.8	34.9	108°53.6	25.2	239°48.1	01.8	Sabik	102°01.3	-15°45.4
17	266°25.7	52°47.9	08.3	141°12.7	34.6	123°55.6	25.0	254°50.7	01.7	Shaula	96°08.5	-37°07.4
18	281°28.2	67°50.3	S21°08.5	156°13.7	N20°34.3	138°57.6	N15°24.9	269°53.3	N02°01.7	Rasalhague	95°57.3	12°32.6
19	296°30.6	82°52.8	08.7	171°14.6	34.0	153°59.6	24.8	284°56.0	01.6	Eltanin	90°41.6	51°29.4
20	311°33.1	97°55.3	08.9	186°15.6	33.7	169°01.7	24.6	299°58.6	01.5	Kaus Aust.	83°30.7	-34°22.4
21	326°35.6	112°57.8	•• 09.1	201°16.5	•• 33.4	184°03.7	•• 24.5	315°01.3	•• 01.4	Vega	80°32.3	38°48.8
22	341°38.0	128°00.3	09.3	216°17.5	33.2	199°05.7	24.4	330°03.9	01.4	Nunki	75°46.0	-26°15.8
23	356°40.5	143°02.8	09.4	231°18.4	32.9	214°07.8	24.3	345°06.6	01.3	Altair	61°58.5	8°56.5
Mer.pass. 23:13				ν 2.4' d 0.2' m -4.77	ν 0.9' d -0.3' m 1.10	ν 2.0' d -0.1' m -1.88	ν 2.6' d -0.1' m 0.34					

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	11°43.0	158°05.3	S21°09.6	246°19.4	N20°32.6	229°09.8	N15°24.1	0°09.2	N02°01.2	Oct 01 Thu	SHA	
1	26°45.4	173°07.8	09.8	261°20.3	32.3	244°11.8	24.0	15°11.9	01.1	Venus	146°24.8	13:33
2	41°47.9	188°10.3	10.0	276°21.3	32.0	259°13.8	23.9	30°14.5	01.0	Mars	235°49.5	07:37
3	56°50.4	203°12.8	•• 10.2	291°22.2	•• 31.7	274°15.9	•• 23.7	45°17.1	•• 01.0	Jupiter	217°47.9	08:49
4	71°52.8	218°15.3	10.4	306°23.2	31.4	289°17.9	23.6	60°19.8	00.9	Saturn	348°17.6	00:08
5	86°55.3	233°17.9	10.6	321°24.1	31.1	304°19.9	23.5	75°22.4	00.8			
6	101°57.7	248°20.4	S21°10.7	336°25.1	N20°30.8	319°22.0	N15°23.3	90°25.1	N02°00.7			
7	117°00.2	263°22.9	10.9	351°26.0	30.5	334°24.0	23.2	105°27.7	00.7			
8	132°02.7	278°25.4	11.1	6°27.0	30.2	349°26.0	23.1	120°30.4	00.6			
9	147°05.1	293°28.0	•• 11.3	21°27.9	•• 29.9	4°28.0	•• 22.9	135°33.0	•• 00.5			
10	162°07.6	308°30.5	11.4	36°28.9	29.7	19°30.1	22.8	150°35.7	00.4			
11	177°10.1	323°33.1	11.6	51°29.8	29.4	34°32.1	22.7	165°38.3	00.3			
12	192°12.5	338°35.6	S21°11.8	66°30.8	N20°29.1	49°34.1	N15°22.5	180°40.9	N02°00.3			
13	207°15.0	353°38.1	11.9	81°31.8	28.8	64°36.2	22.4	195°43.6	00.2			
14	222°17.5	8°40.7	12.1	96°32.7	28.5	79°38.2	22.3	210°46.2	00.1			
15	237°19.9	23°43.3	•• 12.3	111°33.7	•• 28.2	94°40.2	•• 22.1	225°48.9	•• 00.0			
16	252°22.4	38°45.8	12.4	126°34.6	27.9	109°42.3	22.0	240°51.5	02°00.0			
17	267°24.9	53°48.4	12.6	141°35.6	27.6	124°44.3	21.9	255°54.2	01°59.9			
18	282°27.3	68°51.0	S21°12.7	156°36.5	N20°27.3	139°46.3	N15°21.7	270°56.8	N01°59.8			
19	297°29.8	83°53.5	12.9	171°37.5	27.0	154°48.3	21.6	285°59.5	59.7			
20	312°32.2	98°56.1	13.0	186°38.4	26.7	169°50.4	21.5	301°02.1	59.6			
21	327°34.7	113°58.7	•• 13.2	201°39.4	•• 26.4	184°52.4	•• 21.3	316°04.8	•• 59.6			
22	342°37.2	129°01.3	13.3	216°40.4	26.1	199°54.4	21.2	331°07.4	59.5			
23	357°39.6	144°03.9	13.5	231°41.3	25.8	214°56.5	21.1	346°10.0	59.4			
Mer.pass. 23:09				ν 2.5' d 0.2' m -4.76	ν 1.0' d -0.3' m 1.10	ν 2.0' d -0.1' m -1.88	ν 2.6' d -0.1' m 0.33					

Horizontal parallax		
Venus:	0.4	
Mars:	0.1	

h		Sun			Moon		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°32.7	S03°06.6	308°54.6	4.6'	N25°59.1	6.6'	59.3'
1	197°32.9	07.5	323°18.1	4.5'	26°05.6	6.4'	59.3'
2	212°33.1	08.5	337°41.6	4.4'	26°12.0	6.2'	59.3'
3	227°33.3	· · 09.5	352°05.0	4.3'	26°18.3	6.0'	59.3'
4	242°33.5	10.5	6°28.4	4.3'	26°24.3	5.9'	59.3'
5	257°33.7	11.4	20°51.7	4.2'	26°30.2	5.7'	59.3'
6	272°34.0	S03°12.4	35°14.9	4.1'	N26°35.9	5.5'	59.3'
7	287°34.2	13.4	49°38.0	4.1'	26°41.4	5.3'	59.3'
8	302°34.4	14.3	64°01.1	4.0'	26°46.7	5.1'	59.3'
9	317°34.6	· · 15.3	78°24.1	4.0'	26°51.9	5.0'	59.3'
10	332°34.8	16.3	92°47.1	3.9'	26°56.8	4.8'	59.3'
11	347°35.0	17.2	107°10.0	3.9'	27°01.6	4.6'	59.3'
12	2°35.2	S03°18.2	121°32.9	3.8'	N27°06.2	4.4'	59.3'
13	17°35.4	19.2	135°55.7	3.7'	27°10.6	4.2'	59.3'
14	32°35.6	20.1	150°18.4	3.7'	27°14.9	4.0'	59.3'
15	47°35.8	· · 21.1	164°41.1	3.7'	27°18.9	3.9'	59.3'
16	62°36.0	22.1	179°03.8	3.6'	27°22.7	3.7'	59.3'
17	77°36.2	23.0	193°26.4	3.6'	27°26.4	3.5'	59.3'
18	92°36.4	S03°24.0	207°48.9	3.5'	N27°29.9	3.3'	59.3'
19	107°36.6	25.0	222°11.5	3.5'	27°33.2	3.1'	59.3'
20	122°36.8	26.0	236°33.9	3.5'	27°36.3	2.9'	59.3'
21	137°37.0	· · 26.9	250°56.4	3.4'	27°39.2	2.7'	59.3'
22	152°37.2	27.9	265°18.8	3.4'	27°41.9	2.5'	59.3'
23	167°37.4	28.9	279°41.2	3.4'	27°44.4	2.3'	59.3'
SD = 16.0'		$d = 1.0'$	SD = 16.2'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°37.6	S03°29.8	294°03.6	3.3'	N27°46.7	2.1'	59.3'
1	197°37.8	30.8	308°25.9	3.3'	27°48.8	1.9'	59.3'
2	212°38.0	31.8	322°48.3	3.3'	27°50.8	1.7'	59.3'
3	227°38.2	· · 32.7	337°10.6	3.3'	27°52.5	1.5'	59.3'
4	242°38.4	33.7	351°32.8	3.3'	27°54.1	1.4'	59.3'
5	257°38.6	34.7	5°55.1	3.3'	27°55.4	1.2'	59.3'
6	272°38.8	S03°35.6	20°17.4	3.2'	N27°56.6	1.0'	59.3'
7	287°39.0	36.6	34°39.6	3.2'	27°57.6	0.8'	59.3'
8	302°39.2	37.6	49°01.8	3.2'	27°58.3	0.6'	59.3'
9	317°39.4	· · 38.5	63°24.1	3.2'	27°58.9	0.4'	59.3'
10	332°39.6	39.5	77°46.3	3.2'	27°59.3	0.2'	59.3'
11	347°39.8	40.5	92°08.6	3.2'	27°59.5	-0.0'	59.3'
12	2°40.0	S03°41.4	106°30.8	3.2'	N27°59.5	-0.2'	59.3'
13	17°40.2	42.4	120°53.0	3.3'	27°59.2	-0.4'	59.3'
14	32°40.4	43.4	135°15.3	3.3'	27°58.8	-0.6'	59.3'
15	47°40.6	· · 44.3	149°37.6	3.3'	27°58.2	-0.8'	59.3'
16	62°40.8	45.3	163°59.8	3.3'	27°57.5	-1.0'	59.3'
17	77°41.0	46.3	178°22.1	3.3'	27°56.5	-1.2'	59.3'
18	92°41.2	S03°47.2	192°44.4	3.3'	N27°55.3	-1.4'	59.3'
19	107°41.4	48.2	207°06.8	3.4'	27°53.9	-1.6'	59.3'
20	122°41.6	49.2	221°29.1	3.4'	27°52.4	-1.8'	59.3'
21	137°41.8	· · 50.1	235°51.5	3.4'	27°50.6	-2.0'	59.3'
22	152°42.0	51.1	250°13.9	3.4'	27°48.6	-2.1'	59.2'
23	167°42.1	52.1	264°36.4	3.5'	27°46.5	-2.3'	59.2'
SD = 16.0'		$d = 1.0'$	SD = 16.2'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°42.3	S03°53.0	278°58.9	3.5'	N27°44.2	-2.5'	59.2'
1	197°42.5	54.0	293°21.4	3.6'	27°41.6	-2.7'	59.2'
2	212°42.7	55.0	307°43.9	3.6'	27°38.9	-2.9'	59.2'
3	227°42.9	· · 55.9	322°06.5	3.6'	27°36.0	-3.1'	59.2'
4	242°43.1	56.9	336°29.2	3.7'	27°32.9	-3.3'	59.2'
5	257°43.3	57.9	350°51.9	3.7'	27°29.6	-3.5'	59.2'
6	272°43.5	S03°58.8	5°14.6	3.8'	N27°26.2	-3.7'	59.2'
7	287°43.7	03°59.8	19°37.4	3.8'	27°22.5	-3.8'	59.2'
8	302°43.9	04°00.8	34°00.2	3.9'	27°18.7	-4.0'	59.2'
9	317°44.1	· · 01.7	48°23.1	3.9'	27°14.6	-4.2'	59.2'
10	332°44.3	02.7	62°46.1	4.0'	27°10.4	-4.4'	59.2'
11	347°44.5	03.7	77°09.1	4.1'	27°06.0	-4.6'	59.2'
12	2°44.7	S04°04.6	91°32.1	4.1'	N27°01.4	-4.8'	59.2'
13	17°44.9	05.6	105°55.3	4.2'	26°56.7	-4.9'	59.2'
14	32°45.1	06.6	120°18.4	4.3'	26°51.7	-5.1'	59.2'
15	47°45.3	· · 07.5	134°41.7	4.3'	26°46.6	-5.3'	59.2'
16	62°45.5	08.5	149°05.0	4.4'	26°41.3	-5.5'	59.2'
17	77°45.7	09.5	163°28.4	4.5'	26°35.8	-5.7'	59.1'
18	92°45.9	S04°10.4	177°51.9	4.5'	N26°30.2	-5.8'	59.1'
19	107°46.1	11.4	192°15.4	4.6'	26°24.4	-6.0'	59.1'
20	122°46.3	12.4	206°39.1	4.7'	26°18.4	-6.2'	59.1'
21	137°46.4	· · 13.3	221°02.7	4.8'	26°12.2	-6.3'	59.1'
22	152°46.6	14.3	235°26.5	4.9'	26°05.8	-6.5'	59.1'
23	167°46.8	15.2	249°50.4	4.9'	25°59.3	-6.7'	59.1'
SD = 16.0'		$d = 1.0'$	SD = 16.2'				

