EXCERPTS FROM

THE NAUTICAL ALMANAC

A2 ALTITUDE CORRECTION TABLES 10°-90°—SUN, STARS, PLANETS

SUN

OCT.—MAR. App. Alt.	Lower Limb	Upper Limb	APR.—SEPT. App. Alt.	Lower Limb	Upper Limb
° ′	′	′	° ′	′	′
9 34	+10·8	−21·5	9 39	+10·6	−21·2
9 45	+10·9	−21·4	9 51	+10·7	−21·1
9 56	+11·0	−21·3	10 03	+10·8	−21·0
10 08	+11·1	−21·2	10 15	+10·9	−20·9
10 21	+11·2	−21·1	10 27	+11·0	−20·8
10 34	+11·3	−21·0	10 40	+11·1	−20·7
10 47	+11·4	−20·9	10 54	+11·2	−20·6
11 01	+11·5	−20·8	11 08	+11·3	−20·5
11 15	+11·6	−20·7	11 23	+11·4	−20·4
11 30	+11·7	−20·6	11 38	+11·5	−20·3
11 46	+11·8	−20·5	11 54	+11·6	−20·2
12 02	+11·9	−20·4	12 10	+11·7	−20·1
12 19	+12·0	−20·3	12 28	+11·8	−20·0
12 37	+12·1	−20·2	12 46	+11·9	−19·9
12 55	+12·2	−20·1	13 05	+12·0	−19·8
13 14	+12·3	−20·0	13 24	+12·1	−19·7
13 35	+12·4	−19·9	13 45	+12·2	−19·6
13 56	+12·5	−19·8	14 07	+12·3	−19·5
14 18	+12·6	−19·7	14 30	+12·4	−19·4
14 42	+12·7	−19·6	14 54	+12·5	−19·3
15 06	+12·8	−19·5	15 19	+12·6	−19·2
15 32	+12·9	−19·4	15 46	+12·7	−19·1
15 59	+13·0	−19·3	16 14	+12·8	−19·0
16 28	+13·1	−19·2	16 44	+12·9	−18·9
16 59	+13·2	−19·1	17 15	+13·0	−18·8
17 32	+13·3	−19·0	17 48	+13·1	−18·7
18 06	+13·4	−18·9	18 24	+13·2	−18·6
18 42	+13·5	−18·8	19 01	+13·3	−18·5
19 21	+13·6	−18·7	19 42	+13·4	−18·4
20 03	+13·7	−18·6	20 25	+13·5	−18·3
20 48	+13·8	−18·5	21 11	+13·6	−18·2
21 35	+13·9	−18·4	22 00	+13·7	−18·1
22 26	+14·0	−18·3	22 54	+13·8	−18·0
23 22	+14·1	−18·2	23 51	+13·9	−17·9
24 21	+14·2	−18·1	24 53	+14·0	−17·8
25 26	+14·3	−18·0	26 00	+14·1	−17·7
26 36	+14·4	−17·9	27 13	+14·2	−17·6
27 52	+14·5	−17·8	28 33	+14·3	−17·5
29 15	+14·6	−17·7	30 00	+14·4	−17·4
30 46	+14·7	−17·6	31 35	+14·5	−17·3
32 26	+14·8	−17·5	33 20	+14·6	−17·2
34 17	+14·9	−17·4	35 17	+14·7	−17·1
36 20	+15·0	−17·3	37 26	+14·8	−17·0
38 36	+15·1	−17·2	39 50	+14·9	−16·9
41 08	+15·2	−17·1	42 31	+15·0	−16·8
43 59	+15·3	−17·0	45 31	+15·1	−16·7
47 10	+15·4	−16·9	48 55	+15·2	−16·6
50 46	+15·5	−16·8	52 44	+15·3	−16·5
54 49	+15·6	−16·7	57 02	+15·4	−16·4
59 23	+15·7	−16·6	61 51	+15·5	−16·3
64 30	+15·8	−16·5	67 17	+15·6	−16·2
70 12	+15·9	−16·4	73 16	+15·7	−16·1
76 26	+16·0	−16·3	79 43	+15·8	−16·0
83 05	+16·1	−16·2	86 32	+15·9	−15·9
90 00			90 00		

STARS AND PLANETS

App Alt.	Corrⁿ
° ′	′
9 56	−5·3
10 08	−5·2
10 20	−5·1
10 33	−5·0
10 46	−4·9
11 00	−4·8
11 14	−4·7
11 29	−4·6
11 45	−4·5
12 01	−4·4
12 18	−4·3
12 35	−4·2
12 54	−4·1
13 13	−4·0
13 33	−3·9
13 54	−3·8
14 16	−3·7
14 40	−3·6
15 04	−3·5
15 30	−3·4
15 57	−3·3
16 26	−3·2
16 56	−3·1
17 28	−3·0
18 02	−2·9
18 38	−2·8
19 17	−2·7
19 58	−2·6
20 42	−2·5
21 28	−2·4
22 19	−2·3
23 13	−2·2
24 11	−2·1
25 14	−2·0
26 22	−1·9
27 36	−1·8
28 56	−1·7
30 24	−1·6
32 00	−1·5
33 45	−1·4
35 40	−1·3
37 48	−1·2
40 08	−1·1
42 44	−1·0
45 36	−0·9
48 47	−0·8
52 18	−0·7
56 11	−0·6
60 28	−0·5
65 08	−0·4
70 11	−0·3
75 34	−0·2
81 13	−0·1
87 03	0·0
90 00	

App. Alt.	Additional Corrⁿ
	2003
	VENUS
	Jan. 1–Feb. 20
°	′
0	+0·2
41	+0·1
76	
	Feb. 21–Dec. 31
°	′
0	
60	+0·1
	MARS
	Jan. 1–May 2
	Dec. 17–Dec. 31
°	′
0	
60	+0·1
	May 3–June 26
	Oct. 26–Dec. 16
°	′
0	+0·2
41	+0·1
76	
	June 27–Aug. 1
	Sept. 23–Oct. 25
°	′
0	+0·3
34	+0·2
60	+0·1
80	
	Aug. 2–Sept. 22
°	′
0	+0·4
29	+0·3
51	+0·2
68	+0·1
83	

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye
m	′	ft.
2·4	−2·8	8·0
2·6	−2·9	8·6
2·8	−3·0	9·2
3·0	−3·1	9·8
3·2	−3·2	10·5
3·4	−3·3	11·2
3·6	−3·4	11·9
3·8	−3·5	12·6
4·0	−3·6	13·3
4·3	−3·7	14·1
4·5	−3·8	14·9
4·7	−3·9	15·7
5·0	−4·0	16·5
5·2	−4·1	17·4
5·5	−4·2	18·3
5·8	−4·3	19·1
6·1	−4·4	20·1
6·3	−4·5	21·0
6·6	−4·6	22·0
6·9	−4·7	22·9
7·2	−4·8	23·9
7·5	−4·9	24·9
7·9	−5·0	26·0
8·2	−5·1	27·1
8·5	−5·2	28·1
8·8	−5·3	29·2
9·2	−5·4	30·4
9·5	−5·5	31·5
9·9	−5·6	32·7
10·3	−5·7	33·9
10·6	−5·8	35·1
11·0	−5·9	36·3
11·4	−6·0	37·6
11·8	−6·1	38·9
12·2	−6·2	40·1
12·6	−6·3	41·5
13·0	−6·4	42·8
13·4	−6·5	44·2
13·8	−6·6	45·5
14·2	−6·7	46·9
14·7	−6·8	48·4
15·1	−6·9	49·8
15·5	−7·0	51·3
16·0	−7·1	52·8
16·5	−7·2	54·3
16·9	−7·3	55·8
17·4	−7·4	57·4
17·9	−7·5	58·9
18·4	−7·6	60·5
18·8	−7·7	62·1
19·3	−7·8	63·8
19·8	−7·9	65·4
20·4	−8·0	67·1
20·9	−8·1	68·8
21·4		70·5

Ht. of Eye	Corrⁿ
m	′
1·0	− 1·8
1·5	− 2·2
2·0	− 2·5
2·5	− 2·8
3·0	− 3·0
See table ←	
m	′
20	− 7·9
22	− 8·3
24	− 8·6
26	− 9·0
28	− 9·3
30	− 9·6
32	−10·0
34	−10·3
36	−10·6
38	−10·8
40	−11·1
42	−11·4
44	−11·7
46	−11·9
48	−12·2
ft.	′
2	− 1·4
4	− 1·9
6	− 2·4
8	− 2·7
10	− 3·1
See table ←	
ft.	′
70	− 8·1
75	− 8·4
80	− 8·7
85	− 8·9
90	− 9·2
95	− 9·5
100	− 9·7
105	− 9·9
110	−10·2
115	−10·4
120	−10·6
125	−10·8
130	−11·1
135	−11·3
140	−11·5
145	−11·7
150	−11·9
155	−12·1

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

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App. Alt.	OCT.—MAR. SUN Lower Limb	OCT.—MAR. SUN Upper Limb	APR.—SEPT. SUN Lower Limb	APR.—SEPT. SUN Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
0 00	−18·2	−50·5	−18·4	−50·2	−34·5
03	17·5	49·8	17·8	49·6	33·8
06	16·9	49·2	17·1	48·9	33·2
09	16·3	48·6	16·5	48·3	32·6
12	15·7	48·0	15·9	47·7	32·0
15	15·1	47·4	15·3	47·1	31·4
0 18	−14·5	−46·8	−14·8	−46·6	−30·8
21	14·0	46·3	14·2	46·0	30·3
24	13·5	45·8	13·7	45·5	29·8
27	12·9	45·2	13·2	45·0	29·2
30	12·4	44·7	12·7	44·5	28·7
33	11·9	44·2	12·2	44·0	28·2
0 36	−11·5	−43·8	−11·7	−43·5	−27·8
39	11·0	43·3	11·2	43·0	27·3
42	10·5	42·8	10·8	42·6	26·8
45	10·1	42·4	10·3	42·1	26·4
48	9·6	41·9	9·9	41·7	25·9
51	9·2	41·5	9·5	41·3	25·5
0 54	− 8·8	−41·1	− 9·1	−40·9	−25·1
0 57	8·4	40·7	8·7	40·5	24·7
1 00	8·0	40·3	8·3	40·1	24·3
03	7·7	40·0	7·9	39·7	24·0
06	7·3	39·6	7·5	39·3	23·6
09	6·9	39·2	7·2	39·0	23·2
1 12	− 6·6	−38·9	− 6·8	−38·6	−22·9
15	6·2	38·5	6·5	38·3	22·5
18	5·9	38·2	6·2	38·0	22·2
21	5·6	37·9	5·8	37·6	21·9
24	5·3	37·6	5·5	37·3	21·6
27	4·9	37·2	5·2	37·0	21·2
1 30	− 4·6	−36·9	− 4·9	−36·7	−20·9
35	4·2	36·5	4·4	36·2	20·5
40	3·7	36·0	4·0	35·8	20·0
45	3·2	35·5	3·5	35·3	19·5
50	2·8	35·1	3·1	34·9	19·1
1 55	2·4	34·7	2·6	34·4	18·7
2 00	− 2·0	−34·3	− 2·2	−34·0	−18·3
05	1·6	33·9	1·8	33·6	17·9
10	1·2	33·5	1·5	33·3	17·5
15	0·9	33·2	1·1	32·9	17·2
20	0·5	32·8	0·8	32·6	16·8
25	− 0·2	32·5	0·4	32·2	16·5
2 30	+ 0·2	−32·1	− 0·1	−31·9	−16·1
35	0·5	31·8	+ 0·2	31·6	15·8
40	0·8	31·5	0·5	31·3	15·5
45	1·1	31·2	0·8	31·0	15·2
50	1·4	30·9	1·1	30·7	14·9
2 55	1·6	30·7	1·4	30·4	14·7
3 00	+ 1·9	−30·4	+ 1·7	−30·1	−14·4
05	2·2	30·1	1·9	29·9	14·1
10	2·4	29·9	2·1	29·7	13·9
15	2·6	29·7	2·4	29·4	13·7
20	2·9	29·4	2·6	29·2	13·4
25	3·1	29·2	2·9	28·9	13·2
3 30	+ 3·3	−29·0	+ 3·1	−28·7	−13·0

App. Alt.	OCT.—MAR. SUN Lower Limb	OCT.—MAR. SUN Upper Limb	APR.—SEPT. SUN Lower Limb	APR.—SEPT. SUN Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
3 30	+ 3·3	−29·0	+ 3·1	−28·7	−13·0
35	3·6	28·7	3·3	28·5	12·7
40	3·8	28·5	3·5	28·3	12·5
45	4·0	28·3	3·7	28·1	12·3
50	4·2	28·1	3·9	27·9	12·1
3 55	4·4	27·9	4·1	27·7	11·9
4 00	+ 4·5	−27·8	+ 4·3	−27·5	−11·8
05	4·7	27·6	4·5	27·3	11·6
10	4·9	27·4	4·6	27·2	11·4
15	5·1	27·2	4·8	27·0	11·2
20	5·2	27·1	5·0	26·8	11·1
25	5·4	26·9	5·1	26·7	10·9
4 30	+ 5·6	−26·7	+ 5·3	−26·5	−10·7
35	5·7	26·6	5·5	26·3	10·6
40	5·9	26·4	5·6	26·2	10·4
45	6·0	26·3	5·8	26·0	10·3
50	6·2	26·1	5·9	25·9	10·1
4 55	6·3	26·0	6·0	25·8	10·0
5 00	+ 6·4	−25·9	+ 6·2	−25·6	− 9·9
05	6·6	25·7	6·3	25·5	9·7
10	6·7	25·6	6·4	25·4	9·6
15	6·8	25·5	6·6	25·2	9·5
20	6·9	25·4	6·7	25·1	9·4
25	7·1	25·2	6·8	25·0	9·2
5 30	+ 7·2	−25·1	+ 6·9	−24·9	− 9·1
35	7·3	25·0	7·0	24·8	9·0
40	7·4	24·9	7·2	24·6	8·9
45	7·5	24·8	7·3	24·5	8·8
50	7·6	24·7	7·4	24·4	8·7
5 55	7·7	24·6	7·5	24·3	8·6
6 00	+ 7·8	−24·5	+ 7·6	−24·2	− 8·5
10	8·0	24·3	7·8	24·0	8·3
20	8·2	24·1	8·0	23·8	8·1
30	8·4	23·9	8·1	23·7	7·9
40	8·6	23·7	8·3	23·5	7·7
50	8·7	23·6	8·5	23·3	7·6
7 00	+ 8·9	−23·4	+ 8·6	−23·2	− 7·4
10	9·1	23·2	8·8	23·0	7·2
20	9·2	23·1	9·0	22·8	7·1
30	9·3	23·0	9·1	22·7	7·0
40	9·5	22·8	9·2	22·6	6·8
7 50	9·6	22·7	9·4	22·4	6·7
8 00	+ 9·7	−22·6	+ 9·5	−22·3	− 6·6
10	9·9	22·4	9·6	22·2	6·4
20	10·0	22·3	9·7	22·1	6·3
30	10·1	22·2	9·8	22·0	6·2
40	10·2	22·1	10·0	21·8	6·1
8 50	10·3	22·0	10·1	21·7	6·0
9 00	+10·4	−21·9	+10·2	−21·6	− 5·9
10	10·5	21·8	10·3	21·5	5·8
20	10·6	21·7	10·4	21·4	5·7
30	10·7	21·6	10·5	21·3	5·6
40	10·8	21·5	10·6	21·2	5·5
9 50	10·9	21·4	10·6	21·2	5·4
10 00	+11·0	−21·3	+10·7	−21·1	− 5·3

Additional corrections for temperature and pressure are given on the following page.

For bubble sextant observations ignore dip and use the star corrections for Sun, planets and stars.

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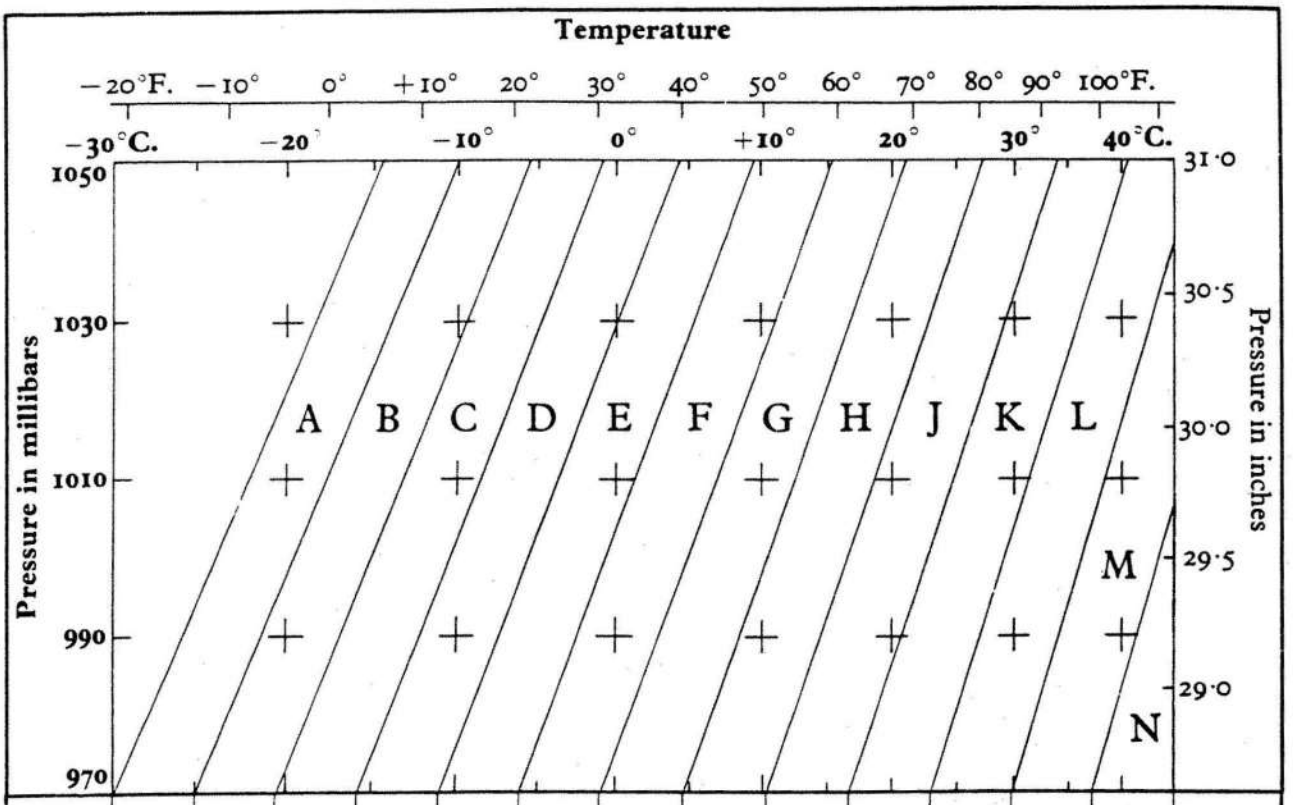
ALTITUDE CORRECTION TABLES—ADDITIONAL CORRECTIONS

ADDITIONAL REFRACTION CORRECTIONS FOR NON-STANDARD CONDITIONS



App. Alt.	A	B	C	D	E	F	G	H	J	K	L	M	N	App. Alt.
° ′	′	′	′	′	′	′	′	′	′	′	′	′	′	° ′
0 00	−6·9	−5·7	−4·6	−3·4	−2·3	−1·1	0·0	+1·1	+2·3	+3·4	+4·6	+5·7	+6·9	0 00
0 30	5·2	4·4	3·5	2·6	1·7	0·9	0·0	0·9	1·7	2·6	3·5	4·4	5·2	0 30
1 00	4·3	3·5	2·8	2·1	1·4	0·7	0·0	0·7	1·4	2·1	2·8	3·5	4·3	1 00
1 30	3·5	2·9	2·4	1·8	1·2	0·6	0·0	0·6	1·2	1·8	2·4	2·9	3·5	1 30
2 00	3·0	2·5	2·0	1·5	1·0	0·5	0·0	0·5	1·0	1·5	2·0	2·5	3·0	2 00
2 30	−2·5	−2·1	−1·6	−1·2	−0·8	−0·4	0·0	+0·4	+0·8	+1·2	+1·6	+2·1	−2·5	2 30
3 00	2·2	1·8	1·5	1·1	0·7	0·4	0·0	0·4	0·7	1·1	1·5	1·8	2·2	3 00
3 30	2·0	1·6	1·3	1·0	0·7	0·3	0·0	0·3	0·7	1·0	1·3	1·6	2·0	3 30
4 00	1·8	1·5	1·2	0·9	0·6	0·3	0·0	0·3	0·6	0·9	1·2	1·5	1·8	4 00
4 30	1·6	1·4	1·1	0·8	0·5	0·3	0·0	0·3	0·5	0·8	1·1	1·4	1·6	4 30
5 00	−1·5	−1·3	−1·0	−0·8	−0·5	−0·2	0·0	+0·2	+0·5	+0·8	+1·0	+1·3	+1·5	5 00
6	1·3	1·1	0·9	0·6	0·4	0·2	0·0	0·2	0·4	0·6	0·9	1·1	1·3	6
7	1·1	0·9	0·7	0·6	0·4	0·2	0·0	0·2	0·4	0·6	0·7	0·9	1·1	7
8	1·0	0·8	0·7	0·5	0·3	0·2	0·0	0·2	0·3	0·5	0·7	0·8	1·0	8
9	0·9	0·7	0·6	0·4	0·3	0·1	0·0	0·1	0·3	0·4	0·6	0·7	0·9	9
10 00	−0·8	−0·7	−0·5	−0·4	−0·3	−0·1	0·0	+0·1	+0·3	+0·4	−0·5	+0·7	+0·8	10 00
12	0·7	0·6	0·5	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·5	0·6	0·7	12
14	0·6	0·5	0·4	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·4	0·5	0·6	14
16	0·5	0·4	0·3	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·3	0·4	0·5	16
18	0·4	0·4	0·3	0·2	0·2	0·1	0·0	0·1	0·2	0·2	0·3	0·4	0·4	18
20 00	−0·4	−0·3	−0·3	−0·2	−0·1	−0·1	0·0	+0·1	+0·1	+0·2	−0·3	+0·3	+0·4	20 00
25	0·3	0·3	0·2	0·2	0·1	−0·1	0·0	+0·1	0·1	0·2	0·2	0·3	0·3	25
30	0·3	0·2	0·2	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·2	0·2	0·3	30
35	0·2	0·2	0·1	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·1	0·2	0·2	35
40	0·2	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	+0·1	0·1	0·1	0·1	0·2	40
50 00	−0·1	−0·1	−0·1	−0·1	0·0	0·0	0·0	0·0	0·0	+0·1	−0·1	+0·1	+0·1	50 00

The graph is entered with arguments temperature and pressure to find a zone letter; using as arguments this zone letter and apparent altitude (sextant altitude corrected for dip), a correction is taken from the table. This correction is to be applied to the sextant altitude in addition to the corrections for standard conditions (for the Sun, stars and planets from page A2 and for the Moon from pages xxxiv and xxxv).

RELIGIOUS CALENDARS

Epiphany	Jan. 6	Low Sunday	Apr. 27
Septuagesima Sunday	Feb. 16	Rogation Sunday	May 25
Quinquagesima Sunday	Mar. 2	Ascension Day—Holy Thursday	May 29
Ash Wednesday	Mar. 5	Whit Sunday—Pentecost	June 8
Quadragesima Sunday	Mar. 9	Trinity Sunday	June 15
Palm Sunday	Apr. 13	Corpus Christi	June 19
Good Friday	Apr. 18	First Sunday in Advent	Nov. 30
Easter Day	Apr. 20	Christmas Day (Thursday)	Dec. 25
First Day of Passover (Pesach)	Apr. 17	Day of Atonement (Yom Kippur)	Oct. 6
Feast of Weeks (Shavuot)	June 6	First day of Tabernacles (Succoth)	Oct. 11
Jewish New Year 5764 (Rosh Hashanah)	Sept. 27		
Islamic New Year (1424)	Mar. 5	Ramadân, First day of (tabular)	Oct. 27

The Jewish and Islamic dates above are tabular dates, which begin at sunset on the previous evening and end at sunset on the date tabulated. In practice, the dates of Islamic fasts and festivals are determined by an actual sighting of the appropriate new moon.

CIVIL CALENDAR—UNITED KINGDOM

Accession of Queen Elizabeth II	Feb. 6	Birthday of Prince Philip, Duke of Edinburgh	June 10
St David (Wales)	Mar. 1	The Queen's Official Birthday†	June 14
Commonwealth Day	Mar. 10	Remembrance Sunday	Nov. 9
St Patrick (Ireland)	Mar. 17	Birthday of the Prince of Wales	Nov. 14
Birthday of Queen Elizabeth II	Apr. 21	St Andrew (Scotland)	Nov. 30
St George (England)	Apr. 23		
Coronation Day	June 2		

PUBLIC HOLIDAYS

England and Wales—Jan. 1†, Apr. 18, Apr. 21, May 5†, May 26, Aug. 25, Dec. 25, Dec. 26
Northern Ireland—Jan. 1†, Mar. 17, Apr. 18, Apr. 21, May 5†, May 26, July 14†, Aug. 25, Dec. 25, Dec. 26
Scotland—Jan. 1, Jan. 2, Apr. 18, May 5, May 26†, Aug. 4, Dec. 25, Dec. 26†

CIVIL CALENDAR—UNITED STATES OF AMERICA

New Year's Day	Jan. 1	Labor Day	Sept. 1
Martin Luther King's Birthday	Jan. 20	Columbus Day	Oct. 13
Washington's Birthday	Feb. 17	Election Day (in certain States)	Nov. 4
Memorial Day	May 26	Veterans Day	Nov. 11
Independence Day	July 4	Thanksgiving Day	Nov. 27

†Dates subject to confirmation

PHASES OF THE MOON

New Moon				First Quarter				Full Moon				Last Quarter			
	d	h	m		d	h	m		d	h	m		d	h	m
Jan.	2	20	23	Jan.	10	13	15	Jan.	18	10	48	Jan.	25	08	33
Feb.	1	10	48	Feb.	9	11	11	Feb.	16	23	51	Feb.	23	16	46
Mar.	3	02	35	Mar.	11	07	15	Mar.	18	10	35	Mar.	25	01	51
Apr.	1	19	19	Apr.	9	23	40	Apr.	16	19	36	Apr.	23	12	18
May	1	12	15	May	9	11	53	May	16	03	36	May	23	00	31
May	31	04	20	June	7	20	28	June	14	11	16	June	21	14	45
June	29	18	39	July	7	02	32	July	13	19	21	July	21	07	01
July	29	06	53	Aug.	5	07	28	Aug.	12	04	48	Aug.	20	00	48
Aug.	27	17	26	Sept.	3	12	34	Sept.	10	16	36	Sept.	18	19	03
Sept.	26	03	09	Oct.	2	19	09	Oct.	10	07	27	Oct.	18	12	31
Oct.	25	12	50	Nov.	1	04	25	Nov.	9	01	13	Nov.	17	04	15
Nov.	23	22	59	Nov.	30	17	16	Dec.	8	20	37	Dec.	16	17	42
Dec.	23	09	43	Dec.	30	10	03								

DAYS OF THE WEEK AND DAYS OF THE YEAR

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Day	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr	Wk Yr
1	W. 1	Sa. 32	Sa. 60	Tu. 91	Th. 121	Su. 152	Tu. 182	F. 213	M. 244	W. 274	Sa. 305	M. 335
2	Th. 2	Su. 33	Su. 61	W. 92	F. 122	M. 153	W. 183	Sa. 214	Tu. 245	Th. 275	Su. 306	Tu. 336
3	F. 3	M. 34	M. 62	Th. 93	Sa. 123	Tu. 154	Th. 184	Su. 215	W. 246	F. 276	M. 307	W. 337
4	Sa. 4	Tu. 35	Tu. 63	F. 94	Su. 124	W. 155	F. 185	M. 216	Th. 247	Sa. 277	Tu. 308	Th. 338
5	Su. 5	W. 36	W. 64	Sa. 95	M. 125	Th. 156	Sa. 186	Tu. 217	F. 248	Su. 278	W. 309	F. 339
6	M. 6	Th. 37	Th. 65	Su. 96	Tu. 126	F. 157	Su. 187	W. 218	Sa. 249	M. 279	Th. 310	Sa. 340
7	Tu. 7	F. 38	F. 66	M. 97	W. 127	Sa. 158	M. 188	Th. 219	Su. 250	Tu. 280	F. 311	Su. 341
8	W. 8	Sa. 39	Sa. 67	Tu. 98	Th. 128	Su. 159	Tu. 189	F. 220	M. 251	W. 281	Sa. 312	M. 342
9	Th. 9	Su. 40	Su. 68	W. 99	F. 129	M. 160	W. 190	Sa. 221	Tu. 252	Th. 282	Su. 313	Tu. 343
10	F. 10	M. 41	M. 69	Th. 100	Sa. 130	Tu. 161	Th. 191	Su. 222	W. 253	F. 283	M. 314	W. 344
11	Sa. 11	Tu. 42	Tu. 70	F. 101	Su. 131	W. 162	F. 192	M. 223	Th. 254	Sa. 284	Tu. 315	Th. 345
12	Su. 12	W. 43	W. 71	Sa. 102	M. 132	Th. 163	Sa. 193	Tu. 224	F. 255	Su. 285	W. 316	F. 346
13	M. 13	Th. 44	Th. 72	Su. 103	Tu. 133	F. 164	Su. 194	W. 225	Sa. 256	M. 286	Th. 317	Sa. 347
14	Tu. 14	F. 45	F. 73	M. 104	W. 134	Sa. 165	M. 195	Th. 226	Su. 257	Tu. 287	F. 318	Su. 348
15	W. 15	Sa. 46	Sa. 74	Tu. 105	Th. 135	Su. 166	Tu. 196	F. 227	M. 258	W. 288	Sa. 319	M. 349
16	Th. 16	Su. 47	Su. 75	W. 106	F. 136	M. 167	W. 197	Sa. 228	Tu. 259	Th. 289	Su. 320	Tu. 350
17	F. 17	M. 48	M. 76	Th. 107	Sa. 137	Tu. 168	Th. 198	Su. 229	W. 260	F. 290	M. 321	W. 351
18	Sa. 18	Tu. 49	Tu. 77	F. 108	Su. 138	W. 169	F. 199	M. 230	Th. 261	Sa. 291	Tu. 322	Th. 352
19	Su. 19	W. 50	W. 78	Sa. 109	M. 139	Th. 170	Sa. 200	Tu. 231	F. 262	Su. 292	W. 323	F. 353
20	M. 20	Th. 51	Th. 79	Su. 110	Tu. 140	F. 171	Su. 201	W. 232	Sa. 263	M. 293	Th. 324	Sa. 354
21	Tu. 21	F. 52	F. 80	M. 111	W. 141	Sa. 172	M. 202	Th. 233	Su. 264	Tu. 294	F. 325	Su. 355
22	W. 22	Sa. 53	Sa. 81	Tu. 112	Th. 142	Su. 173	Tu. 203	F. 234	M. 265	W. 295	Sa. 326	M. 356
23	Th. 23	Su. 54	Su. 82	W. 113	F. 143	M. 174	W. 204	Sa. 235	Tu. 266	Th. 296	Su. 327	Tu. 357
24	F. 24	M. 55	M. 83	Th. 114	Sa. 144	Tu. 175	Th. 205	Su. 236	W. 267	F. 297	M. 328	W. 358
25	Sa. 25	Tu. 56	Tu. 84	F. 115	Su. 145	W. 176	F. 206	M. 237	Th. 268	Sa. 298	Tu. 329	Th. 359
26	Su. 26	W. 57	W. 85	Sa. 116	M. 146	Th. 177	Sa. 207	Tu. 238	F. 269	Su. 299	W. 330	F. 360
27	M. 27	Th. 58	Th. 86	Su. 117	Tu. 147	F. 178	Su. 208	W. 239	Sa. 270	M. 300	Th. 331	Sa. 361
28	Tu. 28	F. 59	F. 87	M. 118	W. 148	Sa. 179	M. 209	Th. 240	Su. 271	Tu. 301	F. 332	Su. 362
29	W. 29		Sa. 88	Tu. 119	Th. 149	Su. 180	Tu. 210	F. 241	M. 272	W. 302	Sa. 333	M. 363
30	Th. 30		Su. 89	W. 120	F. 150	M. 181	W. 211	Sa. 242	Tu. 273	Th. 303	Su. 334	Tu. 364
31	F. 31		M. 90		Sa. 151		Th. 212	Su. 243		F. 304		W. 365

ECLIPSES

There are two eclipses of the Sun and two of the Moon.

