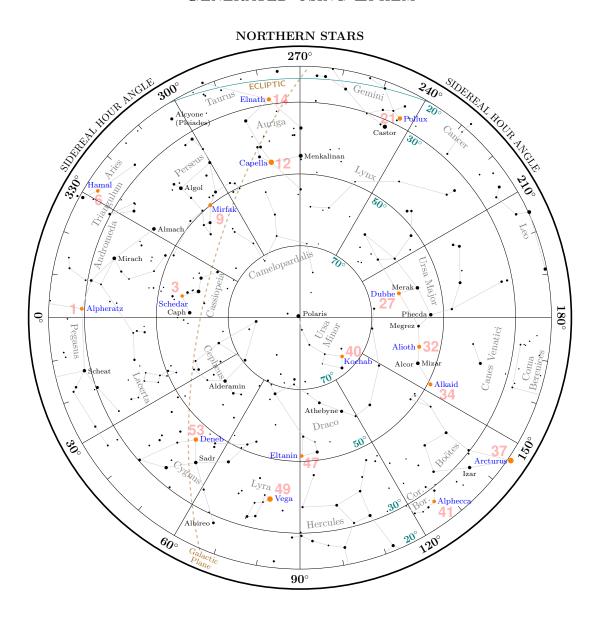
#### GENERATED USING EPHEM



### THE NAUTICAL ALMANAC

## 27.09.2023 - 02.10.2023

Original author: Enno Rodegerdts
Enhancements: Andrew Bauer

September 27, 2023

Disclaimer: These are computer generated tables - use them at your own risk. The accuracy has been randomly checked, but cannot be guaranteed. The author claims no liability for any consequences arising from use of these tables. Besides, this publication only contains the 'daily pages' of the Nautical Almanac: an official version of the Nautical Almanac is indispensable.

# September 27, 28, 29 (Wed., Thu., Fri.)

	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°31.7	223°30.9	<b>N</b> 11°11.5	167°03.4	<b>S</b> 07°23.7	322°49.1	<b>N</b> 14°56.0	31°10.0	<b>S</b> 12°32.4
1	20°34.2	238°31.6	11.3	182°04.3	24.3	337°51.8	55.9	46°12.6	32.4
2	35°36.6	253°32.4	11.1	197°05.2	25.0	352°54.4	55.8	61°15.3	32.5
3	50°39.1	268°33.1	• • 11.0	212°06.2	• • 25.6	7°57.1	• • 55.8	76° 17.9	• • 32.5
4	65°41.6	283°33.8	10.8	227°07.1	26.3	22°59.7	55.7	91°20.5	32.6
5	80°44.0	298°34.6	10.6	242°08.0	26.9	38°02.4	55.7	106°23.1	32.6
6	95°46.5	313°35.3	$N11^{\circ}10.4$	257°08.9	<b>S</b> 07°27.6	53°05.0	<b>N</b> 14°55.6	121°25.7	<b>S</b> 12°32.7
7	110°49.0	328°36.0	10.3	272°09.9	28.2	68°07.6	55.5	136°28.3	32.7
8	125°51.4	343°36.8	10.1	287°10.8	28.9	83° 10.3	55.5	151°30.9	32.8
9	140°53.9	358° 37.5	• • 09.9	302°11.7	• • 29.5	98°12.9	• • 55.4	166°33.5	• • 32.8
10	155°56.4	13°38.2	09.7	317°12.6	30.1	113° 15.6	55.4	181°36.1	32.9
11	170°58.8	28°38.9	09.6	332°13.6	30.8	128° 18.2	55.3	196°38.7	32.9
12	186°01.3	43°39.6	N11°09.4	347°14.5	<b>S</b> 07°31.4	143°20.9	$N14^{\circ}55.3$	211°41.3	<b>S</b> 12°33.0
13	201°03.7	58°40.4	09.2	2°15.4	32.1	158° 23.5	55.2	226°43.9	33.0
14	216°06.2	73°41.1	09.0	17°16.3	32.7	173°26.2	55.1	241°46.5	33.1
15	231°08.7	88°41.8	• • 08.8	32°17.2	• • 33.4	188°28.8	•• 55.1	256°49.1	• • 33.1
16	246°11.1	103°42.5	08.7	47°18.2	34.0	203°31.5	55.0	271°51.7	33.2
17	261°13.6	118°43.2	08.5	62°19.1	34.7	218°34.1	55.0	286°54.3	33.2
18	276°16.1	133°43.9	N11°08.3	77°20.0	<b>S</b> 07°35.3	233°36.8	<b>N</b> 14°54.9	301°56.9	<b>S</b> 12°33.3
19	291°18.5	148°44.6	08.1	92°20.9	36.0	248°39.4	54.8	316°59.5	33.3
20	306°21.0	163°45.3	07.9	107°21.9	36.6	263°42.1	54.8	332°02.1	33.4
21	321°23.5	178°46.0	• • 07.7	122°22.8	• • 37.3	278° 44.7	• • 54.7	347°04.7	• • 33.4
22	336°25.9	193°46.7	07.5	137°23.7	37.9	293°47.4	54.7	2°07.3	33.5
23	351°28.4	208°47.4	07.4	152°24.6	38.6	308°50.0	54.6	17°09.9	33.5
Mer.p	ass. 23:34	$\nu$ 0.7' $d$ -0	).2′ m -4.4	$\nu \ 0.9' \ d - 0$	0.6′ m 1.7	$\nu \ 2.6' \ d \ -0$	0.1′ m -2.6	$\nu$ 2.6' $d$ -0	0.1' m 0.5

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°30.9	223°48.1	N11°07.2	167°25.5	<b>S</b> 07°39.2	323°52.7	<b>N</b> 14°54.5	32° 12.5	<b>S</b> 12°33.6
1	21°33.3	238°48.8	07.0	182°26.5	39.8	338°55.3	54.5	47° 15.1	33.6
2	36°35.8	253°49.5	06.8	197°27.4	40.5	353°58.0	54.4	62°17.7	33.7
3	51°38.2	268°50.2	• • 06.6	212°28.3	• • 41.1	9°00.6	• • 54.3	77°20.3	• • 33.7
4	66°40.7	283°50.9	06.4	227°29.2	41.8	24°03.3	54.3	92°22.9	33.8
5	81°43.2	298°51.6	06.2	242°30.1	42.4	39°05.9	54.2	107°25.5	33.8
6	96° 45.6	313°52.2	<b>N</b> 11°06.0	257°31.1	<b>S</b> 07°43.1	54°08.6	<b>N</b> 14°54.2	122°28.1	<b>S</b> 12°33.9
7	111°48.1	328°52.9	05.8	272°32.0	43.7	69°11.2	54.1	137°30.7	33.9
8	126°50.6	343°53.6	05.6	287°32.9	44.4	84° 13.9	54.0	152°33.3	34.0
9	141°53.0	358° 54.3	•• 05.4	302°33.8	• • 45.0	99° 16.5	• • 54.0	167°35.9	• • 34.0
10	156°55.5	13°55.0	05.2	317°34.7	45.7	114° 19.2	53.9	182°38.5	34.1
11	171°58.0	28°55.6	05.0	332°35.7	46.3	129°21.8	53.9	197°41.1	34.1
12	187°00.4	43°56.3	$N11^{\circ}04.8$	347°36.6	<b>S</b> 07°46.9	144°24.5	<b>N</b> 14°53.8	212°43.7	<b>S</b> 12°34.2
13	202°02.9	58° 57.0	04.6	2°37.5	47.6	159°27.1	53.7	227°46.3	34.2
14	217°05.3	73°57.7	04.4	17°38.4	48.2	174°29.8	53.7	242°48.9	34.3
15	232°07.8	88°58.3	•• 04.2	32°39.3	• • 48.9	189°32.4	• • 53.6	257°51.5	• • 34.3
16	247°10.3	103°59.0	04.0	47°40.2	49.5	204°35.1	53.5	272°54.1	34.4
17	262°12.7	118°59.7	03.8	62°41.2	50.2	219°37.7	53.5	287°56.7	34.4
18	277°15.2	134°00.3	N11°03.6	77°42.1	<b>S</b> 07°50.8	234°40.4	<b>N</b> 14°53.4	302°59.3	<b>S</b> 12°34.5
19	292°17.7	149°01.0	03.4	92°43.0	51.5	249°43.1	53.4	318°01.9	34.5
20	307°20.1	164°01.6	03.2	107°43.9	52.1	264°45.7	53.3	333°04.5	34.6
21	322°22.6	179°02.3	• • 03.0	122°44.8	• • 52.8	279°48.4	• • 53.2	348°07.1	• • 34.6
22	337°25.1	194°03.0	02.7	137°45.8	53.4	294°51.0	53.2	3°09.7	34.6
23	352° 27.5	209°03.6	02.5	152°46.7	54.0	309°53.7	53.1	18° 12.3	34.7
Mer.p	ass. 23:30	ν 0.7′ d -0	).2′ m -4.4	$\nu   0.9'   d$ -(	).6′ m 1.7	ν 2.7′ d -0	).1′ m -2.6	ν 2.6′ d -0	0.0′ m 0.5