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

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

Day	Sun			Moon		Age 20-22 78-57%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	
01	10:11	10:21	11:50	03:33	16:04	
02	10:30	10:40	11:49	04:35	17:07	
03	10:49	10:59	11:49	05:38	18:09	

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

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	12°42.1	159°06.5	S21°13.6	246°42.3	N20°25.5	229°58.5	N15°20.9	1°12.7	N01°59.3	Alpheratz	357°32.9	29°14.5
1	27°44.6	174°09.1	13.8	261°43.2	25.2	245°00.5	20.8	16°15.3	59.3	Ankaa	353°05.3	-42°09.5
2	42°47.0	189°11.7	13.9	276°44.2	25.0	260°02.6	20.7	31°18.0	59.2	Schedar	349°28.8	56°41.2
3	57°49.5	204°14.3	· · 14.0	291°45.1	· · 24.7	275°04.6	· · 20.5	46°20.6	· · 59.1	Diphda	348°45.5	-17°50.2
4	72°52.0	219°16.9	14.2	306°46.1	24.4	290°06.6	20.4	61°23.3	59.0	Achernar	335°18.5	-57°05.9
5	87°54.4	234°19.5	14.3	321°47.1	24.1	305°08.7	20.3	76°25.9	59.0	Hamal	327°49.3	23°35.5
6	102°56.9	249°22.1	S21°14.4	336°48.0	N20°23.8	320°10.7	N15°20.1	91°28.6	N01°58.9	Polaris	312°53.6	89°22.4
7	117°59.4	264°24.7	14.6	351°49.0	23.5	335°12.7	20.0	106°31.2	58.8	Acamar	315°10.3	-40°11.6
8	133°01.8	279°27.3	14.7	6°49.9	23.2	350°14.8	19.9	121°33.8	58.7	Menkar	314°04.4	4°11.8
9	148°04.3	294°30.0	· · 14.8	21°50.9	· · 22.9	5°16.8	· · 19.8	136°36.5	· · 58.6	Mirfak	308°25.8	49°57.3
10	163°06.7	309°32.6	14.9	36°51.9	22.6	20°18.8	19.6	151°39.1	58.6	Aldebaran	290°37.8	16°33.9
11	178°09.2	324°35.2	15.0	51°52.8	22.3	35°20.9	19.5	166°41.8	58.5	Rigel	281°02.4	-8°10.0
12	193°11.7	339°37.9	S21°15.2	66°53.8	N20°22.0	50°22.9	N15°19.4	181°44.4	N01°58.4	Capella	280°19.6	46°01.4
13	208°14.1	354°40.5	15.3	81°54.7	21.7	65°24.9	19.2	196°47.1	58.3	Bellatrix	278°21.2	6°22.5
14	223°16.6	9°43.2	15.4	96°55.7	21.4	80°27.0	19.1	211°49.7	58.3	Elnath	277°59.9	28°37.8
15	238°19.1	24°45.8	· · 15.5	111°56.7	· · 21.1	95°29.0	· · 19.0	226°52.4	· · 58.2	Alnilam	275°36.2	-1°10.9
16	253°21.5	39°48.5	15.6	126°57.6	20.8	110°31.0	18.8	241°55.0	58.1	Betelgeuse	270°50.5	7°24.8
17	268°24.0	54°51.1	15.7	141°58.6	20.5	125°33.1	18.7	256°57.6	58.0	Canopus	263°51.7	-52°42.2
18	283°26.5	69°53.8	S21°15.8	156°59.6	N20°20.2	140°35.1	N15°18.6	272°00.3	N01°57.9	Sirius	258°25.0	-16°44.9
19	298°28.9	84°56.4	15.9	172°00.5	19.9	155°37.1	18.4	287°02.9	57.9	Adhara	255°04.8	-29°00.2
20	313°31.4	99°59.1	16.0	187°01.5	19.6	170°39.2	18.3	302°05.6	57.8	Procyon	244°49.4	5°09.5
21	328°33.8	115°01.8	· · 16.1	202°02.4	· · 19.3	185°41.2	· · 18.2	317°08.2	· · 57.7	Pollux	243°15.6	27°57.6
22	343°36.3	130°04.5	16.2	217°03.4	19.0	200°43.3	18.0	332°10.9	57.6	Avior	234°14.4	-59°35.4
23	358°38.8	145°07.1	16.3	232°04.4	18.7	215°45.3	17.9	347°13.5	57.6	Suhail	222°45.5	-43°32.2
Mer.pass. 23:05		ν 2.6' d 0.1' m -4.74		ν 1.0' d -0.3' m 1.09		ν 2.0' d -0.1' m -1.88		ν 2.6' d -0.1' m 0.33				