1. *A total eclipse of the Moon*, May 16. The eclipse begins at $02^h\ 03^m$ and ends at $05^h\ 17^m$; the total phase begins at $03^h\ 14^m$and ends at $04^h\ 06^m$. It is visible from part of Antarctica, Africa except the north-east and northern Madagascar, western Europe but excluding Scandinavia, southern Greenland, Atlantic Ocean, The Americas except north-west Canada and Alaska, and east Pacific Ocean.

2. *An annular eclipse of the Sun*, May 31. See map on page 6. The eclipse begins at $01^h\ 46^m$ and ends at $06^h\ 30^m$; the annular phase begins at $03^h\ 45^m$ and ends at $04^h\ 31^m$. The maximum duration of the annular phase is $3^m\ 37^s$.

3. *A total eclipse of the Moon*, November 8-9. The eclipse begins on November 8 at $23^h\ 32^m$ and ends on November 9 at $03^h\ 05^m$; the total phase on November 9 begins at $01^h\ 06^m$ and ends at $01^h\ 31^m$. It is visible from western and central parts of Asia, west Indian Ocean, Africa, Europe, Atlantic Ocean, part of Antarctica, Greenland, The Americas except western Alaska, and east Pacific Ocean.

4. *A total eclipse of the Sun*, November 23-24. See map on page 7. The eclipse begins on November 23 at $20^h\ 46^m$ and ends on November 24 at $00^h\ 52^m$; the total phase on November 23 begins at $22^h\ 19^m$ and ends at $23^h\ 19^m$. The maximum duration of totality is $1^m\ 57^s$.

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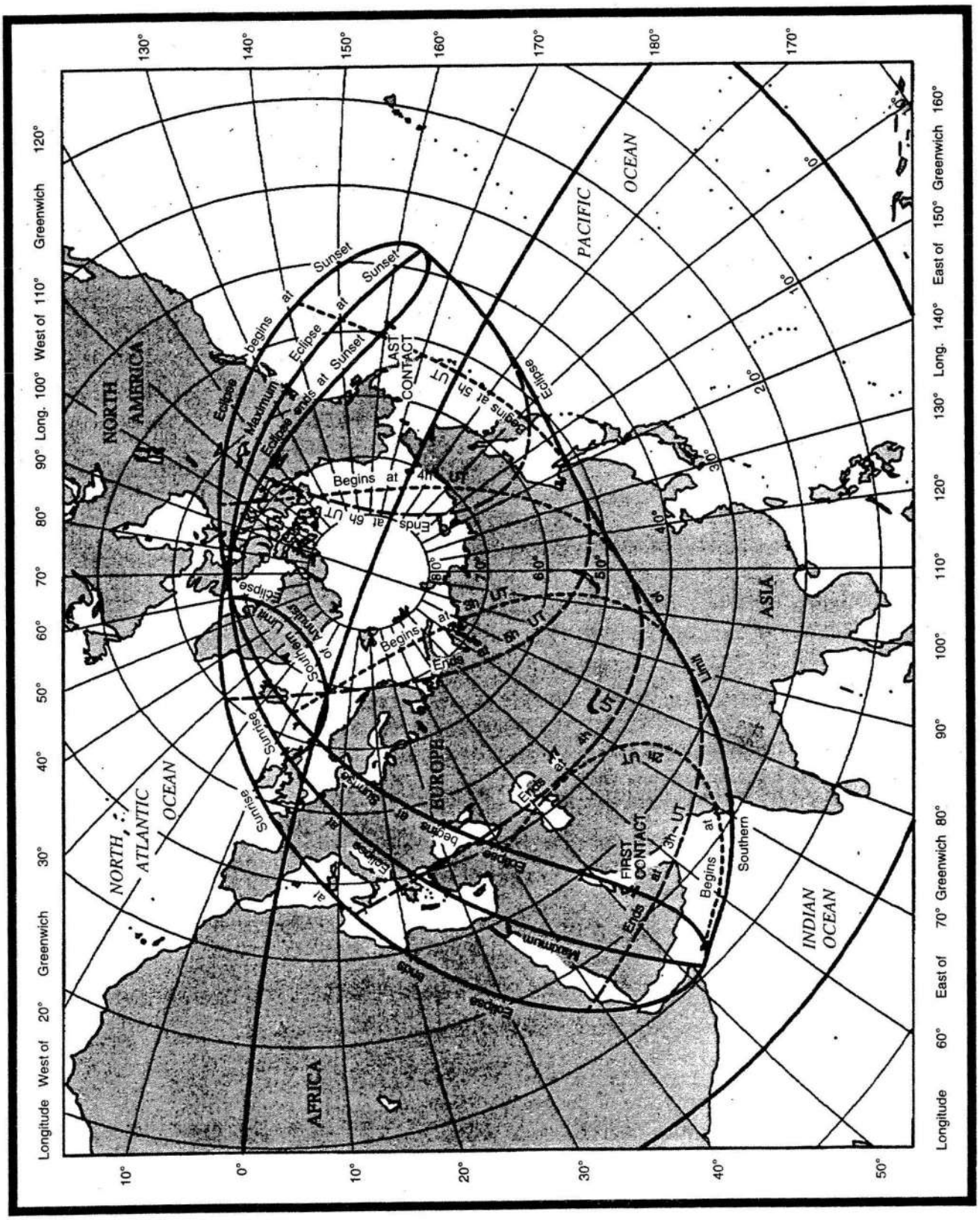
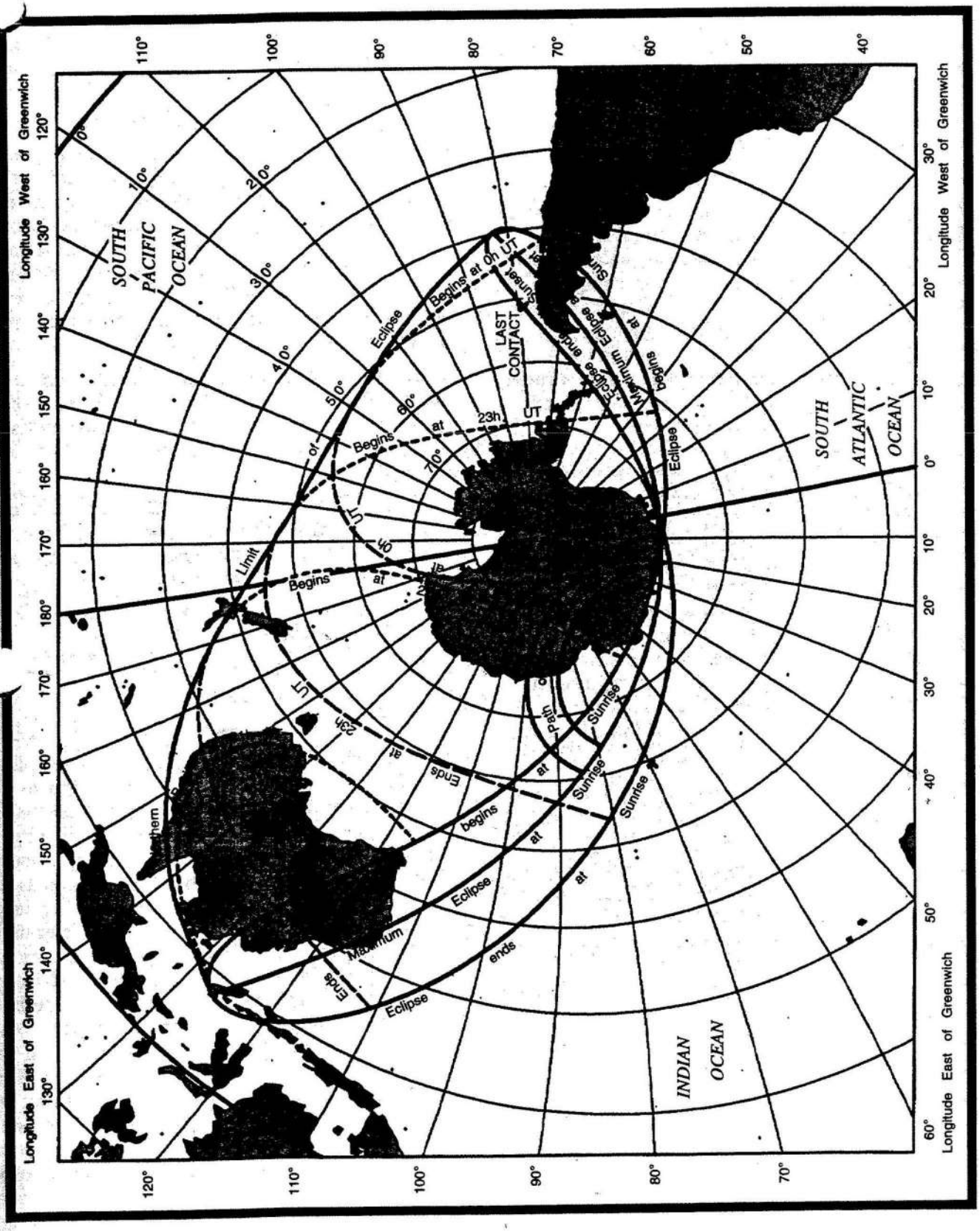

NORTH AMERICA
PACIFIC OCEAN
NORTH ATLANTIC OCEAN
EUROPE
ASIA
AFRICA
INDIAN OCEAN
LAST CONTACT
FIRST CONTACT
Southern Limit of Annular Eclipse
Maximum Eclipse
Eclipse begins at Sunset
Eclipse ends at Sunset
Begins at 4h UT
Ends at 6h UT
Begins at 5h UT
Begins at 3h UT
Ends at 5h UT
Ends at 4h UT
Begins at 3h UT
Ends at 2h UT
Sunrise
Eclipse begins at Sunrise
Eclipse ends at Sunrise
Maximum Eclipse
Longitude West of 20° Greenwich 30° 40° 50° 60° 70° 80° 90° Long. 100° West of 110° Greenwich 120°
Longitude 60° East of 70° Greenwich 80° 90° 100° 110° 120° 130° Long. 140° East of 150° Greenwich 160°
10° 0° 10° 20° 30° 40° 50°
130° 140° 150° 160° 170° 180° 170°



SOLAR ECLIPSE DIAGRAMS

Further details of the paths and times of central eclipse are given in *The Astronomical Almanac*.

VISIBILITY OF PLANETS

VENUS is a brilliant object in the morning sky from the beginning of the year until near the end of the second week of July when it becomes too close to the Sun for observation. During late September it reappears in the evening sky where it stays until the end of the year. Venus is in conjunction with Mercury on May 28 and June 21 and with Saturn on July 8.

MARS rises well after midnight in Libra at the beginning of the year, when it can only be seen in the morning sky. Its westward elongation gradually increases as it moves through Scorpius, Ophiuchus (passing 5° N of *Antares* on January 31), Sagittarius, Capricornus and into Aquarius in early June, when it can be seen for more than half the night. It is at opposition on August 28 when it can be seen throughout the night. It moves into Pisces in early December in which constellation it remains for the rest of the year.

JUPITER can be seen for most of the night in Cancer, its westward elongation gradually increases until it is at opposition on February 2 when it can be seen throughout the night. Its eastward elongation then gradually decreases as it passes into Leo at the very end of June where it can be seen only in the evening sky. In the second week of August it becomes too close to the Sun for observation until early September when it reappears in the morning sky in Leo in which constellation it remains for the rest of the year. Its westward elongation gradually increases and by mid-December it can be seen for more than half the night. Jupiter is in conjunction with Mercury on July 26.

SATURN is in Taurus at the beginning of the year. It can be seen for more than half the night until mid-March after which it can be seen only in the evening sky. Its eastward elongation gradually decreases and from mid-May passes into Orion. In early June it becomes too close to the Sun for observation, reappearing in the morning sky in mid-July in Gemini in which constellation it remains for the rest of the year. Its westward elongation gradually increases and from early October it can be seen for more than half the night. It is at opposition on December 31. Saturn is in conjunction with Venus on July 8.

MERCURY can only be seen low in the east before sunrise, or low in the west after sunset (about the time of beginning or end of civil twilight). It is visible in the mornings between the following approximate dates: January 18 (+1·8) to March 12 (−0·9), May 16 (+3·1) to June 28 (−1·5), and September 18 (+2·0) to October 13 (−1·2); the planet is brighter at the end of each period. It is visible in the evenings between the following approximate dates: January 1 (+0·1) to January 6 (+1·6), March 31 (−1·5) to April 28 (+2·6), July 13 (−1·3) to September 4 (+2·5) and November 10 (−0·6) to December 21 (+1·5); the planet is brighter at the beginning of each period. The figures in parentheses are the magnitudes.

Mercury transits the Sun's disk on May 7 from $05^h 13^m$ to $10^h 32^m$; the event is visible from Alaska, Melanesia Australia, Asia, Arctic regions, Africa, Europe, Green land, eastern Canada and north eastern S. America.

PLANET DIAGRAM

General Description. The diagram on the opposite pag shows, in graphical form for any date during the yea the local mean time of meridian passage of the Sun of the five planets Mercury, Venus, Mars, Jupiter, an Saturn, and of each 30° of SHA; intermediate line corresponding to particular stars, may be drawn i by the user if desired. It is intended to provide general picture of the availability of planets and star for observation.

On each side of the line marking the time of merid ian passage of the Sun a band, 45^m wide, is shaded t indicate that planets and most stars crossing the merid ian within 45^m of the Sun are too close to the Sun fo observation.

Method of use and interpretation. For any date th diagram provides immediately the local mean times o meridian passage of the Sun, planets and stars, an thus the following information:

(a) whether a planet or star is too close to the Su for observation;

(b) some indication of its position in the sky, espe cially during twilight;

(c) the proximity of other planets.

When the meridian passage of an outer planet oc curs at midnight the body is in opposition to the Su and is visible all night; a planet may then be observ able during both morning and evening twilights. As th time of meridian passage decreases, the body eventuall ceases to be observable in the morning, but its altitud above the eastern horizon at sunset gradually increases this continues until the body is on the meridian dur ing evening twilight. From then onwards the body i observable above the western horizon and its altitud at sunset gradually decreases; eventually the body be comes too close to the Sun for observation. When th body again becomes visible it is seen low in the eas during morning twilight; its altitude at sunrise increase until meridian passage occurs during morning twilight Then, as the time of meridian passage decreases to 0^h the body is observable in the west during morning twi light with a gradually decreasing altitude, until it onc again reaches opposition.

DO NOT CONFUSE

Mercury with Venus from the end of the third weel of May to late June when Venus is the brighter object and with Jupiter in the second half of July when Jupite is the brighter object.

LOCAL MEAN TIME OF MERIDIAN PASSAGE
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
SUN
MERCURY
VENUS
MARS
JUPITER
SATURN
LOCAL MEAN TIME OF MERIDIAN PASSAGE

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
24 00	176 40.0	S 9 41.7	266 24.7	7.1	S22 11.2	8.3	58.7
01	191 40.1	40.8	280 50.8	7.0	22 19.5	8.2	58.7
02	206 40.2	39.9	295 16.8	6.9	22 27.7	8.0	58.7
03	221 40.2	. . 39.0	309 42.7	6.9	22 35.7	7.9	58.6
04	236 40.3	38.0	324 08.6	6.9	22 43.6	7.7	58.6
05	251 40.4	37.1	338 34.5	6.8	22 51.3	7.6	58.6
06	266 40.5	S 9 36.2	353 00.3	6.8	S22 58.9	7.4	58.6
07	281 40.6	35.3	7 26.1	6.8	23 06.3	7.3	58.6
08	296 40.7	34.4	21 51.9	6.7	23 13.6	7.1	58.5
M 09	311 40.8	. . 33.4	36 17.6	6.6	23 20.7	7.0	58.5
O 10	326 40.9	32.5	50 43.2	6.7	23 27.7	6.9	58.5
N 11	341 41.0	31.6	65 08.9	6.5	23 34.6	6.7	58.5
D 12	356 41.1	S 9 30.7	79 34.4	6.6	S23 41.3	6.5	58.5
A 13	11 41.1	29.7	94 00.0	6.5	23 47.8	6.4	58.4
Y 14	26 41.2	28.8	108 25.5	6.5	23 54.2	6.2	58.4
15	41 41.3	. . 27.9	122 51.0	6.4	24 00.4	6.1	58.4
16	56 41.4	27.0	137 16.4	6.5	24 06.5	6.0	58.4
17	71 41.5	26.0	151 41.9	6.3	24 12.5	5.7	58.3
18	86 41.6	S 9 25.1	166 07.2	6.4	S24 18.2	5.7	58.3
19	101 41.7	24.2	180 32.6	6.3	24 23.9	5.4	58.3
20	116 41.8	23.3	194 57.9	6.3	24 29.3	5.4	58.3
21	131 41.9	. . 22.3	209 23.2	6.3	24 34.7	5.1	58.3
22	146 42.0	21.4	223 48.5	6.3	24 39.8	5.0	58.2
23	161 42.1	20.5	238 13.8	6.2	24 44.8	4.9	58.2
25 00	176 42.2	S 9 19.6	252 39.0	6.2	S24 49.7	4.7	58.2
01	191 42.3	18.6	267 04.2	6.2	24 54.4	4.5	58.2
02	206 42.4	17.7	281 29.4	6.2	24 58.9	4.4	58.2
03	221 42.5	. . 16.8	295 54.6	6.1	25 03.3	4.2	58.1
04	236 42.5	15.9	310 19.7	6.1	25 07.5	4.0	58.1
05	251 42.6	14.9	324 44.8	6.2	25 11.5	3.9	58.1
06	266 42.7	S 9 14.0	339 10.0	6.1	S25 15.4	3.8	58.1
T 07	281 42.8	13.1	353 35.1	6.1	25 19.2	3.6	58.0
U 08	296 42.9	12.2	8 00.2	6.1	25 22.8	3.4	58.0
E 09	311 43.0	. . 11.2	22 25.3	6.0	25 26.2	3.2	58.0
S 10	326 43.1	10.3	36 50.3	6.1	25 29.4	3.1	58.0
D 11	341 43.2	09.4	51 15.4	6.1	25 32.5	3.0	58.0
A 12	356 43.3	S 9 08.4	65 40.5	6.0	S25 35.5	2.7	57.9
Y 13	11 43.4	07.5	80 05.5	6.1	25 38.2	2.7	57.9
14	26 43.5	06.6	94 30.6	6.1	25 40.9	2.4	57.9
15	41 43.6	. . 05.7	108 55.7	6.0	25 43.3	2.3	57.9
16	56 43.7	04.7	123 20.7	6.1	25 45.6	2.1	57.8
17	71 43.8	03.8	137 45.8	6.0	25 47.7	2.0	57.8
18	86 43.9	S 9 02.9	152 10.8	6.1	S25 49.7	1.8	57.8
19	101 44.0	01.9	166 35.9	6.1	25 51.5	1.7	57.8
20	116 44.1	01.0	181 01.0	6.1	25 53.2	1.5	57.8
21	131 44.2	9 00.1	195 26.1	6.1	25 54.7	1.3	57.7
22	146 44.3	8 59.1	209 51.2	6.1	25 56.0	1.2	57.7
23	161 44.4	58.2	224 16.3	6.1	25 57.2	1.0	57.7
26 00	176 44.5	S 8 57.3	238 41.4	6.2	S25 58.2	0.8	57.7
01	191 44.6	56.3	253 06.6	6.1	25 59.0	0.7	57.7
02	206 44.7	55.4	267 31.7	6.2	25 59.7	0.5	57.6
03	221 44.8	. . 54.5	281 56.9	6.2	26 00.2	0.4	57.6
04	236 44.9	53.5	296 22.1	6.2	26 00.6	0.2	57.6
05	251 45.0	52.6	310 47.3	6.3	26 00.8	0.1	57.6
06	266 45.1	S 8 51.7	325 12.6	6.2	S26 00.9	0.2	57.5
W 07	281 45.2	50.7	339 37.8	6.3	26 00.7	0.2	57.5
E 08	296 45.3	49.8	354 03.1	6.4	26 00.5	0.5	57.5
D 09	311 45.4	. . 48.9	8 28.5	6.3	26 00.0	0.5	57.5
N 10	326 45.5	47.9	22 53.8	6.4	25 59.5	0.8	57.5
E 11	341 45.6	47.0	37 19.2	6.4	25 58.7	0.9	57.4
S 12	356 45.7	S 8 46.1	51 44.6	6.5	S25 57.8	1.0	57.4
D 13	11 45.8	45.1	66 10.1	6.5	25 56.8	1.3	57.4
A 14	26 45.9	44.2	80 35.6	6.5	25 55.5	1.3	57.4
Y 15	41 46.0	. . 43.3	95 01.1	6.6	25 54.2	1.5	57.4
16	56 46.1	42.3	109 26.7	6.6	25 52.7	1.7	57.3
17	71 46.2	41.4	123 52.3	6.6	25 51.0	1.9	57.3
18	86 46.3	S 8 40.5	138 17.9	6.7	S25 49.1	1.9	57.3
19	101 46.4	39.5	152 43.6	6.8	25 47.2	2.2	57.3
20	116 46.6	38.6	167 09.4	6.8	25 45.0	2.3	57.2
21	131 46.7	. . 37.7	181 35.2	6.8	25 42.7	2.4	57.2
22	146 46.8	36.7	196 01.0	6.9	25 40.3	2.6	57.2
23	161 46.9	35.8	210 26.9	7.0	S25 37.7	2.8	57.2
	SD 16.2	d 0.9	SD 15.9		15.8		15.6

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
24	13 20	13 16	12 13	06 29	18 58	23	41
25	13 12	13 07	12 13	07 27	19 56	24	31
26	13 02	12 57	12 13	08 25	20 53	25	21

2003 FEB. 27, 28, MAR. 1 (THURS., FRI., SAT.)

UT	ARIES	VENUS −4.1		MARS +1.0		JUPITER −2.5		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27 00	156 24.9	218 47.5	S19 53.2	250 30.7	S23 22.0	23 39.5	N18 34.9	74 53.1	N22 06.4
01	171 27.4	233 46.8	52.8	265 31.4	22.1	38 42.2	34.9	89 55.5	06.4
02	186 29.9	248 46.2	52.4	280 32.1	22.2	53 44.9	35.0	104 58.0	06.4
03	201 32.3	263 45.6	52.0	295 32.8	22.3	68 47.7	35.1	120 00.4	06.5
04	216 34.8	278 44.9	51.7	310 33.6	22.4	83 50.4	35.1	135 02.9	06.5
05	231 37.3	293 44.3	51.3	325 34.3	22.5	98 53.1	35.2	150 05.3	06.5
06	246 39.7	308 43.7	S19 50.9	340 35.0	S23 22.6	113 55.8	N18 35.3	165 07.7	N22 06.5
07	261 42.2	323 43.0	50.5	355 35.7	22.6	128 58.6	35.4	180 10.2	06.5
T 08	276 44.7	338 42.4	50.1	10 36.5	22.7	144 01.3	35.4	195 12.6	06.5
H 09	291 47.1	353 41.8	49.8	25 37.2	22.8	159 04.0	35.5	210 15.1	06.5
U 10	306 49.6	8 41.1	49.4	40 37.9	22.9	174 06.8	35.6	225 17.5	06.5
R 11	321 52.0	23 40.5	49.0	55 38.6	23.0	189 09.5	35.6	240 19.9	06.5
S 12	336 54.5	38 39.9	S19 48.6	70 39.4	S23 23.1	204 12.2	N18 35.7	255 22.4	N22 06.5
D 13	351 57.0	53 39.2	48.2	85 40.1	23.1	219 14.9	35.8	270 24.8	06.6
A 14	6 59.4	68 38.6	47.8	100 40.8	23.2	234 17.7	35.9	285 27.2	06.6
Y 15	22 01.9	83 38.0	47.4	115 41.5	23.3	249 20.4	35.9	300 29.7	06.6
16	37 04.4	98 37.4	47.0	130 42.3	23.4	264 23.1	36.0	315 32.1	06.6
17	52 06.8	113 36.7	46.6	145 43.0	23.5	279 25.9	36.1	330 34.6	06.6
18	67 09.3	128 36.1	S19 46.3	160 43.7	S23 23.5	294 28.6	N18 36.1	345 37.0	N22 06.6
19	82 11.8	143 35.5	45.9	175 44.4	23.6	309 31.3	36.2	0 39.4	06.6
20	97 14.2	158 34.8	45.5	190 45.2	23.7	324 34.0	36.3	15 41.9	06.6
21	112 16.7	173 34.2	45.1	205 45.9	23.8	339 36.8	36.3	30 44.3	06.6
22	127 19.1	188 33.6	44.7	220 46.6	23.9	354 39.5	36.4	45 46.7	06.7
23	142 21.6	203 32.9	44.3	235 47.3	23.9	9 42.2	36.5	60 49.2	06.7
28 00	157 24.1	218 32.3	S19 43.9	250 48.0	S23 24.0	24 44.9	N18 36.6	75 51.6	N22 06.7
01	172 26.5	233 31.7	43.5	265 48.8	24.1	39 47.7	36.6	90 54.1	06.7
02	187 29.0	248 31.1	43.1	280 49.5	24.2	54 50.4	36.7	105 56.5	06.7
03	202 31.5	263 30.4	42.7	295 50.2	24.3	69 53.1	36.8	120 58.9	06.7
04	217 33.9	278 29.8	42.3	310 50.9	24.3	84 55.8	36.8	136 01.4	06.7
05	232 36.4	293 29.2	41.9	325 51.7	24.4	99 58.5	36.9	151 03.8	06.7
06	247 38.9	308 28.5	S19 41.5	340 52.4	S23 24.5	115 01.3	N18 37.0	166 06.2	N22 06.7
07	262 41.3	323 27.9	41.1	355 53.1	24.6	130 04.0	37.0	181 08.7	06.7
08	277 43.8	338 27.3	40.6	10 53.8	24.6	145 06.7	37.1	196 11.1	06.8
F 09	292 46.3	353 26.7	40.2	25 54.6	24.7	160 09.4	37.2	211 13.5	06.8
R 10	307 48.7	8 26.0	39.8	40 55.3	24.8	175 12.2	37.3	226 16.0	06.8
I 11	322 51.2	23 25.4	39.4	55 56.0	24.9	190 14.9	37.3	241 18.4	06.8
D 12	337 53.6	38 24.8	S19 39.0	70 56.7	S23 24.9	205 17.6	N18 37.4	256 20.8	N22 06.8
A 13	352 56.1	53 24.1	38.6	85 57.5	25.0	220 20.3	37.5	271 23.3	06.8
Y 14	7 58.6	68 23.5	38.2	100 58.2	25.1	235 23.1	37.5	286 25.7	06.8
15	23 01.0	83 22.9	37.8	115 58.9	25.2	250 25.8	37.6	301 28.1	06.8
16	38 03.5	98 22.3	37.4	130 59.6	25.2	265 28.5	37.7	316 30.6	06.8
17	53 06.0	113 21.6	36.9	146 00.4	25.3	280 31.2	37.7	331 33.0	06.9
18	68 08.4	128 21.0	S19 36.5	161 01.1	S23 25.4	295 33.9	N18 37.8	346 35.4	N22 06.9
19	83 10.9	143 20.4	36.1	176 01.8	25.5	310 36.7	37.9	1 37.9	06.9
20	98 13.4	158 19.8	35.7	191 02.5	25.5	325 39.4	37.9	16 40.3	06.9
21	113 15.8	173 19.1	35.3	206 03.3	25.6	340 42.1	38.0	31 42.7	06.9
22	128 18.3	188 18.5	34.9	221 04.0	25.7	355 44.8	38.1	46 45.2	06.9
23	143 20.8	203 17.9	34.4	236 04.7	25.8	10 47.5	38.1	61 47.6	06.9
1 00	158 23.2	218 17.3	S19 34.0	251 05.4	S23 25.8	25 50.3	N18 38.2	76 50.0	N22 06.9
01	173 25.7	233 16.6	33.6	266 06.2	25.9	40 53.0	38.3	91 52.4	06.9
02	188 28.1	248 16.0	33.2	281 06.9	26.0	55 55.7	38.3	106 54.9	06.9
03	203 30.6	263 15.4	32.7	296 07.6	26.0	70 58.4	38.4	121 57.3	07.0
04	218 33.1	278 14.7	32.3	311 08.3	26.1	86 01.1	38.5	136 59.7	07.0
05	233 35.5	293 14.1	31.9	326 09.1	26.2	101 03.8	38.6	152 02.2	07.0
06	248 38.0	308 13.5	S19 31.5	341 09.8	S23 26.2	116 06.6	N18 38.6	167 04.6	N22 07.0
07	263 40.5	323 12.9	31.0	356 10.5	26.3	131 09.3	38.7	182 07.0	07.0
S 08	278 42.9	338 12.2	30.6	11 11.2	26.4	146 12.0	38.8	197 09.5	07.0
A 09	293 45.4	353 11.6	30.2	26 12.0	26.5	161 14.7	38.8	212 11.9	07.0
T 10	308 47.9	8 11.0	29.7	41 12.7	26.5	176 17.4	38.9	227 14.3	07.0
U 11	323 50.3	23 10.4	29.3	56 13.4	26.6	191 20.1	39.0	242 16.7	07.0
R 12	338 52.8	38 09.7	S19 28.9	71 14.1	S23 26.7	206 22.9	N18 39.0	257 19.2	N22 07.1
D 13	353 55.2	53 09.1	28.4	86 14.9	26.7	221 25.6	39.1	272 21.6	07.1
A 14	8 57.7	68 08.5	28.0	101 15.6	26.8	236 28.3	39.2	287 24.0	07.1
Y 15	24 00.2	83 07.9	27.6	116 16.3	26.9	251 31.0	39.2	302 26.5	07.1
16	39 02.6	98 07.2	27.1	131 17.0	26.9	266 33.7	39.3	317 28.9	07.1
17	54 05.1	113 06.6	26.7	146 17.7	27.0	281 36.4	39.4	332 31.3	07.1
18	69 07.6	128 06.0	S19 26.2	161 18.5	S23 27.1	296 39.2	N18 39.4	347 33.7	N22 07.1
19	84 10.0	143 05.4	25.8	176 19.2	27.1	311 41.9	39.5	2 36.2	07.1
20	99 12.5	158 04.8	25.4	191 19.9	27.2	326 44.6	39.6	17 38.6	07.1
21	114 15.0	173 04.1	24.9	206 20.6	27.3	341 47.3	39.6	32 41.0	07.2
22	129 17.4	188 03.5	24.5	221 21.4	27.3	356 50.0	39.7	47 43.4	07.2
23	144 19.9	203 02.9	24.0	236 22.1	27.4	11 52.7	39.8	62 45.9	07.2
	h m								
Mer. Pass.	13 28.2	v −0.6	d 0.4	v 0.7	d 0.1	v 2.7	d 0.1	v 2.4	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.0	S57 13.6
Acrux	173 18.1	S63 06.8
Adhara	255 18.7	S28 58.7
Aldebaran	290 58.7	N16 30.9
Alioth	166 27.1	N55 56.4
Alkaid	153 04.8	N49 17.6
Al Na'ir	27 54.2	S46 56.9
Alnilam	275 54.5	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.7	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.4	N 8 52.3
Ankaa	353 23.9	S42 17.6
Antares	112 36.3	S26 26.3
Arcturus	146 02.9	N19 09.8
Atria	107 45.6	S69 01.8
Avior	234 20.9	S59 31.3
Bellatrix	278 40.6	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.5	S52 42.1
Capella	280 46.4	N46 00.2
Deneb	49 37.5	N45 17.2
Denebola	182 41.6	N14 33.2
Diphda	349 04.2	S17 58.4
Dubhe	194 00.6	N61 44.0
Elnath	278 22.8	N28 36.7
Eltanin	90 50.1	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.2	S29 36.6
Gacrux	172 09.7	S57 07.7
Gienah	176 00.4	S17 33.6
Hadar	148 59.3	S60 23.1
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.7	S34 23.0
Kochab	137 18.8	N74 08.3
Markab	13 46.8	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 17.0	S36 23.0
Miaplacidus	221 40.8	S69 43.8
Mirfak	308 52.2	N49 52.5
Nunki	76 08.5	S26 17.7
Peacock	53 32.3	S56 43.5
Pollux	243 37.3	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 14.1	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.8	S 8 12.0
Rigil Kent.	140 02.8	S60 50.7
Sabik	102 21.9	S15 43.8
Schedar	349 50.5	N56 33.3
Shaula	96 33.0	S37 06.3
Sirius	258 40.7	S16 43.3
Spica	158 39.6	S11 10.7
Suhail	222 58.1	S43 26.8
Vega	80 44.7	N38 46.8
Zuben'ubi	137 14.3	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	61 08.2	9 26
Mars	93 24.0	7 16
Jupiter	227 20.9	22 17
Saturn	278 27.5	18 53