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	7°30.0	224°04.3	$N11^{\circ}02.3$	167°47.6	<b>S</b> 07°54.7	324°56.3	<b>N</b> 14°53.0	33°14.9	<b>S</b> 12°34.7
1	22°32.5	239°04.9	02.1	182°48.5	55.3	339°59.0	53.0	48° 17.5	34.8
2	37°34.9	254°05.6	01.9	197°49.4	56.0	355°01.7	52.9	63°20.1	34.8
3	52°37.4	269°06.2	•• 01.7	212°50.3	• • 56.6	10°04.3	• • 52.9	78°22.7	• • 34.9
4	67°39.8	284°06.9	01.5	227°51.3	57.3	25°07.0	52.8	93°25.3	34.9
5	82°42.3	299°07.5	01.2	242°52.2	57.9	40°09.6	52.7	108°27.9	35.0
6	97°44.8	314°08.2	$N11^{\circ}01.0$	257°53.1	<b>S</b> 07°58.6	55° 12.3	<b>N</b> 14°52.7	123°30.4	<b>S</b> 12°35.0
7	112°47.2	329°08.8	8.00	272°54.0	59.2	70°14.9	52.6	138°33.0	35.1
8	127°49.7	344°09.4	00.6	287°54.9	07°59.8	85° 17.6	52.5	153°35.6	35.1
9	142°52.2	359°10.1	• • 00.4	302°55.8	08°00.5	100°20.3	• • 52.5	168°38.2	• • 35.2
10	157°54.6	14° 10.7	$11^{\circ}00.1$	317°56.8	01.1	115°22.9	52.4	183°40.8	35.2
11	172°57.1	29°11.3	$10^{\circ}59.9$	332°57.7	01.8	130°25.6	52.4	198°43.4	35.3
12	187°59.6	44°12.0	<b>N</b> 10°59.7	347°58.6	<b>S</b> 08°02.4	145°28.2	$N14^{\circ}52.3$	213°46.0	<b>S</b> 12°35.3
13	203°02.0	59°12.6	59.5	2°59.5	03.1	160°30.9	52.2	228°48.6	35.4
14	218°04.5	74°13.2	59.2	18°00.4	03.7	175°33.6	52.2	243°51.2	35.4
15	233°06.9	89°13.9	• • 59.0	33°01.3	• • 04.3	190°36.2	•• 52.1	258°53.8	• • 35.5
16	248°09.4	104°14.5	58.8	48°02.2	05.0	205°38.9	52.0	273°56.4	35.5
17	263°11.9	119° 15.1	58.5	63°03.2	05.6	220°41.6	52.0	288°59.0	35.6
18	278°14.3	134° 15.7	<b>N</b> 10°58.3	78°04.1	<b>S</b> 08°06.3	235°44.2	<b>N</b> 14°51.9	304°01.6	<b>S</b> 12°35.6
19	293°16.8	149°16.4	58.1	93°05.0	06.9	250°46.9	51.8	319°04.2	35.6
20	308° 19.3	164° 17.0	57.8	108°05.9	07.6	265°49.5	51.8	334°06.8	35.7
21	323°21.7	179° 17.6	• • 57.6	123°06.8	• • 08.2	280°52.2	• • 51.7	349°09.4	• • 35.7
22	338°24.2	194°18.2	57.4	138°07.7	8.80	295°54.9	51.7	4°12.0	35.8
23	353°26.7	209° 18.8	57.1	153°08.6	09.5	310°57.5	51.6	19° 14.6	35.8
Mer.p	ass. 23:26	ν 0.7′ d -0	0.2′ m -4.4	$\nu$ 0.9' $d$ -0	0.6′ m 1.7	ν 2.7′ d -0	0.1′ m -2.6	ν 2.6′ d -0	0.0′ m 0.6

	Stars	
	SHA	Dec
Alpheratz	357° 35.5	29°13.4
Ankaa Schedar	353°07.8 349°31.7	-42°10.6 56°40.1
Diphda	348°48.0	-17°51.3
Achernar	$335^{\circ}20.4$	-57°06.8
Hamal	327°52.1	23°34.5
Polaris Acamar	314° 12.3 315° 12.2	89°21.6 -40°12.3
Menkar	$314^{\circ}07.0$	$4^{\circ}11.1$
Mirfak	308° 29.5	49°56.6
Aldebaran Rigel	290°40.7 281°04.8	16°33.5 -8°10.2
Capella	280°23.4	46°01.2
Bellatrix	278°24.0	6°22.4
Elnath Alnilam	278°03.1 275°38.8	28°37.6 -1°11.0
Betelgeuse	270°53.2	7°24.8
Canopus	263°52.9	-52°42.1
Sirius	258° 27.2 255° 06.8	-16°44.6 -28°59.9
Adhara Procyon	244°52.1	-26 59.9 5°10.0
Pollux	$243^{\circ}18.7$	$27^{\circ}58.1$
Avior	234° 15.5	-59°34.7
Suhail Miaplacidus	222°47.4 221°39.2	-43°31.4 -69°48.5
Alphard	217°49.0	-8°45.5
Regulus	207°35.8	11°51.2
Dubhe Denebola	193°42.9 182°26.4	61°37.4 14°26.5
Gienah	175°45.0	-17°40.2
Acrux	173°02.1	-63°13.7
Gacrux	171°53.5	-57°14.7 55°50.0
Alioth Spica	166° 14.4 158° 23.8	-11°17.0
Alkaid	152°53.3	$49^{\circ}11.9$
Hadar	148°38.2	-60°29.3
Menkent Arcturus	147° 59.3 145° 49.2	-36°29.1 19°03.7
Rigil Kent.	139°42.4	-60°56.1
Kochab	137°20.6	74°03.7
Zuben'ubi	136° 57.5 126° 04.9	-16°08.3 26°38.3
Alphecca Antares	112° 17.3	-26°29.1
Atria	107°12.7	-69°04.4
Sabik Shaula	102°04.1 96°11.9	-15°45.2 -37°07.3
Rasalhague	96 11.9 95°59.6	-37 07.3 12°32.7
Eltanin	90°42.7	51°29.4
Kaus Aust.	83°33.9	-34°22.5
Vega Nunki	80°33.9 75°49.0	38°48.6 -26°16.1
Altair	62°00.9	8°56.0
Peacock	53°07.1	-56°39.7
Deneb Enif	49°26.3 33°39.6	45°22.1 9°59.1
Al Na'ir	27°33.9	-46°50.9
Fomalhaut	15° 15.3	-29°29.8
Scheat Markab	13°45.9 13°30.7	28°12.8 15°20.1
Sep 27 Wed Venus	<b>SHA</b> 217°59.2	Mer.pass 09:05
Mars	$161^{\circ}31.7$	12:51
Jupiter	317°17.4	02:28
Saturn	25° 38.3	21:52
Sep 28 Thu Venus	<b>SHA</b> 217° 17.2	Mer.pass 09:04
Mars	160°54.7	12:50
Jupiter	317°21.8	02:24
Saturn	25°41.6	21:47
Sep 29 Fri	SHA	Mer.pass
Venus Mars	216°34.3 160°17.6	09:03 12:48
Jupiter	$317^{\circ}26.4$	02:20
Saturn	25°44.9	21:43
-		

Horizontal parallax Venus: Mars:

0.3 0.1

h	Su	n			Moon		
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°11.4	<b>S</b> 01°26.8	32°03.0	8.0'	<b>S</b> 15°34.1	15.2'	60.8'
1	197°11.6	27.8	46°30.1	8.1'	15°18.9	15.3'	60.8'
2	212° 11.8	28.7	60°57.2	8.2'	15°03.6	15.4'	60.8'
3 4	227° 12.0 242° 12.2	· · 29.7 30.7	75°24.4 89°51.6	8.3' 8.3'	14°48.2 14°32.7	15.5' 15.6'	60.8' 60.8'
5	257°12.5	31.6	104°18.9	8.4'	14 32.7 14°17.2	15.0	60.8
6	272°12.7	<b>S</b> 01°32.6	118°46.3	8.5'	<b>S</b> 14°01.5	15.8'	60.8'
7	287° 12.9	33.6	133°13.8	8.5'	13°45.7	15.8'	60.8'
8	302° 13.1	34.6	147°41.3	8.6'	13°29.9	15.9'	60.9'
9 10	317° 13.3 332° 13.5	· · 35.5 36.5	162°08.9 176°36.5	8.7' 8.7'	13°14.0 12°57.9	16.0' 16.1'	60.9' 60.9'
11	347°13.7	37.5	191°04.2	8.8'	12°41.8	16.1	60.9
12	2°14.0	<b>S</b> 01°38.5	205°32.0	8.8'	<b>S</b> 12°25.7	16.3'	60.9'
13	17° 14.2	39.4	219°59.9	8.9'	12°09.4	16.3'	60.9'
14	32°14.4 47°14.6	40.4	234°27.8 248°55.7	9.0'	11°53.1 11°36.7	16.4'	60.9'
15 16	62°14.8	· · 41.4 42.3	248 55.7 263°23.8	9.0' 9.1'	11 30.7 11°20.2	16.5' 16.5'	60.9' 60.9'
17	77° 15.0	43.3	277°51.8	9.1'	11°03.7	16.6'	60.9'
18	92° 15.2	<b>S</b> 01°44.3	292°20.0	9.2'	<b>S</b> 10°47.0	16.7'	60.9'
19	107°15.5	45.3	306°48.2	9.3'	10°30.4	16.7'	60.9'
20 21	122° 15.7 137° 15.9	46.2 •• 47.2	321°16.4 335°44.8	9.3' 9.4'	10°13.6 09°56.8	16.8' 16.9'	60.9' 60.9'
22	152° 16.1	48.2	350°13.1	9.4	09°40.0	16.9	60.9
23	167° 16.3	49.2	4°41.6	9.5'	09°23.0	17.0'	60.9'
	SD = 16.0'	d = -1.0'		S	D = 16.6'		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°16.5	<b>S</b> 01°50.1	19°10.0	9.5'	<b>S</b> 09°06.1	17.0'	60.9'
1 2	197° 16.7 212° 16.9	51.1 52.1	33°38.6 48°07.1	9.6' 9.6'	08°49.0 08°31.9	17.1' 17.1'	60.9' 60.9'
3	212 10.9 227°17.2	• • 53.0	62°35.8	9.0 9.7'	08°14.8	17.1	60.9'
4	242° 17.4	54.0	77°04.4	9.7'	07°57.6	17.2'	60.9'
5	257° 17.6	55.0	91°33.2	9.8'	07°40.4	17.3'	60.9'
6	272°17.8	<b>S</b> 01°56.0	106°01.9	9.8'	<b>S</b> 07°23.1	17.3'	60.9'
7 8	287° 18.0 302° 18.2	56.9 57.9	120°30.8 134°59.6	9.9' 9.9'	07°05.8 06°48.5	17.3' 17.4'	60.9' 60.9'
9	317° 18.4	• 58.9	149°28.5	9.9'	06°31.1	17.4	60.9'
10	332° 18.6	01°59.9	163°57.5	10.0'	06°13.7	17.5'	60.9'
11	347° 18.8	02°00.8	178°26.5	10.0'	05°56.2	17.5'	60.9'
12 13	2°19.1 17°19.3	<b>S</b> 02°01.8 02.8	192°55.5 207°24.5	10.1' 10.1'	<b>S</b> 05°38.7 05°21.2	17.5' 17.5'	60.9' 60.9'
14	32° 19.5	03.7	221°53.6	10.1	05°03.7	17.6'	60.9'
15	47° 19.7	• • 04.7	236°22.8	10.2'	04°46.1	17.6'	60.9'
16	62°19.9 77°20.1	05.7 06.7	250°52.0 265°21.2	10.2' 10.2'	04°28.5 04°10.9	17.6' 17.6'	60.9'
17 18	92°20.3	<b>S</b> 02°07.6	279°50.4	10.2	<b>S</b> 03°53.3	17.6'	60.9' 60.8'
19	107°20.5	08.6	294°19.7	10.3	03°35.6	17.0	60.8
20	122°20.7	09.6	308°49.0	10.3'	03°17.9	17.7'	60.8'
21	137°21.0	• • 10.5	323°18.3	10.4'	03°00.3	17.7'	60.8'
22 23	152°21.2 167°21.4	11.5 12.5	337°47.7 352°17.1	10.4' 10.4'	02°42.6 02°24.9	17.7' 17.7'	60.8' 60.8'
25	SD = 16.0'	d = -1.0'	332 17.1		D = 16.6'	17.7	00.0
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°21.6	<b>S</b> 02°13.5	6°46.5	10.4'	<b>S</b> 02°07.2	17.7'	60.8
1	197°21.8	14.4	21°16.0	10.5'	$01^{\circ}49.5$	17.7'	60.8'
2	212°22.0 227°22.2	15.4	35°45.4 50°14.9	10.5'	01°31.8 01°14.0	17.7'	60.8'
3 4	242°22.4	· · 16.4 17.3	64°44.4	10.5' 10.5'	01 14.0 00°56.3	17.7' 17.7'	60.7' 60.7'
5	257° 22.6	18.3	79°14.0	10.5	00°38.6	17.7'	60.7'
6	272°22.8	<b>S</b> 02°19.3	93°43.5	10.6'	<b>S</b> 00°20.9	17.7'	60.7'
7	287°23.1	20.3	108°13.1	10.6'	<b>S</b> 00°03.2	17.7'	60.7'
8	302°23.3 317°23.5	21.2 · · 22.2	122°42.7 137°12.3	10.6' 10.6'	<b>N</b> 00°14.5 00°32.2	17.7' 17.7'	60.7' 60.7'
10	332°23.7	23.2	151°41.9	10.6'	00°49.8	17.7'	60.6'
11	347°23.9	24.1	166°11.5	10.6'	$01^{\circ}07.5$	17.6'	60.6'
12	2°24.1	<b>S</b> 02°25.1	180°41.1	10.7'	N01°25.1	17.6'	60.6'
13 14	17°24.3 32°24.5	26.1 27.1	195°10.8 209°40.4	10.7' 10.7'	01°42.8 02°00.4	17.6' 17.6'	60.6' 60.6'
	32 24.5 47°24.7	. 28.0	209 40.4 224°10.1	10.7 10.7'	02 00.4 02°17.9	17.6' 17.6'	60.6
15		29.0	238°39.8	10.7'	02°35.5	17.5'	60.5'
16	62°24.9				000 50 0		60 F1
16 17	77°25.1	30.0	253°09.5	10.7'	02°53.0	17.5'	60.5'
16 17 18	77°25.1 92°25.3	30.0 <b>S</b> 02°30.9	267°39.2	10.7'	$N03^{\circ}10.5$	17.5'	60.5'
16 17 18 19	77° 25.1 92° 25.3 107° 25.6	30.0 <b>S</b> 02°30.9 31.9	267°39.2 282°08.9	10.7' 10.7'	<b>N</b> 03°10.5 03°28.0	17.5' 17.4'	60.5' 60.5'
16 17 18	77°25.1 92°25.3	30.0 <b>S</b> 02°30.9	267°39.2 282°08.9 296°38.5 311°08.2	10.7'	N03°10.5 03°28.0 03°45.5 04°02.9	17.5'	60.5'
16 17 18 19 20 21 22	77°25.1 92°25.3 107°25.6 122°25.8 137°26.0 152°26.2	30.0 \$02°30.9 31.9 32.9 •• 33.9 34.8	267°39.2 282°08.9 296°38.5 311°08.2 325°37.9	10.7' 10.7' 10.7' 10.7' 10.7'	N03°10.5 03°28.0 03°45.5 04°02.9 04°20.3	17.5' 17.4' 17.4' 17.4' 17.3'	60.5' 60.5' 60.5' 60.4' 60.4'
16 17 18 19 20 21	77°25.1 92°25.3 107°25.6 122°25.8 137°26.0	30.0 \$02°30.9 31.9 32.9 · · 33.9	267°39.2 282°08.9 296°38.5 311°08.2	10.7' 10.7' 10.7' 10.7' 10.7' 10.7'	N03°10.5 03°28.0 03°45.5 04°02.9	17.5' 17.4' 17.4' 17.4'	60.5' 60.5' 60.5' 60.4'