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°41.2	160°09.8	S21°16.4	247°05.3	N20°18.4	230°47.3	N15°17.8	2°16.2	N01°57.5
1	28°43.7	175°12.5	16.5	262°06.3	18.1	245°49.4	17.7	17°18.8	57.4
2	43°46.2	190°15.2	16.6	277°07.3	17.8	260°51.4	17.5	32°21.5	57.3
3	58°48.6	205°17.9	· · 16.7	292°08.2	· · 17.5	275°53.4	· · 17.4	47°24.1	· · 57.3
4	73°51.1	220°20.6	16.8	307°09.2	17.2	290°55.5	17.3	62°26.7	57.2
5	88°53.6	235°23.3	16.8	322°10.2	16.9	305°57.5	17.1	77°29.4	57.1
6	103°56.0	250°26.0	S21°16.9	337°11.1	N20°16.6	320°59.5	N15°17.0	92°32.0	N01°57.0
7	118°58.5	265°28.7	17.0	352°12.1	16.3	336°01.6	16.9	107°34.7	56.9
8	134°01.0	280°31.4	17.1	7°13.1	16.0	351°03.6	16.7	122°37.3	56.9
9	149°03.4	295°34.2	· · 17.1	22°14.0	· · 15.7	6°05.7	· · 16.6	137°40.0	· · 56.8
10	164°05.9	310°36.9	17.2	37°15.0	15.4	21°07.7	16.5	152°42.6	56.7
11	179°08.3	325°39.6	17.3	52°16.0	15.1	36°09.7	16.3	167°45.3	56.6
12	194°10.8	340°42.3	S21°17.3	67°16.9	N20°14.8	51°11.8	N15°16.2	182°47.9	N01°56.6
13	209°13.3	355°45.1	17.4	82°17.9	14.5	66°13.8	16.1	197°50.5	56.5
14	224°15.7	10°47.8	17.5	97°18.9	14.2	81°15.8	16.0	212°53.2	56.4
15	239°18.2	25°50.6	· · 17.5	112°19.9	· · 13.9	96°17.9	· · 15.8	227°55.8	· · 56.3
16	254°20.7	40°53.3	17.6	127°20.8	13.6	111°19.9	15.7	242°58.5	56.3
17	269°23.1	55°56.1	17.6	142°21.8	13.3	126°22.0	15.6	258°01.1	56.2
18	284°25.6	70°58.8	S21°17.7	157°22.8	N20°13.0	141°24.0	N15°15.4	273°03.8	N01°56.1
19	299°28.1	86°01.6	17.8	172°23.7	12.7	156°26.0	15.3	288°06.4	56.0
20	314°30.5	101°04.3	17.8	187°24.7	12.4	171°28.1	15.2	303°09.1	55.9
21	329°33.0	116°07.1	· · 17.9	202°25.7	· · 12.1	186°30.1	· · 15.0	318°11.7	· · 55.9
22	344°35.5	131°09.9	17.9	217°26.7	11.8	201°32.2	14.9	333°14.3	55.8
23	359°37.9	146°12.6	17.9	232°27.6	11.5	216°34.2	14.8	348°17.0	55.7
Mer.pass. 23:01		ν 2.7' d 0.1' m -4.72		ν 1.0' d -0.3' m 1.08		ν 2.0' d -0.1' m -1.89		ν 2.6' d -0.1' m 0.33	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°40.4	161°15.4	S21°18.0	247°28.6	N20°11.2	231°36.2	N15°14.7	3°19.6	N01°55.6
1	29°42.8	176°18.2	18.0	262°29.6	10.9	246°38.3	14.5	18°22.3	55.6
2	44°45.3	191°21.0	18.1	277°30.5	10.6	261°40.3	14.4	33°24.9	55.5
3	59°47.8	206°23.8	· · 18.1	292°31.5	· · 10.3	276°42.4	· · 14.3	48°27.6	· · 55.4
4	74°50.2	221°26.6	18.1	307°32.5	10.0	291°44.4	14.1	63°30.2	55.3
5	89°52.7	236°29.3	18.1	322°33.5	09.7	306°46.4	14.0	78°32.9	55.2
6	104°55.2	251°32.1	S21°18.2	337°34.4	N20°09.4	321°48.5	N15°13.9	93°35.5	N01°55.2
7	119°57.6	266°35.0	18.2	352°35.4	09.1	336°50.5	13.7	108°38.2	55.1
8	135°00.1	281°37.8	18.2	7°36.4	08.8	351°52.6	13.6	123°40.8	55.0
9	150°02.6	296°40.6	· · 18.2	22°37.4	· · 08.5	6°54.6	· · 13.5	138°43.4	· · 54.9
10	165°05.0	311°43.4	18.3	37°38.3	08.2	21°56.6	13.4	153°46.1	54.9
11	180°07.5	326°46.2	18.3	52°39.3	07.9	36°58.7	13.2	168°48.7	54.8
12	195°10.0	341°49.0	S21°18.3	67°40.3	N20°07.6	52°00.7	N15°13.1	183°51.4	N01°54.7
13	210°12.4	356°51.9	18.3	82°41.3	07.3	67°02.8	13.0	198°54.0	54.6
14	225°14.9	11°54.7	18.3	97°42.2	07.0	82°04.8	12.8	213°56.7	54.6
15	240°17.3	26°57.5	· · 18.3	112°43.2	· · 06.7	97°06.9	· · 12.7	228°59.3	· · 54.5
16	255°19.8	42°00.4	18.3	127°44.2	06.4	112°08.9	12.6	244°02.0	54.4
17	270°22.3	57°03.2	18.3	142°45.2	06.1	127°10.9	12.4	259°04.6	54.3
18	285°24.7	72°06.0	S21°18.3	157°46.2	N20°05.8	142°13.0	N15°12.3	274°07.2	N01°54.2
19	300°27.2	87°08.9	18.3	172°47.1	05.5	157°15.0	12.2	289°09.9	54.2
20	315°29.7	102°11.7	18.3	187°48.1	05.2	172°17.1	12.1	304°12.5	54.1
21	330°32.1	117°14.6	· · 18.3	202°49.1	· · 04.9	187°19.1	· · 11.9	319°15.2	· · 54.0
22	345°34.6	132°17.5	18.3	217°50.1	04.6	202°21.2	11.8	334°17.8	53.9
23	0°37.1	147°20.3	18.3	232°51.1	04.3	217°23.2	11.7	349°20.5	53.9
Mer.pass. 22:58		ν 2.8' d 0.0' m -4.69		ν 1.0' d -0.3' m 1.08		ν 2.0' d -0.1' m -1.89		ν 2.6' d -0.1' m 0.33	

Oct 04 Sun	SHA	Mer.pass
Venus	146°24.4	13:21
Mars	234°00.2	07:33
Jupiter	217°16.4	08:39
Saturn	348°30.6	23:51

Oct 05 Mon	SHA	Mer.pass
Venus	146°28.6	13:17
Mars	233°24.1	07:31
Jupiter	217°06.1	08:36
Saturn	348°34.9	23:47

Oct 06 Tue	SHA	Mer.pass
Venus	146°35.0	13:13
Mars	232°48.2	07:30
Jupiter	216°55.9	08:32
Saturn	348°39.3	23:43