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
27 00	176 47.0	S 8 34.8	224 52.9	7.0	S25 34.9	2.8	57.2
01	191 47.1	33.9	239 18.9	7.0	25 32.1	3.1	57.1
02	206 47.2	33.0	253 44.9	7.1	25 29.0	3.2	57.1
03	221 47.3	. . 32.0	268 11.0	7.2	25 25.8	3.3	57.1
04	236 47.4	31.1	282 37.2	7.2	25 22.5	3.5	57.1
05	251 47.5	30.2	297 03.4	7.3	25 19.0	3.6	57.1
06	266 47.6	S 8 29.2	311 29.7	7.3	S25 15.4	3.8	57.0
07	281 47.7	28.3	325 56.0	7.4	25 11.6	3.9	57.0
08	296 47.8	27.3	340 22.4	7.5	25 07.7	4.1	57.0
09	311 47.9	. . 26.4	354 48.9	7.5	25 03.6	4.2	57.0
10	326 48.0	25.5	9 15.4	7.6	24 59.4	4.3	56.9
11	341 48.1	24.5	23 42.0	7.7	24 55.1	4.5	56.9
12	356 48.3	S 8 23.6	38 08.7	7.7	S24 50.6	4.6	56.9
13	11 48.4	22.6	52 35.4	7.8	24 46.0	4.8	56.9
14	26 48.5	21.7	67 02.2	7.9	24 41.2	4.9	56.9
15	41 48.6	. . 20.8	81 29.1	7.9	24 36.3	5.0	56.8
16	56 48.7	19.8	95 56.0	8.0	24 31.3	5.2	56.8
17	71 48.8	18.9	110 23.0	8.1	24 26.1	5.3	56.8
18	86 48.9	S 8 17.9	124 50.1	8.1	S24 20.8	5.4	56.8
19	101 49.0	17.0	139 17.2	8.3	24 15.4	5.6	56.8
20	116 49.1	16.1	153 44.5	8.3	24 09.8	5.7	56.7
21	131 49.2	. . 15.1	168 11.8	8.3	24 04.1	5.8	56.7
22	146 49.4	14.2	182 39.1	8.5	23 58.3	6.0	56.7
23	161 49.5	13.2	197 06.6	8.5	23 52.3	6.1	56.7
28 00	176 49.6	S 8 12.3	211 34.1	8.6	S23 46.2	6.2	56.7
01	191 49.7	11.3	226 01.7	8.7	23 40.0	6.3	56.6
02	206 49.8	10.4	240 29.4	8.8	23 33.7	6.5	56.6
03	221 49.9	. . 09.5	254 57.2	8.8	23 27.2	6.6	56.6
04	236 50.0	08.5	269 25.0	8.9	23 20.6	6.7	56.6
05	251 50.1	07.6	283 52.9	9.0	23 13.9	6.8	56.6
06	266 50.3	S 8 06.6	298 20.9	9.1	S23 07.1	7.0	56.5
07	281 50.4	05.7	312 49.0	9.2	23 00.1	7.0	56.5
08	296 50.5	04.7	327 17.2	9.2	22 53.1	7.2	56.5
09	311 50.6	. . 03.8	341 45.4	9.4	22 45.9	7.3	56.5
10	326 50.7	02.9	356 13.8	9.4	22 38.6	7.5	56.5
11	341 50.8	01.9	10 42.2	9.5	22 31.1	7.5	56.4
12	356 50.9	S 8 01.0	25 10.7	9.6	S22 23.6	7.6	56.4
13	11 51.0	8 00.0	39 39.3	9.6	22 16.0	7.8	56.4
14	26 51.2	7 59.1	54 07.9	9.8	22 08.2	7.9	56.4
15	41 51.3	. . 58.1	68 36.7	9.8	22 00.3	8.0	56.4
16	56 51.4	57.2	83 05.5	10.0	21 52.3	8.1	56.3
17	71 51.5	56.2	97 34.5	10.0	21 44.2	8.2	56.3
18	86 51.6	S 7 55.3	112 03.5	10.1	S21 36.0	8.3	56.3
19	101 51.7	54.3	126 32.6	10.1	21 27.7	8.4	56.3
20	116 51.9	53.4	141 01.7	10.3	21 19.3	8.5	56.3
21	131 52.0	. . 52.5	155 31.0	10.3	21 10.8	8.6	56.2
22	146 52.1	51.5	170 00.3	10.5	21 02.2	8.7	56.2
23	161 52.2	50.6	184 29.8	10.5	20 53.5	8.9	56.2
1 00	176 52.3	S 7 49.6	198 59.3	10.6	S20 44.6	8.9	56.2
01	191 52.4	48.7	213 28.9	10.7	20 35.7	9.0	56.2
02	206 52.5	47.7	227 58.6	10.8	20 26.7	9.1	56.1
03	221 52.7	. . 46.8	242 28.4	10.8	20 17.6	9.2	56.1
04	236 52.8	45.8	256 58.2	11.0	20 08.4	9.3	56.1
05	251 52.9	44.9	271 28.2	11.0	19 59.1	9.4	56.1
06	266 53.0	S 7 43.9	285 58.2	11.1	S19 49.7	9.5	56.1
07	281 53.1	43.0	300 28.3	11.2	19 40.2	9.6	56.0
08	296 53.3	42.0	314 58.5	11.3	19 30.6	9.7	56.0
09	311 53.4	. . 41.1	329 28.8	11.4	19 20.9	9.7	56.0
10	326 53.5	40.1	343 59.2	11.4	19 11.2	9.9	56.0
11	341 53.6	39.2	358 29.6	11.6	19 01.3	9.9	56.0
12	356 53.7	S 7 38.2	13 00.2	11.6	S18 51.4	10.0	55.9
13	11 53.9	37.3	27 30.8	11.7	18 41.4	10.1	55.9
14	26 54.0	36.3	42 01.5	11.8	18 31.3	10.2	55.9
15	41 54.1	. . 35.4	56 32.3	11.9	18 21.1	10.2	55.9
16	56 54.2	34.4	71 03.2	11.9	18 10.9	10.4	55.9
17	71 54.3	33.5	85 34.1	12.1	18 00.5	10.4	55.8
18	86 54.5	S 7 32.5	100 05.2	12.1	S17 50.1	10.5	55.8
19	101 54.6	31.6	114 36.3	12.2	17 39.6	10.5	55.8
20	116 54.7	30.6	129 07.5	12.3	17 29.1	10.7	55.8
21	131 54.8	. . 29.7	143 38.8	12.3	17 18.4	10.7	55.8
22	146 54.9	28.7	158 10.1	12.5	17 07.7	10.8	55.7
23	161 55.1	27.8	172 41.6	12.5	S16 56.9	10.9	55.7
	SD 16.2	d 0.9	SD 15.5		15.4		15.2

THURSDAY

FRIDAY

SATURDAY

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 1	Moonrise 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 17	06 35	07 44	▬	▬	▬	09 33
N 70	05 21	06 32	07 34	▬	▬	10 01	09 01
68	05 25	06 29	07 25	▬	▬	09 06	08 37
66	05 27	06 26	07 18	▬	08 59	08 33	08 19
64	05 30	06 24	07 12	08 19	08 13	08 08	08 04
62	05 31	06 22	07 07	07 28	07 43	07 49	07 51
60	05 33	06 21	07 03	06 56	07 20	07 33	07 40
N 58	05 34	06 19	06 59	06 33	07 01	07 19	07 31
56	05 35	06 18	06 55	06 13	06 46	07 07	07 22
54	05 36	06 16	06 52	05 57	06 32	06 57	07 15
52	05 36	06 15	06 49	05 43	06 21	06 48	07 08
50	05 37	06 14	06 46	05 31	06 10	06 39	07 02
45	05 37	06 11	06 41	05 06	05 48	06 22	06 49
N 40	05 37	06 08	06 36	04 46	05 30	06 07	06 38
35	05 37	06 06	06 31	04 29	05 16	05 55	06 29
30	05 36	06 04	06 28	04 14	05 03	05 44	06 21
20	05 33	05 59	06 21	03 50	04 40	05 26	06 06
N 10	05 29	05 54	06 15	03 28	04 21	05 10	05 54
0	05 24	05 48	06 09	03 08	04 03	04 54	05 42
S 10	05 17	05 42	06 03	02 48	03 45	04 39	05 31
20	05 09	05 35	05 57	02 27	03 25	04 23	05 18
30	04 57	05 26	05 50	02 02	03 03	04 04	05 03
35	04 49	05 20	05 46	01 47	02 50	03 53	04 55
40	04 40	05 13	05 41	01 30	02 34	03 40	04 45
45	04 28	05 05	05 35	01 10	02 16	03 25	04 34
S 50	04 13	04 55	05 28	00 44	01 53	03 07	04 20
52	04 06	04 50	05 25	00 32	01 43	02 58	04 14
54	03 58	04 44	05 21	00 18	01 30	02 48	04 07
56	03 49	04 38	05 18	00 01	01 16	02 37	03 59
58	03 38	04 31	05 13	24 59	00 59	02 24	03 50
S 60	03 25	04 23	05 08	24 39	00 39	02 09	03 39

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 27	Moonset 28	Moonset 1	Moonset 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 43	17 53	19 11	▬	▬	▬	14 36
N 70	16 53	17 56	19 06	▬	▬	12 29	15 06
68	17 01	17 58	19 03	▬	▬	13 22	15 28
66	17 08	18 00	19 00	▬	11 43	13 54	15 45
64	17 14	18 02	18 57	10 29	12 29	14 18	15 59
62	17 19	18 04	18 55	11 20	12 58	14 37	16 11
60	17 24	18 06	18 54	11 52	13 20	14 52	16 21
N 58	17 28	18 07	18 53	12 15	13 39	15 05	16 29
56	17 31	18 09	18 52	12 34	13 54	15 16	16 37
54	17 34	18 10	18 51	12 50	14 07	15 26	16 44
52	17 37	18 11	18 50	13 04	14 18	15 34	16 50
50	17 40	18 12	18 50	13 16	14 28	15 42	16 55
45	17 45	18 15	18 49	13 41	14 49	15 58	17 07
N 40	17 50	18 17	18 49	14 00	15 06	16 12	17 16
35	17 54	18 20	18 49	14 17	15 20	16 23	17 24
30	17 58	18 22	18 50	14 31	15 32	16 33	17 31
20	18 05	18 27	18 52	14 55	15 53	16 50	17 44
N 10	18 10	18 32	18 56	15 16	16 11	17 04	17 54
0	18 16	18 37	19 01	15 35	16 28	17 18	18 04
S 10	18 22	18 43	19 08	15 54	16 45	17 31	18 14
20	18 28	18 50	19 16	16 14	17 03	17 46	18 24
30	18 35	18 59	19 28	16 38	17 23	18 02	18 36
35	18 39	19 05	19 35	16 52	17 35	18 11	18 43
40	18 44	19 11	19 44	17 08	17 48	18 22	18 51
45	18 49	19 20	19 56	17 26	18 04	18 35	19 00
S 50	18 56	19 30	20 10	17 50	18 24	18 50	19 10
52	18 59	19 34	20 17	18 01	18 33	18 57	19 15
54	19 02	19 40	20 25	18 14	18 44	19 05	19 21
56	19 06	19 45	20 35	18 29	18 55	19 13	19 27
58	19 10	19 52	20 45	18 46	19 09	19 23	19 33
S 60	19 15	20 00	20 58	19 06	19 24	19 35	19 41

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
27	12 52	12 47	12 13	09 22	21 49	26	13
28	12 42	12 36	12 13	10 16	22 41	27	7
1	12 31	12 25	12 12	11 06	23 30	28	3

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2003 MARCH 2, 3, 4 (SUN., MON., TUES.)

UT	ARIES	VENUS −4.1		MARS +0.9		JUPITER −2.5		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
2 00	159 22.4	218 02.3	S19 23.6	251 22.8	S23 27.4	26 55.4	N18 39.8	77 48.3	N22 07.2
01	174 24.8	233 01.6	23.1	266 23.5	27.5	41 58.2	39.9	92 50.7	07.2
02	189 27.3	248 01.0	22.7	281 24.3	27.6	57 00.9	40.0	107 53.1	07.2
03	204 29.7	263 00.4	22.2	296 25.0	27.6	72 03.6	40.0	122 55.6	07.2
04	219 32.2	277 59.8	21.8	311 25.7	27.7	87 06.3	40.1	137 58.0	07.2
05	234 34.7	292 59.2	21.3	326 26.4	27.8	102 09.0	40.2	153 00.4	07.2
06	249 37.1	307 58.5	S19 20.9	341 27.2	S23 27.8	117 11.7	N18 40.2	168 02.8	N22 07.3
07	264 39.6	322 57.9	20.4	356 27.9	27.9	132 14.4	40.3	183 05.3	07.3
08	279 42.1	337 57.3	20.0	11 28.6	28.0	147 17.1	40.4	198 07.7	07.3
S 09	294 44.5	352 56.7	19.5	26 29.3	28.0	162 19.8	40.4	213 10.1	07.3
U 10	309 47.0	7 56.0	19.1	41 30.1	28.1	177 22.6	40.5	228 12.5	07.3
N 11	324 49.5	22 55.4	18.6	56 30.8	28.1	192 25.3	40.5	243 15.0	07.3
D 12	339 51.9	37 54.8	S19 18.2	71 31.5	S23 28.2	207 28.0	N18 40.6	258 17.4	N22 07.3
A 13	354 54.4	52 54.2	17.7	86 32.2	28.3	222 30.7	40.7	273 19.8	07.3
Y 14	9 56.9	67 53.6	17.3	101 33.0	28.3	237 33.4	40.7	288 22.2	07.3
15	24 59.3	82 52.9	16.8	116 33.7	28.4	252 36.1	40.8	303 24.7	07.4
16	40 01.8	97 52.3	16.3	131 34.4	28.4	267 38.8	40.9	318 27.1	07.4
17	55 04.2	112 51.7	15.9	146 35.1	28.5	282 41.5	40.9	333 29.5	07.4
18	70 06.7	127 51.1	S19 15.4	161 35.9	S23 28.6	297 44.2	N18 41.0	348 31.9	N22 07.4
19	85 09.2	142 50.5	15.0	176 36.6	28.6	312 46.9	41.1	3 34.3	07.4
20	100 11.6	157 49.8	14.5	191 37.3	28.7	327 49.7	41.1	18 36.8	07.4
21	115 14.1	172 49.2	14.0	206 38.0	28.7	342 52.4	41.2	33 39.2	07.4
22	130 16.6	187 48.6	13.6	221 38.8	28.8	357 55.1	41.3	48 41.6	07.4
23	145 19.0	202 48.0	13.1	236 39.5	28.8	12 57.8	41.3	63 44.0	07.4
3 00	160 21.5	217 47.4	S19 12.6	251 40.2	S23 28.9	28 00.5	N18 41.4	78 46.4	N22 07.5
01	175 24.0	232 46.7	12.2	266 40.9	29.0	43 03.2	41.5	93 48.9	07.5
02	190 26.4	247 46.1	11.7	281 41.7	29.0	58 05.9	41.5	108 51.3	07.5
03	205 28.9	262 45.5	11.2	296 42.4	29.1	73 08.6	41.6	123 53.7	07.5
04	220 31.3	277 44.9	10.7	311 43.1	29.1	88 11.3	41.6	138 56.1	07.5
05	235 33.8	292 44.3	10.3	326 43.8	29.2	103 14.0	41.7	153 58.5	07.5
06	250 36.3	307 43.7	S19 09.8	341 44.6	S23 29.2	118 16.7	N18 41.8	169 01.0	N22 07.5
07	265 38.7	322 43.0	09.3	356 45.3	29.3	133 19.4	41.8	184 03.4	07.5
08	280 41.2	337 42.4	08.8	11 46.0	29.4	148 22.1	41.9	199 05.8	07.5
M 09	295 43.7	352 41.8	08.4	26 46.7	29.4	163 24.8	42.0	214 08.2	07.6
O 10	310 46.1	7 41.2	07.9	41 47.5	29.5	178 27.5	42.0	229 10.6	07.6
N 11	325 48.6	22 40.6	07.4	56 48.2	29.5	193 30.2	42.1	244 13.1	07.6
D 12	340 51.1	37 40.0	S19 06.9	71 48.9	S23 29.6	208 33.0	N18 42.2	259 15.5	N22 07.6
A 13	355 53.5	52 39.3	06.5	86 49.6	29.6	223 35.7	42.2	274 17.9	07.6
Y 14	10 56.0	67 38.7	06.0	101 50.4	29.7	238 38.4	42.3	289 20.3	07.6
15	25 58.5	82 38.1	05.5	116 51.1	29.7	253 41.1	42.3	304 22.7	07.6
16	41 00.9	97 37.5	05.0	131 51.8	29.8	268 43.8	42.4	319 25.1	07.6
17	56 03.4	112 36.9	04.5	146 52.5	29.8	283 46.5	42.5	334 27.6	07.6
18	71 05.8	127 36.3	S19 04.0	161 53.3	S23 29.9	298 49.2	N18 42.5	349 30.0	N22 07.7
19	86 08.3	142 35.6	03.5	176 54.0	29.9	313 51.9	42.6	4 32.4	07.7
20	101 10.8	157 35.0	03.1	191 54.7	30.0	328 54.6	42.7	19 34.8	07.7
21	116 13.2	172 34.4	02.6	206 55.4	30.0	343 57.3	42.7	34 37.2	07.7
22	131 15.7	187 33.8	02.1	221 56.2	30.1	359 00.0	42.8	49 39.6	07.7
23	146 18.2	202 33.2	01.6	236 56.9	30.1	14 02.7	42.9	64 42.1	07.7
4 00	161 20.6	217 32.6	S19 01.1	251 57.6	S23 30.2	29 05.4	N18 42.9	79 44.5	N22 07.7
01	176 23.1	232 32.0	00.6	266 58.3	30.2	44 08.1	43.0	94 46.9	07.7
02	191 25.6	247 31.3	19 00.1	281 59.1	30.3	59 10.8	43.0	109 49.3	07.8
03	206 28.0	262 30.7	18 59.6	296 59.8	30.3	74 13.5	43.1	124 51.7	07.8
04	221 30.5	277 30.1	59.1	312 00.5	30.4	89 16.2	43.2	139 54.1	07.8
05	236 32.9	292 29.5	58.6	327 01.3	30.4	104 18.9	43.2	154 56.6	07.8
06	251 35.4	307 28.9	S18 58.1	342 02.0	S23 30.5	119 21.6	N18 43.3	169 59.0	N22 07.8
07	266 37.9	322 28.3	57.6	357 02.7	30.5	134 24.3	43.3	185 01.4	07.8
08	281 40.3	337 27.7	57.1	12 03.4	30.6	149 27.0	43.4	200 03.8	07.8
T 09	296 42.8	352 27.1	56.6	27 04.2	30.6	164 29.7	43.5	215 06.2	07.8
U 10	311 45.3	7 26.4	56.1	42 04.9	30.7	179 32.4	43.5	230 08.6	07.8
E 11	326 47.7	22 25.8	55.6	57 05.6	30.7	194 35.1	43.6	245 11.0	07.9
S 12	341 50.2	37 25.2	S18 55.1	72 06.3	S23 30.8	209 37.8	N18 43.7	260 13.5	N22 07.9
D 13	356 52.7	52 24.6	54.6	87 07.1	30.8	224 40.5	43.7	275 15.9	07.9
A 14	11 55.1	67 24.0	54.1	102 07.8	30.9	239 43.2	43.8	290 18.3	07.9
Y 15	26 57.6	82 23.4	53.6	117 08.5	30.9	254 45.9	43.8	305 20.7	07.9
16	42 00.1	97 22.8	53.1	132 09.2	30.9	269 48.6	43.9	320 23.1	07.9
17	57 02.5	112 22.2	52.6	147 10.0	31.0	284 51.3	44.0	335 25.5	07.9
18	72 05.0	127 21.6	S18 52.1	162 10.7	S23 31.0	299 54.0	N18 44.0	350 27.9	N22 07.9
19	87 07.4	142 20.9	51.6	177 11.4	31.1	314 56.7	44.1	5 30.3	07.9
20	102 09.9	157 20.3	51.1	192 12.1	31.1	329 59.4	44.1	20 32.7	08.0
21	117 12.4	172 19.7	50.6	207 12.9	31.2	345 02.0	44.2	35 35.2	08.0
22	132 14.8	187 19.1	50.1	222 13.6	31.2	0 04.7	44.3	50 37.6	08.0
23	147 17.3	202 18.5	49.6	237 14.3	31.3	15 07.4	44.3	65 40.0	08.0
Mer. Pass.	h m 13 16.4	v −0.6	d 0.5	v 0.7	d 0.1	v 2.7	d 0.1	v 2.4	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.0	S57 13.6
Acrux	173 18.1	S63 06.9
Adhara	255 18.7	S28 58.7
Aldebaran	290 58.7	N16 30.9
Alioth	166 27.1	N55 56.4
Alkaid	153 04.8	N49 17.6
Al Na'ir	27 54.2	S46 56.9
Alnilam	275 54.5	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.7	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.4	N 8 52.3
Ankaa	353 23.9	S42 17.6
Antares	112 36.2	S26 26.3
Arcturus	146 02.9	N19 09.8
Atria	107 45.5	S69 01.8
Avior	234 21.0	S59 31.3
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.5	S52 42.1
Capella	280 46.4	N46 00.3
Deneb	49 37.5	N45 17.2
Denebola	182 41.6	N14 33.2
Diphda	349 04.2	S17 58.4
Dubhe	194 00.6	N61 44.0
Elnath	278 22.8	N28 36.7
Eltanin	90 50.1	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.2	S29 36.6
Gacrux	172 09.7	S57 07.7
Gienah	176 00.4	S17 33.6
Hadar	148 59.3	S60 23.1
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.7	S34 23.0
Kochab	137 18.8	N74 08.3
Markab	13 46.8	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 17.0	S36 23.0
Miaplacidus	221 40.9	S69 43.9
Mirfak	308 52.3	N49 52.5
Nunki	76 08.5	S26 17.7
Peacock	53 32.3	S56 43.5
Pollux	243 37.3	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 14.0	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.8	S 8 12.0
Rigil Kent.	140 02.8	S60 50.7
Sabik	102 21.9	S15 43.8
Schedar	349 50.5	N56 33.3
Shaula	96 33.0	S37 06.3
Sirius	258 40.7	S16 43.3
Spica	158 39.6	S11 10.7
Suhail	222 58.1	S43 26.8
Vega	80 44.7	N38 46.8
Zuben'ubi	137 14.3	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	57 25.9	9 29
Mars	91 18.7	7 13
Jupiter	227 39.0	22 04
Saturn	278 25.0	18 42

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UT	SUN		MOON					
	GHA	Dec	GHA	v	Dec	d	HP
d h	° ′	° ′	° ′	′	° ′	′	′
2 00	176 55.2	S 7 26.8	187 13.1	12.6	S16 46.0	10.9	55.7
01	191 55.3	25.9	201 44.7	12.7	16 35.1	11.0	55.7
02	206 55.4	24.9	216 16.4	12.7	16 24.1	11.1	55.7
03	221 55.5	. . 24.0	230 48.1	12.9	16 13.0	11.1	55.6
04	236 55.7	23.0	245 20.0	12.9	16 01.9	11.2	55.6
05	251 55.8	22.1	259 51.9	13.0	15 50.7	11.3	55.6
06	266 55.9	S 7 21.1	274 23.9	13.0	S15 39.4	11.3	55.6
07	281 56.0	20.2	288 55.9	13.2	15 28.1	11.4	55.6
08	296 56.2	19.2	303 28.1	13.2	15 16.7	11.4	55.6
09	311 56.3	. . 18.2	318 00.3	13.3	15 05.3	11.6	55.5
10	326 56.4	17.3	332 32.6	13.3	14 53.7	11.5	55.5
11	341 56.5	16.3	347 04.9	13.5	14 42.2	11.7	55.5
12	356 56.7	S 7 15.4	1 37.4	13.5	S14 30.5	11.6	55.5
13	11 56.8	14.4	16 09.9	13.5	14 18.9	11.8	55.5
14	26 56.9	13.5	30 42.4	13.7	14 07.1	11.8	55.4
15	41 57.0	. . 12.5	45 15.1	13.7	13 55.3	11.8	55.4
16	56 57.2	11.6	59 47.8	13.8	13 43.5	11.9	55.4
17	71 57.3	10.6	74 20.6	13.9	13 31.6	12.0	55.4
18	86 57.4	S 7 09.7	88 53.5	13.9	S13 19.6	12.0	55.4
19	101 57.5	08.7	103 26.4	14.0	13 07.6	12.0	55.4
20	116 57.7	07.7	117 59.4	14.0	12 55.6	12.1	55.3
21	131 57.8	. . 06.8	132 32.4	14.1	12 43.5	12.2	55.3
22	146 57.9	05.8	147 05.5	14.2	12 31.3	12.2	55.3
23	161 58.0	04.9	161 38.7	14.3	12 19.1	12.2	55.3
3 00	176 58.2	S 7 03.9	176 12.0	14.3	S12 06.9	12.3	55.3
01	191 58.3	03.0	190 45.3	14.4	11 54.6	12.3	55.2
02	206 58.4	02.0	205 18.7	14.4	11 42.3	12.4	55.2
03	221 58.6	. . 01.1	219 52.1	14.5	11 29.9	12.4	55.2
04	236 58.7	7 00.1	234 25.6	14.6	11 17.5	12.4	55.2
05	251 58.8	6 59.1	248 59.2	14.6	11 05.1	12.5	55.2
06	266 58.9	S 6 58.2	263 32.8	14.7	S10 52.6	12.5	55.2
07	281 59.1	57.2	278 06.5	14.7	10 40.1	12.5	55.1
08	296 59.2	56.3	292 40.2	14.8	10 27.6	12.6	55.1
09	311 59.3	. . 55.3	307 14.0	14.8	10 15.0	12.7	55.1
10	326 59.5	54.3	321 47.8	14.9	10 02.3	12.6	55.1
11	341 59.6	53.4	336 21.7	15.0	9 49.7	12.7	55.1
12	356 59.7	S 6 52.4	350 55.7	15.0	S 9 37.0	12.7	55.1
13	11 59.8	51.5	5 29.7	15.1	9 24.3	12.8	55.0
14	27 00.0	50.5	20 03.8	15.1	9 11.5	12.8	55.0
15	42 00.1	. . 49.6	34 37.9	15.1	8 58.7	12.8	55.0
16	57 00.2	48.6	49 12.0	15.3	8 45.9	12.8	55.0
17	72 00.4	47.6	63 46.3	15.2	8 33.1	12.9	55.0
18	87 00.5	S 6 46.7	78 20.5	15.3	S 8 20.2	12.9	55.0
19	102 00.6	45.7	92 54.8	15.4	8 07.3	12.9	54.9
20	117 00.8	44.8	107 29.2	15.4	7 54.4	12.9	54.9
21	132 00.9	. . 43.8	122 03.6	15.4	7 41.5	13.0	54.9
22	147 01.0	42.8	136 38.0	15.5	7 28.5	13.0	54.9
23	162 01.2	41.9	151 12.5	15.6	7 15.5	13.0	54.9
4 00	177 01.3	S 6 40.9	165 47.1	15.6	S 7 02.5	13.0	54.9
01	192 01.4	40.0	180 21.7	15.6	6 49.5	13.0	54.9
02	207 01.5	39.0	194 56.3	15.6	6 36.5	13.1	54.8
03	222 01.7	. . 38.0	209 30.9	15.8	6 23.4	13.1	54.8
04	237 01.8	37.1	224 05.7	15.7	6 10.3	13.1	54.8
05	252 01.9	36.1	238 40.4	15.8	5 57.2	13.1	54.8
06	267 02.1	S 6 35.2	253 15.2	15.8	S 5 44.1	13.1	54.8
07	282 02.2	34.2	267 50.0	15.9	5 31.0	13.2	54.8
08	297 02.3	33.2	282 24.9	15.8	5 17.8	13.1	54.7
09	312 02.5	. . 32.3	296 59.7	16.0	5 04.7	13.2	54.7
10	327 02.6	31.3	311 34.7	15.9	4 51.5	13.2	54.7
11	342 02.7	30.3	326 09.6	16.0	4 38.3	13.2	54.7
12	357 02.9	S 6 29.4	340 44.6	16.1	S 4 25.1	13.2	54.7
13	12 03.0	28.4	355 19.7	16.0	4 11.9	13.2	54.7
14	27 03.2	27.5	9 54.7	16.1	3 58.7	13.2	54.7
15	42 03.3	. . 26.5	24 29.8	16.1	3 45.5	13.2	54.6
16	57 03.4	25.5	39 04.9	16.2	3 32.3	13.2	54.6
17	72 03.6	24.6	53 40.1	16.1	3 19.1	13.3	54.6
18	87 03.7	S 6 23.6	68 15.2	16.2	S 3 05.8	13.2	54.6
19	102 03.8	22.6	82 50.4	16.2	2 52.6	13.3	54.6
20	117 04.0	21.7	97 25.6	16.3	2 39.3	13.2	54.6
21	132 04.1	. . 20.7	112 00.9	16.3	2 26.1	13.3	54.6
22	147 04.2	19.8	126 36.2	16.3	2 12.8	13.2	54.6
23	162 04.4	18.8	141 11.5	16.3	S 1 59.6	13.3	54.5
	SD 16.2	d 1.0	SD 15.1		15.0		14.9

SUNDAY

MONDAY

TUESDAY

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 2	Moonrise 3	Moonrise 4	Moonrise 5
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 02	06 20	07 29	09 33	08 48	08 18	07 51
N 70	05 08	06 18	07 20	09 01	08 32	08 10	07 51
68	05 13	06 17	07 13	08 37	08 19	08 04	07 51
66	05 17	06 16	07 07	08 19	08 08	07 59	07 51
64	05 20	06 14	07 02	08 04	07 59	07 55	07 51
62	05 22	06 13	06 58	07 51	07 52	07 51	07 51
60	05 24	06 12	06 54	07 40	07 45	07 48	07 51
N 58	05 26	06 11	06 51	07 31	07 39	07 45	07 51
56	05 28	06 10	06 48	07 22	07 33	07 43	07 51
54	05 29	06 10	06 45	07 15	07 29	07 40	07 51
52	05 30	06 09	06 43	07 08	07 24	07 38	07 51
50	05 31	06 08	06 40	07 02	07 20	07 36	07 51
45	05 32	06 06	06 35	06 49	07 12	07 32	07 50
N 40	05 33	06 04	06 31	06 38	07 05	07 28	07 50
35	05 33	06 02	06 28	06 29	06 58	07 25	07 50
30	05 33	06 00	06 24	06 21	06 53	07 22	07 50
20	05 31	05 57	06 19	06 06	06 43	07 18	07 50
N 10	05 28	05 52	06 14	05 54	06 35	07 13	07 50
0	05 24	05 48	06 09	05 42	06 27	07 09	07 50
S 10	05 18	05 43	06 04	05 31	06 19	07 05	07 50
20	05 10	05 36	05 58	05 18	06 11	07 01	07 50
30	04 59	05 28	05 52	05 03	06 01	06 56	07 50
35	04 52	05 23	05 48	04 55	05 55	06 53	07 50
40	04 44	05 16	05 44	04 45	05 49	06 50	07 50
45	04 33	05 09	05 39	04 34	05 41	06 46	07 50
S 50	04 19	05 00	05 33	04 20	05 32	06 42	07 50
52	04 13	04 56	05 30	04 14	05 28	06 40	07 50
54	04 05	04 51	05 27	04 07	05 23	06 38	07 50
56	03 57	04 45	05 24	03 59	05 18	06 35	07 50
58	03 47	04 39	05 20	03 50	05 12	06 32	07 50
S 60	03 35	04 32	05 16	03 39	05 06	06 29	07 50

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 2	Moonset 3	Moonset 4	Moonset 5
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 57	18 08	19 25	14 36	16 53	18 51	20 44
N 70	17 06	18 08	19 19	15 06	17 06	18 55	20 40
68	17 13	18 09	19 14	15 28	17 18	18 59	20 37
66	17 18	18 10	19 10	15 45	17 27	19 02	20 34
64	17 23	18 11	19 06	15 59	17 34	19 04	20 32
62	17 28	18 12	19 04	16 11	17 41	19 06	20 30
60	17 31	18 13	19 01	16 21	17 46	19 08	20 29
N 58	17 35	18 14	18 59	16 29	17 51	19 10	20 27
56	17 37	18 15	18 58	16 37	17 55	19 11	20 26
54	17 40	18 16	18 56	16 44	17 59	19 13	20 25
52	17 42	18 16	18 55	16 50	18 03	19 14	20 24
50	17 45	18 17	18 54	16 55	18 06	19 15	20 23
45	17 49	18 19	18 53	17 07	18 13	19 17	20 20
N 40	17 53	18 21	18 52	17 16	18 19	19 19	20 19
35	17 57	18 22	18 52	17 24	18 23	19 21	20 17
30	18 00	18 24	18 52	17 31	18 28	19 22	20 16
20	18 06	18 28	18 53	17 44	18 35	19 25	20 13
N 10	18 11	18 32	18 56	17 54	18 42	19 27	20 11
0	18 15	18 36	19 00	18 04	18 48	19 29	20 09
S 10	18 20	18 41	19 06	18 14	18 54	19 31	20 08
20	18 25	18 48	19 14	18 24	19 00	19 33	20 05
30	18 32	18 56	19 24	18 36	19 07	19 36	20 03
35	18 35	19 01	19 31	18 43	19 11	19 37	20 02
40	18 39	19 07	19 39	18 51	19 16	19 38	20 00
45	18 44	19 14	19 50	19 00	19 21	19 40	19 59
S 50	18 50	19 23	20 03	19 10	19 27	19 42	19 56
52	18 52	19 27	20 10	19 15	19 30	19 43	19 55
54	18 55	19 32	20 17	19 21	19 33	19 44	19 54
56	18 59	19 37	20 25	19 27	19 37	19 45	19 53
58	19 02	19 43	20 35	19 33	19 41	19 47	19 52
S 60	19 06	19 50	20 46	19 41	19 45	19 48	19 51

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
2	12 20	12 04	12 12	11 53	24 16	29	1
3	12 08	12 04	12 12	12 37	00 16	00	0
4	11 55	11 49	12 12	13 19	00 59	01	2

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2003 MARCH 5, 6, 7 (WED., THURS., FRI.)