SD = 16.6'

d = -1.0'

 $\mathsf{SD} = 16.0'$ 

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

		Moonrise			Moonset	:
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	18:55	18:11	17:33		03:01	05:36
N 70°	18:38	18:06	17:37	00:33	03:15	05:37
68°	18:25	18:01	17:40	01:01	03:26	05:38
66°	18:14	17:57	17:43	01:22	03:35	05:39
64°	18:04	17:54	17:45	01:39	03:42	05:39
62°	17:56	17:51	17:47	01:52	03:48	05:40
60°	17:49	17:49	17:49	02:04	03:54	05:40
N 58°	17:43	17:47	17:50	02:14	03:59	05:40
56°	17:37	17:45	17:52	02:22	04:03	05:41
54°	17:32	17:43	17:53	02:30	04:07	05:41
52°	17:28	17:42	17:54	02:37	04:10	05:41
50°	17:24	17:40	17:55	02:43	04:13	05:41
45°	17:15	17:37	17:58	02:56	04:20	05:42
<b>N</b> 40°	17:07	17:34	18:00	03:07	04:25	05:42
35°	17:01	17:32	18:01	03:16	04:30	05:42
30°	16:55	17:30	18:03	03:24	04:34	05:43
20°	16:45	17:26	18:06	03:37	04:41	05:43
N 10°	16:36	17:23	18:08	03:49	04:47	05:44
0°	16:28	17:20	18:10	04:00	04:53	05:44
<b>S</b> 10°	16:20	17:17	18:13	04:11	04:58	05:44
20°	16:11	17:14	18:15	04:22	05:04	05:44
30°	16:01	17:10	18:18	04:35	05:11	05:45
35°	15:55	17:08	18:20	04:43	05:15	05:45
40°	15:48	17:06	18:22	04:51	05:19	05:45
45°	15:40	17:03	18:24	05:01	05:24	05:45
<b>S</b> 50°	15:30	17:00	18:27	05:12	05:30	05:46
52°	15:26	16:58	18:28	05:18	05:33	05:46
54°	15:21	16:56	18:30	05:24	05:36	05:46
56°	15:16	16:55	18:31	05:30	05:39	05:46
58° <b>S</b> 60°	15:10 15:03	16:53 16:50	18:33 18:35	05:38 05:46	05:42 05:46	05:46 05:46
3 00	15:03	10:50	10:33	05:40	05:40	05:40
		_		1		-

		Sun		Moon			
Day	Eqn.of	f Time	Mer.	Mer.Pass.			
Day	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	Age	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		
27	08:45	08:56	11:51	22:41	10:14	12(91%)	
28	09:06	09:16	11:51	23:32	11:06	13(97%)	
29	09:26	09:36	11:50	-:-	11:57	14(100%)	

#### September 30, 01, 02 (Sat., Sun., Mon.)

	Aries	Ve	nus	M	ars	Jup	oiter	Sat	urn
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°29.1	224°19.5	<b>N</b> 10°56.9	168°09.6	<b>S</b> 08°10.1	326°00.2	<b>N</b> 14°51.5	34°17.2	<b>S</b> 12°35.9
1	23°31.6	239°20.1	56.7	183°10.5	10.8	341°02.9	51.5	49°19.8	35.9
2	38°34.1	254°20.7	56.4	198°11.4	11.4	356°05.5	51.4	64°22.4	36.0
3	53°36.5	269°21.3	• • 56.2	213°12.3	• • 12.1	11°08.2	• • 51.3	79°25.0	• • 36.0
4	68°39.0	284°21.9	56.0	228°13.2	12.7	26°10.9	51.3	94°27.6	36.1
5	83°41.4	299°22.5	55.7	243°14.1	13.3	41°13.5	51.2	109°30.1	36.1
6	98°43.9	314°23.1	N10°55.5	258°15.0	<b>S</b> 08°14.0	56°16.2	$N14^{\circ}51.1$	124°32.7	<b>S</b> 12°36.2
7	113°46.4	329°23.7	55.2	273°15.9	14.6	71°18.9	51.1	139°35.3	36.2
8	128°48.8	344°24.3	55.0	288°16.9	15.3	86°21.5	51.0	154°37.9	36.3
9	143°51.3	359°24.9	• • 54.7	303°17.8	• • 15.9	101°24.2	• • 50.9	169°40.5	• • 36.3
10	158°53.8	14°25.5	54.5	318°18.7	16.6	116°26.9	50.9	184°43.1	36.4
11	173°56.2	29°26.1	54.2	333°19.6	17.2	131°29.5	50.8	199°45.7	36.4
12	188°58.7	44°26.7	<b>N</b> 10°54.0	348°20.5	<b>S</b> 08°17.8	146°32.2	$N14^{\circ}50.7$	214°48.3	<b>S</b> 12°36.4
13	204°01.2	59°27.3	53.7	3°21.4	18.5	161°34.9	50.7	229°50.9	36.5
14	219°03.6	74°27.9	53.5	18°22.3	19.1	176°37.5	50.6	244°53.5	36.5
15	234°06.1	89°28.5	• • 53.2	33°23.2	• • 19.8	191°40.2	• • 50.5	259°56.1	• • 36.6
16	249°08.5	104°29.0	53.0	48°24.1	20.4	206°42.9	50.5	274°58.7	36.6
17	264°11.0	119°29.6	52.7	63°25.1	21.0	221°45.5	50.4	290°01.3	36.7
18	279°13.5	134°30.2	$N10^{\circ}52.5$	78°26.0	<b>S</b> 08°21.7	236°48.2	$N14^{\circ}50.3$	305°03.9	<b>S</b> 12°36.7
19	294°15.9	149°30.8	52.2	93°26.9	22.3	251°50.9	50.3	320°06.5	36.8
20	309°18.4	164°31.4	52.0	108°27.8	23.0	266°53.5	50.2	335°09.1	36.8
21	324°20.9	179°32.0	• • 51.7	123°28.7	• • 23.6	281°56.2	• • 50.1	350°11.6	• • 36.9
22	339°23.3	194°32.5	51.5	138°29.6	24.3	296°58.9	50.1	5°14.2	36.9
23	354°25.8	209°33.1	51.2	153°30.5	24.9	312°01.6	50.0	20°16.8	36.9
Mer.p	pass. 23:22	$\nu$ 0.6' $d$ -0	).2′ m -4.4	$\nu$ 0.9' $d$ -0	).6′ m 1.7	$\nu$ 2.7' $d$ -0	0.1′ m -2.6	$\nu$ 2.6' $d$ -0	0.0′ m 0.6