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°47.0	S04°16.2	264°14.3	5.0'	N25°52.6	-6.9'	59.1'
1	197°47.2	17.2	278°38.3	5.1'	25°45.8	-7.0'	59.1'
2	212°47.4	18.1	293°02.4	5.2'	25°38.8	-7.2'	59.1'
3	227°47.6	· · 19.1	307°26.6	5.3'	25°31.6	-7.3'	59.1'
4	242°47.8	20.1	321°50.9	5.4'	25°24.2	-7.5'	59.1'
5	257°48.0	21.0	336°15.2	5.4'	25°16.7	-7.7'	59.1'
6	272°48.2	S04°22.0	350°39.7	5.5'	N25°09.0	-7.8'	59.1'
7	287°48.4	23.0	5°04.2	5.6'	25°01.2	-8.0'	59.0'
8	302°48.6	23.9	19°28.8	5.7'	24°53.2	-8.1'	59.0'
9	317°48.8	· · 24.9	33°53.6	5.8'	24°45.1	-8.3'	59.0'
10	332°49.0	25.9	48°18.4	5.9'	24°36.8	-8.5'	59.0'
11	347°49.1	26.8	62°43.3	6.0'	24°28.3	-8.6'	59.0'
12	2°49.3	S04°27.8	77°08.3	6.1'	N24°19.7	-8.8'	59.0'
13	17°49.5	28.7	91°33.4	6.2'	24°11.0	-8.9'	59.0'
14	32°49.7	29.7	105°58.6	6.3'	24°02.1	-9.1'	59.0'
15	47°49.9	· · 30.7	120°23.9	6.4'	23°53.0	-9.2'	59.0'
16	62°50.1	31.6	134°49.3	6.5'	23°43.8	-9.3'	59.0'
17	77°50.3	32.6	149°14.8	6.6'	23°34.5	-9.5'	59.0'
18	92°50.5	S04°33.6	163°40.3	6.7'	N23°25.0	-9.6'	58.9'
19	107°50.7	34.5	178°06.0	6.8'	23°15.4	-9.8'	58.9'
20	122°50.9	35.5	192°31.8	6.9'	23°05.6	-9.9'	58.9'
21	137°51.0	· · 36.4	206°57.7	7.0'	22°55.7	-10.0'	58.9'
22	152°51.2	37.4	221°23.7	7.1'	22°45.7	-10.2'	58.9'
23	167°51.4	38.4	235°49.8	7.2'	22°35.5	-10.3'	58.9'
SD = 16.0' $d = 1.0'$			SD = 16.1'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°51.6	S04°39.3	250°15.9	7.3'	N22°25.2	-10.4'	58.9'
1	197°51.8	40.3	264°42.2	7.4'	22°14.7	-10.6'	58.9'
2	212°52.0	41.3	279°08.6	7.5'	22°04.2	-10.7'	58.9'
3	227°52.2	· · 42.2	293°35.1	7.6'	21°53.5	-10.8'	58.9'
4	242°52.4	43.2	308°01.7	7.7'	21°42.7	-10.9'	58.8'
5	257°52.6	44.1	322°28.4	7.8'	21°31.7	-11.1'	58.8'
6	272°52.8	S04°45.1	336°55.2	7.9'	N21°20.6	-11.2'	58.8'
7	287°52.9	46.1	351°22.1	8.0'	21°09.4	-11.3'	58.8'
8	302°53.1	47.0	5°49.1	8.1'	20°58.1	-11.4'	58.8'
9	317°53.3	· · 48.0	20°16.2	8.2'	20°46.7	-11.5'	58.8'
10	332°53.5	49.0	34°43.4	8.3'	20°35.2	-11.7'	58.8'
11	347°53.7	49.9	49°10.7	8.4'	20°23.5	-11.8'	58.8'
12	2°53.9	S04°50.9	63°38.1	8.5'	N20°11.7	-11.9'	58.8'
13	17°54.1	51.8	78°05.6	8.6'	19°59.8	-12.0'	58.7'
14	32°54.3	52.8	92°33.2	8.7'	19°47.8	-12.1'	58.7'
15	47°54.4	· · 53.8	107°00.9	8.8'	19°35.7	-12.2'	58.7'
16	62°54.6	54.7	121°28.7	8.9'	19°23.5	-12.3'	58.7'
17	77°54.8	55.7	135°56.6	9.0'	19°11.2	-12.4'	58.7'
18	92°55.0	S04°56.6	150°24.6	9.1'	N18°58.8	-12.5'	58.7'
19	107°55.2	57.6	164°52.7	9.2'	18°46.3	-12.6'	58.7'
20	122°55.4	58.6	179°20.9	9.3'	18°33.7	-12.7'	58.7'
21	137°55.6	04°59.5	193°49.2	9.4'	18°20.9	-12.8'	58.6'
22	152°55.7	05°00.5	208°17.6	9.5'	18°08.1	-12.9'	58.6'
23	167°55.9	01.4	222°46.0	9.6'	17°55.2	-13.0'	58.6'
SD = 16.0' $d = 1.0'$			SD = 16.1'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°56.1	S05°02.4	237°14.6	9.7'	N17°42.2	-13.1'	58.6'
1	197°56.3	03.4	251°43.3	9.8'	17°29.1	-13.2'	58.6'
2	212°56.5	04.3	266°12.1	9.9'	17°16.0	-13.3'	58.6'
3	227°56.7	· · 05.3	280°40.9	10.0'	17°02.7	-13.4'	58.6'
4	242°56.9	06.2	295°09.9	10.0'	16°49.3	-13.4'	58.6'
5	257°57.0	07.2	309°38.9	10.1'	16°35.9	-13.5'	58.5'
6	272°57.2	S05°08.2	324°08.1	10.2'	N16°22.4	-13.6'	58.5'
7	287°57.4	09.1	338°37.3	10.3'	16°08.8	-13.7'	58.5'
8	302°57.6	10.1	353°06.6	10.4'	15°55.1	-13.8'	58.5'
9	317°57.8	· · 11.0	7°36.0	10.5'	15°41.3	-13.8'	58.5'
10	332°58.0	12.0	22°05.5	10.6'	15°27.5	-13.9'	58.5'
11	347°58.1	13.0	36°35.1	10.7'	15°13.5	-14.0'	58.5'
12	2°58.3	S05°13.9	51°04.7	10.8'	N14°59.6	-14.1'	58.4'
13	17°58.5	14.9	65°34.5	10.8'	14°45.5	-14.1'	58.4'
14	32°58.7	15.8	80°04.3	10.9'	14°31.4	-14.2'	58.4'
15	47°58.9	· · 16.8	94°34.2	11.0'	14°17.2	-14.3'	58.4'
16	62°59.1	17.7	109°04.2	11.1'	14°02.9	-14.3'	58.4'
17	77°59.2	18.7	123°34.3	11.2'	13°48.6	-14.4'	58.4'
18	92°59.4	S05°19.7	138°04.5	11.2'	N13°34.2	-14.5'	58.4'
19	107°59.6	20.6	152°34.7	11.3'	13°19.7	-14.5'	58.3'
20	122°59.8	21.6	167°05.0	11.4'	13°05.2	-14.6'	58.3'
21	138°00.0	· · 22.5	181°35.4	11.5'	12°50.6	-14.6'	58.3'
22	153°00.1	23.5	196°05.9	11.5'	12°36.0	-14.7'	58.3'
23	168°00.3	24.5	210°36.5	11.6'	12°21.3	-14.7'	58.3'
SD = 16.0' $d = 1.0'$			SD = 16.0'				

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	hh:mm	Upper hh:mm	Lower hh:mm	23-25 45-24%
04	11:08	11:17	11:49	06:39	19:08	
05	11:26	11:36	11:48	07:36	20:03	
06	11:44	11:53	11:48	08:29	20:53	

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

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	15°39.5	162°23.2	S21°18.3	247°52.0	N20°04.0	232°25.2	N15°11.5	4°23.1	N01°53.8	Alpheratz	357°32.9	29°14.5
1	30°42.0	177°26.1	18.3	262°53.0	03.7	247°27.3	11.4	19°25.8	53.7	Ankaa	353°05.3	-42°09.5
2	45°44.4	192°28.9	18.3	277°54.0	03.4	262°29.3	11.3	34°28.4	53.6	Schedar	349°28.8	56°41.2
3	60°46.9	207°31.8	•• 18.2	292°55.0	•• 03.0	277°31.4	•• 11.2	49°31.0	•• 53.6	Diphda	348°45.5	-17°50.2
4	75°49.4	222°34.7	18.2	307°56.0	02.7	292°33.4	11.0	64°33.7	53.5	Achernar	335°18.5	-57°05.9
5	90°51.8	237°37.6	18.2	322°56.9	02.4	307°35.5	10.9	79°36.3	53.4	Hamal	327°49.2	23°35.5
6	105°54.3	252°40.5	S21°18.2	337°57.9	N20°02.1	322°37.5	N15°10.8	94°39.0	N01°53.3	Polaris	312°52.7	89°22.4
7	120°56.8	267°43.4	18.1	352°58.9	01.8	337°39.6	10.6	109°41.6	53.3	Acamar	315°10.3	-40°11.6
8	135°59.2	282°46.3	18.1	7°59.9	01.5	352°41.6	10.5	124°44.3	53.2	Menkar	314°04.4	4°11.8
9	151°01.7	297°49.2	•• 18.1	23°00.9	•• 01.2	7°43.6	•• 10.4	139°46.9	•• 53.1	Mirfak	308°25.8	49°57.3
10	166°04.2	312°52.1	18.0	38°01.9	00.9	22°45.7	10.3	154°49.6	53.0	Aldebaran	290°37.8	16°33.9
11	181°06.6	327°55.0	18.0	53°02.8	00.6	37°47.7	10.1	169°52.2	52.9	Rigel	281°02.3	-8°10.0
12	196°09.1	342°57.9	S21°18.0	68°03.8	N20°00.3	52°49.8	N15°10.0	184°54.8	N01°52.9	Capella	280°19.6	46°01.4
13	211°11.6	358°00.8	17.9	83°04.8	20°00.0	67°51.8	09.9	199°57.5	52.8	Bellatrix	278°21.2	6°22.5
14	226°14.0	13°03.8	17.9	98°05.8	19°59.7	82°53.9	09.7	215°00.1	52.7	Elnath	277°59.9	28°37.8
15	241°16.5	28°06.7	•• 17.8	113°06.8	•• 59.4	97°55.9	•• 09.6	230°02.8	•• 52.6	Alnilam	275°36.2	-1°10.9
16	256°18.9	43°09.6	17.8	128°07.8	59.1	112°58.0	09.5	245°05.4	52.6	Betelgeuse	270°50.4	7°24.8
17	271°21.4	58°12.6	17.7	143°08.8	58.8	128°00.0	09.4	260°08.1	52.5	Canopus	263°51.7	-52°42.2
18	286°23.9	73°15.5	S21°17.7	158°09.7	N19°58.5	143°02.1	N15°09.2	275°10.7	N01°52.4	Sirius	258°24.9	-16°44.9
19	301°26.3	88°18.4	17.6	173°10.7	58.2	158°04.1	09.1	290°13.4	52.3	Adhara	255°04.7	-29°00.2
20	316°28.8	103°21.4	17.6	188°11.7	57.8	173°06.2	09.0	305°16.0	52.3	Procyon	244°49.4	5°09.5
21	331°31.3	118°24.3	•• 17.5	203°12.7	•• 57.5	188°08.2	•• 08.8	320°18.7	•• 52.2	Pollux	243°15.6	27°57.6
22	346°33.7	133°27.3	17.4	218°13.7	57.2	203°10.3	08.7	335°21.3	52.1	Avior	234°14.4	-59°35.4
23	1°36.2	148°30.2	17.4	233°14.7	56.9	218°12.3	08.6	350°23.9	52.0	Suhail	222°45.5	-43°32.2
Mer.pass. 22:54		ν 2.9' d -0.0' m -4.67		ν 1.0' d -0.3' m 1.07		ν 2.0' d -0.1' m -1.89		ν 2.6' d -0.1' m 0.34				