UT	ARIES	VENUS −4.1		MARS +0.9		JUPITER −2.5		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
5 00	162 19.8	217 17.9	S18 49.0	252 15.0	S23 31.3	30 10.1	N18 44.4	80 42.4	N22 08.0
01	177 22.2	232 17.3	48.5	267 15.8	31.3	45 12.8	44.4	95 44.8	08.0
02	192 24.7	247 16.7	48.0	282 16.5	31.4	60 15.5	44.5	110 47.2	08.0
03	207 27.2	262 16.1	. . 47.5	297 17.2	. . 31.4	75 18.2	. . 44.6	125 49.6	. . 08.0
04	222 29.6	277 15.5	47.0	312 17.9	31.5	90 20.9	44.6	140 52.0	08.1
05	237 32.1	292 14.8	46.5	327 18.7	31.5	105 23.6	44.7	155 54.4	08.1
06	252 34.5	307 14.2	S18 45.9	342 19.4	S23 31.5	120 26.3	N18 44.8	170 56.9	N22 08.1
W 07	267 37.0	322 13.6	45.4	357 20.1	31.6	135 29.0	44.8	185 59.3	08.1
E 08	282 39.5	337 13.0	44.9	12 20.9	31.6	150 31.7	44.9	201 01.7	08.1
D 09	297 41.9	352 12.4	. . 44.4	27 21.6	. . 31.7	165 34.4	. . 44.9	216 04.1	. . 08.1
N 10	312 44.4	7 11.8	43.9	42 22.3	31.7	180 37.1	45.0	231 06.5	08.1
E 11	327 46.9	22 11.2	43.3	57 23.0	31.7	195 39.8	45.0	246 08.9	08.1
S 12	342 49.3	37 10.6	S18 42.8	72 23.8	S23 31.8	210 42.5	N18 45.1	261 11.3	N22 08.1
D 13	357 51.8	52 10.0	42.3	87 24.5	31.8	225 45.1	45.2	276 13.7	08.2
A 14	12 54.3	67 09.4	41.8	102 25.2	31.9	240 47.8	45.2	291 16.1	08.2
Y 15	27 56.7	82 08.8	. . 41.2	117 25.9	. . 31.9	255 50.5	. . 45.3	306 18.5	. . 08.2
16	42 59.2	97 08.2	40.7	132 26.7	31.9	270 53.2	45.3	321 20.9	08.2
17	58 01.7	112 07.6	40.2	147 27.4	32.0	285 55.9	45.4	336 23.3	08.2
18	73 04.1	127 07.0	S18 39.7	162 28.1	S23 32.0	300 58.6	N18 45.5	351 25.7	N22 08.2
19	88 06.6	142 06.4	39.1	177 28.8	32.0	316 01.3	45.5	6 28.2	08.2
20	103 09.0	157 05.7	38.6	192 29.6	32.1	331 04.0	45.6	21 30.6	08.2
21	118 11.5	172 05.1	. . 38.1	207 30.3	. . 32.1	346 06.7	. . 45.6	36 33.0	. . 08.3
22	133 14.0	187 04.5	37.5	222 31.0	32.2	1 09.4	45.7	51 35.4	08.3
23	148 16.4	202 03.9	37.0	237 31.7	32.2	16 12.0	45.8	66 37.8	08.3
6 00	163 18.9	217 03.3	S18 36.5	252 32.5	S23 32.2	31 14.7	N18 45.8	81 40.2	N22 08.3
01	178 21.4	232 02.7	35.9	267 33.2	32.3	46 17.4	45.9	96 42.6	08.3
02	193 23.8	247 02.1	35.4	282 33.9	32.3	61 20.1	45.9	111 45.0	08.3
03	208 26.3	262 01.5	. . 34.8	297 34.7	. . 32.3	76 22.8	. . 46.0	126 47.4	. . 08.3
04	223 28.8	277 00.9	34.3	312 35.4	32.4	91 25.5	46.1	141 49.8	08.3
05	238 31.2	292 00.3	33.8	327 36.1	32.4	106 28.2	46.1	156 52.2	08.3
06	253 33.7	306 59.7	S18 33.2	342 36.8	S23 32.4	121 30.9	N18 46.2	171 54.6	N22 08.4
07	268 36.2	321 59.1	32.7	357 37.6	32.5	136 33.5	46.2	186 57.0	08.4
T 08	283 38.6	336 58.5	32.1	12 38.3	32.5	151 36.2	46.3	201 59.4	08.4
H 09	298 41.1	351 57.9	. . 31.6	27 39.0	. . 32.5	166 38.9	. . 46.3	217 01.8	. . 08.4
U 10	313 43.5	6 57.3	31.1	42 39.7	32.6	181 41.6	46.4	232 04.2	08.4
R 11	328 46.0	21 56.7	30.5	57 40.5	32.6	196 44.3	46.5	247 06.6	08.4
S 12	343 48.5	36 56.1	S18 30.0	72 41.2	S23 32.6	211 47.0	N18 46.5	262 09.0	N22 08.4
D 13	358 50.9	51 55.5	29.4	87 41.9	32.7	226 49.7	46.6	277 11.4	08.4
A 14	13 53.4	66 54.9	28.9	102 42.7	32.7	241 52.3	46.6	292 13.8	08.5
Y 15	28 55.9	81 54.3	. . 28.3	117 43.4	. . 32.7	256 55.0	. . 46.7	307 16.2	. . 08.5
16	43 58.3	96 53.7	27.8	132 44.1	32.8	271 57.7	46.7	322 18.6	08.5
17	59 00.8	111 53.1	27.2	147 44.8	32.8	287 00.4	46.8	337 21.0	08.5
18	74 03.3	126 52.5	S18 26.7	162 45.6	S23 32.8	302 03.1	N18 46.9	352 23.5	N22 08.5
19	89 05.7	141 51.9	26.1	177 46.3	32.8	317 05.8	46.9	7 25.9	08.5
20	104 08.2	156 51.3	25.6	192 47.0	32.9	332 08.4	47.0	22 28.3	08.5
21	119 10.6	171 50.7	. . 25.0	207 47.7	. . 32.9	347 11.1	. . 47.0	37 30.7	. . 08.5
22	134 13.1	186 50.1	24.4	222 48.5	32.9	2 13.8	47.1	52 33.1	08.6
23	149 15.6	201 49.5	23.9	237 49.2	33.0	17 16.5	47.1	67 35.5	08.6
7 00	164 18.0	216 48.9	S18 23.3	252 49.9	S23 33.0	32 19.2	N18 47.2	82 37.9	N22 08.6
01	179 20.5	231 48.3	22.8	267 50.7	33.0	47 21.8	47.3	97 40.3	08.6
02	194 23.0	246 47.7	22.2	282 51.4	33.0	62 24.5	47.3	112 42.7	08.6
03	209 25.4	261 47.1	. . 21.7	297 52.1	. . 33.1	77 27.2	. . 47.4	127 45.1	. . 08.6
04	224 27.9	276 46.5	21.1	312 52.8	33.1	92 29.9	47.4	142 47.5	08.6
05	239 30.4	291 45.9	20.5	327 53.6	33.1	107 32.6	47.5	157 49.9	08.6
06	254 32.8	306 45.3	S18 20.0	342 54.3	S23 33.2	122 35.3	N18 47.5	172 52.3	N22 08.7
07	269 35.3	321 44.7	19.4	357 55.0	33.2	137 37.9	47.6	187 54.7	08.7
08	284 37.8	336 44.1	18.8	12 55.7	33.2	152 40.6	47.6	202 57.1	08.7
F 09	299 40.2	351 43.5	. . 18.3	27 56.5	. . 33.2	167 43.3	. . 47.7	217 59.5	. . 08.7
R 10	314 42.7	6 42.9	17.7	42 57.2	33.3	182 46.0	47.8	233 01.9	08.7
I 11	329 45.1	21 42.3	17.1	57 57.9	33.3	197 48.6	47.8	248 04.3	08.7
D 12	344 47.6	36 41.7	S18 16.6	72 58.7	S23 33.3	212 51.3	N18 47.9	263 06.6	N22 08.7
A 13	359 50.1	51 41.1	16.0	87 59.4	33.3	227 54.0	47.9	278 09.0	08.7
Y 14	14 52.5	66 40.5	15.4	103 00.1	33.4	242 56.7	48.0	293 11.4	08.7
15	29 55.0	81 39.9	. . 14.9	118 00.8	. . 33.4	257 59.4	. . 48.0	308 13.8	. . 08.8
16	44 57.5	96 39.3	14.3	133 01.6	33.4	273 02.0	48.1	323 16.2	08.8
17	59 59.9	111 38.8	13.7	148 02.3	33.4	288 04.7	48.1	338 18.6	08.8
18	75 02.4	126 38.2	S18 13.1	163 03.0	S23 33.5	303 07.4	N18 48.2	353 21.0	N22 08.8
19	90 04.9	141 37.6	12.6	178 03.8	33.5	318 10.1	48.3	8 23.4	08.8
20	105 07.3	156 37.0	12.0	193 04.5	33.5	333 12.7	48.3	23 25.8	08.8
21	120 09.8	171 36.4	. . 11.4	208 05.2	. . 33.5	348 15.4	. . 48.4	38 28.2	. . 08.8
22	135 12.2	186 35.8	10.8	223 05.9	33.5	3 18.1	48.4	53 30.6	08.8
23	150 14.7	201 35.2	10.3	238 06.7	33.6	18 20.8	48.5	68 33.0	08.9
Mer. Pass.	h m 13 04.6	v −0.6	d 0.5	v 0.7	d 0.0	v 2.7	d 0.1	v 2.4	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.0	S57 13.5
Acrux	173 18.1	S63 06.9
Adhara	255 18.7	S28 58.7
Aldebaran	290 58.7	N16 30.9
Alioth	166 27.1	N55 56.4
Alkaid	153 04.8	N49 17.7
Al Na'ir	27 54.2	S46 56.9
Alnilam	275 54.5	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.7	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.4	N 8 52.3
Ankaa	353 23.9	S42 17.6
Antares	112 36.2	S26 26.3
Arcturus	146 02.9	N19 09.8
Atria	107 45.5	S69 01.8
Avior	234 21.0	S59 31.3
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.6	S52 42.1
Capella	280 46.4	N46 00.3
Deneb	49 37.5	N45 17.2
Denebola	182 41.6	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.8	N28 36.7
Eltanin	90 50.0	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.2	S29 36.6
Gacrux	172 09.7	S57 07.7
Gienah	176 00.4	S17 33.6
Hadar	148 59.2	S60 23.1
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.7	S34 23.0
Kochab	137 18.7	N74 08.3
Markab	13 46.8	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 17.0	S36 23.1
Miaplacidus	221 40.9	S69 43.9
Mirfak	308 52.3	N49 52.5
Nunki	76 08.5	S26 17.6
Peacock	53 32.3	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 14.0	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.8	S 8 12.0
Rigil Kent.	140 02.8	S60 50.7
Sabik	102 21.9	S15 43.8
Schedar	349 50.5	N56 33.2
Shaula	96 33.0	S37 06.3
Sirius	258 40.8	S16 43.3
Spica	158 39.6	S11 10.7
Suhail	222 58.1	S43 26.8
Vega	80 44.6	N38 46.8
Zuben'ubi	137 14.3	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	53 44.4	9 32
Mars	89 13.6	7 09
Jupiter	227 55.8	21 51
Saturn	278 21.3	18 30

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
5 00	177 04.5	S 6 17.8	155 46.8	16.3	S 1 46.3	13.2	54.5
01	192 04.6	16.9	170 22.1	16.4	1 33.1	13.3	54.5
02	207 04.8	15.9	184 57.5	16.3	1 19.8	13.2	54.5
03	222 04.9	. . 14.9	199 32.8	16.4	1 06.6	13.3	54.5
04	237 05.1	14.0	214 08.2	16.4	0 53.3	13.2	54.5
05	252 05.2	13.0	228 43.6	16.5	0 40.1	13.3	54.5
06	267 05.3	S 6 12.0	243 19.1	16.4	S 0 26.8	13.2	54.5
W 07	282 05.5	11.1	257 54.5	16.5	0 13.6	13.2	54.4
E 08	297 05.6	10.1	272 30.0	16.4	S 0 00.4	13.3	54.4
D 09	312 05.8	. . 09.1	287 05.4	16.5	N 0 12.9	13.2	54.4
N 10	327 05.9	08.2	301 40.9	16.5	0 26.1	13.2	54.4
E 11	342 06.0	07.2	316 16.4	16.5	0 39.3	13.2	54.4
S 12	357 06.2	S 6 06.2	330 51.9	16.5	N 0 52.5	13.2	54.4
D 13	12 06.3	05.3	345 27.4	16.5	1 05.7	13.2	54.4
A 14	27 06.4	04.3	0 02.9	16.6	1 18.9	13.2	54.4
Y 15	42 06.6	. . 03.3	14 38.5	16.5	1 32.1	13.1	54.4
16	57 06.7	02.4	29 14.0	16.5	1 45.2	13.2	54.4
17	72 06.9	01.4	43 49.5	16.6	1 58.4	13.1	54.3
18	87 07.0	S 6 00.4	58 25.1	16.5	N 2 11.5	13.1	54.3
19	102 07.1	5 59.5	73 00.6	16.6	2 24.6	13.1	54.3
20	117 07.3	58.5	87 36.2	16.6	2 37.7	13.1	54.3
21	132 07.4	. . 57.5	102 11.8	16.5	2 50.8	13.1	54.3
22	147 07.6	56.6	116 47.3	16.6	3 03.9	13.1	54.3
23	162 07.7	55.6	131 22.9	16.5	3 17.0	13.0	54.3
6 00	177 07.9	S 5 54.6	145 58.4	16.6	N 3 30.0	13.1	54.3
01	192 08.0	53.7	160 34.0	16.5	3 43.1	13.0	54.3
02	207 08.1	52.7	175 09.5	16.6	3 56.1	13.0	54.3
03	222 08.3	. . 51.7	189 45.1	16.5	4 09.1	12.9	54.2
04	237 08.4	50.8	204 20.6	16.6	4 22.0	13.0	54.2
05	252 08.6	49.8	218 56.2	16.5	4 35.0	12.9	54.2
06	267 08.7	S 5 48.8	233 31.7	16.5	N 4 47.9	12.9	54.2
T 07	282 08.8	47.9	248 07.2	16.6	5 00.8	12.9	54.2
H 08	297 09.0	46.9	262 42.8	16.5	5 13.7	12.9	54.2
U 09	312 09.1	. . 45.9	277 18.3	16.5	5 26.6	12.8	54.2
R 10	327 09.3	45.0	291 53.8	16.5	5 39.4	12.8	54.2
S 11	342 09.4	44.0	306 29.3	16.4	5 52.2	12.8	54.2
D 12	357 09.6	S 5 43.0	321 04.7	16.5	N 6 05.0	12.8	54.2
A 13	12 09.7	42.1	335 40.2	16.4	6 17.8	12.7	54.2
Y 14	27 09.9	41.1	350 15.6	16.5	6 30.5	12.7	54.2
15	42 10.0	. . 40.1	4 51.1	16.4	6 43.2	12.7	54.2
16	57 10.1	39.1	19 26.5	16.4	6 55.9	12.7	54.2
17	72 10.3	38.2	34 01.9	16.4	7 08.6	12.6	54.2
18	87 10.4	S 5 37.2	48 37.3	16.4	N 7 21.2	12.6	54.1
19	102 10.6	36.2	63 12.7	16.3	7 33.8	12.5	54.1
20	117 10.7	35.3	77 48.0	16.4	7 46.3	12.6	54.1
21	132 10.9	. . 34.3	92 23.4	16.3	7 58.9	12.5	54.1
22	147 11.0	33.3	106 58.7	16.3	8 11.4	12.4	54.1
23	162 11.2	32.4	121 34.0	16.2	8 23.8	12.5	54.1
7 00	177 11.3	S 5 31.4	136 09.2	16.3	N 8 36.3	12.4	54.1
01	192 11.4	30.4	150 44.5	16.2	8 48.7	12.3	54.1
02	207 11.6	29.4	165 19.7	16.2	9 01.0	12.3	54.1
03	222 11.7	. . 28.5	179 54.9	16.2	9 13.3	12.3	54.1
04	237 11.9	27.5	194 30.1	16.1	9 25.6	12.3	54.1
05	252 12.0	26.5	209 05.2	16.1	9 37.9	12.2	54.1
06	267 12.2	S 5 25.6	223 40.3	16.1	N 9 50.1	12.2	54.1
07	282 12.3	24.6	238 15.4	16.1	10 02.3	12.1	54.1
F 08	297 12.5	23.6	252 50.5	16.0	10 14.4	12.1	54.1
R 09	312 12.6	. . 22.6	267 25.5	16.0	10 26.5	12.1	54.1
I 10	327 12.8	21.7	282 00.5	16.0	10 38.6	12.0	54.1
D 11	342 12.9	20.7	296 35.5	15.9	10 50.6	11.9	54.1
A 12	357 13.1	S 5 19.7	311 10.4	15.9	N11 02.5	12.0	54.1
Y 13	12 13.2	18.8	325 45.3	15.9	11 14.5	11.8	54.1
14	27 13.4	17.8	340 20.2	15.8	11 26.3	11.9	54.1
15	42 13.5	. . 16.8	354 55.0	15.8	11 38.2	11.8	54.1
16	57 13.7	15.8	9 29.8	15.7	11 50.0	11.7	54.1
17	72 13.8	14.9	24 04.5	15.8	12 01.7	11.7	54.1
18	87 14.0	S 5 13.9	38 39.3	15.6	N12 13.4	11.7	54.1
19	102 14.1	12.9	53 13.9	15.7	12 25.1	11.6	54.1
20	117 14.3	11.9	67 48.6	15.6	12 36.7	11.6	54.1
21	132 14.4	. . 11.0	82 23.2	15.5	12 48.3	11.5	54.1
22	147 14.6	10.0	96 57.7	15.6	12 59.8	11.4	54.1
23	162 14.7	09.0	111 32.3	15.4	N13 11.2	11.4	54.1
	SD 16.1	d 1.0	SD 14.8		14.8		14.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 5	Moonrise 6	Moonrise 7	Moonrise 8
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 47	06 05	07 13	07 51	07 26	06 56	06 16
N 70	04 54	06 05	07 06	07 51	07 32	07 12	06 45
68	05 00	06 05	07 00	07 51	07 38	07 24	07 07
66	05 05	06 05	06 56	07 51	07 43	07 34	07 24
64	05 09	06 04	06 52	07 51	07 47	07 43	07 38
62	05 13	06 04	06 48	07 51	07 50	07 50	07 50
60	05 16	06 04	06 45	07 51	07 53	07 56	08 01
N 58	05 18	06 03	06 42	07 51	07 56	08 02	08 10
56	05 20	06 03	06 40	07 51	07 59	08 07	08 17
54	05 22	06 03	06 38	07 51	08 01	08 12	08 24
52	05 23	06 02	06 36	07 51	08 03	08 16	08 31
50	05 24	06 02	06 34	07 51	08 05	08 20	08 37
45	05 27	06 01	06 30	07 50	08 09	08 28	08 49
N 40	05 28	06 00	06 27	07 50	08 12	08 35	08 59
35	05 29	05 58	06 24	07 50	08 15	08 41	09 08
30	05 29	05 57	06 21	07 50	08 18	08 46	09 16
20	05 29	05 54	06 16	07 50	08 22	08 55	09 30
N 10	05 27	05 51	06 12	07 50	08 26	09 03	09 42
0	05 23	05 47	06 08	07 50	08 30	09 11	09 53
S 10	05 18	05 43	06 04	07 50	08 34	09 19	10 04
20	05 11	05 37	05 59	07 50	08 38	09 27	10 16
30	05 02	05 30	05 54	07 50	08 43	09 36	10 30
35	04 55	05 25	05 51	07 50	08 46	09 42	10 39
40	04 47	05 20	05 47	07 50	08 49	09 48	10 48
45	04 38	05 13	05 43	07 50	08 53	09 56	10 59
S 50	04 25	05 05	05 38	07 50	08 57	10 05	11 12
52	04 19	05 01	05 36	07 50	08 59	10 09	11 19
54	04 12	04 57	05 33	07 50	09 02	10 13	11 26
56	04 05	04 52	05 31	07 50	09 04	10 18	11 33
58	03 56	04 47	05 27	07 50	09 07	10 24	11 42
S 60	03 45	04 40	05 24	07 50	09 10	10 30	11 52

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 5	Moonset 6	Moonset 7	Moonset 8
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 12	18 20	19 39	20 44	22 39	24 46	00 46
N 70	17 19	18 20	19 31	20 40	22 26	24 19	00 19
68	17 24	18 20	19 25	20 37	22 16	23 58	25 53
66	17 29	18 20	19 20	20 34	22 07	23 43	25 24
64	17 32	18 20	19 15	20 32	22 00	23 30	25 03
62	17 36	18 20	19 12	20 30	21 54	23 19	24 46
60	17 39	18 20	19 09	20 29	21 48	23 09	24 32
N 58	17 41	18 21	19 06	20 27	21 44	23 01	24 20
56	17 44	18 21	19 04	20 26	21 40	22 54	24 10
54	17 46	18 21	19 02	20 25	21 36	22 48	24 01
52	17 48	18 22	19 01	20 24	21 33	22 42	23 53
50	17 50	18 22	18 59	20 23	21 30	22 37	23 45
45	17 53	18 23	18 57	20 20	21 23	22 26	23 30
N 40	17 57	18 24	18 55	20 19	21 18	22 17	23 17
35	18 00	18 25	18 54	20 17	21 13	22 09	23 06
30	18 02	18 26	18 54	20 16	21 09	22 02	22 57
20	18 07	18 29	18 54	20 13	21 02	21 51	22 41
N 10	18 11	18 32	18 56	20 11	20 56	21 41	22 27
0	18 15	18 35	19 00	20 09	20 50	21 31	22 14
S 10	18 19	18 40	19 04	20 08	20 44	21 21	22 01
20	18 23	18 45	19 11	20 05	20 38	21 11	21 47
30	18 28	18 52	19 21	20 03	20 31	21 00	21 31
35	18 31	18 57	19 27	20 02	20 27	20 53	21 22
40	18 35	19 02	19 34	20 00	20 22	20 46	21 12
45	18 39	19 08	19 44	19 59	20 17	20 37	21 00
S 50	18 43	19 16	19 56	19 56	20 11	20 27	20 45
52	18 46	19 20	20 02	19 55	20 08	20 22	20 38
54	18 48	19 24	20 09	19 54	20 05	20 17	20 30
56	18 51	19 29	20 16	19 53	20 01	20 11	20 22
58	18 54	19 34	20 25	19 52	19 58	20 04	20 12
S 60	18 57	19 41	20 35	19 51	19 53	19 57	20 02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
5			12 12	14 00	01 40	02	6
6			12 11	14 40	02 20	03	11
7			12 11	15 21	03 00	04	17

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2003 MARCH 8, 9, 10 (SAT., SUN., MON.)

UT	ARIES	VENUS −4.1		MARS +0.8		JUPITER −2.5		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
8 00	165 17.2	216 34.6	S18 09.7	253 07.4	S23 33.6	33 23.4	N18 48.5	83 35.4	N22 08.9
01	180 19.6	231 34.0	09.1	268 08.1	33.6	48 26.1	48.6	98 37.8	08.9
02	195 22.1	246 33.4	08.5	283 08.8	33.6	63 28.8	48.6	113 40.2	08.9
03	210 24.6	261 32.8	07.9	298 09.6	33.6	78 31.5	48.7	128 42.6	08.9
04	225 27.0	276 32.2	07.4	313 10.3	33.7	93 34.1	48.8	143 45.0	08.9
05	240 29.5	291 31.6	06.8	328 11.0	33.7	108 36.8	48.8	158 47.4	08.9
06	255 32.0	306 31.0	S18 06.2	343 11.8	S23 33.7	123 39.5	N18 48.9	173 49.8	N22 08.9
07	270 34.4	321 30.5	05.6	358 12.5	33.7	138 42.2	48.9	188 52.2	09.0
S 08	285 36.9	336 29.9	05.0	13 13.2	33.7	153 44.8	49.0	203 54.6	09.0
A 09	300 39.4	351 29.3	04.4	28 13.9	33.8	168 47.5	49.0	218 57.0	09.0
T 10	315 41.8	6 28.7	03.9	43 14.7	33.8	183 50.2	49.1	233 59.4	09.0
U 11	330 44.3	21 28.1	03.3	58 15.4	33.8	198 52.9	49.1	249 01.7	09.0
R 12	345 46.7	36 27.5	S18 02.7	73 16.1	S23 33.8	213 55.5	N18 49.2	264 04.1	N22 09.0
D 13	0 49.2	51 26.9	02.1	88 16.9	33.8	228 58.2	49.2	279 06.5	09.0
A 14	15 51.7	66 26.3	01.5	103 17.6	33.8	244 00.9	49.3	294 08.9	09.0
Y 15	30 54.1	81 25.7	00.9	118 18.3	33.9	259 03.5	49.3	309 11.3	09.1
16	45 56.6	96 25.1	18 00.3	133 19.1	33.9	274 06.2	49.4	324 13.7	09.1
17	60 59.1	111 24.6	17 59.7	148 19.8	33.9	289 08.9	49.4	339 16.1	09.1
18	76 01.5	126 24.0	S17 59.1	163 20.5	S23 33.9	304 11.5	N18 49.5	354 18.5	N22 09.1
19	91 04.0	141 23.4	58.5	178 21.2	33.9	319 14.2	49.6	9 20.9	09.1
20	106 06.5	156 22.8	57.9	193 22.0	33.9	334 16.9	49.6	24 23.3	09.1
21	121 08.9	171 22.2	57.3	208 22.7	34.0	349 19.6	49.7	39 25.7	09.1
22	136 11.4	186 21.6	56.7	223 23.4	34.0	4 22.2	49.7	54 28.1	09.1
23	151 13.9	201 21.0	56.1	238 24.2	34.0	19 24.9	49.8	69 30.5	09.2
9 00	166 16.3	216 20.4	S17 55.5	253 24.9	S23 34.0	34 27.6	N18 49.8	84 32.8	N22 09.2
01	181 18.8	231 19.9	54.9	268 25.6	34.0	49 30.2	49.9	99 35.2	09.2
02	196 21.2	246 19.3	54.3	283 26.3	34.0	64 32.9	49.9	114 37.6	09.2
03	211 23.7	261 18.7	53.7	298 27.1	34.0	79 35.6	50.0	129 40.0	09.2
04	226 26.2	276 18.1	53.1	313 27.8	34.1	94 38.2	50.0	144 42.4	09.2
05	241 28.6	291 17.5	52.5	328 28.5	34.1	109 40.9	50.1	159 44.8	09.2
06	256 31.1	306 16.9	S17 51.9	343 29.3	S23 34.1	124 43.6	N18 50.1	174 47.2	N22 09.2
07	271 33.6	321 16.3	51.3	358 30.0	34.1	139 46.2	50.2	189 49.6	09.3
08	286 36.0	336 15.8	50.7	13 30.7	34.1	154 48.9	50.2	204 52.0	09.3
S 09	301 38.5	351 15.2	50.1	28 31.4	34.1	169 51.6	50.3	219 54.4	09.3
U 10	316 41.0	6 14.6	49.5	43 32.2	34.1	184 54.2	50.3	234 56.7	09.3
N 11	331 43.4	21 14.0	48.9	58 32.9	34.1	199 56.9	50.4	249 59.1	09.3
D 12	346 45.9	36 13.4	S17 48.3	73 33.6	S23 34.1	214 59.6	N18 50.4	265 01.5	N22 09.3
A 13	1 48.3	51 12.8	47.6	88 34.4	34.2	230 02.2	50.5	280 03.9	09.3
Y 14	16 50.8	66 12.3	47.0	103 35.1	34.2	245 04.9	50.5	295 06.3	09.3
15	31 53.3	81 11.7	46.4	118 35.8	34.2	260 07.5	50.6	310 08.7	09.4
16	46 55.7	96 11.1	45.8	133 36.6	34.2	275 10.2	50.6	325 11.1	09.4
17	61 58.2	111 10.5	45.2	148 37.3	34.2	290 12.9	50.7	340 13.5	09.4
18	77 00.7	126 09.9	S17 44.6	163 38.0	S23 34.2	305 15.5	N18 50.8	355 15.8	N22 09.4
19	92 03.1	141 09.3	44.0	178 38.7	34.2	320 18.2	50.8	10 18.2	09.4
20	107 05.6	156 08.8	43.3	193 39.5	34.2	335 20.9	50.9	25 20.6	09.4
21	122 08.1	171 08.2	42.7	208 40.2	34.2	350 23.5	50.9	40 23.0	09.4
22	137 10.5	186 07.6	42.1	223 40.9	34.2	5 26.2	51.0	55 25.4	09.5
23	152 13.0	201 07.0	41.5	238 41.7	34.2	20 28.8	51.0	70 27.8	09.5
10 00	167 15.5	216 06.4	S17 40.9	253 42.4	S23 34.3	35 31.5	N18 51.1	85 30.2	N22 09.5
01	182 17.9	231 05.9	40.2	268 43.1	34.3	50 34.2	51.1	100 32.5	09.5
02	197 20.4	246 05.3	39.6	283 43.9	34.3	65 36.8	51.2	115 34.9	09.5
03	212 22.8	261 04.7	39.0	298 44.6	34.3	80 39.5	51.2	130 37.3	09.5
04	227 25.3	276 04.1	38.4	313 45.3	34.3	95 42.2	51.3	145 39.7	09.5
05	242 27.8	291 03.5	37.7	328 46.0	34.3	110 44.8	51.3	160 42.1	09.5
06	257 30.2	306 03.0	S17 37.1	343 46.8	S23 34.3	125 47.5	N18 51.4	175 44.5	N22 09.6
07	272 32.7	321 02.4	36.5	358 47.5	34.3	140 50.1	51.4	190 46.9	09.6
08	287 35.2	336 01.8	35.9	13 48.2	34.3	155 52.8	51.5	205 49.2	09.6
M 09	302 37.6	351 01.2	35.2	28 49.0	34.3	170 55.4	51.5	220 51.6	09.6
O 10	317 40.1	6 00.7	34.6	43 49.7	34.3	185 58.1	51.6	235 54.0	09.6
N 11	332 42.6	21 00.1	34.0	58 50.4	34.3	201 00.8	51.6	250 56.4	09.6
D 12	347 45.0	35 59.5	S17 33.3	73 51.2	S23 34.3	216 03.4	N18 51.7	265 58.8	N22 09.6
A 13	2 47.5	50 58.9	32.7	88 51.9	34.3	231 06.1	51.7	281 01.2	09.6
Y 14	17 50.0	65 58.3	32.1	103 52.6	34.3	246 08.7	51.8	296 03.5	09.7
15	32 52.4	80 57.8	31.4	118 53.4	34.3	261 11.4	51.8	311 05.9	09.7
16	47 54.9	95 57.2	30.8	133 54.1	34.3	276 14.0	51.9	326 08.3	09.7
17	62 57.3	110 56.6	30.2	148 54.8	34.3	291 16.7	51.9	341 10.7	09.7
18	77 59.8	125 56.0	S17 29.5	163 55.5	S23 34.3	306 19.4	N18 52.0	356 13.1	N22 09.7
19	93 02.3	140 55.5	28.9	178 56.3	34.3	321 22.0	52.0	11 15.4	09.7
20	108 04.7	155 54.9	28.2	193 57.0	34.3	336 24.7	52.1	26 17.8	09.7
21	123 07.2	170 54.3	27.6	208 57.7	34.3	351 27.3	52.1	41 20.2	09.7
22	138 09.7	185 53.7	27.0	223 58.5	34.3	6 30.0	52.1	56 22.6	09.8
23	153 12.1	200 53.2	26.3	238 59.2	34.3	21 32.6	52.2	71 25.0	09.8
Mer. Pass.	h m 12 52.8	v −0.6	d 0.6	v 0.7	d 0.0	v 2.7	d 0.1	v 2.4	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.0	S57 13.5
Acrux	173 18.0	S63 06.9
Adhara	255 18.7	S28 58.7
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.4
Alkaid	153 04.7	N49 17.7
Al Na'ir	27 54.2	S46 56.9
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.7	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.3	N 8 52.3
Ankaa	353 23.9	S42 17.6
Antares	112 36.2	S26 26.3
Arcturus	146 02.9	N19 09.8
Atria	107 45.4	S69 01.8
Avior	234 21.0	S59 31.3
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.6	S52 42.1
Capella	280 46.4	N46 00.3
Deneb	49 37.5	N45 17.2
Denebola	182 41.6	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.9	N28 36.7
Eltanin	90 50.0	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.2	S29 36.5
Gacrux	172 09.7	S57 07.7
Gienah	176 00.4	S17 33.6
Hadar	148 59.2	S60 23.1
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.7	S34 23.0
Kochab	137 18.7	N74 08.3
Markab	13 46.8	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 17.0	S36 23.1
Miaplacidus	221 40.9	S69 43.9
Mirfak	308 52.3	N49 52.5
Nunki	76 08.5	S26 17.6
Peacock	53 32.3	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 14.0	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.8	S 8 12.0
Rigil Kent.	140 02.7	S60 50.7
Sabik	102 21.9	S15 43.8
Schedar	349 50.5	N56 33.2
Shaula	96 33.0	S37 06.3
Sirius	258 40.8	S16 43.3
Spica	158 39.6	S11 10.7
Suhail	222 58.1	S43 26.8
Vega	80 44.6	N38 46.8
Zuben'ubi	137 14.3	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	50 04.1	9 35
Mars	87 08.6	7 06
Jupiter	228 11.2	21 38
Saturn	278 16.5	18 19