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°28.3	224°33.7	<b>N</b> 10°50.9	168°31.4	<b>S</b> 08°25.5	327°04.2	<b>N</b> 14°49.9	35°19.4	<b>S</b> 12°37.0
1	24°30.7	239°34.3	50.7	183°32.3	26.2	342°06.9	49.9	50°22.0	37.0
2	39°33.2	254°34.8	50.4	198°33.2	26.8	357°09.6	49.8	65°24.6	37.1
3	54°35.7	269°35.4	• • 50.2	213°34.2	• • 27.5	12°12.2	• • 49.7	80°27.2	• • 37.1
4	69°38.1	284°36.0	49.9	228°35.1	28.1	27°14.9	49.7	95°29.8	37.2
5	84°40.6	299°36.5	49.6	243°36.0	28.7	42°17.6	49.6	110°32.4	37.2
6	99°43.0	314°37.1	<b>N</b> 10°49.4	258°36.9	<b>S</b> 08°29.4	57°20.3	<b>N</b> 14°49.5	125°35.0	<b>S</b> 12°37.3
7	114°45.5	329°37.7	49.1	273°37.8	30.0	72°22.9	49.5	140°37.6	37.3
8	129°48.0	344°38.2	48.8	288°38.7	30.7	87°25.6	49.4	155°40.2	37.4
9	144°50.4	359°38.8	• • 48.6	303°39.6	• • 31.3	102°28.3	• • 49.3	170°42.7	• • 37.4
10	159°52.9	14°39.4	48.3	318°40.5	31.9	117°31.0	49.3	185°45.3	37.4
11	174°55.4	29°39.9	48.0	333°41.4	32.6	132°33.6	49.2	200°47.9	37.5
12	189°57.8	44°40.5	<b>N</b> 10°47.8	348°42.3	<b>S</b> 08°33.2	147°36.3	$N14^{\circ}49.1$	215°50.5	<b>S</b> 12°37.5
13	205°00.3	59°41.0	47.5	3°43.2	33.9	162°39.0	49.1	230°53.1	37.6
14	220°02.8	74°41.6	47.2	18°44.1	34.5	177°41.6	49.0	245°55.7	37.6
15	235°05.2	89°42.1	• • 46.9	33°45.0	• • 35.1	192°44.3	• • 48.9	260°58.3	• • 37.7
16	250°07.7	104°42.7	46.7	48°46.0	35.8	207°47.0	48.9	276°00.9	37.7
17	265°10.2	119°43.2	46.4	63°46.9	36.4	222°49.7	48.8	291°03.5	37.8
18	280°12.6	134°43.8	<b>N</b> 10°46.1	78°47.8	<b>S</b> 08°37.1	237°52.4	<b>N</b> 14°48.7	306°06.1	<b>S</b> 12°37.8
19	295°15.1	149°44.3	45.8	93°48.7	37.7	252°55.0	48.7	321°08.6	37.9
20	310°17.5	164°44.9	45.6	108°49.6	38.3	267°57.7	48.6	336°11.2	37.9
21	325°20.0	179°45.4	• • 45.3	123°50.5	• • 39.0	283°00.4	• • 48.5	351°13.8	• • 37.9
22	340°22.5	194°46.0	45.0	138°51.4	39.6	298°03.1	48.5	6°16.4	38.0
23	355°24.9	209°46.5	44.7	153°52.3	40.3	313°05.7	48.4	21°19.0	38.0
Mer.p	ass. 23:18	ν 0.6′ d -0	).3′ m -4.4	$\nu$ 0.9 $^{\prime}$ $d$ -0	).6′ m 1.7	ν 2.7′ d -0	).1′ m -2.6	ν 2.6′ d -0	0.0′ m 0.6

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°27.4	224°47.0	<b>N</b> 10°44.4	168°53.2	<b>S</b> 08°40.9	328°08.4	<b>N</b> 14°48.3	36°21.6	<b>S</b> 12°38.1
1	25°29.9	239°47.6	44.2	183°54.1	41.5	343°11.1	48.3	51°24.2	38.1
2	40°32.3	254°48.1	43.9	198°55.0	42.2	358°13.8	48.2	66°26.8	38.2
3	55°34.8	269°48.6	• • 43.6	213°55.9	• • 42.8	13°16.5	• • 48.1	81°29.4	• • 38.2
4	70°37.3	284°49.2	43.3	228°56.8	43.5	28°19.1	48.0	96°32.0	38.3
5	85°39.7	299°49.7	43.0	243°57.7	44.1	43°21.8	48.0	111°34.5	38.3
6	100°42.2	314°50.2	<b>N</b> 10°42.7	258°58.6	<b>S</b> 08°44.7	58°24.5	<b>N</b> 14°47.9	126°37.1	<b>S</b> 12°38.3
7	115°44.6	329°50.8	42.4	273°59.5	45.4	73°27.2	47.8	141°39.7	38.4
8	130°47.1	344°51.3	42.1	289°00.4	46.0	88°29.8	47.8	156°42.3	38.4
9	145°49.6	359°51.8	• • 41.9	304°01.3	• • 46.7	103°32.5	• • 47.7	171°44.9	• • 38.5
10	160°52.0	14°52.3	41.6	319°02.2	47.3	118°35.2	47.6	186°47.5	38.5
11	175°54.5	29°52.9	41.3	334°03.1	47.9	133°37.9	47.6	201°50.1	38.6
12	190°57.0	44°53.4	<b>N</b> 10°41.0	349°04.1	<b>S</b> 08°48.6	148°40.6	<b>N</b> 14°47.5	216°52.7	<b>S</b> 12°38.6
13	205°59.4	59°53.9	40.7	4°05.0	49.2	163°43.3	47.4	231°55.2	38.6
14	221°01.9	74°54.4	40.4	19°05.9	49.8	178°45.9	47.4	246°57.8	38.7
15	236°04.4	89°54.9	• • 40.1	34°06.8	• • 50.5	193°48.6	• • 47.3	262°00.4	• • 38.7
16	251°06.8	104°55.5	39.8	49°07.7	51.1	208°51.3	47.2	277°03.0	38.8
17	266°09.3	119°56.0	39.5	64°08.6	51.8	223°54.0	47.1	292°05.6	38.8
18	281°11.8	134°56.5	N10°39.2	79°09.5	<b>S</b> 08°52.4	238°56.7	N14°47.1	307°08.2	<b>S</b> 12°38.9
19	296°14.2	149°57.0	38.9	94°10.4	53.0	253°59.3	47.0	322°10.8	38.9
20	311°16.7	164°57.5	38.6	109°11.3	53.7	269°02.0	46.9	337°13.4	39.0
21	326°19.1	179°58.0	• • 38.3	124°12.2	• • 54.3	284°04.7	• • 46.9	352°15.9	• • 39.0
22	341°21.6	194°58.5	38.0	139°13.1	54.9	299°07.4	46.8	7°18.5	39.0
23	356°24.1	209°59.0	37.7	154°14.0	55.6	314°10.1	46.7	22°21.1	39.1
Mer.p	ass. 23:14	$\nu$ 0.5 $^{\prime}$ $d$ -0	).3′ m -4.4	$\nu$ 0.9 $^{\prime}$ $d$ -0	0.6′ m 1.7	ν 2.7′ d -0	0.1′ m -2.7	ν 2.6′ d -0	0.0′ m 0.6

	Stars	
	SHA	Dec
Alpheratz	357°35.5	29°13.4
Ankaa Schedar	353°07.8 349°31.7	-42°10.6 56°40.1
Diphda	348° 48.0	-17°51.3
Achernar	335°20.4	-57°06.9
Hamal Polaris	327°52.1 314°11.3	23°34.5 89°21.7
Acamar	315° 12.2	-40°12.3
Menkar	314°07.0	4°11.1
Mirfak Aldebaran	308° 29.4 290° 40.7	49°56.6 16°33.5
Rigel	290 40.7 281°04.8	-8°10.2
Capella	280°23.3	46°01.2
Bellatrix	278°23.9	6°22.4
Elnath Alnilam	278°03.1 275°38.7	28°37.6 -1°11.0
Betelgeuse	270°53.2	7°24.8
Canopus	263°52.8	-52°42.1
Sirius Adhara	258° 27.2 255° 06.7	-16°44.6 -28°59.9
Procyon	244°52.0	5°10.0
Pollux	243°18.7	27°58.1
Avior	234° 15.5 222° 47.4	-59°34.7
Suhail Miaplacidus	222°47.4 221°39.1	-43°31.4 -69°48.5
Alphard	$217^{\circ}49.0$	-8°45.5
Regulus	207°35.8 193°42.9	11°51.2
Dubhe Denebola	193°42.9 182°26.4	61°37.4 14°26.5
Gienah	175° 45.0	-17°40.2
Acrux	173°02.1	-63°13.7
Gacrux Alioth	171°53.5 166°14.4	-57°14.6 55°50.0
Spica	158° 23.8	-11°17.0
Alkaid	152°53.3	49°11.9
Hadar Menkent	148° 38.2 147° 59.3	-60°29.2 -36°29.1
Arcturus	147 59.5 145°49.2	-30 29.1 19°03.7
Rigil Kent.	139°42.4	-60°56.0
Kochab	137° 20.7 136° 57.5	74°03.6 -16°08.3
Zuben'ubi Alphecca	130 57.5 126°04.9	-16 08.3 26°38.3
Antares	$112^{\circ}17.3$	-26°29.1
Atria	107°12.8	-69°04.4
Sabik Shaula	102°04.1 96°11.9	-15°45.2 -37°07.3
Rasalhague	95°59.6	12°32.7
Eltanin	90°42.8	51°29.4
Kaus Aust. Vega	83°34.0 80°34.0	-34°22.5 38°48.6
Nunki	75°49.1	-26°16.1
Altair	62°00.9	8°56.0
Peacock Deneb	53°07.1 49°26.3	-56°39.7 45°22.1
Enif	33°39.6	9°59.1
Al Na'ir	27°33.9	-46°50.9
Fomalhaut	15° 15.4 13° 45.9	-29°29.8 28°12.8
Scheat Markab	13° 45.9 13° 30.7	28 12.8 15°20.1
Sep 30 Sat	SHA	Mer.pass
Venus	215°50.3	09:02
Mars	159°40.4	12:47
Jupiter Saturn	317°31.1 25°48.0	02:16 21:39
Oct 01 Sun Venus	<b>SHA</b> 215° 05.4	Mer.pass 09:01
Mars	159°03.2	12:45
Jupiter	317°36.0	02:11
Saturn	25°51.2	21:35
Oct 02 Mon Venus	<b>SHA</b> 214° 19.6	Mer.pass 09:01
venus Mars	214 19.6 158° 25.8	12:44
Jupiter	$317^{\circ}41.0$	02:07
Saturn	25°54.2	21:31
Horizont	tal parallax	
	Venus:	0.3
	Mars:	0.1