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°38.7	163°33.2	S21°17.3	248°15.7	N19°56.6	233°14.3	N15°08.5	5°26.6	N01°52.0
1	31°41.1	178°36.2	17.2	263°16.7	56.3	248°16.4	08.3	20°29.2	51.9
2	46°43.6	193°39.1	17.1	278°17.6	56.0	263°18.4	08.2	35°31.9	51.8
3	61°46.0	208°42.1	•• 17.1	293°18.6	•• 55.7	278°20.5	•• 08.1	50°34.5	•• 51.7
4	76°48.5	223°45.1	17.0	308°19.6	55.4	293°22.5	07.9	65°37.2	51.6
5	91°51.0	238°48.1	16.9	323°20.6	55.1	308°24.6	07.8	80°39.8	51.6
6	106°53.4	253°51.0	S21°16.8	338°21.6	N19°54.8	323°26.6	N15°07.7	95°42.5	N01°51.5
7	121°55.9	268°54.0	16.8	353°22.6	54.5	338°28.7	07.6	110°45.1	51.4
8	136°58.4	283°57.0	16.7	8°23.6	54.2	353°30.7	07.4	125°47.7	51.3
9	152°00.8	299°00.0	•• 16.6	23°24.6	•• 53.8	8°32.8	•• 07.3	140°50.4	•• 51.3
10	167°03.3	314°03.0	16.5	38°25.6	53.5	23°34.8	07.2	155°53.0	51.2
11	182°05.8	329°06.0	16.4	53°26.6	53.2	38°36.9	07.1	170°55.7	51.1
12	197°08.2	344°09.0	S21°16.3	68°27.6	N19°52.9	53°38.9	N15°06.9	185°58.3	N01°51.0
13	212°10.7	359°12.0	16.2	83°28.6	52.6	68°41.0	06.8	201°01.0	51.0
14	227°13.2	14°15.0	16.1	98°29.5	52.3	83°43.0	06.7	216°03.6	50.9
15	242°15.6	29°18.0	•• 16.0	113°30.5	•• 52.0	98°45.1	•• 06.5	231°06.3	•• 50.8
16	257°18.1	44°21.1	15.9	128°31.5	51.7	113°47.1	06.4	246°08.9	50.7
17	272°20.5	59°24.1	15.8	143°32.5	51.4	128°49.2	06.3	261°11.5	50.7
18	287°23.0	74°27.1	S21°15.7	158°33.5	N19°51.1	143°51.2	N15°06.2	276°14.2	N01°50.6
19	302°25.5	89°30.2	15.6	173°34.5	50.8	158°53.3	06.0	291°16.8	50.5
20	317°27.9	104°33.2	15.4	188°35.5	50.4	173°55.3	05.9	306°19.5	50.4
21	332°30.4	119°36.2	•• 15.3	203°36.5	•• 50.1	188°57.4	•• 05.8	321°22.1	•• 50.4
22	347°32.9	134°39.3	15.2	218°37.5	49.8	203°59.5	05.7	336°24.8	50.3
23	2°35.3	149°42.3	15.1	233°38.5	49.5	219°01.5	05.5	351°27.4	50.2
Mer.pass. 22:50		ν 3.0' d -0.1' m -4.64		ν 1.0' d -0.3' m 1.06		ν 2.0' d -0.1' m -1.90		ν 2.6' d -0.1' m 0.34	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°37.8	164°45.4	S21°15.0	248°39.5	N19°49.2	234°03.6	N15°05.4	6°30.1	N01°50.1
1	32°40.3	179°48.4	14.8	263°40.5	48.9	249°05.6	05.3	21°32.7	50.0
2	47°42.7	194°51.5	14.7	278°41.5	48.6	264°07.7	05.1	36°35.3	50.0
3	62°45.2	209°54.5	•• 14.6	293°42.5	•• 48.3	279°09.7	•• 05.0	51°38.0	•• 49.9
4	77°47.6	224°57.6	14.4	308°43.5	48.0	294°11.8	04.9	66°40.6	49.8
5	92°50.1	240°00.7	14.3	323°44.5	47.6	309°13.8	04.8	81°43.3	49.7
6	107°52.6	255°03.7	S21°14.2	338°45.5	N19°47.3	324°15.9	N15°04.6	96°45.9	N01°49.7
7	122°55.0	270°06.8	14.0	353°46.5	47.0	339°17.9	04.5	111°48.6	49.6
8	137°57.5	285°09.9	13.9	8°47.5	46.7	354°20.0	04.4	126°51.2	49.5
9	153°00.0	300°13.0	•• 13.7	23°48.5	•• 46.4	9°22.0	•• 04.3	141°53.8	•• 49.4
10	168°02.4	315°16.1	13.6	38°49.5	46.1	24°24.1	04.1	156°56.5	49.4
11	183°04.9	330°19.2	13.4	53°50.5	45.8	39°26.1	04.0	171°59.1	49.3
12	198°07.4	345°22.3	S21°13.3	68°51.5	N19°45.5	54°28.2	N15°03.9	187°01.8	N01°49.2
13	213°09.8	0°25.4	13.1	83°52.5	45.2	69°30.2	03.8	202°04.4	49.1
14	228°12.3	15°28.5	13.0	98°53.5	44.8	84°32.3	03.6	217°07.1	49.1
15	243°14.8	30°31.6	•• 12.8	113°54.5	•• 44.5	99°34.4	•• 03.5	232°09.7	•• 49.0
16	258°17.2	45°34.7	12.6	128°55.5	44.2	114°36.4	03.4	247°12.4	48.9
17	273°19.7	60°37.8	12.5	143°56.5	43.9	129°38.5	03.2	262°15.0	48.8
18	288°22.1	75°40.9	S21°12.3	158°57.5	N19°43.6	144°40.5	N15°03.1	277°17.6	N01°48.8
19	303°24.6	90°44.0	12.1	173°58.5	43.3	159°42.6	03.0	292°20.3	48.7
20	318°27.1	105°47.1	12.0	188°59.5	43.0	174°44.6	02.9	307°22.9	48.6
21	333°29.5	120°50.3	•• 11.8	204°00.5	•• 42.7	189°46.7	•• 02.7	322°25.6	•• 48.5
22	348°32.0	135°53.4	11.6	219°01.5	42.3	204°48.7	02.6	337°28.2	48.5
23	3°34.5	150°56.5	11.4	234°02.5	42.0	219°50.8	02.5	352°30.9	48.4
Mer.pass. 22:46		ν 3.1' d -0.1' m -4.60		ν 1.0' d -0.3' m 1.06		ν 2.1' d -0.1' m -1.90		ν 2.6' d -0.1' m 0.35	

Oct 07 Wed	SHA	Mer.pass
Venus	146°43.7	13:08
Mars	232°12.5	07:28
Jupiter	216°45.7	08:29
Saturn	348°43.6	23:38

Oct 08 Thu	SHA	Mer.pass
Venus	146°54.5	13:03
Mars	231°37.0	07:26
Jupiter	216°35.7	08:26
Saturn	348°47.9	23:34

Oct 09 Fri	SHA	Mer.pass
Venus	147°07.6	12:58
Mars	231°01.7	07:25
Jupiter	216°25.8	08:23
Saturn	348°52.3	23:30