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
8 00	177 14.9	S 5 08.1	126 06.7	15.5	N13 22.6	11.4	54.1
01	192 15.0	07.1	140 41.2	15.3	13 34.0	11.3	54.1
02	207 15.2	06.1	155 15.5	15.4	13 45.3	11.3	54.1
03	222 15.3	. . 05.1	169 49.9	15.3	13 56.6	11.2	54.1
04	237 15.5	04.2	184 24.2	15.2	14 07.8	11.1	54.1
05	252 15.6	03.2	198 58.4	15.2	14 18.9	11.1	54.1
06	267 15.8	S 5 02.2	213 32.6	15.2	N14 30.0	11.0	54.1
07	282 15.9	01.2	228 06.8	15.1	14 41.0	11.0	54.1
S 08	297 16.1	5 00.3	242 40.9	15.0	14 52.0	10.9	54.1
A 09	312 16.2	4 59.3	257 14.9	15.0	15 02.9	10.9	54.1
T 10	327 16.4	58.3	271 48.9	15.0	15 13.8	10.8	54.1
U 11	342 16.5	57.3	286 22.9	14.9	15 24.6	10.8	54.1
R 12	357 16.7	S 4 56.4	300 56.8	14.8	N15 35.4	10.6	54.1
D 13	12 16.8	55.4	315 30.6	14.8	15 46.0	10.7	54.1
A 14	27 17.0	54.4	330 04.4	14.8	15 56.7	10.5	54.1
Y 15	42 17.1	. . 53.4	344 38.2	14.7	16 07.2	10.5	54.2
16	57 17.3	52.5	359 11.9	14.6	16 17.7	10.5	54.2
17	72 17.4	51.5	13 45.5	14.6	16 28.2	10.3	54.2
18	87 17.6	S 4 50.5	28 19.1	14.5	N16 38.5	10.3	54.2
19	102 17.7	49.5	42 52.6	14.4	16 48.8	10.3	54.2
20	117 17.9	48.6	57 26.0	14.5	16 59.1	10.2	54.2
21	132 18.0	. . 47.6	71 59.5	14.3	17 09.3	10.1	54.2
22	147 18.2	46.6	86 32.8	14.3	17 19.4	10.0	54.2
23	162 18.4	45.6	101 06.1	14.2	17 29.4	10.0	54.2
9 00	177 18.5	S 4 44.6	115 39.3	14.2	N17 39.4	9.9	54.2
01	192 18.7	43.7	130 12.5	14.1	17 49.3	9.8	54.2
02	207 18.8	42.7	144 45.6	14.0	17 59.1	9.8	54.2
03	222 19.0	. . 41.7	159 18.6	14.0	18 08.9	9.7	54.2
04	237 19.1	40.7	173 51.6	13.9	18 18.6	9.6	54.3
05	252 19.3	39.8	188 24.5	13.8	18 28.2	9.5	54.3
06	267 19.4	S 4 38.8	202 57.3	13.8	N18 37.7	9.5	54.3
07	282 19.6	37.8	217 30.1	13.8	18 47.2	9.4	54.3
08	297 19.7	36.8	232 02.9	13.6	18 56.6	9.3	54.3
S 09	312 19.9	. . 35.9	246 35.5	13.6	19 05.9	9.3	54.3
U 10	327 20.1	34.9	261 08.1	13.5	19 15.2	9.1	54.3
N 11	342 20.2	33.9	275 40.6	13.5	19 24.3	9.1	54.3
D 12	357 20.4	S 4 32.9	290 13.1	13.4	N19 33.4	9.0	54.3
A 13	12 20.5	31.9	304 45.5	13.3	19 42.4	8.9	54.3
Y 14	27 20.7	31.0	319 17.8	13.2	19 51.3	8.9	54.4
15	42 20.8	. . 30.0	333 50.0	13.2	20 00.2	8.8	54.4
16	57 21.0	29.0	348 22.2	13.1	20 09.0	8.6	54.4
17	72 21.2	28.0	2 54.3	13.1	20 17.6	8.6	54.4
18	87 21.3	S 4 27.1	17 26.4	13.0	N20 26.2	8.5	54.4
19	102 21.5	26.1	31 58.4	12.9	20 34.7	8.5	54.4
20	117 21.6	25.1	46 30.3	12.8	20 43.2	8.3	54.4
21	132 21.8	. . 24.1	61 02.1	12.8	20 51.5	8.3	54.5
22	147 21.9	23.1	75 33.9	12.7	20 59.8	8.1	54.5
23	162 22.1	22.2	90 05.6	12.6	21 07.9	8.1	54.5
10 00	177 22.3	S 4 21.2	104 37.2	12.5	N21 16.0	8.0	54.5
01	192 22.4	20.2	119 08.7	12.5	21 24.0	7.9	54.5
02	207 22.6	19.2	133 40.2	12.4	21 31.9	7.8	54.5
03	222 22.7	. . 18.3	148 11.6	12.4	21 39.7	7.7	54.5
04	237 22.9	17.3	162 43.0	12.2	21 47.4	7.7	54.6
05	252 23.1	16.3	177 14.2	12.2	21 55.1	7.5	54.6
06	267 23.2	S 4 15.3	191 45.4	12.1	N22 02.6	7.4	54.6
07	282 23.4	14.3	206 16.5	12.0	22 10.0	7.3	54.6
08	297 23.5	13.4	220 47.5	12.0	22 17.3	7.3	54.6
M 09	312 23.7	. . 12.4	235 18.5	11.9	22 24.6	7.1	54.6
O 10	327 23.8	11.4	249 49.4	11.8	22 31.7	7.1	54.7
N 11	342 24.0	10.4	264 20.2	11.8	22 38.8	6.9	54.7
D 12	357 24.2	S 4 09.4	278 51.0	11.6	N22 45.7	6.9	54.7
A 13	12 24.3	08.5	293 21.6	11.6	22 52.6	6.7	54.7
Y 14	27 24.5	07.5	307 52.2	11.5	22 59.3	6.7	54.7
15	42 24.6	. . 06.5	322 22.7	11.5	23 06.0	6.5	54.8
16	57 24.8	05.5	336 53.2	11.4	23 12.5	6.4	54.8
17	72 25.0	04.5	351 23.6	11.2	23 18.9	6.4	54.8
18	87 25.1	S 4 03.6	5 53.8	11.3	N23 25.3	6.2	54.8
19	102 25.3	02.6	20 24.1	11.1	23 31.5	6.1	54.8
20	117 25.5	01.6	34 54.2	11.1	23 37.6	6.0	54.9
21	132 25.6	4 00.6	49 24.3	11.0	23 43.6	5.9	54.9
22	147 25.8	3 59.6	63 54.3	10.9	23 49.5	5.8	54.9
23	162 25.9	S 3 58.7	78 24.2	10.9	N23 55.3	5.7	54.9
	SD 16.1	d 1.0	SD 14.8		14.8		14.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 8	Moonrise 9	Moonrise 10	Moonrise 11
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 30	05 50	06 57	06 16			
N 70	04 40	05 52	06 52	06 45	06 00		
68	04 48	05 53	06 48	07 07	06 43	05 35	
66	04 54	05 53	06 44	07 24	07 12	06 53	
64	04 59	05 54	06 41	07 38	07 34	07 30	07 25
62	05 03	05 55	06 39	07 50	07 52	07 56	08 07
60	05 07	05 55	06 36	08 01	08 07	08 17	08 35
N 58	05 10	05 55	06 34	08 10	08 20	08 34	08 57
56	05 12	05 55	06 32	08 17	08 31	08 49	09 15
54	05 15	05 55	06 31	08 24	08 40	09 01	09 31
52	05 16	05 56	06 29	08 31	08 49	09 12	09 44
50	05 18	05 56	06 28	08 37	08 57	09 22	09 55
45	05 21	05 55	06 25	08 49	09 13	09 43	10 20
N 40	05 24	05 55	06 22	08 59	09 27	10 00	10 39
35	05 25	05 54	06 20	09 08	09 39	10 14	10 55
30	05 26	05 54	06 18	09 16	09 49	10 26	11 09
20	05 26	05 52	06 14	09 30	10 07	10 48	11 33
N 10	05 25	05 50	06 11	09 42	10 22	11 06	11 54
0	05 23	05 47	06 07	09 53	10 37	11 24	12 14
S 10	05 18	05 43	06 04	10 04	10 52	11 41	12 33
20	05 12	05 38	06 00	10 16	11 07	12 00	12 54
30	05 04	05 32	05 56	10 30	11 26	12 22	13 19
35	04 58	05 28	05 54	10 39	11 36	12 35	13 33
40	04 51	05 23	05 51	10 48	11 49	12 50	13 50
45	04 42	05 18	05 47	10 59	12 03	13 07	14 10
S 50	04 31	05 10	05 43	11 12	12 21	13 29	14 35
52	04 25	05 07	05 41	11 19	12 29	13 40	14 48
54	04 19	05 03	05 39	11 26	12 39	13 52	15 02
56	04 12	04 59	05 37	11 33	12 50	14 06	15 18
58	04 04	04 54	05 34	11 42	13 02	14 22	15 38
S 60	03 55	04 48	05 32	11 52	13 16	14 41	16 02

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 8	Moonset 9	Moonset 10	Moonset 11
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 26	18 34	19 54	00 46			
N 70	17 31	18 32	19 44	00 19	02 35		
68	17 35	18 31	19 36	25 53	01 53	04 36	
66	17 39	18 30	19 30	25 24	01 24	03 19	
64	17 42	18 29	19 24	25 03	01 03	02 43	04 29
62	17 44	18 28	19 20	24 46	00 46	02 17	03 48
60	17 46	18 28	19 16	24 32	00 32	01 56	03 20
N 58	17 48	18 27	19 13	24 20	00 20	01 40	02 58
56	17 50	18 27	19 10	24 10	00 10	01 26	02 40
54	17 52	18 27	19 08	24 01	00 01	01 14	02 26
52	17 53	18 27	19 06	23 53	25 03	01 03	02 13
50	17 55	18 27	19 04	23 45	24 54	00 54	02 01
45	17 57	18 27	19 01	23 30	24 34	00 34	01 38
N 40	18 00	18 27	18 58	23 17	24 18	00 18	01 19
35	18 02	18 27	18 57	23 06	24 04	00 04	01 03
30	18 04	18 28	18 56	22 57	23 53	24 49	00 49
20	18 08	18 30	18 55	22 41	23 33	24 26	00 26
N 10	18 11	18 32	18 56	22 27	23 15	24 06	00 06
0	18 14	18 35	18 59	22 14	22 59	23 48	24 39
S 10	18 17	18 38	19 03	22 01	22 43	23 29	24 19
20	18 21	18 43	19 09	21 47	22 26	23 09	23 57
30	18 25	18 49	19 17	21 31	22 06	22 46	23 32
35	18 27	18 53	19 23	21 22	21 55	22 33	23 17
40	18 30	18 57	19 29	21 12	21 42	22 17	23 00
45	18 33	19 03	19 38	21 00	21 26	21 59	22 40
S 50	18 37	19 10	19 49	20 45	21 07	21 36	22 14
52	18 39	19 13	19 54	20 38	20 58	21 25	22 02
54	18 41	19 17	20 00	20 30	20 48	21 13	21 47
56	18 43	19 21	20 07	20 22	20 37	20 59	21 31
58	18 45	19 26	20 15	20 12	20 24	20 42	21 11
S 60	18 48	19 31	20 24	20 02	20 09	20 22	20 46

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
8	11 01	10 54	12 11	16 03	03 42	05	25
9	10 48	10 41	12 11	16 48	04 25	06	33
10	10 34	10 27	12 10	17 36	05 11	07	42

2003 MARCH 11, 12, 13 (TUES., WED., THURS.)

UT	ARIES	VENUS −4.1		MARS +0.8		JUPITER −2.4		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
11 00	168 14.6	215 52.6	S17 25.7	253 59.9	S23 34.3	36 35.3	N18 52.2	86 27.4	N22 09.8
01	183 17.1	230 52.0	25.0	269 00.7	34.3	51 37.9	52.3	101 29.7	09.8
02	198 19.5	245 51.4	24.4	284 01.4	34.3	66 40.6	52.3	116 32.1	09.8
03	213 22.0	260 50.9	. . 23.7	299 02.1	. . 34.3	81 43.2	. . 52.4	131 34.5	. . 09.8
04	228 24.4	275 50.3	23.1	314 02.9	34.3	96 45.9	52.4	146 36.9	09.8
05	243 26.9	290 49.7	22.5	329 03.6	34.3	111 48.6	52.5	161 39.3	09.9
06	258 29.4	305 49.2	S17 21.8	344 04.3	S23 34.3	126 51.2	N18 52.5	176 41.6	N22 09.9
07	273 31.8	320 48.6	21.2	359 05.1	34.3	141 53.9	52.6	191 44.0	09.9
T 08	288 34.3	335 48.0	20.5	14 05.8	34.3	156 56.5	52.6	206 46.4	09.9
U 09	303 36.8	350 47.4	. . 19.9	29 06.5	. . 34.3	171 59.2	. . 52.7	221 48.8	. . 09.9
E 10	318 39.2	5 46.9	19.2	44 07.3	34.3	187 01.8	52.7	236 51.2	09.9
S 11	333 41.7	20 46.3	18.6	59 08.0	34.3	202 04.5	52.8	251 53.5	09.9
D 12	348 44.2	35 45.7	S17 17.9	74 08.7	S23 34.3	217 07.1	N18 52.8	266 55.9	N22 09.9
A 13	3 46.6	50 45.2	17.3	89 09.4	34.3	232 09.8	52.9	281 58.3	10.0
Y 14	18 49.1	65 44.6	16.6	104 10.2	34.3	247 12.4	52.9	297 00.7	10.0
15	33 51.6	80 44.0	. . 15.9	119 10.9	. . 34.3	262 15.1	. . 53.0	312 03.0	. . 10.0
16	48 54.0	95 43.5	15.3	134 11.6	34.3	277 17.7	53.0	327 05.4	10.0
17	63 56.5	110 42.9	14.6	149 12.4	34.3	292 20.4	53.1	342 07.8	10.0
18	78 58.9	125 42.3	S17 14.0	164 13.1	S23 34.3	307 23.0	N18 53.1	357 10.2	N22 10.0
19	94 01.4	140 41.7	13.3	179 13.8	34.3	322 25.7	53.2	12 12.6	10.0
20	109 03.9	155 41.2	12.7	194 14.6	34.3	337 28.3	53.2	27 14.9	10.1
21	124 06.3	170 40.6	. . 12.0	209 15.3	. . 34.3	352 31.0	. . 53.2	42 17.3	. . 10.1
22	139 08.8	185 40.0	11.3	224 16.0	34.3	7 33.6	53.3	57 19.7	10.1
23	154 11.3	200 39.5	10.7	239 16.8	34.3	22 36.2	53.3	72 22.1	10.1
12 00	169 13.7	215 38.9	S17 10.0	254 17.5	S23 34.2	37 38.9	N18 53.4	87 24.4	N22 10.1
01	184 16.2	230 38.3	09.3	269 18.2	34.2	52 41.5	53.4	102 26.8	10.1
02	199 18.7	245 37.8	08.7	284 19.0	34.2	67 44.2	53.5	117 29.2	10.1
03	214 21.1	260 37.2	. . 08.0	299 19.7	. . 34.2	82 46.8	. . 53.5	132 31.6	. . 10.1
04	229 23.6	275 36.6	07.3	314 20.4	34.2	97 49.5	53.6	147 33.9	10.2
05	244 26.1	290 36.1	06.7	329 21.2	34.2	112 52.1	53.6	162 36.3	10.2
06	259 28.5	305 35.5	S17 06.0	344 21.9	S23 34.2	127 54.8	N18 53.7	177 38.7	N22 10.2
W 07	274 31.0	320 34.9	05.3	359 22.6	34.2	142 57.4	53.7	192 41.1	10.2
E 08	289 33.4	335 34.4	04.7	14 23.4	34.2	158 00.1	53.8	207 43.4	10.2
D 09	304 35.9	350 33.8	. . 04.0	29 24.1	. . 34.2	173 02.7	. . 53.8	222 45.8	. . 10.2
N 10	319 38.4	5 33.3	03.3	44 24.8	34.2	188 05.3	53.8	237 48.2	10.2
E 11	334 40.8	20 32.7	02.7	59 25.6	34.1	203 08.0	53.9	252 50.6	10.3
S 12	349 43.3	35 32.1	S17 02.0	74 26.3	S23 34.1	218 10.6	N18 53.9	267 52.9	N22 10.3
D 13	4 45.8	50 31.6	01.3	89 27.0	34.1	233 13.3	54.0	282 55.3	10.3
A 14	19 48.2	65 31.0	00.6	104 27.8	34.1	248 15.9	54.0	297 57.7	10.3
Y 15	34 50.7	80 30.4	17 00.0	119 28.5	. . 34.1	263 18.6	. . 54.1	313 00.1	. . 10.3
16	49 53.2	95 29.9	16 59.3	134 29.2	34.1	278 21.2	54.1	328 02.4	10.3
17	64 55.6	110 29.3	58.6	149 30.0	34.1	293 23.8	54.2	343 04.8	10.3
18	79 58.1	125 28.8	S16 57.9	164 30.7	S23 34.1	308 26.5	N18 54.2	358 07.2	N22 10.3
19	95 00.6	140 28.2	57.3	179 31.4	34.1	323 29.1	54.3	13 09.5	10.4
20	110 03.0	155 27.6	56.6	194 32.2	34.0	338 31.8	54.3	28 11.9	10.4
21	125 05.5	170 27.1	. . 55.9	209 32.9	. . 34.0	353 34.4	. . 54.3	43 14.3	. . 10.4
22	140 07.9	185 26.5	55.2	224 33.6	34.0	8 37.1	54.4	58 16.7	10.4
23	155 10.4	200 25.9	54.5	239 34.4	34.0	23 39.7	54.4	73 19.0	10.4
13 00	170 12.9	215 25.4	S16 53.9	254 35.1	S23 34.0	38 42.3	N18 54.5	88 21.4	N22 10.4
01	185 15.3	230 24.8	53.2	269 35.8	34.0	53 45.0	54.5	103 23.8	10.4
02	200 17.8	245 24.3	52.5	284 36.6	34.0	68 47.6	54.6	118 26.1	10.5
03	215 20.3	260 23.7	. . 51.8	299 37.3	. . 33.9	83 50.2	. . 54.6	133 28.5	. . 10.5
04	230 22.7	275 23.2	51.1	314 38.0	33.9	98 52.9	54.7	148 30.9	10.5
05	245 25.2	290 22.6	50.4	329 38.8	33.9	113 55.5	54.7	163 33.3	10.5
06	260 27.7	305 22.0	S16 49.7	344 39.5	S23 33.9	128 58.2	N18 54.7	178 35.6	N22 10.5
07	275 30.1	320 21.5	49.0	359 40.2	33.9	144 00.8	54.8	193 38.0	10.5
T 08	290 32.6	335 20.9	48.4	14 41.0	33.9	159 03.4	54.8	208 40.4	10.5
H 09	305 35.0	350 20.4	. . 47.7	29 41.7	. . 33.8	174 06.1	. . 54.9	223 42.7	. . 10.5
U 10	320 37.5	5 19.8	47.0	44 42.4	33.8	189 08.7	54.9	238 45.1	10.6
R 11	335 40.0	20 19.2	46.3	59 43.2	33.8	204 11.3	55.0	253 47.5	10.6
S 12	350 42.4	35 18.7	S16 45.6	74 43.9	S23 33.8	219 14.0	N18 55.0	268 49.8	N22 10.6
D 13	5 44.9	50 18.1	44.9	89 44.6	33.8	234 16.6	55.0	283 52.2	10.6
A 14	20 47.4	65 17.6	44.2	104 45.4	33.8	249 19.3	55.1	298 54.6	10.6
Y 15	35 49.8	80 17.0	. . 43.5	119 46.1	. . 33.7	264 21.9	. . 55.1	313 56.9	. . 10.6
16	50 52.3	95 16.5	42.8	134 46.8	33.7	279 24.5	55.2	328 59.3	10.6
17	65 54.8	110 15.9	42.1	149 47.6	33.7	294 27.2	55.2	344 01.7	10.7
18	80 57.2	125 15.4	S16 41.4	164 48.3	S23 33.7	309 29.8	N18 55.3	359 04.0	N22 10.7
19	95 59.7	140 14.8	40.7	179 49.1	33.7	324 32.4	55.3	14 06.4	10.7
20	111 02.2	155 14.3	40.0	194 49.8	33.6	339 35.1	55.3	29 08.8	10.7
21	126 04.6	170 13.7	. . 39.3	209 50.5	. . 33.6	354 37.7	. . 55.4	44 11.1	. . 10.7
22	141 07.1	185 13.1	38.6	224 51.3	33.6	9 40.3	55.4	59 13.5	10.7
23	156 09.5	200 12.6	37.9	239 52.0	33.6	24 43.0	55.5	74 15.9	10.7
	h m								
Mer. Pass.	12 41.0	*v* −0.6	*d* 0.7	*v* 0.7	*d* 0.0	*v* 2.6	*d* 0.0	*v* 2.4	*d* 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.0	S57 13.5
Acrux	173 18.0	S63 06.9
Adhara	255 18.8	S28 58.8
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.5
Alkaid	153 04.7	N49 17.7
Al Na'ir	27 54.1	S46 56.9
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.7	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.3	N 8 52.3
Ankaa	353 23.9	S42 17.6
Antares	112 36.2	S26 26.3
Arcturus	146 02.8	N19 09.8
Atria	107 45.3	S69 01.8
Avior	234 21.0	S59 31.3
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.6	S52 42.1
Capella	280 46.5	N46 00.2
Deneb	49 37.4	N45 17.2
Denebola	182 41.5	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.9	N28 36.7
Eltanin	90 50.0	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.2	S29 36.5
Gacrux	172 09.6	S57 07.8
Gienah	176 00.4	S17 33.6
Hadar	148 59.2	S60 23.1
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.6	S34 23.0
Kochab	137 18.6	N74 08.3
Markab	13 46.8	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 16.9	S36 23.1
Miaplacidus	221 40.9	S69 43.9
Mirfak	308 52.3	N49 52.5
Nunki	76 08.5	S26 17.6
Peacock	53 32.2	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 14.0	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.8	S 8 12.0
Rigil Kent.	140 02.7	S60 50.7
Sabik	102 21.8	S15 43.8
Schedar	349 50.5	N56 33.2
Shaula	96 32.9	S37 06.3
Sirius	258 40.8	S16 43.3
Spica	158 39.5	S11 10.7
Suhail	222 58.1	S43 26.8
Vega	80 44.6	N38 46.8
Zuben'ubi	137 14.2	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	46 25.2	9 38
Mars	85 03.8	7 02
Jupiter	228 25.2	21 26
Saturn	278 10.7	18 08

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
11 00	177 26.1	S 3 57.7	92 54.1	10.7	N24 01.0	5.6	54.9
01	192 26.3	56.7	107 23.8	10.7	24 06.6	5.5	55.0
02	207 26.4	55.7	121 53.5	10.7	24 12.1	5.3	55.0
03	222 26.6	. . 54.7	136 23.2	10.5	24 17.4	5.2	55.0
04	237 26.7	53.7	150 52.7	10.5	24 22.6	5.2	55.0
05	252 26.9	52.8	165 22.2	10.4	24 27.8	5.0	55.1
06	267 27.1	S 3 51.8	179 51.6	10.4	N24 32.8	4.9	55.1
07	282 27.2	50.8	194 21.0	10.2	24 37.7	4.7	55.1
08	297 27.4	49.8	208 50.2	10.2	24 42.4	4.7	55.1
09	312 27.6	. . 48.8	223 19.4	10.2	24 47.1	4.5	55.2
10	327 27.7	47.9	237 48.6	10.0	24 51.6	4.5	55.2
11	342 27.9	46.9	252 17.6	10.0	24 56.1	4.3	55.2
12	357 28.1	S 3 45.9	266 46.6	9.9	N25 00.4	4.1	55.2
13	12 28.2	44.9	281 15.5	9.9	25 04.5	4.1	55.3
14	27 28.4	43.9	295 44.4	9.7	25 08.6	3.9	55.3
15	42 28.5	. . 43.0	310 13.1	9.8	25 12.5	3.8	55.3
16	57 28.7	42.0	324 41.9	9.6	25 16.3	3.7	55.3
17	72 28.9	41.0	339 10.5	9.6	25 20.0	3.6	55.4
18	87 29.0	S 3 40.0	353 39.1	9.5	N25 23.6	3.4	55.4
19	102 29.2	39.0	8 07.6	9.4	25 27.0	3.3	55.4
20	117 29.4	38.0	22 36.0	9.4	25 30.3	3.2	55.4
21	132 29.5	. . 37.1	37 04.4	9.3	25 33.5	3.0	55.5
22	147 29.7	36.1	51 32.7	9.3	25 36.5	3.0	55.5
23	162 29.9	35.1	66 01.0	9.2	25 39.5	2.8	55.5
12 00	177 30.0	S 3 34.1	80 29.2	9.1	N25 42.3	2.6	55.6
01	192 30.2	33.1	94 57.3	9.0	25 44.9	2.5	55.6
02	207 30.4	32.1	109 25.3	9.0	25 47.4	2.4	55.6
03	222 30.5	. . 31.2	123 53.3	9.0	25 49.8	2.3	55.6
04	237 30.7	30.2	138 21.3	8.9	25 52.1	2.1	55.7
05	252 30.9	29.2	152 49.2	8.8	25 54.2	2.0	55.7
06	267 31.0	S 3 28.2	167 17.0	8.8	N25 56.2	1.9	55.7
07	282 31.2	27.2	181 44.8	8.7	25 58.1	1.7	55.8
08	297 31.4	26.2	196 12.5	8.6	25 59.8	1.6	55.8
09	312 31.5	. . 25.3	210 40.1	8.6	26 01.4	1.4	55.8
10	327 31.7	24.3	225 07.7	8.6	26 02.8	1.3	55.9
11	342 31.9	23.3	239 35.3	8.4	26 04.1	1.2	55.9
12	357 32.0	S 3 22.3	254 02.7	8.5	N26 05.3	1.0	55.9
13	12 32.2	21.3	268 30.2	8.4	26 06.3	0.9	56.0
14	27 32.4	20.3	282 57.6	8.3	26 07.2	0.8	56.0
15	42 32.5	. . 19.4	297 24.9	8.3	26 08.0	0.6	56.0
16	57 32.7	18.4	311 52.2	8.2	26 08.6	0.4	56.0
17	72 32.9	17.4	326 19.4	8.2	26 09.0	0.4	56.1
18	87 33.0	S 3 16.4	340 46.6	8.2	N26 09.4	0.1	56.1
19	102 33.2	15.4	355 13.8	8.1	26 09.5	0.1	56.1
20	117 33.4	14.4	9 40.9	8.1	26 09.6	0.1	56.2
21	132 33.5	. . 13.5	24 08.0	8.0	26 09.5	0.3	56.2
22	147 33.7	12.5	38 35.0	8.0	26 09.2	0.4	56.2
23	162 33.9	11.5	53 02.0	7.9	26 08.8	0.5	56.3
13 00	177 34.0	S 3 10.5	67 28.9	7.9	N26 08.3	0.7	56.3
01	192 34.2	09.5	81 55.8	7.9	26 07.6	0.9	56.3
02	207 34.4	08.5	96 22.7	7.8	26 06.7	0.9	56.4
03	222 34.5	. . 07.6	110 49.5	7.8	26 05.8	1.2	56.4
04	237 34.7	06.6	125 16.3	7.7	26 04.6	1.3	56.5
05	252 34.9	05.6	139 43.0	7.8	26 03.3	1.4	56.5
06	267 35.0	S 3 04.6	154 09.8	7.7	N26 01.9	1.6	56.5
07	282 35.2	03.6	168 36.5	7.6	26 00.3	1.7	56.6
08	297 35.4	02.6	183 03.1	7.7	25 58.6	1.9	56.6
09	312 35.6	. . 01.6	197 29.8	7.6	25 56.7	2.0	56.6
10	327 35.7	3 00.7	211 56.4	7.5	25 54.7	2.2	56.7
11	342 35.9	2 59.7	226 22.9	7.6	25 52.5	2.3	56.7
12	357 36.1	S 2 58.7	240 49.5	7.5	N25 50.2	2.5	56.7
13	12 36.2	57.7	255 16.0	7.5	25 47.7	2.6	56.8
14	27 36.4	56.7	269 42.5	7.5	25 45.1	2.8	56.8
15	42 36.6	. . 55.7	284 09.0	7.5	25 42.3	2.9	56.8
16	57 36.7	54.8	298 35.5	7.4	25 39.4	3.1	56.9
17	72 36.9	53.8	313 01.9	7.5	25 36.3	3.2	56.9
18	87 37.1	S 2 52.8	327 28.4	7.4	N25 33.1	3.4	57.0
19	102 37.3	51.8	341 54.8	7.4	25 29.7	3.5	57.0
20	117 37.4	50.8	356 21.2	7.4	25 26.2	3.7	57.0
21	132 37.6	. . 49.8	10 47.6	7.3	25 22.5	3.9	57.1
22	147 37.8	48.8	25 13.9	7.4	25 18.6	4.0	57.1
23	162 37.9	47.9	39 40.3	7.4	N25 14.6	4.1	57.1
	SD 16.1	d 1.0	SD 15.0		15.2		15.5

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
11	[illegible]	[illegible]	12 10	18 26	06 01	08	52
12	[illegible]	[illegible]	12 10	19 20	06 53	09	62
13	[illegible]	[illegible]	12 10	20 15	07 47	10	71

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2003 MARCH 14, 15, 16 (FRI., SAT., SUN.)