Sat   GHA   Dec   GHA   Dec	h	Su	n			Moon		
1				GHA	ν		d	HP
1								
3	1	197°26.8						
A	1							
5	1							
Color								
R   302°9.83   44.5   110°34.7   10.6   06°94.8   16.9   60.2   9   317°28.5   · · · · · · · · · · · · · · · · · ·								
9   317°28.5	I .							
10			44.5					60.2'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
13								
14								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1	32°29.5	50.4	197°32.3	10.5'	08°52.1		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1							
18	I .							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
122° 90.7   56.2   284° 29.3   10.4'   10° 30.2   16.1'   59.8'								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	21		•• 57.1		10.4'			59.8'
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	1							
Sun GHA   Dec   GHA   ν   Dec   d   HP	23			327°57.5			15.9′	59.7
0		$SD = 16.0^{\circ}$	d = -1.0'		5	5D = 16.5'		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Sun							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
3	1							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
6 272°32.8 S03°05.9 69°22.4 10.2' N13°07.6 15.3' 59.5' 7 287°33.0 06.8 83°51.6 10.1' 13°22.9 15.2' 59.5' 8 302°33.2 07.8 98°20.7 10.1' 13°22.9 15.2' 59.5' 10.1' 33°38.1 15.1' 59.4' 9 317°33.4 · 08.8 112°49.8 10.1' 13°53.2 15.0' 59.4' 10 332°33.6 09.7 127°18.9 10.0' 14°08.2 14.9' 59.4' 11 347°33.8 10.7 141°47.9 10.0' 14°08.2 14.9' 59.4' 11 347°33.8 10.7 141°47.9 10.0' 14°33.1 14.8' 59.3' 12 2°34.0 S03°11.7 156°16.9 10.0' N14°37.9 14.7' 59.3' 13 17°34.2 12.7 170°45.8 9.9' 14°52.6 14.6' 59.3' 14 32°34.4 13.6 185°14.8 9.9' 15°07.2 14.5' 59.2' 15 47°34.6 · 14.6 199°43.7 9.9' 15°21.7 14.4' 59.2' 16 62°34.8 15.6 214°12.5 9.8' 15°36.1 14.3' 59.2' 17 77°35.0 16.5 228°41.4 9.8' 15°36.1 14.3' 59.2' 18 92°35.2 S03°17.5 243°10.2 9.8' N16°04.6 14.1' 59.1' 19 107°35.4 18.5 257°38.9 9.7' 16°18.7 14.0' 59.1' 20 122°35.6 19.4 272°07.6 9.7' 16°32.7 13.9' 59.0' 21 137°35.8 · 20.4 286°36.3 9.6' 16°46.6 13.8' 59.0' 22 152°36.0 21.4 301°05.0 9.6' 17°00.3 13.7' 58.9' 23 167°36.2 22.3 315°33.6 9.6' 17°10.0 313.7' 58.9' 23 167°36.2 22.3 315°33.6 9.6' 17°10.3 13.7' 58.9' 21 19 19°36.6 24.3 344°30.7 9.5' 17°41.0 13.3' 58.8' 2 2 122°36.8 25.2 358°59.1 9.4' 17°54.3 13.2' 58.8' 3 227°37.0 · 26.2 13°27.6 9.4' 18°75.5 13.4' 58.9' 3 227°37.0 · 26.2 13°27.6 9.4' 18°75.5 13.4' 58.9' 5 257°37.8 30.1 71°21.0 9.3' 18°59.1 12.6' 58.6' 6 272°37.6 S03°29.1 56°52.7 9.3' N18°46.4 12.7' 58.6' 9 317°38.2 · 32.0 100°17.5 9.2' 19°24.2 12.4' 58.5' 10 332°38.4 33.0 18°65.2 9.9' 19°11.7 12.5' 58.6' 9 317°38.2 · 32.0 100°17.5 9.2' 19°24.2 12.4' 58.5' 11 34°38.6 34.0 129°138 9.1' 19°48.8 12.1' 58.5' 11 34°38.6 34.0 129°138 9.1' 19°48.8 12.1' 58.5' 11 34°38.6 34.0 129°138 9.1' 19°48.8 12.1' 58.5' 11 34°38.6 34.0 129°138 9.1' 19°48.8 12.1' 58.5' 11 34°39.0 35.9 158°09.9 9.0' 20°24.7 11.7' 58.3' 11 34°39.0 35.9 158°09.9 9.0' 20°24.7 11.7' 58.3' 11 34°39.0 35.9 158°09.9 9.0' 20°24.7 11.7' 58.3' 11 34°39.0 35.9 158°09.9 9.0' 20°24.7 11.7' 58.3' 11 34°39.0 35.9 158°09.9 9.0' 20°24.7 11.7' 58.3' 11 34°39.0 35.9 158°09.9 9.0' 20°44.0 11.5' 58.3' 11 31°40.6 44.6 44.6 288	I .							
7 287°33.0 06.8 83°51.6 10.1' 13°22.9 15.2' 59.5' 8 302°33.2 07.8 98°20.7 10.1' 13°38.1 15.1' 59.4' 10 332°33.6 09.7 127°18.9 10.0' 14°08.2 14.9' 59.4' 11 34°33.8 10.7 14°47.9 10.0' 14°08.2 14.9' 59.4' 11 34°33.8 10.7 14°47.9 10.0' 14°31.7 14.8' 59.3' 12 2°34.0 \$S03°11.7 156°16.9 10.0' N14°37.9 14.7' 59.3' 13 17°34.2 12.7 170°45.8 9.9' 14°52.6 14.6' 59.3' 14 32°34.4 13.6 185°14.8 9.9' 15°07.2 14.5' 59.2' 15 47°34.6 · 14.6 199°43.7 9.9' 15°07.2 14.5' 59.2' 16 62°34.8 15.6 214°12.5 9.8' 15°36.1 14.3' 59.2' 17 77°35.0 16.5 228°41.4 9.8' 15°50.4 14.2' 59.1' 18 92°35.2 \$S03°17.5 243°10.2 9.8' N16°04.6 14.1' 59.1' 19 107°35.4 18.5 257°38.9 9.7' 16°18.7 14.0' 59.1' 20 122°35.6 19.4 272°07.6 9.7' 16°32.7 13.9' 59.1' 21 137°35.8 · 20.4 286°36.3 9.6' 17°10.3 13.7' 58.9' 22 152°36.0 21.4 301°05.0 9.6' 17°00.3 13.7' 58.9' 23 16°36.2 22.3 315°33.6 9.6' 17°14.0 13.5' 58.9'     Mon GHA Dec GHA ν Dec GHA ν Dec d HP	5	257°32.6	04.9	54°53.2	10.2'	12°52.3	15.4'	59.5'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
9 317°33.4 · · · 08.8 112°49.8 10.1' 13°53.2 15.0' 59.4' 10 332°33.6 09.7 127°18.9 10.0' 14°08.2 14.9' 59.4' 11 347°33.8 10.7 141°47.9 10.0' 14°08.2 14.9' 59.4' 11 347°33.8 10.7 141°47.9 10.0' 14°03.1 14.8' 59.3' 12 2°34.0 \$S03°11.7 156°16.9 10.0' N14°37.9 14.7' 59.3' 13 17°34.2 12.7 170°45.8 9.9' 14°52.6 14.6' 59.3' 14 32°34.4 13.6 185°14.8 9.9' 15°07.2 14.5' 59.2' 15 47°34.6 · · 14.6 199°43.7 9.9' 15°21.7 14.4' 59.2' 16 62°34.8 15.6 214°12.5 9.8' 15°36.1 14.3' 59.2' 17 77°35.0 16.5 228°41.4 9.8' 15°50.4 14.2' 59.1' 18 92°35.2 \$S03°17.5 243°10.2 9.8' N16°04.6 14.1' 59.1' 19 107°35.4 18.5 257°38.9 9.7' 16°18.7 14.0' 59.1' 20 122°35.6 19.4 272°07.6 9.7' 16°32.7 13.9' 59.0' 21 137°35.8 · · · 20.4 286°36.3 9.6' 16°46.6 13.8' 59.0' 22 152°36.0 21.4 301°05.0 9.6' 17°00.3 13.7' 58.9' 316°36.2 22.3 315°33.6 9.6' 17°14.0 13.5' 58.9' 31 197°36.6 24.3 344°30.7 9.5' N17°27.5 13.4' 58.9' 31 197°36.6 24.3 344°30.7 9.5' N17°27.5 13.4' 58.9' 31 197°36.6 24.3 344°30.7 9.5' N17°27.5 13.4' 58.9' 32 212°36.8 25.2 358°59.1 9.4' 17°54.3 13.2' 58.8' 3 227°37.0 · · · 26.2 13°27.6 9.4' 18°07.5 13.1' 58.8' 4 242°37.2 27.2 27.2 27°56.0 9.4' 18°07.5 13.1' 58.8' 4 242°37.2 27.2 27.2 27°56.0 9.4' 18°07.5 13.1' 58.8' 58.7' 557°37.4 28.1 42°24.4 9.3' 18°33.5 12.8' 58.7' 58.6' 7 287°37.8 30.1 71°21.0 9.3' 18°33.5 12.8' 58.7' 58.6' 7 287°37.8 30.1 71°21.0 9.3' 18°33.5 12.8' 58.7' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.6' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.6' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°38.6 34.0 129°13.8 9.1' 19°36.5 12.2' 58.5' 11 347°39.0 35.9 158°0.9 9.0' 20°12.9 11.8' 58.4' 11 347°39.0 35.9 158°0.9 9.0' 20°12.9 11.8' 58.4' 11 347°39.0 35.9 158°0.9 9.0' 20°24.7 11.7' 58.3' 11 347°30.0 35.9 158°0.9 9.0' 20°24.7 11.7' 58.3' 11 347°30.0 38.8								
10	1							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	11	347°33.8	10.7	141°47.9	10.0'	$14^{\circ}23.1$	14.8'	59.3'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	12	2°34.0	<b>S</b> 03°11.7		10.0'		14.7'	59.3'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	-							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	I .	77°35.0		228°41.4		15°50.4		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	18	92°35.2	<b>S</b> 03°17.5	243°10.2	9.8'	<b>N</b> 16°04.6	14.1'	59.1'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								
Mon         GHA         Dec         GHA         ν         Dec         d         HP           0         182°36.4         \$30°23.3         330°02.1         9.5'         N17°27.5         13.4'         58.9'           1         197°36.6         24.3         344°30.7         9.5'         17°41.0         13.3'         58.8'           2         212°36.8         25.2         358°59.1         9.4'         17°54.3         13.2'         58.8'           3         227°37.0         · · 26.2         13°27.6         9.4'         18°07.5         13.1'         58.8'           4         242°37.2         27.2         27°56.0         9.4'         18°20.6         13.0'         58.7'           5         257°37.4         28.1         42°24.4         9.3'         18°33.5         12.8'         58.7'           6         272°37.6         \$03°29.1         56°52.7         9.3'         N18°46.4         12.7'         58.6'           7         287°37.8         30.1         71°21.0         9.3'         18°59.1         12.6'         58.6'           8         302°38.0         31.0         85°49.2         9.2'         19°11.7         12.5'         58.6'								
0         182°36.4         \$03°23.3         330°02.1         9.5'         N17°27.5         13.4'         58.9'           1         197°36.6         24.3         344°30.7         9.5'         17°41.0         13.3'         58.8'           2         212°36.8         25.2         358°59.1         9.4'         17°54.3         13.2'         58.8'           3         227°37.0         · · 26.2         13°27.6         9.4'         18°07.5         13.1'         58.8'           4         242°37.2         27.2         27°56.0         9.4'         18°20.6         13.0'         58.7'           5         257°37.4         28.1         42°24.4         9.3'         18°33.5         12.8'         58.7'           6         272°37.6         \$03°29.1         56°52.7         9.3'         N18°46.4         12.7'         58.6'           7         287°37.8         30.1         71°21.0         9.3'         18°59.1         12.6'         58.6'           8         302°38.0         31.0         85°49.2         9.2'         19°11.7         12.5'         58.6'           9         317°38.2         -32.0         100°17.5         9.2'         19°24.2         12.4'         58.5'<		SD = 16.0'	d = -1.0'		S	5D = 16.3'		
1         197°36.6         24.3         344°30.7         9.5'         17°41.0         13.3'         58.8'           2         212°36.8         25.2         358°59.1         9.4'         17°54.3         13.2'         58.8'           3         227°37.0         · · 26.2         13°27.6         9.4'         18°07.5         13.1'         58.8'           4         242°37.2         27.2         27°56.0         9.4'         18°30.6         13.0'         58.7'           5         257°37.4         28.1         42°24.4         9.3'         18°33.5         12.8'         58.7'           6         272°37.6         S03°29.1         56°52.7         9.3'         N18°46.4         12.7'         58.6'           7         287°37.8         30.1         71°21.0         9.3'         18°59.1         12.6'         58.6'           8         302°38.0         31.0         85°49.2         9.2'         19°11.7         12.6'         58.6'           9         317°38.2         - 32.0         100°17.5         9.2'         19°24.2         12.4'         58.5'           10         332°38.4         33.0         114°45.6         9.1'         19°36.5         12.2'         58.5' <th>Mon</th> <th>GHA</th> <th>Dec</th> <th>GHA</th> <th>ν</th> <th>Dec</th> <th>d</th> <th>HP</th>	Mon	GHA	Dec	GHA	ν	Dec	d	HP