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°00.5	S05°25.4	225°07.1	11.7'	N12°06.5	-14.8'	58.3'
1	198°00.7	26.4	239°37.8	11.8'	11°51.7	-14.9'	58.2'
2	213°00.9	27.3	254°08.6	11.8'	11°36.9	-14.9'	58.2'
3	228°01.0	· · 28.3	268°39.4	11.9'	11°22.0	-15.0'	58.2'
4	243°01.2	29.2	283°10.3	12.0'	11°07.0	-15.0'	58.2'
5	258°01.4	30.2	297°41.3	12.0'	10°52.0	-15.0'	58.2'
6	273°01.6	S05°31.1	312°12.3	12.1'	N10°36.9	-15.1'	58.2'
7	288°01.8	32.1	326°43.4	12.2'	10°21.9	-15.1'	58.1'
8	303°01.9	33.1	341°14.6	12.2'	10°06.7	-15.2'	58.1'
9	318°02.1	· · 34.0	355°45.9	12.3'	09°51.5	-15.2'	58.1'
10	333°02.3	35.0	10°17.2	12.4'	09°36.3	-15.3'	58.1'
11	348°02.5	35.9	24°48.5	12.4'	09°21.1	-15.3'	58.1'
12	3°02.7	S05°36.9	39°20.0	12.5'	N09°05.8	-15.3'	58.1'
13	18°02.8	37.8	53°51.5	12.5'	08°50.5	-15.4'	58.0'
14	33°03.0	38.8	68°23.0	12.6'	08°35.1	-15.4'	58.0'
15	48°03.2	· · 39.8	82°54.6	12.7'	08°19.7	-15.4'	58.0'
16	63°03.4	40.7	97°26.3	12.7'	08°04.3	-15.5'	58.0'
17	78°03.6	41.7	111°58.0	12.8'	07°48.8	-15.5'	58.0'
18	93°03.7	S05°42.6	126°29.8	12.8'	N07°33.3	-15.5'	58.0'
19	108°03.9	43.6	141°01.6	12.9'	07°17.8	-15.5'	57.9'
20	123°04.1	44.5	155°33.5	12.9'	07°02.3	-15.6'	57.9'
21	138°04.3	· · 45.5	170°05.4	13.0'	06°46.7	-15.6'	57.9'
22	153°04.4	46.4	184°37.4	13.0'	06°31.2	-15.6'	57.9'
23	168°04.6	47.4	199°09.4	13.1'	06°15.6	-15.6'	57.9'
SD = 16.0'			SD = 15.9'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°04.8	S05°48.3	213°41.5	13.1'	N05°59.9	-15.6'	57.9'
1	198°05.0	49.3	228°13.6	13.2'	05°44.3	-15.7'	57.8'
2	213°05.2	50.3	242°45.8	13.2'	05°28.6	-15.7'	57.8'
3	228°05.3	· · 51.2	257°18.0	13.3'	05°12.9	-15.7'	57.8'
4	243°05.5	52.2	271°50.2	13.3'	04°57.3	-15.7'	57.8'
5	258°05.7	53.1	286°22.5	13.3'	04°41.6	-15.7'	57.8'
6	273°05.9	S05°54.1	300°54.9	13.4'	N04°25.8	-15.7'	57.7'
7	288°06.0	55.0	315°27.2	13.4'	04°10.1	-15.7'	57.7'
8	303°06.2	56.0	329°59.6	13.4'	03°54.4	-15.7'	57.7'
9	318°06.4	· · 56.9	344°32.1	13.5'	03°38.6	-15.8'	57.7'
10	333°06.6	57.9	359°04.6	13.5'	03°22.9	-15.8'	57.7'
11	348°06.7	58.8	13°37.1	13.5'	03°07.1	-15.8'	57.6'
12	3°06.9	S05°59.8	28°09.6	13.6'	N02°51.4	-15.8'	57.6'
13	18°07.1	06°00.7	42°42.2	13.6'	02°35.6	-15.8'	57.6'
14	33°07.3	01.7	57°14.8	13.6'	02°19.8	-15.8'	57.6'
15	48°07.4	· · 02.6	71°47.5	13.7'	02°04.1	-15.8'	57.6'
16	63°07.6	03.6	86°20.1	13.7'	01°48.3	-15.8'	57.5'
17	78°07.8	04.6	100°52.8	13.7'	01°32.5	-15.8'	57.5'
18	93°07.9	S06°05.5	115°25.6	13.7'	N01°16.8	-15.8'	57.5'
19	108°08.1	06.5	129°58.3	13.8'	01°01.0	-15.7'	57.5'
20	123°08.3	07.4	144°31.1	13.8'	00°45.3	-15.7'	57.5'
21	138°08.5	· · 08.4	159°03.9	13.8'	00°29.5	-15.7'	57.4'
22	153°08.6	09.3	173°36.7	13.8'	N00°13.8	-15.7'	57.4'
23	168°08.8	10.3	188°09.5	13.9'	S00°01.9	15.7'	57.4'
SD = 16.0'			SD = 15.8'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°09.0	S06°11.2	202°42.4	13.9'	S00°17.7	15.7'	57.4'
1	198°09.2	12.2	217°15.3	13.9'	00°33.4	15.7'	57.4'
2	213°09.3	13.1	231°48.2	13.9'	00°49.0	15.7'	57.3'
3	228°09.5	· · 14.1	246°21.1	13.9'	01°04.7	15.7'	57.3'
4	243°09.7	15.0	260°54.0	13.9'	01°20.4	15.6'	57.3'
5	258°09.8	16.0	275°26.9	14.0'	01°36.0	15.6'	57.3'
6	273°10.0	S06°16.9	289°59.9	14.0'	S01°51.6	15.6'	57.3'
7	288°10.2	17.9	304°32.9	14.0'	02°07.2	15.6'	57.2'
8	303°10.3	18.8	319°05.8	14.0'	02°22.8	15.6'	57.2'
9	318°10.5	· · 19.8	333°38.8	14.0'	02°38.4	15.5'	57.2'
10	333°10.7	20.7	348°11.8	14.0'	02°53.9	15.5'	57.2'
11	348°10.9	21.7	2°44.8	14.0'	03°09.4	15.5'	57.1'
12	3°11.0	S06°22.6	17°17.8	14.0'	S03°24.9	15.5'	57.1'
13	18°11.2	23.6	31°50.8	14.0'	03°40.4	15.4'	57.1'
14	33°11.4	24.5	46°23.8	14.0'	03°55.8	15.4'	57.1'
15	48°11.5	· · 25.5	60°56.9	14.0'	04°11.2	15.4'	57.1'
16	63°11.7	26.4	75°29.9	14.0'	04°26.6	15.3'	57.0'
17	78°11.9	27.4	90°02.9	14.0'	04°41.9	15.3'	57.0'
18	93°12.0	S06°28.3	104°35.9	14.0'	S04°57.2	15.3'	57.0'
19	108°12.2	29.3	119°08.9	14.0'	05°12.5	15.2'	57.0'
20	123°12.4	30.2	133°42.0	14.0'	05°27.8	15.2'	56.9'
21	138°12.5	· · 31.2	148°15.0	14.0'	05°43.0	15.2'	56.9'
22	153°12.7	32.1	162°48.0	14.0'	05°58.1	15.1'	56.9'
23	168°12.9	33.0	177°21.0	14.0'	06°13.3	15.1'	56.9'
SD = 16.0'			SD = 15.6'				

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

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

Day	Sun		Mer.	Moon		Age
	Eqn.of Time	12 ^h	Pass	Mer.Pass.	Lower	26-28
	00 ^h	mm:ss	hh:mm	Upper	hh:mm	15-3%
07	12:02	12:11	11:48	09:18	21:41	
08	12:19	12:28	11:48	10:04	22:26	
09	12:36	12:44	11:47	10:49	23:11	

Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	18°36.9	165°59.7	S21°11.2	249°03.5	N19°41.7	234°52.9	N15°02.4	7°33.5	N01°48.3
1	33°39.4	181°02.8	11.1	264°04.5	41.4	249°54.9	02.2	22°36.2	48.2
2	48°41.9	196°06.0	10.9	279°05.5	41.1	264°57.0	02.1	37°38.8	48.2
3	63°44.3	211°09.1	· · 10.7	294°06.5	· · 40.8	279°59.0	· · 02.0	52°41.4	· · 48.1
4	78°46.8	226°12.3	10.5	309°07.5	40.5	295°01.1	01.9	67°44.1	48.0
5	93°49.2	241°15.4	10.3	324°08.5	40.2	310°03.1	01.7	82°46.7	47.9
6	108°51.7	256°18.6	S21°10.1	339°09.5	N19°39.8	325°05.2	N15°01.6	97°49.4	N01°47.8
7	123°54.2	271°21.8	09.9	354°10.6	39.5	340°07.3	01.5	112°52.0	47.8
8	138°56.6	286°24.9	09.7	9°11.6	39.2	355°09.3	01.4	127°54.7	47.7
9	153°59.1	301°28.1	· · 09.5	24°12.6	· · 38.9	10°11.4	· · 01.2	142°57.3	· · 47.6
10	169°01.6	316°31.3	09.3	39°13.6	38.6	25°13.4	01.1	157°59.9	47.5
11	184°04.0	331°34.4	09.1	54°14.6	38.3	40°15.5	01.0	173°02.6	47.5
12	199°06.5	346°37.6	S21°08.9	69°15.6	N19°38.0	55°17.6	N15°00.9	188°05.2	N01°47.4
13	214°09.0	1°40.8	08.6	84°16.6	37.6	70°19.6	00.7	203°07.9	47.3
14	229°11.4	16°44.0	08.4	99°17.6	37.3	85°21.7	00.6	218°10.5	47.2
15	244°13.9	31°47.2	· · 08.2	114°18.6	· · 37.0	100°23.7	· · 00.5	233°13.2	· · 47.2
16	259°16.4	46°50.4	08.0	129°19.6	36.7	115°25.8	00.4	248°15.8	47.1
17	274°18.8	61°53.6	07.8	144°20.6	36.4	130°27.8	00.2	263°18.5	47.0
18	289°21.3	76°56.8	S21°07.5	159°21.7	N19°36.1	145°29.9	N15°00.1	278°21.1	N01°46.9
19	304°23.7	92°00.0	07.3	174°22.7	35.7	160°32.0	15°00.0	293°23.7	46.9
20	319°26.2	107°03.2	07.1	189°23.7	35.4	175°34.0	14°59.9	308°26.4	46.8
21	334°28.7	122°06.4	· · 06.8	204°24.7	· · 35.1	190°36.1	· · 59.7	323°29.0	· · 46.7
22	349°31.1	137°09.6	06.6	219°25.7	34.8	205°38.1	59.6	338°31.7	46.6
23	4°33.6	152°12.9	06.4	234°26.7	34.5	220°40.2	59.5	353°34.3	46.6
Mer.pass. 22:42		ν 3.1' d -0.2' m -4.57		ν 1.0' d -0.3' m 1.05		ν 2.1' d -0.1' m -1.90		ν 2.6' d -0.1' m 0.36	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	19°36.1	167°16.1	S21°06.1	249°27.7	N19°34.2	235°42.3	N14°59.4	8°37.0	N01°46.5
1	34°38.5	182°19.3	05.9	264°28.7	33.9	250°44.3	59.2	23°39.6	46.4
2	49°41.0	197°22.5	05.6	279°29.8	33.5	265°46.4	59.1	38°42.2	46.3
3	64°43.5	212°25.8	· · 05.4	294°30.8	· · 33.2	280°48.5	· · 59.0	53°44.9	· · 46.3
4	79°45.9	227°29.0	05.1	309°31.8	32.9	295°50.5	58.9	68°47.5	46.2
5	94°48.4	242°32.3	04.9	324°32.8	32.6	310°52.6	58.7	83°50.2	46.1
6	109°50.9	257°35.5	S21°04.6	339°33.8	N19°32.3	325°54.6	N14°58.6	98°52.8	N01°46.0
7	124°53.3	272°38.8	04.4	354°34.8	32.0	340°56.7	58.5	113°55.5	46.0
8	139°55.8	287°42.0	04.1	9°35.8	31.6	355°58.8	58.4	128°58.1	45.9
9	154°58.2	302°45.3	· · 03.8	24°36.9	· · 31.3	11°00.8	· · 58.2	144°00.7	· · 45.8
10	170°00.7	317°48.5	03.6	39°37.9	31.0	26°02.9	58.1	159°03.4	45.7
11	185°03.2	332°51.8	03.3	54°38.9	30.7	41°03.9	58.0	174°06.0	45.7
12	200°05.6	347°55.1	S21°03.0	69°39.9	N19°30.4	56°07.0	N14°57.9	189°08.7	N01°45.6
13	215°08.1	2°58.3	02.8	84°40.9	30.1	71°09.1	57.7	204°11.3	45.5
14	230°10.6	18°01.6	02.5	99°41.9	29.7	86°11.1	57.6	219°14.0	45.4
15	245°13.0	33°04.9	· · 02.2	114°43.0	· · 29.4	101°13.2	· · 57.5	234°16.6	· · 45.4
16	260°15.5	48°08.2	01.9	129°44.0	29.1	116°15.3	57.4	249°19.2	45.3
17	275°18.0	63°11.4	01.6	144°45.0	28.8	131°17.3	57.2	264°21.9	45.2
18	290°20.4	78°14.7	S21°01.3	159°46.0	N19°28.5	146°19.4	N14°57.1	279°24.5	N01°45.1
19	305°22.9	93°18.0	01.1	174°47.0	28.1	161°21.5	57.0	294°27.2	45.1
20	320°25.3	108°21.3	00.8	189°48.1	27.8	176°23.5	56.9	309°29.8	45.0
21	335°27.8	123°24.6	· · 00.5	204°49.1	· · 27.5	191°25.6	· · 56.8	324°32.5	· · 44.9
22	350°30.3	138°27.9	21°00.2	219°50.1	27.2	206°27.7	56.6	339°35.1	44.8
23	5°32.7	153°31.2	20°59.9	234°51.1	26.9	221°29.7	56.5	354°37.7	44.8
Mer.pass. 22:38		ν 3.2' d -0.2' m -4.52		ν 1.0' d -0.3' m 1.04		ν 2.1' d -0.1' m -1.91		ν 2.6' d -0.1' m 0.36	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	20°35.2	168°34.5	S20°59.6	249°52.1	N19°26.6	236°31.8	N14°56.4	9°40.4	N01°44.7
1	35°37.7	183°37.8	59.3	264°53.2	26.2	251°33.8	56.3	24°43.0	44.6
2	50°40.1	198°41.1	59.0	279°54.2	25.9	266°35.9	56.1	39°45.7	44.5
3	65°42.6	213°44.5	· · 58.7	294°55.2	· · 25.6	281°38.0	· · 56.0	54°48.3	· · 44.5
4	80°45.1	228°47.8	58.3	309°56.2	25.3	296°40.0	55.9	69°51.0	44.4
5	95°47.5	243°51.1	58.0	324°57.2	25.0	311°42.1	55.8	84°53.6	44.3
6	110°50.0	258°54.4	S20°57.7	339°58.3	N19°24.6	326°44.2	N14°55.6	99°56.2	N01°44.2
7	125°52.5	273°57.8	57.4	354°59.3	24.3	341°46.2	55.5	114°58.9	44.2
8	140°54.9	289°01.1	57.1	10°00.3	24.0	356°48.3	55.4	130°01.5	44.1
9	155°57.4	304°04.4	· · 56.7	25°01.3	· · 23.7	11°50.4	· · 55.3	145°04.2	· · 44.0
10	170°59.8	319°07.8	56.4	40°02.4	23.4	26°52.4	55.1	160°06.8	43.9
11	186°02.3	334°11.1	56.1	55°03.4	23.0	41°54.5	55.0	175°09.5	43.9
12	201°04.8	349°14.5	S20°55.8	70°04.4	N19°22.7	56°56.6	N14°54.9	190°12.1	N01°43.8
13	216°07.2	4°17.8	55.4	85°05.4	22.4	71°58.6	54.8	205°14.7	43.7
14	231°09.7	19°21.2	55.1	100°06.5	22.1	87°00.7	54.7	220°17.4	43.7
15	246°12.2	34°24.5	· · 54.7	115°07.5	· · 21.8	102°02.8	· · 54.5	235°20.0	· · 43.6
16	261°14.6	49°27.9	54.4	130°08.5	21.5	117°04.8	54.4	250°22.7	43.5
17	276°17.1	64°31.2	54.1	145°09.5	21.1	132°06.9	54.3	265°25.3	43.4
18	291°19.6	79°34.6	S20°53.7	160°10.6	N19°20.8	147°09.0	N14°54.2	280°28.0	N01°43.4
19	306°22.0	94°38.0	53.4	175°11.6	20.5	162°11.1	54.0	295°30.6	43.3
20	321°24.5	109°41.4	53.0	190°12.6	20.2	177°13.1	53.9	310°33.2	43.2
21	336°27.0	124°44.7	· · 52.7	205°13.7	· · 19.8	192°15.2	· · 53.8	325°35.9	· · 43.1
22	351°29.4	139°48.1	52.3	220°14.7	19.5	207°17.3	53.7	340°38.5	43.1
23	6°31.9	154°51.5	51.9	235°15.7	19.2	222°19.3	53.6	355°41.2	43.0
Mer.pass. 22:34	ν 3.3' d -0.3' m -4.48			ν 1.0' d -0.3' m 1.03		ν 2.1' d -0.1' m -1.91		ν 2.6' d -0.1' m 0.37	

	Stars	
	SHA	Dec
Alpheratz	357° 32.9	29° 14.5
Ankaa	353° 05.3	-42° 09.5
Schedar	340° 28.8	56° 41.2
Diphda	348° 45.5	-17° 50.2
Achernar	335° 18.5	-57° 05.9
Hamal	327° 49.2	23° 35.5
Polaris	312° 51.8	89° 22.5
Acamar	315° 10.3	-40° 11.6
Menkar	314° 04.4	4° 11.8
Mirfak	308° 25.8	49° 57.3
Aldebaran	290° 37.8	16° 33.9
Rigel	281° 02.3	-8° 10.0
Capella	280° 19.5	46° 01.4
Bellatrix	278° 21.2	6° 22.5
Elnath	277° 59.9	28° 37.8
Alnilam	275° 36.1	-1° 10.9
Betelgeuse	270° 50.4	7° 24.8
Canopus	263° 51.6	-52° 42.2
Sirius	258° 24.9	-16° 44.9
Adhara	255° 04.7	-29° 00.2
Procyon	244° 49.4	5° 09.5
Pollux	243° 15.6	27° 57.6
Ahvor	234° 14.3	-59° 35.4
Suhail	222° 45.5	-43° 32.2
Miaplacidus	221° 38.4	-69° 49.3
Alphard	217° 46.5	-8° 46.3
Regulus	207° 33.1	11° 50.2
Dubhe	193° 39.8	61° 36.3
Denebola	182° 23.8	14° 25.4
Gienah	175° 42.4	-17° 41.3
Acrux	172° 59.2	-63° 14.8
Gacrux	171° 50.6	-57° 15.7
Alioth	166° 12.3	55° 48.9
Spica	158° 21.1	-11° 18.0
Alkaid	152° 51.3	49° 10.8
Hadar	148° 34.6	-60° 30.2
Menkent	147° 56.3	-36° 30.1
Arcturus	145° 46.9	19° 02.7
Rigel Kent.	139° 38.9	-60° 56.8
Kochab	137° 20.9	74° 02.8
Zuben 'ubi	136° 54.7	-16° 09.1
Alphecca	126° 02.8	26° 37.6
Antares	112° 14.3	-26° 29.5
Atria	107° 07.5	-69° 04.7
Sabik	102° 01.3	-15° 45.4
Shaula	96° 08.6	-37° 07.4
Rasalhague	95° 57.4	12° 32.6
Eltanin	90° 41.7	51° 29.4
Kaus Aust.	83° 30.7	-34° 22.4
Vega	80° 32.3	38° 48.8
Nunki	75° 46.0	-26° 15.8
Altair	61° 58.5	8° 56.5
Peacock	53° 03.3	-56° 39.1
Deneb	49° 24.7	45° 22.9
Enif	33° 37.2	10° 00.1
Al Na'ir	27° 30.8	-46° 49.9
Fomalhaut	15° 12.6	-29° 28.7
Scheat	13° 43.5	28° 13.9
Markab	13° 28.2	15° 21.2