UT	ARIES	VENUS −4.0		MARS +0.8		JUPITER −2.4		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
14 00	171 12.0	215 12.0	S16 37.2	254 52.7	S23 33.6	39 45.6	N18 55.5	89 18.2	N22 10.8
01	186 14.5	230 11.5	36.5	269 53.5	33.5	54 48.2	55.6	104 20.6	10.8
02	201 16.9	245 10.9	35.8	284 54.2	33.5	69 50.9	55.6	119 23.0	10.8
03	216 19.4	260 10.4	35.1	299 54.9	33.5	84 53.5	55.6	134 25.3	10.8
04	231 21.9	275 09.8	34.4	314 55.7	33.5	99 56.1	55.7	149 27.7	10.8
05	246 24.3	290 09.3	33.7	329 56.4	33.5	114 58.7	55.7	164 30.1	10.8
06	261 26.8	305 08.7	S16 33.0	344 57.1	S23 33.4	130 01.4	N18 55.8	179 32.4	N22 10.8
07	276 29.3	320 08.2	32.3	359 57.9	33.4	145 04.0	55.8	194 34.8	10.8
08	291 31.7	335 07.6	31.6	14 58.6	33.4	160 06.6	55.8	209 37.2	10.9
F 09	306 34.2	350 07.1	30.9	29 59.3	33.4	175 09.3	55.9	224 39.5	10.9
R 10	321 36.7	5 06.5	30.1	45 00.1	33.3	190 11.9	55.9	239 41.9	10.9
I 11	336 39.1	20 06.0	29.4	60 00.8	33.3	205 14.5	56.0	254 44.3	10.9
D 12	351 41.6	35 05.4	S16 28.7	75 01.6	S23 33.3	220 17.2	N18 56.0	269 46.6	N22 10.9
A 13	6 44.0	50 04.9	28.0	90 02.3	33.3	235 19.8	56.1	284 49.0	10.9
Y 14	21 46.5	65 04.3	27.3	105 03.0	33.2	250 22.4	56.1	299 51.4	10.9
15	36 49.0	80 03.8	26.6	120 03.8	33.2	265 25.0	56.1	314 53.7	11.0
16	51 51.4	95 03.2	25.9	135 04.5	33.2	280 27.7	56.2	329 56.1	11.0
17	66 53.9	110 02.7	25.1	150 05.2	33.2	295 30.3	56.2	344 58.4	11.0
18	81 56.4	125 02.1	S16 24.4	165 06.0	S23 33.1	310 32.9	N18 56.3	0 00.8	N22 11.0
19	96 58.8	140 01.6	23.7	180 06.7	33.1	325 35.5	56.3	15 03.2	11.0
20	112 01.3	155 01.0	23.0	195 07.4	33.1	340 38.2	56.3	30 05.5	11.0
21	127 03.8	170 00.5	22.3	210 08.2	33.1	355 40.8	56.4	45 07.9	11.0
22	142 06.2	185 00.0	21.5	225 08.9	33.0	10 43.4	56.4	60 10.3	11.1
23	157 08.7	199 59.4	20.8	240 09.7	33.0	25 46.0	56.5	75 12.6	11.1
15 00	172 11.2	214 58.9	S16 20.1	255 10.4	S23 33.0	40 48.7	N18 56.5	90 15.0	N22 11.1
01	187 13.6	229 58.3	19.4	270 11.1	32.9	55 51.3	56.5	105 17.3	11.1
02	202 16.1	244 57.8	18.7	285 11.9	32.9	70 53.9	56.6	120 19.7	11.1
03	217 18.5	259 57.2	17.9	300 12.6	32.9	85 56.5	56.6	135 22.1	11.1
04	232 21.0	274 56.7	17.2	315 13.3	32.9	100 59.2	56.7	150 24.4	11.1
05	247 23.5	289 56.1	16.5	330 14.1	32.8	116 01.8	56.7	165 26.8	11.2
06	262 25.9	304 55.6	S16 15.8	345 14.8	S23 32.8	131 04.4	N18 56.7	180 29.2	N22 11.2
07	277 28.4	319 55.1	15.0	0 15.5	32.8	146 07.0	56.8	195 31.5	11.2
S 08	292 30.9	334 54.5	14.3	15 16.3	32.7	161 09.7	56.8	210 33.9	11.2
A 09	307 33.3	349 54.0	13.6	30 17.0	32.7	176 12.3	56.9	225 36.2	11.2
T 10	322 35.8	4 53.4	12.8	45 17.8	32.7	191 14.9	56.9	240 38.6	11.2
U 11	337 38.3	19 52.9	12.1	60 18.5	32.6	206 17.5	56.9	255 40.9	11.2
R 12	352 40.7	34 52.3	S16 11.4	75 19.2	S23 32.6	221 20.1	N18 57.0	270 43.3	N22 11.2
D 13	7 43.2	49 51.8	10.6	90 20.0	32.6	236 22.8	57.0	285 45.7	11.3
A 14	22 45.6	64 51.3	09.9	105 20.7	32.6	251 25.4	57.1	300 48.0	11.3
Y 15	37 48.1	79 50.7	09.2	120 21.4	32.5	266 28.0	57.1	315 50.4	11.3
16	52 50.6	94 50.2	08.4	135 22.2	32.5	281 30.6	57.1	330 52.7	11.3
17	67 53.0	109 49.6	07.7	150 22.9	32.5	296 33.2	57.2	345 55.1	11.3
18	82 55.5	124 49.1	S16 07.0	165 23.7	S23 32.4	311 35.9	N18 57.2	0 57.5	N22 11.3
19	97 58.0	139 48.6	06.2	180 24.4	32.4	326 38.5	57.3	15 59.8	11.3
20	113 00.4	154 48.0	05.5	195 25.1	32.4	341 41.1	57.3	31 02.2	11.4
21	128 02.9	169 47.5	04.8	210 25.9	32.3	356 43.7	57.3	46 04.5	11.4
22	143 05.4	184 46.9	04.0	225 26.6	32.3	11 46.3	57.4	61 06.9	11.4
23	158 07.8	199 46.4	03.3	240 27.3	32.3	26 49.0	57.4	76 09.2	11.4
16 00	173 10.3	214 45.9	S16 02.5	255 28.1	S23 32.2	41 51.6	N18 57.4	91 11.6	N22 11.4
01	188 12.8	229 45.3	01.8	270 28.8	32.2	56 54.2	57.5	106 14.0	11.4
02	203 15.2	244 44.8	01.0	285 29.6	32.1	71 56.8	57.5	121 16.3	11.4
03	218 17.7	259 44.2	16 00.3	300 30.3	32.1	86 59.4	57.6	136 18.7	11.5
04	233 20.1	274 43.7	15 59.6	315 31.0	32.1	102 02.0	57.6	151 21.0	11.5
05	248 22.6	289 43.2	58.8	330 31.8	32.0	117 04.7	57.6	166 23.4	11.5
06	263 25.1	304 42.6	S15 58.1	345 32.5	S23 32.0	132 07.3	N18 57.7	181 25.7	N22 11.5
07	278 27.5	319 42.1	57.3	0 33.2	32.0	147 09.9	57.7	196 28.1	11.5
08	293 30.0	334 41.6	56.6	15 34.0	31.9	162 12.5	57.7	211 30.5	11.5
S 09	308 32.5	349 41.0	55.8	30 34.7	31.9	177 15.1	57.8	226 32.8	11.5
U 10	323 34.9	4 40.5	55.1	45 35.5	31.9	192 17.7	57.8	241 35.2	11.6
N 11	338 37.4	19 40.0	54.3	60 36.2	31.8	207 20.3	57.9	256 37.5	11.6
D 12	353 39.9	34 39.4	S15 53.6	75 36.9	S23 31.8	222 23.0	N18 57.9	271 39.9	N22 11.6
A 13	8 42.3	49 38.9	52.8	90 37.7	31.7	237 25.6	57.9	286 42.2	11.6
Y 14	23 44.8	64 38.4	52.1	105 38.4	31.7	252 28.2	58.0	301 44.6	11.6
15	38 47.3	79 37.8	51.3	120 39.2	31.7	267 30.8	58.0	316 46.9	11.6
16	53 49.7	94 37.3	50.6	135 39.9	31.6	282 33.4	58.0	331 49.3	11.6
17	68 52.2	109 36.8	49.8	150 40.6	31.6	297 36.0	58.1	346 51.6	11.7
18	83 54.6	124 36.2	S15 49.0	165 41.4	S23 31.5	312 38.6	N18 58.1	1 54.0	N22 11.7
19	98 57.1	139 35.7	48.3	180 42.1	31.5	327 41.2	58.2	16 56.4	11.7
20	113 59.6	154 35.2	47.5	195 42.9	31.5	342 43.8	58.2	31 58.7	11.7
21	129 02.0	169 34.6	46.8	210 43.6	31.4	357 46.5	58.2	47 01.1	11.7
22	144 04.5	184 34.1	46.0	225 44.3	31.4	12 49.1	58.3	62 03.4	11.7
23	159 07.0	199 33.6	45.3	240 45.1	31.3	27 51.7	58.3	77 05.8	11.7
	h m								
Mer. Pass.	12 29.2	v −0.5	d 0.7	v 0.7	d 0.0	v 2.6	d 0.0	v 2.4	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.1	S57 13.5
Acrux	173 18.0	S63 06.9
Adhara	255 18.8	S28 58.8
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.5
Alkaid	153 04.7	N49 17.7
Al Na'ir	27 54.1	S46 56.9
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.6	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.3	N 8 52.3
Ankaa	353 23.9	S42 17.6
Antares	112 36.1	S26 26.4
Arcturus	146 02.8	N19 09.8
Atria	107 45.3	S69 01.8
Avior	234 21.1	S59 31.3
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.6	S52 42.1
Capella	280 46.5	N46 00.3
Deneb	49 37.4	N45 17.1
Denebola	182 41.5	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.9	N28 36.7
Eltanin	90 49.9	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.1	S29 36.5
Gacrux	172 09.6	S57 07.8
Gienah	176 00.4	S17 33.6
Hadar	148 59.2	S60 23.2
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.6	S34 23.0
Kochab	137 18.6	N74 08.3
Markab	13 46.8	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 16.9	S36 23.1
Miaplacidus	221 41.0	S69 43.9
Mirfak	308 52.3	N49 52.5
Nunki	76 08.4	S26 17.6
Peacock	53 32.2	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 14.0	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.9	S 8 12.0
Rigil Kent.	140 02.7	S60 50.7
Sabik	102 21.8	S15 43.8
Schedar	349 50.6	N56 33.2
Shaula	96 32.9	S37 06.3
Sirius	258 40.8	S16 43.3
Spica	158 39.5	S11 10.7
Suhail	222 58.2	S43 26.8
Vega	80 44.6	N38 46.8
Zuben'ubi	137 14.2	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	42 47.7	9 40
Mars	82 59.2	6 59
Jupiter	228 37.5	21 13
Saturn	278 03.8	17 56

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
14 00	177 38.1	S 2 46.9	54 06.7	7.3	N25 10.5	4.3	57.2
01	192 38.3	45.9	68 33.0	7.3	25 06.2	4.5	57.2
02	207 38.5	44.9	82 59.3	7.4	25 01.7	4.6	57.3
03	222 38.6	. . 43.9	97 25.7	7.3	24 57.1	4.7	57.3
04	237 38.8	42.9	111 52.0	7.3	24 52.4	4.9	57.3
05	252 39.0	41.9	126 18.3	7.3	24 47.5	5.1	57.4
06	267 39.1	S 2 41.0	140 44.6	7.4	N24 42.4	5.2	57.4
07	282 39.3	40.0	155 11.0	7.3	24 37.2	5.3	57.5
08	297 39.5	39.0	169 37.3	7.3	24 31.9	5.6	57.5
F 09	312 39.7	. . 38.0	184 03.6	7.3	24 26.3	5.6	57.5
R 10	327 39.8	37.0	198 29.9	7.3	24 20.7	5.8	57.6
I 11	342 40.0	36.0	212 56.2	7.4	24 14.9	6.0	57.6
D 12	357 40.2	S 2 35.0	227 22.6	7.3	N24 08.9	6.1	57.6
A 13	12 40.4	34.1	241 48.9	7.3	24 02.8	6.3	57.7
Y 14	27 40.5	33.1	256 15.2	7.4	23 56.5	6.4	57.7
15	42 40.7	. . 32.1	270 41.6	7.3	23 50.1	6.6	57.8
16	57 40.9	31.1	285 07.9	7.4	23 43.5	6.7	57.8
17	72 41.1	30.1	299 34.3	7.4	23 36.8	6.9	57.8
18	87 41.2	S 2 29.1	314 00.7	7.4	N23 29.9	7.0	57.9
19	102 41.4	28.1	328 27.1	7.4	23 22.9	7.1	57.9
20	117 41.6	27.2	342 53.5	7.4	23 15.8	7.3	58.0
21	132 41.7	. . 26.2	357 19.9	7.4	23 08.5	7.5	58.0
22	147 41.9	25.2	11 46.3	7.5	23 01.0	7.6	58.0
23	162 42.1	24.2	26 12.8	7.4	22 53.4	7.8	58.1
15 00	177 42.3	S 2 23.2	40 39.2	7.5	N22 45.6	7.9	58.1
01	192 42.4	22.2	55 05.7	7.5	22 37.7	8.0	58.1
02	207 42.6	21.2	69 32.2	7.6	22 29.7	8.2	58.2
03	222 42.8	. . 20.2	83 58.8	7.5	22 21.5	8.3	58.2
04	237 43.0	19.3	98 25.3	7.6	22 13.2	8.5	58.3
05	252 43.1	18.3	112 51.9	7.5	22 04.7	8.6	58.3
06	267 43.3	S 2 17.3	127 18.4	7.7	N21 56.1	8.8	58.3
S 07	282 43.5	16.3	141 45.1	7.6	21 47.3	8.9	58.4
A 08	297 43.7	15.3	156 11.7	7.6	21 38.4	9.0	58.4
T 09	312 43.8	. . 14.3	170 38.3	7.7	21 29.4	9.2	58.5
U 10	327 44.0	13.3	185 05.0	7.7	21 20.2	9.3	58.5
R 11	342 44.2	12.4	199 31.7	7.8	21 10.9	9.5	58.5
D 12	357 44.4	S 2 11.4	213 58.5	7.7	N21 01.4	9.6	58.6
A 13	12 44.5	10.4	228 25.2	7.8	20 51.8	9.7	58.6
Y 14	27 44.7	09.4	242 52.0	7.8	20 42.1	9.9	58.7
15	42 44.9	. . 08.4	257 18.8	7.9	20 32.2	10.0	58.7
16	57 45.1	07.4	271 45.7	7.8	20 22.2	10.1	58.7
17	72 45.3	06.4	286 12.5	7.9	20 12.1	10.3	58.8
18	87 45.4	S 2 05.4	300 39.4	8.0	N20 01.8	10.4	58.8
19	102 45.6	04.5	315 06.4	7.9	19 51.4	10.5	58.8
20	117 45.8	03.5	329 33.3	8.0	19 40.9	10.7	58.9
21	132 46.0	. . 02.5	344 00.3	8.1	19 30.2	10.8	58.9
22	147 46.1	01.5	358 27.4	8.0	19 19.4	10.9	59.0
23	162 46.3	2 00.5	12 54.4	8.1	19 08.5	11.1	59.0
16 00	177 46.5	S 1 59.5	27 21.5	8.1	N18 57.4	11.1	59.0
01	192 46.7	58.5	41 48.6	8.2	18 46.3	11.4	59.1
02	207 46.8	57.5	56 15.8	8.2	18 34.9	11.4	59.1
03	222 47.0	. . 56.6	70 43.0	8.2	18 23.5	11.5	59.1
04	237 47.2	55.6	85 10.2	8.3	18 12.0	11.7	59.2
05	252 47.4	54.6	99 37.5	8.2	18 00.3	11.8	59.2
06	267 47.6	S 1 53.6	114 04.7	8.4	N17 48.5	11.9	59.2
07	282 47.7	52.6	128 32.1	8.3	17 36.6	12.1	59.3
08	297 47.9	51.6	142 59.4	8.4	17 24.5	12.1	59.3
S 09	312 48.1	. . 50.6	157 26.8	8.4	17 12.4	12.3	59.3
U 10	327 48.3	49.6	171 54.2	8.5	17 00.1	12.4	59.4
N 11	342 48.4	48.7	186 21.7	8.5	16 47.7	12.5	59.4
D 12	357 48.6	S 1 47.7	200 49.2	8.5	N16 35.2	12.6	59.4
A 13	12 48.8	46.7	215 16.7	8.6	16 22.6	12.7	59.5
Y 14	27 49.0	45.7	229 44.3	8.6	16 09.9	12.8	59.5
15	42 49.2	. . 44.7	244 11.9	8.6	15 57.1	13.0	59.6
16	57 49.3	43.7	258 39.5	8.6	15 44.1	13.0	59.6
17	72 49.5	42.7	273 07.1	8.7	15 31.1	13.2	59.6
18	87 49.7	S 1 41.7	287 34.8	8.8	N15 17.9	13.3	59.6
19	102 49.9	40.8	302 02.6	8.7	15 04.6	13.3	59.7
20	117 50.0	39.8	316 30.3	8.8	14 51.3	13.5	59.7
21	132 50.2	. . 38.8	330 58.1	8.8	14 37.8	13.6	59.7
22	147 50.4	37.8	345 25.9	8.9	14 24.2	13.6	59.8
23	162 50.6	36.8	359 53.8	8.9	N14 10.6	13.8	59.8
	SD 16.1	d 1.0	SD 15.7		16.0		16.2

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
14	09 28	09 28	12 09	21 11	08 43	11	80
15	09 11	09 03	12 09	22 06	09 39	12	88
16	08 54	08 46	12 09	23 00	10 34	13	95

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UT	ARIES	VENUS −4.0		MARS +0.7		JUPITER −2.4		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
17 00	174 09.4	214 33.0	S15 44.5	255 45.8	S23 31.3	42 54.3	N18 58.3	92 08.1	N22 11.8
01	189 11.9	229 32.5	43.7	270 46.6	31.3	57 56.9	58.4	107 10.5	11.8
02	204 14.4	244 32.0	43.0	285 47.3	31.2	72 59.5	58.4	122 12.8	11.8
03	219 16.8	259 31.4 . .	42.2	300 48.0 . .	31.2	88 02.1 . .	58.4	137 15.2 . .	11.8
04	234 19.3	274 30.9	41.5	315 48.8	31.1	103 04.7	58.5	152 17.5	11.8
05	249 21.7	289 30.4	40.7	330 49.5	31.1	118 07.3	58.5	167 19.9	11.8
06	264 24.2	304 29.9	S15 39.9	345 50.3	S23 31.0	133 09.9	N18 58.5	182 22.2	N22 11.8
07	279 26.7	319 29.3	39.2	0 51.0	31.0	148 12.5	58.6	197 24.6	11.9
08	294 29.1	334 28.8	38.4	15 51.7	31.0	163 15.2	58.6	212 26.9	11.9
M 09	309 31.6	349 28.3 . .	37.6	30 52.5 . .	30.9	178 17.8 . .	58.7	227 29.3 . .	11.9
O 10	324 34.1	4 27.8	36.9	45 53.2	30.9	193 20.4	58.7	242 31.6	11.9
N 11	339 36.5	19 27.2	36.1	60 54.0	30.8	208 23.0	58.7	257 34.0	11.9
D 12	354 39.0	34 26.7	S15 35.3	75 54.7	S23 30.8	223 25.6	N18 58.8	272 36.3	N22 11.9
A 13	9 41.5	49 26.2	34.5	90 55.4	30.7	238 28.2	58.8	287 38.7	11.9
Y 14	24 43.9	64 25.6	33.8	105 56.2	30.7	253 30.8	58.8	302 41.0	12.0
15	39 46.4	79 25.1 . .	33.0	120 56.9 . .	30.6	268 33.4 . .	58.9	317 43.4 . .	12.0
16	54 48.9	94 24.6	32.2	135 57.7	30.6	283 36.0	58.9	332 45.7	12.0
17	69 51.3	109 24.1	31.5	150 58.4	30.5	298 38.6	58.9	347 48.1	12.0
18	84 53.8	124 23.5	S15 30.7	165 59.1	S23 30.5	313 41.2	N18 59.0	2 50.4	N22 12.0
19	99 56.2	139 23.0	29.9	180 59.9	30.5	328 43.8	59.0	17 52.8	12.0
20	114 58.7	154 22.5	29.1	196 00.6	30.4	343 46.4	59.0	32 55.1	12.0
21	130 01.2	169 22.0 . .	28.4	211 01.4 . .	30.4	358 49.0 . .	59.1	47 57.5 . .	12.1
22	145 03.6	184 21.4	27.6	226 02.1	30.3	13 51.6	59.1	62 59.8	12.1
23	160 06.1	199 20.9	26.8	241 02.8	30.3	28 54.2	59.1	78 02.2	12.1
18 00	175 08.6	214 20.4	S15 26.0	256 03.6	S23 30.2	43 56.8	N18 59.2	93 04.5	N22 12.1
01	190 11.0	229 19.9	25.2	271 04.3	30.2	58 59.4	59.2	108 06.9	12.1
02	205 13.5	244 19.4	24.5	286 05.1	30.1	74 02.0	59.2	123 09.2	12.1
03	220 16.0	259 18.8 . .	23.7	301 05.8 . .	30.1	89 04.6 . .	59.3	138 11.6 . .	12.1
04	235 18.4	274 18.3	22.9	316 06.5	30.0	104 07.2	59.3	153 13.9	12.2
05	250 20.9	289 17.8	22.1	331 07.3	30.0	119 09.8	59.3	168 16.2	12.2
06	265 23.3	304 17.3	S15 21.3	346 08.0	S23 29.9	134 12.4	N18 59.4	183 18.6	N22 12.2
07	280 25.8	319 16.7	20.6	1 08.8	29.9	149 15.0	59.4	198 20.9	12.2
T 08	295 28.3	334 16.2	19.8	16 09.5	29.8	164 17.6	59.4	213 23.3	12.2
U 09	310 30.7	349 15.7 . .	19.0	31 10.3 . .	29.8	179 20.2 . .	59.5	228 25.6 . .	12.2
E 10	325 33.2	4 15.2	18.2	46 11.0	29.7	194 22.8	59.5	243 28.0	12.2
S 11	340 35.7	19 14.7	17.4	61 11.7	29.7	209 25.4	59.5	258 30.3	12.3
D 12	355 38.1	34 14.1	S15 16.6	76 12.5	S23 29.6	224 28.0	N18 59.6	273 32.7	N22 12.3
A 13	10 40.6	49 13.6	15.8	91 13.2	29.6	239 30.6	59.6	288 35.0	12.3
Y 14	25 43.1	64 13.1	15.0	106 14.0	29.5	254 33.2	59.6	303 37.4	12.3
15	40 45.5	79 12.6 . .	14.3	121 14.7 . .	29.5	269 35.8 . .	59.7	318 39.7 . .	12.3
16	55 48.0	94 12.1	13.5	136 15.5	29.4	284 38.4	59.7	333 42.0	12.3
17	70 50.5	109 11.6	12.7	151 16.2	29.3	299 41.0	59.7	348 44.4	12.3
18	85 52.9	124 11.0	S15 11.9	166 16.9	S23 29.3	314 43.6	N18 59.8	3 46.7	N22 12.4
19	100 55.4	139 10.5	11.1	181 17.7	29.2	329 46.2	59.8	18 49.1	12.4
20	115 57.8	154 10.0	10.3	196 18.4	29.2	344 48.8	59.8	33 51.4	12.4
21	131 00.3	169 09.5 . .	09.5	211 19.2 . .	29.1	359 51.4 . .	59.9	48 53.8 . .	12.4
22	146 02.8	184 09.0	08.7	226 19.9	29.1	14 54.0	59.9	63 56.1	12.4
23	161 05.2	199 08.5	07.9	241 20.6	29.0	29 56.6	18 59.9	78 58.5	12.4
19 00	176 07.7	214 07.9	S15 07.1	256 21.4	S23 29.0	44 59.2	N19 00.0	94 00.8	N22 12.4
01	191 10.2	229 07.4	06.3	271 22.1	28.9	60 01.8	00.0	109 03.1	12.5
02	206 12.6	244 06.9	05.5	286 22.9	28.9	75 04.4	00.0	124 05.5	12.5
03	221 15.1	259 06.4 . .	04.7	301 23.6 . .	28.8	90 07.0 . .	00.1	139 07.8 . .	12.5
04	236 17.6	274 05.9	03.9	316 24.4	28.7	105 09.6	00.1	154 10.2	12.5
05	251 20.0	289 05.4	03.1	331 25.1	28.7	120 12.1	00.1	169 12.5	12.5
06	266 22.5	304 04.9	S15 02.3	346 25.8	S23 28.6	135 14.7	N19 00.2	184 14.9	N22 12.5
W 07	281 24.9	319 04.3	01.5	1 26.6	28.6	150 17.3	00.2	199 17.2	12.6
E 08	296 27.4	334 03.8	15 00.7	16 27.3	28.5	165 19.9	00.2	214 19.5	12.6
D 09	311 29.9	349 03.3	14 59.9	31 28.1 . .	28.5	180 22.5 . .	00.2	229 21.9 . .	12.6
N 10	326 32.3	4 02.8	59.1	46 28.8	28.4	195 25.1	00.3	244 24.2	12.6
E 11	341 34.8	19 02.3	58.3	61 29.6	28.3	210 27.7	00.3	259 26.6	12.6
S 12	356 37.3	34 01.8	S14 57.5	76 30.3	S23 28.3	225 30.3	N19 00.3	274 28.9	N22 12.6
D 13	11 39.7	49 01.3	56.7	91 31.1	28.2	240 32.9	00.4	289 31.2	12.6
A 14	26 42.2	64 00.8	55.9	106 31.8	28.2	255 35.5	00.4	304 33.6	12.7
Y 15	41 44.7	79 00.2 . .	55.1	121 32.5 . .	28.1	270 38.1 . .	00.4	319 35.9 . .	12.7
16	56 47.1	93 59.7	54.3	136 33.3	28.0	285 40.6	00.5	334 38.3	12.7
17	71 49.6	108 59.2	53.5	151 34.0	28.0	300 43.2	00.5	349 40.6	12.7
18	86 52.1	123 58.7	S14 52.6	166 34.8	S23 27.9	315 45.8	N19 00.5	4 42.9	N22 12.7
19	101 54.5	138 58.2	51.8	181 35.5	27.9	330 48.4	00.6	19 45.3	12.7
20	116 57.0	153 57.7	51.0	196 36.3	27.8	345 51.0	00.6	34 47.6	12.7
21	131 59.4	168 57.2 . .	50.2	211 37.0 . .	27.7	0 53.6 . .	00.6	49 50.0 . .	12.8
22	147 01.9	183 56.7	49.4	226 37.8	27.7	15 56.2	00.6	64 52.3	12.8
23	162 04.4	198 56.2	48.6	241 38.5	27.6	30 58.8	00.7	79 54.6	12.8
	h m								
Mer. Pass.	12 17.4	v −0.5	d 0.8	v 0.7	d 0.1	v 2.6	d 0.0	v 2.3	d 0.0

STARS		
Name	SHA	Dec
	° ′	° ′
Acamar	315 24.6	S40 17.8
Achernar	335 33.1	S57 13.5
Acrux	173 18.0	S63 06.9
Adhara	255 18.8	S28 58.8
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.5
Alkaid	153 04.7	N49 17.7
Al Na'ir	27 54.1	S46 56.8
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.6	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.3	N 8 52.3
Ankaa	353 23.9	S42 17.5
Antares	112 36.1	S26 26.4
Arcturus	146 02.8	N19 09.8
Atria	107 45.2	S69 01.8
Avior	234 21.1	S59 31.4
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.0	N 7 24.4
Canopus	263 59.7	S52 42.1
Capella	280 46.5	N46 00.3
Deneb	49 37.4	N45 17.1
Denebola	182 41.5	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.9	N28 36.7
Eltanin	90 49.9	N51 28.9
Enif	33 55.4	N 9 53.1
Fomalhaut	15 33.1	S29 36.5
Gacrux	172 09.6	S57 07.8
Gienah	176 00.4	S17 33.6
Hadar	148 59.1	S60 23.2
Hamal	328 10.2	N23 28.6
Kaus Aust.	83 54.6	S34 23.0
Kochab	137 18.5	N74 08.3
Markab	13 46.7	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 16.9	S36 23.1
Miaplacidus	221 41.0	S69 43.9
Mirfak	308 52.4	N49 52.5
Nunki	76 08.4	S26 17.6
Peacock	53 32.2	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.0	N 5 13.0
Rasalhague	96 13.9	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.9	S 8 12.0
Rigil Kent.	140 02.6	S60 50.7
Sabik	102 21.8	S15 43.8
Schedar	349 50.6	N56 33.2
Shaula	96 32.9	S37 06.3
Sirius	258 40.8	S16 43.3
Spica	158 39.5	S11 10.7
Suhail	222 58.2	S43 26.8
Vega	80 44.5	N38 46.8
Zuben'ubi	137 14.2	S16 03.3

	SHA	Mer. Pass.
	° ′	h m
Venus	39 11.8	9 43
Mars	80 55.0	6 55
Jupiter	228 48.3	21 01
Saturn	277 55.9	17 45