2         212°36.8         25.2         358°59.1         9.4'         17°54.3         13.2'         58.8'           3         227°37.0         · · 26.2         13°27.6         9.4'         18°07.5         13.1'         58.8'           4         242°37.2         27.2         27°56.0         9.4'         18°20.6         13.0'         58.7'           5         257°37.4         28.1         42°24.4         9.3'         18°33.5         12.8'         58.7'           6         272°37.6         \$03°29.1         56°52.7         9.3'         N18°46.4         12.7'         58.6'           7         287°37.8         30.1         71°21.0         9.3'         18°59.1         12.6'         58.6'           8         302°38.0         31.0         85°49.2         9.2'         19°11.7         12.5'         58.6'           9         317°38.2         · 32.0         100°17.5         9.2'         19°24.2         12.4'         58.5'           10         332°38.4         33.0         114°45.6         9.1'         19°36.5         12.2'         58.5'           11         347°38.6         34.0         129°13.8         9.1'         N20°00.9         12.0'         58.4' </td <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	0							
3         227°37.0         · · · 26.2         13°27.6         9.4'         18°07.5         13.1'         58.8'           4         242°37.2         27.2         27°56.0         9.4'         18°20.6         13.0'         58.7'           5         257°37.4         28.1         42°24.4         9.3'         18°33.5         12.8'         58.7'           6         272°37.6         S03°29.1         56°52.7         9.3'         N18°46.4         12.7'         58.6'           7         287°37.8         30.1         71°21.0         9.3'         18°59.1         12.6'         58.6'           8         302°38.0         31.0         85°49.2         9.2'         19°11.7         12.5'         58.6'           9         317°38.2         · · 32.0         100°17.5         9.2'         19°24.2         12.4'         58.5'           10         332°38.4         33.0         114°45.6         9.1'         19°36.5         12.2'         58.5'           11         347°38.6         34.0         129°13.8         9.1'         19°48.8         12.1'         58.5'           12         2°38.8         503°34.9         143°41.9         9.1'         N20°00.9         12.0'								
4         242°37.2         27.2         27°56.0         9.4'         18°20.6         13.0'         58.7'           5         257°37.4         28.1         42°24.4         9.3'         18°33.5         12.8'         58.7'           6         272°37.6         \$03°29.1         56°52.7         9.3'         N18°46.4         12.7'         58.6'           7         287°37.8         30.1         71°21.0         9.3'         18°59.1         12.6'         58.6'           8         302°38.0         31.0         85°49.2         9.2'         19°11.7         12.5'         58.6'           9         317°38.2         32.0         100°17.5         9.2'         19°24.2         12.4'         58.5'           10         332°38.4         33.0         114°45.6         9.1'         19°36.5         12.2'         58.5'           11         347°38.6         34.0         129°13.8         9.1'         19°48.8         12.1'         58.5'           12         2°38.8         \$03°34.9         143°41.9         9.1'         N20°00.9         12.0'         58.4'           13         17°39.0         35.9         158°09.9         9.0'         20°12.9         11.8'         58.4' <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
5         257° 37.4         28.1         42° 24.4         9.3'         18° 33.5         12.8'         58.7'           6         272° 37.6         \$03° 29.1         56° 52.7         9.3'         \$\text{N18}^\circ 46.4         12.7'         58.6'           7         287° 37.8         30.1         71° 21.0         9.3'         18° 59.1         12.6'         58.6'           8         302° 38.0         31.0         85° 49.2         9.2'         19° 11.7         12.6'         58.6'           9         317° 38.2         \display 32.0         100° 17.5         9.2'         19° 24.2         12.4'         58.5'           10         332° 38.4         33.0         114° 45.6         9.1'         19° 36.5         12.2'         58.5'           11         347° 38.6         34.0         129° 13.8         9.1'         19° 48.8         12.1'         58.5'           12         2° 38.8         \$03° 34.9         143° 41.9         9.1'         \$10° 40.8         12.1'         58.5'           13         17° 39.0         35.9         158° 09.9         9.0'         20° 12.9         11.8'         58.4'           14         32° 39.2         36.9         172° 37.9         9.0'         20°	1							
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
9         317°38.2         · · 32.0         100°17.5         9.2'         19°24.2         12.4'         58.5'           10         332°38.4         33.0         114°45.6         9.1'         19°36.5         12.2'         58.5'           11         347°38.6         34.0         129°13.8         9.1'         19°48.8         12.1'         58.5'           12         2°38.8         S03°34.9         143°41.9         9.1'         N20°00.9         12.0'         58.4'           13         17°39.0         35.9         158°09.9         9.0'         20°12.9         11.8'         58.4'           14         32°39.2         36.9         172°37.9         9.0'         20°21.9         11.8'         58.4'           15         47°39.4         · · 37.8         187°05.9         8.9'         20°36.4         11.6'         58.3'           16         62°39.6         38.8         201°33.8         8.9'         20°48.0         11.5'         58.3'           17         77°39.8         39.8         216°01.7         8.9'         20°59.5         11.3'         58.2'           18         92°40.0         503°40.7         230°29.6         8.8'         N21°10.8         11.2'	7	287°37.8	30.1	71°21.0	9.3'	18°59.1	12.6'	58.6'
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1							
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								
16         62°39.6         38.8         201°33.8         8.9'         20°48.0         11.5'         58.3'           17         77°39.8         39.8         216°01.7         8.9'         20°59.5         11.3'         58.2'           18         92°40.0         \$03°40.7         230°29.6         8.8'         N21°10.8         11.2'         58.2'           19         107°40.2         41.7         244°57.4         8.8'         21°22.0         11.1'         58.1'           20         122°40.4         42.7         259°25.2         8.7'         21°33.0         10.9'         58.1'           21         137°40.6         · 43.6         273°52.9         8.7'         21°44.0         10.8'         58.1'           22         152°40.8         44.6         288°20.6         8.7'         21°54.7         10.6'         58.0'           23         167°41.0         45.6         302°48.3         8.6'         22°05.4         10.5'         58.0'	14	32°39.2	36.9	172°37.9	9.0'	20°24.7	11.7'	58.3'
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								
18         92°40.0         \$03°40.7         230°29.6         8.8'         \$N21°10.8         \$11.2'         58.2'           19         107°40.2         41.7         244°57.4         8.8'         21°22.0         \$11.1'         58.1'           20         122°40.4         42.7         259°25.2         8.7'         21°33.0         10.9'         58.1'           21         137°40.6         · · 43.6         273°52.9         8.7'         21°44.0         10.8'         58.1'           22         152°40.8         44.6         288°20.6         8.7'         21°54.7         10.6'         58.0'           23         167°41.0         45.6         302°48.3         8.6'         22°05.4         10.5'         58.0'	1							
19     107°40.2     41.7     244°57.4     8.8'     21°22.0     11.1'     58.1'       20     122°40.4     42.7     259°25.2     8.7'     21°33.0     10.9'     58.1'       21     137°40.6     · · 43.6     273°52.9     8.7'     21°44.0     10.8'     58.1'       22     152°40.8     44.6     288°20.6     8.7'     21°54.7     10.6'     58.0'       23     167°41.0     45.6     302°48.3     8.6'     22°05.4     10.5'     58.0'								
20     122°40.4     42.7     259°25.2     8.7'     21°33.0     10.9'     58.1'       21     137°40.6     · · 43.6     273°52.9     8.7'     21°44.0     10.8'     58.1'       22     152°40.8     44.6     288°20.6     8.7'     21°54.7     10.6'     58.0'       23     167°41.0     45.6     302°48.3     8.6'     22°05.4     10.5'     58.0'								
21     137°40.6     · · 43.6     273°52.9     8.7'     21°44.0     10.8'     58.1'       22     152°40.8     44.6     288°20.6     8.7'     21°54.7     10.6'     58.0'       23     167°41.0     45.6     302°48.3     8.6'     22°05.4     10.5'     58.0'								
23 167°41.0 45.6 302°48.3 8.6' 22°05.4 10.5' 58.0'	21	137°40.6	• • 43.6	273°52.9	8.7'	21°44.0	10.8'	58.1'
	1							
$SD = 16.0^{\circ}$ $d = -1.0^{\circ}$ $SD = 16.1^{\circ}$	23			302~48.3			10.5	58.0'
		SD = 16.0'	d = -1.0'		<u> </u>	D = 16.1'		