Oct 10 Sat	SHA	Mer.pass
Venus	147° 22.8	12:53
Mars	230° 26.6	07:23
Jupiter	216° 15.9	08:19
Saturn	348° 56.6	23:26

Oct 11 Sun	SHA	Mer.pass
Venus	147° 40.0	12:48
Mars	229° 51.7	07:22
Jupiter	216° 06.2	08:16
Saturn	349° 00.9	23:21

Oct 12 Mon	SHA	Mer.pass
Venus	147°59.3	12:43
Mars	229°16.9	07:20
Jupiter	215°56.6	08:13
Saturn	349°05.2	23:17

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h Sun Moon							
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°13.1	S06°34.0	191°54.0	14.0'	S06°28.4	15.1'	56.9'
1	198°13.2	34.9	206°27.0	14.0'	06°43.4	15.0'	56.8'
2	213°13.4	35.9	221°00.0	14.0'	06°58.4	15.0'	56.8'
3	228°13.6	· · 36.8	235°33.0	14.0'	07°13.4	14.9'	56.8'
4	243°13.7	37.8	250°05.9	14.0'	07°28.3	14.9'	56.8'
5	258°13.9	38.7	264°38.9	13.9'	07°43.2	14.8'	56.7'
6	273°14.0	S06°39.7	279°11.8	13.9'	S07°58.0	14.8'	56.7'
7	288°14.2	40.6	293°44.8	13.9'	08°12.8	14.7'	56.7'
8	303°14.4	41.6	308°17.7	13.9'	08°27.6	14.7'	56.7'
9	318°14.5	· · 42.5	322°50.6	13.9'	08°42.3	14.6'	56.7'
10	333°14.7	43.5	337°23.5	13.9'	08°56.9	14.6'	56.6'
11	348°14.9	44.4	351°56.4	13.9'	09°11.5	14.5'	56.6'
12	3°15.0	S06°45.4	6°29.2	13.8'	S09°26.0	14.5'	56.6'
13	18°15.2	46.3	21°02.1	13.8'	09°40.5	14.4'	56.6'
14	33°15.4	47.2	35°34.9	13.8'	09°55.0	14.4'	56.5'
15	48°15.5	· · 48.2	50°07.7	13.8'	10°09.3	14.3'	56.5'
16	63°15.7	49.1	64°40.5	13.8'	10°23.7	14.3'	56.5'
17	78°15.9	50.1	79°13.2	13.7'	10°37.9	14.2'	56.5'
18	93°16.0	S06°51.0	93°46.0	13.7'	S10°52.1	14.1'	56.4'
19	108°16.2	52.0	108°18.7	13.7'	11°06.3	14.1'	56.4'
20	123°16.4	52.9	122°51.4	13.7'	11°20.3	14.0'	56.4'
21	138°16.5	· · 53.9	137°24.1	13.6'	11°34.4	14.0'	56.4'
22	153°16.7	54.8	151°56.7	13.6'	11°48.3	13.9'	56.4'
23	168°16.8	55.7	166°29.3	13.6'	12°02.2	13.8'	56.3'
SD = 16.0' $d = 0.9'$ SD = 15.5'							
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°17.0	S06°56.7	181°01.9	13.6'	S12°16.0	13.8'	56.3'
1	198°17.2	57.6	195°34.5	13.5'	12°29.8	13.7'	56.3'
2	213°17.3	58.6	210°07.0	13.5'	12°43.5	13.6'	56.3'
3	228°17.5	06°59.5	224°39.5	13.5'	12°57.1	13.6'	56.2'
4	243°17.7	07°00.5	239°12.0	13.4'	13°10.7	13.5'	56.2'
5	258°17.8	01.4	253°44.5	13.4'	13°24.2	13.4'	56.2'
6	273°18.0	S07°02.3	268°16.9	13.4'	S13°37.6	13.3'	56.2'
7	288°18.1	03.3	282°49.3	13.4'	13°51.0	13.3'	56.1'
8	303°18.3	04.2	297°21.6	13.3'	14°04.2	13.2'	56.1'
9	318°18.5	· · 05.2	311°53.9	13.3'	14°17.4	13.1'	56.1'
10	333°18.6	06.1	326°26.2	13.3'	14°30.6	13.1'	56.1'
11	348°18.8	07.1	340°58.5	13.2'	14°43.6	13.0'	56.1'
12	3°18.9	S07°08.0	355°30.7	13.2'	S14°56.6	12.9'	56.0'
13	18°19.1	08.9	10°02.9	13.1'	15°09.5	12.8'	56.0'
14	33°19.3	09.9	24°35.0	13.1'	15°22.3	12.7'	56.0'
15	48°19.4	· · 10.8	39°07.1	13.1'	15°35.0	12.7'	56.0'
16	63°19.6	11.8	53°39.2	13.0'	15°47.7	12.6'	55.9'
17	78°19.7	12.7	68°11.2	13.0'	16°00.3	12.5'	55.9'
18	93°19.9	S07°13.7	82°43.2	13.0'	S16°12.8	12.4'	55.9'
19	108°20.0	14.6	97°15.2	12.9'	16°25.2	12.3'	55.9'
20	123°20.2	15.5	111°47.1	12.9'	16°37.5	12.2'	55.8'
21	138°20.4	· · 16.5	126°19.0	12.8'	16°49.7	12.2'	55.8'
22	153°20.5	17.4	140°50.9	12.8'	17°01.9	12.1'	55.8'
23	168°20.7	18.4	155°22.7	12.8'	17°14.0	12.0'	55.8'
SD = 16.0' $d = 0.9'$ SD = 15.4'							
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.8	S07°19.3	169°54.4	12.7'	S17°25.9	11.9'	55.8'
1	198°21.0	20.2	184°26.1	12.7'	17°37.8	11.8'	55.7'
2	213°21.2	21.2	198°57.8	12.6'	17°49.6	11.7'	55.7'
3	228°21.3	· · 22.1	213°29.5	12.6'	18°01.3	11.6'	55.7'
4	243°21.5	23.0	228°01.1	12.6'	18°13.0	11.5'	55.7'
5	258°21.6	24.0	242°32.6	12.5'	18°24.5	11.4'	55.6'
6	273°21.8	S07°24.9	257°04.1	12.5'	S18°35.9	11.3'	55.6'
7	288°21.9	25.9	271°35.6	12.4'	18°47.2	11.2'	55.6'
8	303°22.1	26.8	286°07.0	12.4'	18°58.5	11.1'	55.6'
9	318°22.2	· · 27.7	300°38.4	12.3'	19°09.6	11.0'	55.6'
10	333°22.4	28.7	315°09.8	12.3'	19°20.7	11.0'	55.5'
11	348°22.6	29.6	329°41.1	12.3'	19°31.6	10.9'	55.5'
12	3°22.7	S07°30.6	344°12.3	12.2'	S19°42.5	10.8'	55.5'
13	18°22.9	31.5	358°43.5	12.2'	19°53.2	10.7'	55.5'
14	33°23.0	32.4	13°14.7	12.1'	20°03.9	10.6'	55.4'
15	48°23.2	· · 33.4	27°45.8	12.1'	20°14.4	10.4'	55.4'
16	63°23.3	34.3	42°16.9	12.0'	20°24.9	10.3'	55.4'
17	78°23.5	35.2	56°47.9	12.0'	20°35.2	10.2'	55.4'
18	93°23.6	S07°36.2	71°18.9	11.9'	S20°45.5	10.1'	55.4'
19	108°23.8	37.1	85°49.8	11.9'	20°55.6	10.0'	55.3'
20	123°23.9	38.1	100°20.7	11.9'	21°05.6	9.9'	55.3'
21	138°24.1	· · 39.0	114°51.6	11.8'	21°15.6	9.8'	55.3'
22	153°24.2	39.9	129°22.4	11.8'	21°25.4	9.7'	55.3'
23	168°24.4	40.9	143°53.2	11.7'	21°35.1	9.6'	55.3'
SD = 16.0' $d = 0.9'$ SD = 15.2'							

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

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

Day	Sun			Moon		Age 0-2 1-2%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	
10	12:52	13:00	11:47	11:33	23:56	
11	13:08	13:16	11:47	12:19	—	
12	13:23	13:31	11:46	13:05	00:42	