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
17 00	177 50.8	S 1 35.8	14 21.7	8.9	N13 56.8	13.8	59.8
01	192 50.9	34.8	28 49.6	9.0	13 43.0	14.0	59.9
02	207 51.1	33.8	43 17.6	9.0	13 29.0	14.1	59.9
03	222 51.3	. . 32.9	57 45.6	9.0	13 14.9	14.1	59.9
04	237 51.5	31.9	72 13.6	9.0	13 00.8	14.2	60.0
05	252 51.7	30.9	86 41.6	9.1	12 46.6	14.4	60.0
06	267 51.8	S 1 29.9	101 09.7	9.1	N12 32.2	14.4	60.0
07	282 52.0	28.9	115 37.8	9.2	12 17.8	14.5	60.0
08	297 52.2	27.9	130 06.0	9.1	12 03.3	14.5	60.1
M 09	312 52.4	. . 26.9	144 34.1	9.2	11 48.8	14.7	60.1
O 10	327 52.6	25.9	159 02.3	9.2	11 34.1	14.7	60.1
N 11	342 52.7	25.0	173 30.5	9.3	11 19.4	14.9	60.2
D 12	357 52.9	S 1 24.0	187 58.8	9.3	N11 04.5	14.9	60.2
A 13	12 53.1	23.0	202 27.1	9.3	10 49.6	14.9	60.2
Y 14	27 53.3	22.0	216 55.4	9.3	10 34.7	15.1	60.2
15	42 53.5	. . 21.0	231 23.7	9.4	10 19.6	15.1	60.3
16	57 53.6	20.0	245 52.1	9.3	10 04.5	15.2	60.3
17	72 53.8	19.0	260 20.4	9.4	9 49.3	15.3	60.3
18	87 54.0	S 1 18.0	274 48.8	9.5	N 9 34.0	15.3	60.3
19	102 54.2	17.1	289 17.3	9.4	9 18.7	15.4	60.4
20	117 54.4	16.1	303 45.7	9.5	9 03.3	15.5	60.4
21	132 54.6	. . 15.1	318 14.2	9.5	8 47.8	15.5	60.4
22	147 54.7	14.1	332 42.7	9.5	8 32.3	15.6	60.4
23	162 54.9	13.1	347 11.2	9.5	8 16.7	15.7	60.4
18 00	177 55.1	S 1 12.1	1 39.7	9.6	N 8 01.0	15.7	60.5
01	192 55.3	11.1	16 08.3	9.6	7 45.3	15.7	60.5
02	207 55.5	10.1	30 36.9	9.5	7 29.6	15.9	60.5
03	222 55.6	. . 09.1	45 05.4	9.7	7 13.7	15.8	60.5
04	237 55.8	08.2	59 34.1	9.6	6 57.9	16.0	60.6
05	252 56.0	07.2	74 02.7	9.6	6 41.9	15.9	60.6
06	267 56.2	S 1 06.2	88 31.3	9.7	N 6 26.0	16.0	60.6
07	282 56.4	05.2	103 00.0	9.6	6 10.0	16.1	60.6
T 08	297 56.5	04.2	117 28.6	9.7	5 53.9	16.1	60.6
U 09	312 56.7	. . 03.2	131 57.3	9.7	5 37.8	16.2	60.6
E 10	327 56.9	02.2	146 26.0	9.7	5 21.6	16.2	60.7
S 11	342 57.1	01.2	160 54.7	9.7	5 05.4	16.2	60.7
D 12	357 57.3	S 1 00.3	175 23.4	9.7	N 4 49.2	16.3	60.7
A 13	12 57.5	0 59.3	189 52.1	9.8	4 32.9	16.3	60.7
Y 14	27 57.6	58.3	204 20.9	9.7	4 16.6	16.3	60.7
15	42 57.8	. . 57.3	218 49.6	9.8	4 00.3	16.4	60.7
16	57 58.0	56.3	233 18.4	9.7	3 43.9	16.3	60.8
17	72 58.2	55.3	247 47.1	9.8	3 27.6	16.5	60.8
18	87 58.4	S 0 54.3	262 15.9	9.7	N 3 11.1	16.4	60.8
19	102 58.6	53.3	276 44.6	9.8	2 54.7	16.5	60.8
20	117 58.7	52.4	291 13.4	9.8	2 38.2	16.5	60.8
21	132 58.9	. . 51.4	305 42.2	9.7	2 21.7	16.5	60.8
22	147 59.1	50.4	320 10.9	9.8	2 05.2	16.5	60.8
23	162 59.3	49.4	334 39.7	9.8	1 48.7	16.6	60.8
19 00	177 59.5	S 0 48.4	349 08.5	9.7	N 1 32.1	16.5	60.8
01	192 59.7	47.4	3 37.2	9.8	1 15.6	16.6	60.9
02	207 59.8	46.4	18 06.0	9.8	0 59.0	16.6	60.9
03	223 00.0	. . 45.4	32 34.8	9.7	0 42.4	16.6	60.9
04	238 00.2	44.4	47 03.5	9.8	0 25.8	16.6	60.9
05	253 00.4	43.5	61 32.3	9.7	N 0 09.2	16.6	60.9
06	268 00.6	S 0 42.5	76 01.0	9.8	S 0 07.4	16.6	60.9
W 07	283 00.8	41.5	90 29.8	9.7	0 24.0	16.6	60.9
E 08	298 00.9	40.5	104 58.5	9.7	0 40.6	16.6	60.9
D 09	313 01.1	. . 39.5	119 27.2	9.7	0 57.2	16.6	60.9
N 10	328 01.3	38.5	133 55.9	9.7	1 13.8	16.6	60.9
E 11	343 01.5	37.5	148 24.6	9.7	1 30.4	16.6	60.9
S 12	358 01.7	S 0 36.5	162 53.3	9.7	S 1 47.0	16.6	60.9
D 13	13 01.9	35.6	177 22.0	9.7	2 03.6	16.6	60.9
A 14	28 02.0	34.6	191 50.7	9.6	2 20.2	16.5	60.9
Y 15	43 02.2	. . 33.6	206 19.3	9.6	2 36.7	16.6	60.9
16	58 02.4	32.6	220 47.9	9.6	2 53.3	16.5	60.9
17	73 02.6	31.6	235 16.5	9.6	3 09.8	16.5	60.9
18	88 02.8	S 0 30.6	249 45.1	9.6	S 3 26.3	16.5	60.9
19	103 03.0	29.6	264 13.7	9.6	3 42.8	16.5	60.9
20	118 03.1	28.6	278 42.3	9.5	3 59.3	16.4	60.9
21	133 03.3	. . 27.6	293 10.8	9.5	4 15.7	16.4	60.9
22	148 03.5	26.7	307 39.3	9.5	4 32.1	16.4	60.9
23	163 03.7	25.7	322 07.8	9.5	S 4 48.5	16.4	60.9
	SD 16.1	d 1.0	SD 16.4		16.5		16.6

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
17			12 08	23 53	11 27	14	99
18			12 08	24 45	12 19	15	100
19			12 08	00 45	13 11	16	98

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2003 MARCH 20, 21, 22 (THURS., FRI., SAT.)

UT	ARIES	VENUS −4.0		MARS +0.7		JUPITER −2.4		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
20 00	177 06.8	213 55.7	S14 47.8	256 39.2	S23 27.6	46 01.3	N19 00.7	94 57.0	N22 12.8
01	192 09.3	228 55.2	46.9	271 40.0	27.5	61 03.9	00.7	109 59.3	12.8
02	207 11.8	243 54.6	46.1	286 40.7	27.4	76 06.5	00.8	125 01.6	12.8
03	222 14.2	258 54.1	. . 45.3	301 41.5	. . 27.4	91 09.1	. . 00.8	140 04.0	. . 12.8
04	237 16.7	273 53.6	44.5	316 42.2	27.3	106 11.7	00.8	155 06.3	12.9
05	252 19.2	288 53.1	43.7	331 43.0	27.2	121 14.3	00.8	170 08.7	12.9
06	267 21.6	303 52.6	S14 42.9	346 43.7	S23 27.2	136 16.9	N19 00.9	185 11.0	N22 12.9
07	282 24.1	318 52.1	42.0	1 44.5	27.1	151 19.4	00.9	200 13.3	12.9
T 08	297 26.5	333 51.6	41.2	16 45.2	27.1	166 22.0	00.9	215 15.7	12.9
H 09	312 29.0	348 51.1	. . 40.4	31 45.9	. . 27.0	181 24.6	. . 01.0	230 18.0	. . 12.9
U 10	327 31.5	3 50.6	39.6	46 46.7	26.9	196 27.2	01.0	245 20.3	12.9
R 11	342 33.9	18 50.1	38.8	61 47.4	26.9	211 29.8	01.0	260 22.7	13.0
S 12	357 36.4	33 49.6	S14 37.9	76 48.2	S23 26.8	226 32.4	N19 01.0	275 25.0	N22 13.0
D 13	12 38.9	48 49.1	37.1	91 48.9	26.7	241 34.9	01.1	290 27.4	13.0
A 14	27 41.3	63 48.6	36.3	106 49.7	26.7	256 37.5	01.1	305 29.7	13.0
Y 15	42 43.8	78 48.1	. . 35.5	121 50.4	. . 26.6	271 40.1	. . 01.1	320 32.0	. . 13.0
16	57 46.3	93 47.6	34.6	136 51.2	26.5	286 42.7	01.2	335 34.4	13.0
17	72 48.7	108 47.1	33.8	151 51.9	26.5	301 45.3	01.2	350 36.7	13.0
18	87 51.2	123 46.6	S14 33.0	166 52.7	S23 26.4	316 47.9	N19 01.2	5 39.0	N22 13.1
19	102 53.7	138 46.1	32.2	181 53.4	26.3	331 50.4	01.2	20 41.4	13.1
20	117 56.1	153 45.6	31.3	196 54.2	26.3	346 53.0	01.3	35 43.7	13.1
21	132 58.6	168 45.1	. . 30.5	211 54.9	. . 26.2	1 55.6	. . 01.3	50 46.0	. . 13.1
22	148 01.0	183 44.6	29.7	226 55.6	26.1	16 58.2	01.3	65 48.4	13.1
23	163 03.5	198 44.1	28.8	241 56.4	26.1	32 00.8	01.4	80 50.7	13.1
21 00	178 06.0	213 43.6	S14 28.0	256 57.1	S23 26.0	47 03.3	N19 01.4	95 53.0	N22 13.2
01	193 08.4	228 43.1	27.2	271 57.9	25.9	62 05.9	01.4	110 55.4	13.2
02	208 10.9	243 42.6	26.3	286 58.6	25.8	77 08.5	01.4	125 57.7	13.2
03	223 13.4	258 42.1	. . 25.5	301 59.4	. . 25.8	92 11.1	. . 01.5	141 00.0	. . 13.2
04	238 15.8	273 41.6	24.7	317 00.1	25.7	107 13.6	01.5	156 02.4	13.2
05	253 18.3	288 41.1	23.8	332 00.9	25.6	122 16.2	01.5	171 04.7	13.2
06	268 20.8	303 40.6	S14 23.0	347 01.6	S23 25.6	137 18.8	N19 01.5	186 07.0	N22 13.2
07	283 23.2	318 40.1	22.2	2 02.4	25.5	152 21.4	01.6	201 09.4	13.3
08	298 25.7	333 39.6	21.3	17 03.1	25.4	167 23.9	01.6	216 11.7	13.3
F 09	313 28.2	348 39.1	. . 20.5	32 03.9	. . 25.4	182 26.5	. . 01.6	231 14.0	. . 13.3
R 10	328 30.6	3 38.6	19.6	47 04.6	25.3	197 29.1	01.7	246 16.4	13.3
I 11	343 33.1	18 38.1	18.8	62 05.4	25.2	212 31.7	01.7	261 18.7	13.3
D 12	358 35.5	33 37.6	S14 18.0	77 06.1	S23 25.1	227 34.2	N19 01.7	276 21.0	N22 13.3
A 13	13 38.0	48 37.1	17.1	92 06.8	25.1	242 36.8	01.7	291 23.4	13.3
Y 14	28 40.5	63 36.6	16.3	107 07.6	25.0	257 39.4	01.8	306 25.7	13.4
15	43 42.9	78 36.1	. . 15.4	122 08.3	. . 24.9	272 42.0	. . 01.8	321 28.0	. . 13.4
16	58 45.4	93 35.6	14.6	137 09.1	24.8	287 44.5	01.8	336 30.4	13.4
17	73 47.9	108 35.1	13.7	152 09.8	24.8	302 47.1	01.8	351 32.7	13.4
18	88 50.3	123 34.6	S14 12.9	167 10.6	S23 24.7	317 49.7	N19 01.9	6 35.0	N22 13.4
19	103 52.8	138 34.1	12.1	182 11.3	24.6	332 52.3	01.9	21 37.3	13.4
20	118 55.3	153 33.6	11.2	197 12.1	24.6	347 54.8	01.9	36 39.7	13.4
21	133 57.7	168 33.1	. . 10.4	212 12.8	. . 24.5	2 57.4	. . 01.9	51 42.0	. . 13.5
22	149 00.2	183 32.6	09.5	227 13.6	24.4	18 00.0	02.0	66 44.3	13.5
23	164 02.6	198 32.1	08.7	242 14.3	24.3	33 02.6	02.0	81 46.7	13.5
22 00	179 05.1	213 31.7	S14 07.8	257 15.1	S23 24.3	48 05.1	N19 02.0	96 49.0	N22 13.5
01	194 07.6	228 31.2	07.0	272 15.8	24.2	63 07.7	02.0	111 51.3	13.5
02	209 10.0	243 30.7	06.1	287 16.6	24.1	78 10.3	02.1	126 53.7	13.5
03	224 12.5	258 30.2	. . 05.3	302 17.3	. . 24.0	93 12.8	. . 02.1	141 56.0	. . 13.6
04	239 15.0	273 29.7	04.4	317 18.1	23.9	108 15.4	02.1	156 58.3	13.6
05	254 17.4	288 29.2	03.6	332 18.8	23.9	123 18.0	02.1	172 00.6	13.6
06	269 19.9	303 28.7	S14 02.7	347 19.6	S23 23.8	138 20.5	N19 02.2	187 03.0	N22 13.6
07	284 22.4	318 28.2	01.9	2 20.3	23.7	153 23.1	02.2	202 05.3	13.6
S 08	299 24.8	333 27.7	01.0	17 21.1	23.6	168 25.7	02.2	217 07.6	13.6
A 09	314 27.3	348 27.2	14 00.1	32 21.8	. . 23.6	183 28.2	. . 02.2	232 09.9	. . 13.6
T 10	329 29.8	3 26.7	13 59.3	47 22.6	23.5	198 30.8	02.3	247 12.3	13.7
U 11	344 32.2	18 26.3	58.4	62 23.3	23.4	213 33.4	02.3	262 14.6	13.7
R 12	359 34.7	33 25.8	S13 57.6	77 24.1	S23 23.3	228 35.9	N19 02.3	277 16.9	N22 13.7
D 13	14 37.1	48 25.3	56.7	92 24.8	23.2	243 38.5	02.3	292 19.3	13.7
A 14	29 39.6	63 24.8	55.9	107 25.6	23.2	258 41.1	02.4	307 21.6	13.7
Y 15	44 42.1	78 24.3	. . 55.0	122 26.3	. . 23.1	273 43.6	. . 02.4	322 23.9	. . 13.7
16	59 44.5	93 23.8	54.1	137 27.1	23.0	288 46.2	02.4	337 26.2	13.7
17	74 47.0	108 23.3	53.3	152 27.8	22.9	303 48.8	02.4	352 28.6	13.8
18	89 49.5	123 22.8	S13 52.4	167 28.6	S23 22.8	318 51.3	N19 02.5	7 30.9	N22 13.8
19	104 51.9	138 22.4	51.6	182 29.3	22.8	333 53.9	02.5	22 33.2	13.8
20	119 54.4	153 21.9	50.7	197 30.1	22.7	348 56.5	02.5	37 35.5	13.8
21	134 56.9	168 21.4	. . 49.8	212 30.8	. . 22.6	3 59.0	. . 02.5	52 37.9	. . 13.8
22	149 59.3	183 20.9	49.0	227 31.6	22.5	19 01.6	02.6	67 40.2	13.8
23	165 01.8	198 20.4	48.1	242 32.3	22.4	34 04.2	02.6	82 42.5	13.9
	h m								
Mer. Pass.	12 05.6	v −0.5	d 0.8	v 0.7	d 0.1	v 2.6	d 0.0	v 2.3	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.7	S40 17.8
Achernar	335 33.1	S57 13.5
Acrux	173 18.0	S63 07.0
Adhara	255 18.8	S28 58.8
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.5
Alkaid	153 04.7	N49 17.7
Al Na'ir	27 54.1	S46 56.8
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.6	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.3	N 8 52.3
Ankaa	353 23.9	S42 17.5
Antares	112 36.1	S26 26.4
Arcturus	146 02.8	N19 09.8
Atria	107 45.2	S69 01.8
Avior	234 21.1	S59 31.4
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.1	N 7 24.4
Canopus	263 59.7	S52 42.1
Capella	280 46.5	N46 00.2
Deneb	49 37.4	N45 17.1
Denebola	182 41.5	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.9	N28 36.7
Eltanin	90 49.9	N51 28.9
Enif	33 55.3	N 9 53.1
Fomalhaut	15 33.1	S29 36.5
Gacrux	172 09.6	S57 07.8
Gienah	176 00.4	S17 33.6
Hadar	148 59.1	S60 23.2
Hamal	328 10.2	N23 28.5
Kaus Aust.	83 54.6	S34 23.0
Kochab	137 18.5	N74 08.3
Markab	13 46.7	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 16.9	S36 23.1
Miaplacidus	221 41.0	S69 43.9
Mirfak	308 52.4	N49 52.4
Nunki	76 08.4	S26 17.6
Peacock	53 32.1	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.1	N 5 13.0
Rasalhague	96 13.9	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.9	S 8 12.0
Rigil Kent.	140 02.6	S60 50.8
Sabik	102 21.8	S15 43.8
Schedar	349 50.6	N56 33.2
Shaula	96 32.9	S37 06.3
Sirius	258 40.8	S16 43.3
Spica	158 39.5	S11 10.7
Suhail	222 58.2	S43 26.9
Vega	80 44.5	N38 46.8
Zuben'ubi	137 14.2	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	35 37.6	9 45
Mars	78 51.2	6 52
Jupiter	228 57.4	20 48
Saturn	277 47.1	17 34

UT	SUN			MOON					
	GHA		Dec	GHA	v		Dec	d	HP
d h	° ′		° ′	° ′	′		° ′	′	′
20 00	178 03.9	S	0 24.7	336 36.3	9.5	S	5 04.9	16.3	60.9
01	193 04.1		23.7	351 04.8	9.4		5 21.2	16.3	60.9
02	208 04.3		22.7	5 33.2	9.4		5 37.5	16.3	60.9
03	223 04.4	. .	21.7	20 01.6	9.4		5 53.8	16.2	60.9
04	238 04.6		20.7	34 30.0	9.3		6 10.0	16.2	60.9
05	253 04.8		19.7	48 58.3	9.3		6 26.2	16.1	60.9
06	268 05.0	S	0 18.8	63 26.6	9.3	S	6 42.3	16.1	60.9
07	283 05.2		17.8	77 54.9	9.3		6 58.4	16.1	60.9
08	298 05.4		16.8	92 23.2	9.2		7 14.5	16.0	60.9
09	313 05.6	. .	15.8	106 51.4	9.2		7 30.5	16.0	60.9
10	328 05.7		14.8	121 19.6	9.1		7 46.5	15.9	60.9
11	343 05.9		13.8	135 47.7	9.2		8 02.4	15.8	60.9
12	358 06.1	S	0 12.8	150 15.9	9.0	S	8 18.2	15.9	60.9
13	13 06.3		11.8	164 43.9	9.1		8 34.1	15.7	60.9
14	28 06.5		10.9	179 12.0	9.0		8 49.8	15.7	60.9
15	43 06.7	. .	09.9	193 40.0	9.0		9 05.5	15.6	60.8
16	58 06.9		08.9	208 08.0	9.0		9 21.1	15.6	60.8
17	73 07.0		07.9	222 36.0	8.9		9 36.7	15.5	60.8
18	88 07.2	S	0 06.9	237 03.9	8.8	S	9 52.2	15.5	60.8
19	103 07.4		05.9	251 31.7	8.9		10 07.7	15.3	60.8
20	118 07.6		04.9	265 59.6	8.7		10 23.0	15.3	60.8
21	133 07.8	. .	03.9	280 27.3	8.8		10 38.3	15.3	60.8
22	148 08.0		03.0	294 55.1	8.7		10 53.6	15.1	60.8
23	163 08.2		02.0	309 22.8	8.7		11 08.7	15.1	60.7
21 00	178 08.3	S	0 01.0	323 50.5	8.6	S	11 23.8	15.0	60.7
01	193 08.5		00.0	338 18.1	8.5		11 38.8	15.0	60.7
02	208 08.7	N	01.0	352 45.6	8.6		11 53.8	14.8	60.7
03	223 08.9	. .	02.0	7 13.2	8.5		12 08.6	14.8	60.7
04	238 09.1		03.0	21 40.7	8.4		12 23.4	14.7	60.7
05	253 09.3		04.0	36 08.1	8.4		12 38.1	14.6	60.7
06	268 09.5	N	0 04.9	50 35.5	8.3	S	12 52.7	14.5	60.6
07	283 09.6		05.9	65 02.8	8.3		13 07.2	14.5	60.6
08	298 09.8		06.9	79 30.1	8.3		13 21.7	14.3	60.6
09	313 10.0	. .	07.9	93 57.4	8.2		13 36.0	14.3	60.6
10	328 10.2		08.9	108 24.6	8.2		13 50.3	14.1	60.6
11	343 10.4		09.9	122 51.8	8.1		14 04.4	14.1	60.6
12	358 10.6	N	0 10.9	137 18.9	8.0	S	14 18.5	14.0	60.5
13	13 10.8		11.9	151 45.9	8.0		14 32.5	13.8	60.5
14	28 10.9		12.8	166 12.9	8.0		14 46.3	13.8	60.5
15	43 11.1	. .	13.8	180 39.9	7.9		15 00.1	13.7	60.5
16	58 11.3		14.8	195 06.8	7.9		15 13.8	13.5	60.5
17	73 11.5		15.8	209 33.7	7.8		15 27.3	13.5	60.4
18	88 11.7	N	0 16.8	224 00.5	7.7	S	15 40.8	13.4	60.4
19	103 11.9		17.8	238 27.2	7.7		15 54.2	13.2	60.4
20	118 12.1		18.8	252 53.9	7.7		16 07.4	13.2	60.4
21	133 12.3	. .	19.8	267 20.6	7.6		16 20.6	13.0	60.4
22	148 12.4		20.7	281 47.2	7.6		16 33.6	12.9	60.3
23	163 12.6		21.7	296 13.8	7.5		16 46.5	12.8	60.3
22 00	178 12.8	N	0 22.7	310 40.3	7.4	S	16 59.3	12.7	60.3
01	193 13.0		23.7	325 06.7	7.4		17 12.0	12.5	60.3
02	208 13.2		24.7	339 33.1	7.3		17 24.5	12.5	60.2
03	223 13.4	. .	25.7	353 59.4	7.3		17 37.0	12.3	60.2
04	238 13.6		26.7	8 25.7	7.3		17 49.3	12.2	60.2
05	253 13.8		27.7	22 52.0	7.2		18 01.5	12.1	60.2
06	268 13.9	N	0 28.6	37 18.2	7.1	S	18 13.6	12.0	60.1
07	283 14.1		29.6	51 44.3	7.1		18 25.6	11.8	60.1
08	298 14.3		30.6	66 10.4	7.0		18 37.4	11.7	60.1
09	313 14.5	. .	31.6	80 36.4	7.0		18 49.1	11.6	60.1
10	328 14.7		32.6	95 02.4	7.0		19 00.7	11.4	60.0
11	343 14.9		33.6	109 28.4	6.9		19 12.1	11.4	60.0
12	358 15.1	N	0 34.6	123 54.3	6.8	S	19 23.5	11.2	60.0
13	13 15.3		35.5	138 20.1	6.8		19 34.7	11.0	60.0
14	28 15.4		36.5	152 45.9	6.7		19 45.7	10.9	59.9
15	43 15.6	. .	37.5	167 11.6	6.7		19 56.6	10.8	59.9
16	58 15.8		38.5	181 37.3	6.6		20 07.4	10.6	59.9
17	73 16.0		39.5	196 02.9	6.6		20 18.0	10.6	59.9
18	88 16.2	N	0 40.5	210 28.5	6.6	S	20 28.6	10.3	59.8
19	103 16.4		41.5	224 54.1	6.5		20 38.9	10.2	59.8
20	118 16.6		42.5	239 19.6	6.4		20 49.1	10.1	59.8
21	133 16.8	. .	43.4	253 45.0	6.4		20 59.2	10.0	59.8
22	148 16.9		44.4	268 10.4	6.4		21 09.2	9.8	59.7
23	163 17.1		45.4	282 35.8	6.3	S	21 19.0	9.6	59.7
	SD 16.1	d	1.0	SD 16.6			16.5		16.3

THURSDAY

FRIDAY

SATURDAY

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
20	07 45	07 36	12 08	01 37	14 03	17	94
21	07 27	07 18	12 07	02 30	14 57	18	87
22	07 09	07 00	12 07	03 25	15 53	19	78

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UT	ARIES	VENUS −4.0		MARS +0.6		JUPITER −2.4		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
23 00	180 04.3	213 19.9	S13 47.2	257 33.1	S23 22.4	49 06.7	N19 02.6	97 44.8	N22 13.9
01	195 06.7	228 19.4	46.4	272 33.8	22.3	64 09.3	02.6	112 47.2	13.9
02	210 09.2	243 19.0	45.5	287 34.6	22.2	79 11.9	02.7	127 49.5	13.9
03	225 11.6	258 18.5	44.6	302 35.3	22.1	94 14.4	02.7	142 51.8	13.9
04	240 14.1	273 18.0	43.8	317 36.1	22.0	109 17.0	02.7	157 54.1	13.9
05	255 16.6	288 17.5	42.9	332 36.8	21.9	124 19.5	02.7	172 56.5	13.9
06	270 19.0	303 17.0	S13 42.0	347 37.6	S23 21.9	139 22.1	N19 02.7	187 58.8	N22 14.0
07	285 21.5	318 16.5	41.2	2 38.3	21.8	154 24.7	02.8	203 01.1	14.0
08	300 24.0	333 16.1	40.3	17 39.1	21.7	169 27.2	02.8	218 03.4	14.0
S 09	315 26.4	348 15.6	39.4	32 39.8	21.6	184 29.8	02.8	233 05.8	14.0
U 10	330 28.9	3 15.1	38.5	47 40.6	21.5	199 32.3	02.8	248 08.1	14.0
N 11	345 31.4	18 14.6	37.7	62 41.3	21.4	214 34.9	02.9	263 10.4	14.0
D 12	0 33.8	33 14.1	S13 36.8	77 42.1	S23 21.4	229 37.5	N19 02.9	278 12.7	N22 14.0
A 13	15 36.3	48 13.6	35.9	92 42.8	21.3	244 40.0	02.9	293 15.0	14.1
Y 14	30 38.7	63 13.2	35.1	107 43.6	21.2	259 42.6	02.9	308 17.4	14.1
15	45 41.2	78 12.7	34.2	122 44.3	21.1	274 45.1	02.9	323 19.7	14.1
16	60 43.7	93 12.2	33.3	137 45.1	21.0	289 47.7	03.0	338 22.0	14.1
17	75 46.1	108 11.7	32.4	152 45.8	20.9	304 50.3	03.0	353 24.3	14.1
18	90 48.6	123 11.2	S13 31.5	167 46.6	S23 20.8	319 52.8	N19 03.0	8 26.7	N22 14.1
19	105 51.1	138 10.8	30.7	182 47.4	20.7	334 55.4	03.0	23 29.0	14.2
20	120 53.5	153 10.3	29.8	197 48.1	20.7	349 57.9	03.1	38 31.3	14.2
21	135 56.0	168 09.8	28.9	212 48.9	20.6	5 00.5	03.1	53 33.6	14.2
22	150 58.5	183 09.3	28.0	227 49.6	20.5	20 03.0	03.1	68 35.9	14.2
23	166 00.9	198 08.9	27.1	242 50.4	20.4	35 05.6	03.1	83 38.3	14.2
24 00	181 03.4	213 08.4	S13 26.3	257 51.1	S23 20.3	50 08.1	N19 03.1	98 40.6	N22 14.2
01	196 05.9	228 07.9	25.4	272 51.9	20.2	65 10.7	03.2	113 42.9	14.2
02	211 08.3	243 07.4	24.5	287 52.6	20.1	80 13.3	03.2	128 45.2	14.3
03	226 10.8	258 06.9	23.6	302 53.4	20.0	95 15.8	03.2	143 47.5	14.3
04	241 13.2	273 06.5	22.7	317 54.1	20.0	110 18.4	03.2	158 49.9	14.3
05	256 15.7	288 06.0	21.8	332 54.9	19.9	125 20.9	03.2	173 52.2	14.3
06	271 18.2	303 05.5	S13 21.0	347 55.6	S23 19.8	140 23.5	N19 03.3	188 54.5	N22 14.3
07	286 20.6	318 05.0	20.1	2 56.4	19.7	155 26.0	03.3	203 56.8	14.3
08	301 23.1	333 04.6	19.2	17 57.1	19.6	170 28.6	03.3	218 59.1	14.4
M 09	316 25.6	348 04.1	18.3	32 57.9	19.5	185 31.1	03.3	234 01.5	14.4
O 10	331 28.0	3 03.6	17.4	47 58.7	19.4	200 33.7	03.3	249 03.8	14.4
N 11	346 30.5	18 03.1	16.5	62 59.4	19.3	215 36.2	03.4	264 06.1	14.4
D 12	1 33.0	33 02.7	S13 15.6	78 00.2	S23 19.2	230 38.8	N19 03.4	279 08.4	N22 14.4
A 13	16 35.4	48 02.2	14.7	93 00.9	19.1	245 41.3	03.4	294 10.7	14.4
Y 14	31 37.9	63 01.7	13.9	108 01.7	19.0	260 43.9	03.4	309 13.0	14.4
15	46 40.4	78 01.3	13.0	123 02.4	18.9	275 46.4	03.4	324 15.4	14.5
16	61 42.8	93 00.8	12.1	138 03.2	18.9	290 49.0	03.5	339 17.7	14.5
17	76 45.3	108 00.3	11.2	153 03.9	18.8	305 51.5	03.5	354 20.0	14.5
18	91 47.7	122 59.8	S13 10.3	168 04.7	S23 18.7	320 54.1	N19 03.5	9 22.3	N22 14.5
19	106 50.2	137 59.4	09.4	183 05.4	18.6	335 56.6	03.5	24 24.6	14.5
20	121 52.7	152 58.9	08.5	198 06.2	18.5	350 59.2	03.5	39 27.0	14.5
21	136 55.1	167 58.4	07.6	213 07.0	18.4	6 01.7	03.6	54 29.3	14.6
22	151 57.6	182 58.0	06.7	228 07.7	18.3	21 04.3	03.6	69 31.6	14.6
23	167 00.1	197 57.5	05.8	243 08.5	18.2	36 06.8	03.6	84 33.9	14.6
25 00	182 02.5	212 57.0	S13 04.9	258 09.2	S23 18.1	51 09.4	N19 03.6	99 36.2	N22 14.6
01	197 05.0	227 56.5	04.0	273 10.0	18.0	66 11.9	03.6	114 38.5	14.6
02	212 07.5	242 56.1	03.1	288 10.7	17.9	81 14.5	03.7	129 40.8	14.6
03	227 09.9	257 55.6	02.2	303 11.5	17.8	96 17.0	03.7	144 43.2	14.6
04	242 12.4	272 55.1	01.3	318 12.2	17.7	111 19.6	03.7	159 45.5	14.7
05	257 14.9	287 54.7	13 00.4	333 13.0	17.6	126 22.1	03.7	174 47.8	14.7
06	272 17.3	302 54.2	S12 59.5	348 13.8	S23 17.5	141 24.6	N19 03.7	189 50.1	N22 14.7
07	287 19.8	317 53.7	58.6	3 14.5	17.4	156 27.2	03.8	204 52.4	14.7
T 08	302 22.2	332 53.3	57.7	18 15.3	17.3	171 29.7	03.8	219 54.7	14.7
U 09	317 24.7	347 52.8	56.8	33 16.0	17.2	186 32.3	03.8	234 57.1	14.7
E 10	332 27.2	2 52.3	55.9	48 16.8	17.1	201 34.8	03.8	249 59.4	14.8
S 11	347 29.6	17 51.9	55.0	63 17.5	17.0	216 37.4	03.8	265 01.7	14.8
D 12	2 32.1	32 51.4	S12 54.1	78 18.3	S23 16.9	231 39.9	N19 03.8	280 04.0	N22 14.8
A 13	17 34.6	47 50.9	53.2	93 19.1	16.8	246 42.4	03.9	295 06.3	14.8
Y 14	32 37.0	62 50.5	52.3	108 19.8	16.7	261 45.0	03.9	310 08.6	14.8
15	47 39.5	77 50.0	51.4	123 20.6	16.6	276 47.5	03.9	325 10.9	14.8
16	62 42.0	92 49.5	50.5	138 21.3	16.5	291 50.1	03.9	340 13.2	14.8
17	77 44.4	107 49.1	49.6	153 22.1	16.4	306 52.6	03.9	355 15.6	14.9
18	92 46.9	122 48.6	S12 48.6	168 22.8	S23 16.3	321 55.2	N19 03.9	10 17.9	N22 14.9
19	107 49.4	137 48.2	47.7	183 23.6	16.2	336 57.7	04.0	25 20.2	14.9
20	122 51.8	152 47.7	46.8	198 24.4	16.1	352 00.2	04.0	40 22.5	14.9
21	137 54.3	167 47.2	45.9	213 25.1	16.0	7 02.8	04.0	55 24.8	14.9
22	152 56.7	182 46.8	45.0	228 25.9	15.9	22 05.3	04.0	70 27.1	14.9
23	167 59.2	197 46.3	44.1	243 26.6	15.8	37 07.9	04.0	85 29.4	15.0
	h m								
Mer. Pass.	11 53.8	v −0.5	d 0.9	v 0.8	d 0.1	v 2.6	d 0.0	v 2.3	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.7	S40 17.8
Achernar	335 33.1	S57 13.5
Acrux	173 18.0	S63 07.0
Adhara	255 18.8	S28 58.8
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.5
Alkaid	153 04.6	N49 17.7
Al Na'ir	27 54.1	S46 56.8
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.6	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.2	N 8 52.3
Ankaa	353 23.9	S42 17.5
Antares	112 36.1	S26 26.4
Arcturus	146 02.8	N19 09.8
Atria	107 45.1	S69 01.8
Avior	234 21.1	S59 31.4
Bellatrix	278 40.7	N 6 21.1
Betelgeuse	271 10.1	N 7 24.4
Canopus	263 59.7	S52 42.1
Capella	280 46.5	N46 00.2
Deneb	49 37.3	N45 17.1
Denebola	182 41.5	N14 33.2
Diphda	349 04.3	S17 58.4
Dubhe	194 00.6	N61 44.1
Elnath	278 22.9	N28 36.7
Eltanin	90 49.9	N51 28.9
Enif	33 55.3	N 9 53.1
Fomalhaut	15 33.1	S29 36.5
Gacrux	172 09.6	S57 07.8
Gienah	176 00.3	S17 33.6
Hadar	148 59.1	S60 23.2
Hamal	328 10.2	N23 28.5
Kaus Aust.	83 54.5	S34 23.0
Kochab	137 18.4	N74 08.3
Markab	13 46.7	N15 13.1
Menkar	314 23.7	N 4 06.0
Menkent	148 16.9	S36 23.1
Miaplacidus	221 41.1	S69 44.0
Mirfak	308 52.4	N49 52.4
Nunki	76 08.4	S26 17.6
Peacock	53 32.1	S56 43.5
Pollux	243 37.4	N28 01.2
Procyon	245 08.1	N 5 13.0
Rasalhague	96 13.9	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.9	S 8 12.0
Rigil Kent.	140 02.6	S60 50.8
Sabik	102 21.7	S15 43.8
Schedar	349 50.6	N56 33.2
Shaula	96 32.8	S37 06.3
Sirius	258 40.8	S16 43.4
Spica	158 39.5	S11 10.7
Suhail	222 58.2	S43 26.9
Vega	80 44.5	N38 46.8
Zuben'ubi	137 14.2	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	32 05.0	9 48
Mars	76 47.7	6 48
Jupiter	229 04.8	20 36
Saturn	277 37.2	17 23