1 -4	Twilight		C	C	Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.	
N 72°	03:47	05:10	06:17	17:20	18:27	19:48	
<b>N</b> 70°	04:00	05:13	06:14	17:23	18:24	19:36	
68°	04:10	05:16	06:12	17:26	18:21	19:27	
66°	04:18	05:19	06:10	17:28	18:19	19:19	
64°	04:24	05:20	06:08	17:30	18:17	19:13	
62°	04:30	05:22	06:06	17:32	18:16	19:08	
60°	04:34	05:23	06:05	17:34	18:15	19:03	
N 58°	04:38	05:24	06:03	17:35	18:14	19:00	
56°	04:42	05:25	06:02	17:36	18:13	18:56	
54°	04:45	05:26	06:01	17:37	18:12	18:53	
52°	04:47	05:27	06:00	17:38	18:12	18:51	
50°	04:50	05:27	05:59	17:39	18:11	18:49	
45°	04:54	05:28	05:58	17:41	18:10	18:44	
<b>N</b> 40°	04:57	05:29	05:56	17:43	18:10	18:41	
35°	05:00	05:29	05:54	17:45	18:10	18:39	
30°	05:02	05:29	05:53	17:46	18:10	18:37	
20°	05:03	05:29	05:51	17:48	18:10	18:36	
N 10°	05:03	05:28	05:49	17:51	18:12	18:36	
0°	05:02	05:26	05:46	17:53	18:14	18:38	
<b>S</b> 10°	04:59	05:23	05:44	17:55	18:16	18:41	
20°	04:54	05:20	05:42	17:58	18:20	18:46	
30°	04:47	05:15	05:39	18:01	18:25	18:53	
35°	04:42	05:12	05:37	18:03	18:28	18:58	
40°	04:36	05:08	05:35	18:05	18:32	19:04	
45°	04:28	05:03	05:33	18:08	18:37	19:12	
<b>S</b> 50°	04:19	04:57	05:30	18:11	18:43	19:22	
52°	04:14	04:55	05:29	18:12	18:46	19:27	
54°	04:08	04:51	05:27	18:14	18:49	19:33	
56°	04:02	04:48	05:25	18:15	18:53	19:39	
58°	03:55	04:44	05:24	18:17	18:57	19:46	
<b>S</b> 60°	03:47	04:39	05:22	18:19	19:02	19:54	

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	Age
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
30	09:46	09:56	11:50	00:22	12:47	15(99%)
01	10:06	10:16	11:50	01:13	13:38	16(96%)
02	10:26	10:35	11:49	02:04	14:31	17(91%)