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UT	SUN			MOON					
	GHA		Dec	GHA	v	Dec	d	HP
d h	° ′		° ′	° ′	′	° ′	′	′
23 00	178 17.3	N	0 46.4	297 01.1	6.3	S21 28.6	9.5	59.7
01	193 17.5		47.4	311 26.4	6.2	21 38.1	9.4	59.6
02	208 17.7		48.4	325 51.6	6.2	21 47.5	9.2	59.6
03	223 17.9	. .	49.4	340 16.8	6.1	21 56.7	9.0	59.6
04	238 18.1		50.3	354 41.9	6.1	22 05.7	8.9	59.6
05	253 18.3		51.3	9 07.0	6.1	22 14.6	8.8	59.5
06	268 18.4	N	0 52.3	23 32.1	6.0	S22 23.4	8.6	59.5
07	283 18.6		53.3	37 57.1	6.0	22 32.0	8.4	59.5
08	298 18.8		54.3	52 22.1	6.0	22 40.4	8.3	59.4
S 09	313 19.0	. .	55.3	66 47.1	5.9	22 48.7	8.2	59.4
U 10	328 19.2		56.3	81 12.0	5.9	22 56.9	8.0	59.4
N 11	343 19.4		57.2	95 36.9	5.8	23 04.9	7.8	59.3
D 12	358 19.6	N	0 58.2	110 01.7	5.9	S23 12.7	7.7	59.3
A 13	13 19.8		0 59.2	124 26.6	5.7	23 20.4	7.5	59.3
Y 14	28 19.9		1 00.2	138 51.3	5.8	23 27.9	7.3	59.3
15	43 20.1	. .	01.2	153 16.1	5.7	23 35.2	7.2	59.2
16	58 20.3		02.2	167 40.8	5.7	23 42.4	7.1	59.2
17	73 20.5		03.2	182 05.5	5.7	23 49.5	6.8	59.2
18	88 20.7	N	1 04.1	196 30.2	5.7	S23 56.3	6.7	59.1
19	103 20.9		05.1	210 54.9	5.6	24 03.0	6.6	59.1
20	118 21.1		06.1	225 19.5	5.6	24 09.6	6.4	59.1
21	133 21.3	. .	07.1	239 44.1	5.6	24 16.0	6.2	59.0
22	148 21.5		08.1	254 08.7	5.5	24 22.2	6.1	59.0
23	163 21.6		09.1	268 33.2	5.6	24 28.3	5.9	59.0
24 00	178 21.8	N	1 10.1	282 57.8	5.5	S24 34.2	5.7	58.9
01	193 22.0		11.0	297 22.3	5.5	24 39.9	5.6	58.9
02	208 22.2		12.0	311 46.8	5.5	24 45.5	5.4	58.9
03	223 22.4	. .	13.0	326 11.3	5.5	24 50.9	5.2	58.8
04	238 22.6		14.0	340 35.8	5.5	24 56.1	5.1	58.8
05	253 22.8		15.0	355 00.3	5.4	25 01.2	4.9	58.8
06	268 23.0	N	1 16.0	9 24.7	5.5	S25 06.1	4.7	58.8
07	283 23.2		16.9	23 49.2	5.4	25 10.8	4.6	58.7
08	298 23.3		17.9	38 13.6	5.5	25 15.4	4.4	58.7
M 09	313 23.5	. .	18.9	52 38.1	5.4	25 19.8	4.2	58.7
O 10	328 23.7		19.9	67 02.5	5.5	25 24.0	4.1	58.6
N 11	343 23.9		20.9	81 27.0	5.4	25 28.1	3.9	58.6
D 12	358 24.1	N	1 21.9	95 51.4	5.4	S25 32.0	3.7	58.6
A 13	13 24.3		22.9	110 15.8	5.5	25 35.7	3.6	58.5
Y 14	28 24.5		23.8	124 40.3	5.4	25 39.3	3.4	58.5
15	43 24.7	. .	24.8	139 04.7	5.5	25 42.7	3.2	58.5
16	58 24.9		25.8	153 29.2	5.5	25 45.9	3.1	58.4
17	73 25.0		26.8	167 53.7	5.4	25 49.0	2.9	58.4
18	88 25.2	N	1 27.8	182 18.1	5.5	S25 51.9	2.7	58.4
19	103 25.4		28.8	196 42.6	5.5	25 54.6	2.5	58.3
20	118 25.6		29.7	211 07.1	5.5	25 57.1	2.4	58.3
21	133 25.8	. .	30.7	225 31.6	5.6	25 59.5	2.3	58.3
22	148 26.0		31.7	239 56.2	5.5	26 01.8	2.0	58.2
23	163 26.2		32.7	254 20.7	5.6	26 03.8	1.9	58.2
25 00	178 26.4	N	1 33.7	268 45.3	5.6	S26 05.7	1.7	58.2
01	193 26.5		34.7	283 09.9	5.6	26 07.4	1.6	58.2
02	208 26.7		35.6	297 34.5	5.6	26 09.0	1.4	58.1
03	223 26.9	. .	36.6	311 59.1	5.7	26 10.4	1.2	58.1
04	238 27.1		37.6	326 23.8	5.7	26 11.6	1.0	58.1
05	253 27.3		38.6	340 48.5	5.7	26 12.6	0.9	58.0
06	268 27.5	N	1 39.6	355 13.2	5.8	S26 13.5	0.8	58.0
07	283 27.7		40.6	9 38.0	5.8	26 14.3	0.5	58.0
T 08	298 27.9		41.5	24 02.8	5.8	26 14.8	0.4	57.9
U 09	313 28.1	. .	42.5	38 27.6	5.9	26 15.2	0.3	57.9
E 10	328 28.2		43.5	52 52.5	5.9	26 15.5	0.0	57.9
S 11	343 28.4		44.5	67 17.4	5.9	26 15.5	0.1	57.8
D 12	358 28.6	N	1 45.5	81 42.3	6.0	S26 15.4	0.2	57.8
A 13	13 28.8		46.5	96 07.3	6.0	26 15.2	0.4	57.8
Y 14	28 29.0		47.4	110 32.3	6.1	26 14.8	0.6	57.7
15	43 29.2	. .	48.4	124 57.4	6.1	26 14.2	0.8	57.7
16	58 29.4		49.4	139 22.5	6.2	26 13.4	0.8	57.7
17	73 29.6		50.4	153 47.7	6.2	26 12.6	1.1	57.7
18	88 29.8	N	1 51.4	168 12.9	6.2	S26 11.5	1.2	57.6
19	103 29.9		52.4	182 38.1	6.4	26 10.3	1.4	57.6
20	118 30.1		53.3	197 03.5	6.3	26 08.9	1.5	57.6
21	133 30.3	. .	54.3	211 28.8	6.5	26 07.4	1.7	57.5
22	148 30.5		55.3	225 54.3	6.4	26 05.7	1.8	57.5
23	163 30.7		56.3	240 19.7	6.6	S26 03.9	2.0	57.5
	SD 16.1		d 1.0	SD 16.2		16.0		15.8

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
23	06 51	06 42	12 07	04 22	16 51	20	67
24	06 33	06 24	12 06	05 21	17 50	21	56
25	06 15	06 06	12 06	06 20	18 49	22	46

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UT	ARIES	VENUS −4.0		MARS +0.6		JUPITER −2.3		SATURN +0.1		STARS		
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Name	SHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
26 00	183 01.7	212 45.8	S12 43.2	258 27.4	S23 15.7	52 10.4	N19 04.1	100 31.7	N22 15.0	Acamar	315 24.7	S40 17.8
01	198 04.1	227 45.4	42.3	273 28.1	15.6	67 12.9	04.1	115 34.1	15.0	Achernar	335 33.1	S57 13.4
02	213 06.6	242 44.9	41.4	288 28.9	15.5	82 15.5	04.1	130 36.4	15.0	Acrux	173 18.0	S63 07.0
03	228 09.1	257 44.5	40.4	303 29.7	15.4	97 18.0	04.1	145 38.7	15.0	Adhara	255 18.8	S28 58.8
04	243 11.5	272 44.0	39.5	318 30.4	15.3	112 20.6	04.1	160 41.0	15.0	Aldebaran	290 58.8	N16 30.9
05	258 14.0	287 43.5	38.6	333 31.2	15.2	127 23.1	04.1	175 43.3	15.0			
06	273 16.5	302 43.1	S12 37.7	348 31.9	S23 15.1	142 25.6	N19 04.2	190 45.6	N22 15.1	Alioth	166 27.0	N55 56.5
W 07	288 18.9	317 42.6	36.8	3 32.7	15.0	157 28.2	04.2	205 47.9	15.1	Alkaid	153 04.6	N49 17.7
E 08	303 21.4	332 42.2	35.9	18 33.5	14.9	172 30.7	04.2	220 50.2	15.1	Al Na'ir	27 54.0	S46 56.8
D 09	318 23.8	347 41.7	34.9	33 34.2	14.8	187 33.2	04.2	235 52.5	15.1	Alnilam	275 54.6	S 1 12.1
N 10	333 26.3	2 41.2	34.0	48 35.0	14.7	202 35.8	04.2	250 54.9	15.1	Alphard	218 03.8	S 8 40.4
E 11	348 28.8	17 40.8	33.1	63 35.7	14.6	217 38.3	04.2	265 57.2	15.1			
S 12	3 31.2	32 40.3	S12 32.2	78 36.5	S23 14.5	232 40.8	N19 04.2	280 59.5	N22 15.2	Alphecca	126 17.6	N26 42.0
D 13	18 33.7	47 39.9	31.3	93 37.3	14.4	247 43.4	04.3	296 01.8	15.2	Alpheratz	357 52.3	N29 06.3
A 14	33 36.2	62 39.4	30.3	108 38.0	14.3	262 45.9	04.3	311 04.1	15.2	Altair	62 16.2	N 8 52.3
Y 15	48 38.6	77 38.9	29.4	123 38.8	14.2	277 48.4	04.3	326 06.4	15.2	Ankaa	353 23.9	S42 17.5
16	63 41.1	92 38.5	28.5	138 39.5	14.1	292 51.0	04.3	341 08.7	15.2	Antares	112 36.0	S26 26.4
17	78 43.6	107 38.0	27.6	153 40.3	14.0	307 53.5	04.3	356 11.0	15.2			
18	93 46.0	122 37.6	S12 26.6	168 41.1	S23 13.9	322 56.0	N19 04.3	11 13.3	N22 15.2	Arcturus	146 02.8	N19 09.8
19	108 48.5	137 37.1	25.7	183 41.8	13.8	337 58.6	04.4	26 15.6	15.3	Atria	107 45.0	S69 01.8
20	123 51.0	152 36.7	24.8	198 42.6	13.7	353 01.1	04.4	41 17.9	15.3	Avior	234 21.2	S59 31.4
21	138 53.4	167 36.2	23.9	213 43.3	13.5	8 03.6	04.4	56 20.2	15.3	Bellatrix	278 40.8	N 6 21.1
22	153 55.9	182 35.7	22.9	228 44.1	13.4	23 06.2	04.4	71 22.6	15.3	Betelgeuse	271 10.1	N 7 24.4
23	168 58.3	197 35.3	22.0	243 44.9	13.3	38 08.7	04.4	86 24.9	15.3			
27 00	184 00.8	212 34.8	S12 21.1	258 45.6	S23 13.2	53 11.2	N19 04.4	101 27.2	N22 15.3	Canopus	263 59.8	S52 42.1
01	199 03.3	227 34.4	20.2	273 46.4	13.1	68 13.8	04.4	116 29.5	15.4	Capella	280 46.5	N46 00.2
02	214 05.7	242 33.9	19.2	288 47.1	13.0	83 16.3	04.5	131 31.8	15.4	Deneb	49 37.3	N45 17.1
03	229 08.2	257 33.5	18.3	303 47.9	12.9	98 18.8	04.5	146 34.1	15.4	Denebola	182 41.5	N14 33.2
04	244 10.7	272 33.0	17.4	318 48.7	12.8	113 21.4	04.5	161 36.4	15.4	Diphda	349 04.3	S17 58.4
05	259 13.1	287 32.6	16.4	333 49.4	12.7	128 23.9	04.5	176 38.7	15.4			
06	274 15.6	302 32.1	S12 15.5	348 50.2	S23 12.6	143 26.4	N19 04.5	191 41.0	N22 15.4	Dubhe	194 00.6	N61 44.1
07	289 18.1	317 31.7	14.6	3 50.9	12.5	158 28.9	04.5	206 43.3	15.5	Elnath	278 22.9	N28 36.7
T 08	304 20.5	332 31.2	13.7	18 51.7	12.3	173 31.5	04.5	221 45.6	15.5	Eltanin	90 49.8	N51 28.9
H 09	319 23.0	347 30.8	12.7	33 52.5	12.2	188 34.0	04.6	236 47.9	15.5	Enif	33 55.3	N 9 53.1
U 10	334 25.5	2 30.3	11.8	48 53.2	12.1	203 36.5	04.6	251 50.2	15.5	Fomalhaut	15 33.1	S29 36.5
R 11	349 27.9	17 29.9	10.9	63 54.0	12.0	218 39.1	04.6	266 52.5	15.5			
S 12	4 30.4	32 29.4	S12 09.9	78 54.8	S23 11.9	233 41.6	N19 04.6	281 54.8	N22 15.5	Gacrux	172 09.6	S57 07.9
D 13	19 32.8	47 29.0	09.0	93 55.5	11.8	248 44.1	04.6	296 57.1	15.5	Gienah	176 00.3	S17 33.6
A 14	34 35.3	62 28.5	08.0	108 56.3	11.7	263 46.6	04.6	311 59.5	15.6	Hadar	148 59.1	S60 23.2
Y 15	49 37.8	77 28.1	07.1	123 57.0	11.6	278 49.2	04.6	327 01.8	15.6	Hamal	328 10.2	N23 28.5
16	64 40.2	92 27.6	06.2	138 57.8	11.5	293 51.7	04.7	342 04.1	15.6	Kaus Aust.	83 54.5	S34 23.0
17	79 42.7	107 27.2	05.2	153 58.6	11.3	308 54.2	04.7	357 06.4	15.6			
18	94 45.2	122 26.7	S12 04.3	168 59.3	S23 11.2	323 56.7	N19 04.7	12 08.7	N22 15.6	Kochab	137 18.4	N74 08.3
19	109 47.6	137 26.3	03.4	184 00.1	11.1	338 59.3	04.7	27 11.0	15.6	Markab	13 46.7	N15 13.1
20	124 50.1	152 25.8	02.4	199 00.9	11.0	354 01.8	04.7	42 13.3	15.7	Menkar	314 23.7	N 4 06.0
21	139 52.6	167 25.4	01.5	214 01.6	10.9	9 04.3	04.7	57 15.6	15.7	Menkent	148 16.9	S36 23.1
22	154 55.0	182 24.9	12 00.5	229 02.4	10.8	24 06.8	04.7	72 17.9	15.7	Miaplacidus	221 41.1	S69 44.0
23	169 57.5	197 24.5	11 59.6	244 03.1	10.7	39 09.4	04.8	87 20.2	15.7			
28 00	185 00.0	212 24.0	S11 58.7	259 03.9	S23 10.6	54 11.9	N19 04.8	102 22.5	N22 15.7	Mirfak	308 52.4	N49 52.4
01	200 02.4	227 23.6	57.7	274 04.7	10.4	69 14.4	04.8	117 24.8	15.7	Nunki	76 08.3	S26 17.6
02	215 04.9	242 23.1	56.8	289 05.4	10.3	84 16.9	04.8	132 27.1	15.7	Peacock	53 32.0	S56 43.4
03	230 07.3	257 22.7	55.8	304 06.2	10.2	99 19.4	04.8	147 29.4	15.8	Pollux	243 37.4	N28 01.7
04	245 09.8	272 22.2	54.9	319 07.0	10.1	114 22.0	04.8	162 31.7	15.8	Procyon	245 08.1	N 5 13.0
05	260 12.3	287 21.8	53.9	334 07.7	10.0	129 24.5	04.8	177 34.0	15.8			
06	275 14.7	302 21.3	S11 53.0	349 08.5	S23 09.9	144 27.0	N19 04.8	192 36.3	N22 15.8	Rasalhague	96 13.9	N12 33.7
07	290 17.2	317 20.9	52.0	4 09.3	09.7	159 29.5	04.9	207 38.6	15.8	Regulus	207 51.8	N11 57.1
08	305 19.7	332 20.5	51.1	19 10.0	09.6	174 32.1	04.9	222 40.9	15.8	Rigel	281 19.9	S 8 12.0
F 09	320 22.1	347 20.0	50.1	34 10.8	09.5	189 34.6	04.9	237 43.2	15.9	Rigil Kent.	140 02.5	S60 50.8
R 10	335 24.6	2 19.6	49.2	49 11.6	09.4	204 37.1	04.9	252 45.5	15.9	Sabik	102 21.7	S15 43.8
I 11	350 27.1	17 19.1	48.3	64 12.3	09.3	219 39.6	04.9	267 47.8	15.9			
D 12	5 29.5	32 18.7	S11 47.3	79 13.1	S23 09.2	234 42.1	N19 04.9	282 50.1	N22 15.9	Schedar	349 50.6	N56 33.2
A 13	20 32.0	47 18.2	46.4	94 13.9	09.0	249 44.6	04.9	297 52.4	15.9	Shaula	96 32.8	S37 06.1
Y 14	35 34.4	62 17.8	45.4	109 14.6	08.9	264 47.2	04.9	312 54.7	15.9	Sirius	258 40.9	S16 43.4
15	50 36.9	77 17.4	44.5	124 15.4	08.8	279 49.7	04.9	327 57.0	16.0	Spica	158 39.5	S11 10.7
16	65 39.4	92 16.9	43.5	139 16.1	08.7	294 52.2	05.0	342 59.3	16.0	Suhail	222 58.2	S43 26.9
17	80 41.8	107 16.5	42.6	154 16.9	08.6	309 54.7	05.0	358 01.6	16.0			
18	95 44.3	122 16.0	S11 41.6	169 17.7	S23 08.5	324 57.2	N19 05.0	13 03.9	N22 16.0	Vega	80 44.5	N38 46.8
19	110 46.8	137 15.6	40.6	184 18.4	08.3	339 59.8	05.0	28 06.2	16.0	Zuben'ubi	137 14.1	S16 03.4
20	125 49.2	152 15.1	39.7	199 19.2	08.2	355 02.3	05.0	43 08.5	16.0		SHA	Mer. Pass
21	140 51.7	167 14.7	38.7	214 20.0	08.1	10 04.8	05.0	58 10.8	16.0		° ′	h m
22	155 54.2	182 14.3	37.8	229 20.7	08.0	25 07.3	05.0	73 13.1	16.1	Venus	28 34.0	9 50
23	170 56.6	197 13.8	36.8	244 21.5	07.9	40 09.8	05.0	88 15.4	16.1	Mars	74 44.8	6 45
	h m									Jupiter	229 10.4	20 24
Mer. Pass.	11 42.0	v −0.5	d 0.9	v 0.8	d 0.1	v 2.5	d 0.0	v 2.3	d 0.0	Saturn	277 26.4	17 12

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
	° ′	° ′	° ′	′	° ′	′	′
26 00	178 30.9	N 1 57.3	254 45.3	6.6	S26 01.9	2.2	57.4
01	193 31.1	58.3	269 10.9	6.6	25 59.7	2.3	57.4
02	208 31.3	1 59.2	283 36.5	6.8	25 57.4	2.5	57.4
03	223 31.5	2 00.2	298 02.3	6.7	25 54.9	2.6	57.3
04	238 31.7	01.2	312 28.0	6.9	25 52.3	2.7	57.3
05	253 31.8	02.2	326 53.9	6.9	25 49.6	2.9	57.3
06	268 32.0	N 2 03.2	341 19.8	7.0	S25 46.7	3.1	57.3
W 07	283 32.2	04.1	355 45.8	7.0	25 43.6	3.2	57.2
E 08	298 32.4	05.1	10 11.8	7.1	25 40.4	3.4	57.2
D 09	313 32.6	06.1	24 37.9	7.2	25 37.0	3.5	57.2
N 10	328 32.8	07.1	39 04.1	7.3	25 33.5	3.6	57.1
E 11	343 33.0	08.1	53 30.4	7.3	25 29.9	3.8	57.1
S 12	358 33.2	N 2 09.1	67 56.7	7.4	S25 26.1	3.9	57.1
D 13	13 33.4	10.0	82 23.1	7.5	25 22.2	4.1	57.1
A 14	28 33.5	11.0	96 49.6	7.6	25 18.1	4.2	57.0
Y 15	43 33.7	12.0	111 16.2	7.6	25 13.9	4.4	57.0
16	58 33.9	13.0	125 42.8	7.7	25 09.5	4.5	57.0
17	73 34.1	14.0	140 09.5	7.8	25 05.0	4.6	56.9
18	88 34.3	N 2 14.9	154 36.3	7.8	S25 00.4	4.8	56.9
19	103 34.5	15.9	169 03.1	8.0	24 55.6	4.9	56.9
20	118 34.7	16.9	183 30.1	8.0	24 50.7	5.0	56.9
21	133 34.9	17.9	197 57.1	8.1	24 45.7	5.2	56.8
22	148 35.1	18.9	212 24.2	8.2	24 40.5	5.3	56.8
23	163 35.2	19.8	226 51.4	8.3	24 35.2	5.5	56.8
27 00	178 35.4	N 2 20.8	241 18.7	8.3	S24 29.7	5.5	56.8
01	193 35.6	21.8	255 46.0	8.5	24 24.2	5.7	56.7
02	208 35.8	22.8	270 13.5	8.5	24 18.5	5.9	56.7
03	223 36.0	23.8	284 41.0	8.6	24 12.6	5.9	56.7
04	238 36.2	24.7	299 08.6	8.7	24 06.7	6.1	56.6
05	253 36.4	25.7	313 36.3	8.7	24 00.6	6.2	56.6
06	268 36.6	N 2 26.7	328 04.0	8.9	S23 54.4	6.4	56.6
07	283 36.8	27.7	342 31.9	8.9	23 48.0	6.4	56.6
08	298 36.9	28.7	356 59.8	9.1	23 41.6	6.6	56.5
09	313 37.1	29.6	11 27.9	9.1	23 35.0	6.7	56.5
U 10	328 37.3	30.6	25 56.0	9.2	23 28.3	6.8	56.5
R 11	343 37.5	31.6	40 24.2	9.3	23 21.5	6.9	56.5
S 12	358 37.7	N 2 32.6	54 52.5	9.4	S23 14.6	7.1	56.4
D 13	13 37.9	33.6	69 20.9	9.5	23 07.5	7.2	56.4
A 14	28 38.1	34.5	83 49.4	9.5	23 00.3	7.3	56.4
Y 15	43 38.3	35.5	98 17.9	9.7	22 53.0	7.4	56.4
16	58 38.5	36.5	112 46.6	9.7	22 45.6	7.5	56.3
17	73 38.6	37.5	127 15.3	9.9	22 38.1	7.6	56.3
18	88 38.8	N 2 38.5	141 44.2	9.9	S22 30.5	7.7	56.3
19	103 39.0	39.4	156 13.1	10.0	22 22.8	7.9	56.3
20	118 39.2	40.4	170 42.1	10.1	22 14.9	7.9	56.2
21	133 39.4	41.4	185 11.2	10.2	22 07.0	8.1	56.2
22	148 39.6	42.4	199 40.4	10.3	21 58.9	8.1	56.2
23	163 39.8	43.3	214 09.7	10.4	21 50.8	8.3	56.2
28 00	178 40.0	N 2 44.3	228 39.1	10.4	S21 42.5	8.4	56.1
01	193 40.1	45.3	243 08.5	10.6	21 34.1	8.4	56.1
02	208 40.3	46.3	257 38.1	10.6	21 25.7	8.6	56.1
03	223 40.5	47.3	272 07.7	10.7	21 17.1	8.7	56.1
04	238 40.7	48.2	286 37.4	10.8	21 08.4	8.7	56.0
05	253 40.9	49.2	301 07.2	10.9	20 59.7	8.9	56.0
06	268 41.1	N 2 50.2	315 37.1	11.0	S20 50.8	9.0	56.0
07	283 41.3	51.2	330 07.1	11.1	20 41.8	9.0	56.0
08	298 41.5	52.1	344 37.2	11.2	20 32.8	9.2	55.9
F 09	313 41.7	53.1	359 07.4	11.2	20 23.6	9.2	55.9
R 10	328 41.8	54.1	13 37.6	11.4	20 14.4	9.3	55.9
I 11	343 42.0	55.1	28 08.0	11.4	20 05.1	9.5	55.9
D 12	358 42.2	N 2 56.1	42 38.4	11.5	S19 55.6	9.5	55.9
A 13	13 42.4	57.0	57 08.9	11.7	19 46.1	9.6	55.8
Y 14	28 42.6	58.0	71 39.6	11.6	19 36.5	9.7	55.8
15	43 42.8	2 59.0	86 10.2	11.8	19 26.8	9.7	55.8
16	58 43.0	3 00.0	100 41.0	11.9	19 17.1	9.9	55.8
17	73 43.2	00.9	115 11.9	11.9	19 07.2	9.9	55.7
18	88 43.4	N 3 01.9	129 42.8	12.1	S18 57.3	10.0	55.7
19	103 43.5	02.9	144 13.9	12.1	18 47.3	10.1	55.7
20	118 43.7	03.9	158 45.0	12.2	18 37.2	10.2	55.7
21	133 43.9	04.8	173 16.2	12.3	18 27.0	10.3	55.7
22	148 44.1	05.8	187 47.5	12.3	18 16.7	10.3	55.6
23	163 44.3	06.8	202 18.8	12.5	S18 06.4	10.4	55.6
	SD 16.1	d 1.0	SD 15.6		15.4		15.2

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
26	05 57	05 48	12 06	07 18	19 45	23	35
27	05 39	05 30	12 05	08 12	20 39	24	25
28	05 21	05 12	12 05	09 04	21 28	25	17

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UT	ARIES	VENUS −4.0		MARS +0.5		JUPITER −2.3		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
29 00	185 59.1	212 13.4	S11 35.9	259 22.3	S23 07.7	55 12.3	N19 05.0	103 17.7	N22 16.1
01	201 01.6	227 12.9	34.9	274 23.0	07.6	70 14.8	05.1	118 20.0	16.1
02	216 04.0	242 12.5	34.0	289 23.8	07.5	85 17.4	05.1	133 22.3	16.1
03	231 06.5	257 12.1	33.0	304 24.6	07.4	100 19.9	05.1	148 24.6	16.1
04	246 08.9	272 11.6	32.0	319 25.3	07.2	115 22.4	05.1	163 26.9	16.2
05	261 11.4	287 11.2	31.1	334 26.1	07.1	130 24.9	05.1	178 29.2	16.2
06	276 13.9	302 10.8	S11 30.1	349 26.9	S23 07.0	145 27.4	N19 05.1	193 31.5	N22 16.2
07	291 16.3	317 10.3	29.2	4 27.7	06.9	160 29.9	05.1	208 33.8	16.2
S 08	306 18.8	332 09.9	28.2	19 28.4	06.8	175 32.4	05.1	223 36.1	16.2
A 09	321 21.3	347 09.4	27.2	34 29.2	06.6	190 34.9	05.1	238 38.4	16.2
T 10	336 23.7	2 09.0	26.3	49 30.0	06.5	205 37.5	05.1	253 40.7	16.3
U 11	351 26.2	17 08.6	25.3	64 30.7	06.4	220 40.0	05.2	268 43.0	16.3
R 12	6 28.7	32 08.1	S11 24.4	79 31.5	S23 06.3	235 42.5	N19 05.2	283 45.3	N22 16.3
D 13	21 31.1	47 07.7	23.4	94 32.3	06.1	250 45.0	05.2	298 47.6	16.3
A 14	36 33.6	62 07.3	22.4	109 33.0	06.0	265 47.5	05.2	313 49.9	16.3
Y 15	51 36.0	77 06.8	21.5	124 33.8	05.9	280 50.0	05.2	328 52.2	16.3
16	66 38.5	92 06.4	20.5	139 34.6	05.8	295 52.5	05.2	343 54.5	16.3
17	81 41.0	107 06.0	19.5	154 35.3	05.6	310 55.0	05.2	358 56.8	16.4
18	96 43.4	122 05.5	S11 18.6	169 36.1	S23 05.5	325 57.5	N19 05.2	13 59.0	N22 16.4
19	111 45.9	137 05.1	17.6	184 36.9	05.4	341 00.0	05.2	29 01.3	16.4
20	126 48.4	152 04.7	16.6	199 37.6	05.3	356 02.6	05.2	44 03.6	16.4
21	141 50.8	167 04.2	15.7	214 38.4	05.1	11 05.1	05.2	59 05.9	16.4
22	156 53.3	182 03.8	14.7	229 39.2	05.0	26 07.6	05.3	74 08.2	16.4
23	171 55.8	197 03.4	13.7	244 40.0	04.9	41 10.1	05.3	89 10.5	16.5
30 00	186 58.2	212 02.9	S11 12.8	259 40.7	S23 04.8	56 12.6	N19 05.3	104 12.8	N22 16.5
01	202 00.7	227 02.5	11.8	274 41.5	04.6	71 15.1	05.3	119 15.1	16.5
02	217 03.2	242 02.1	10.8	289 42.3	04.5	86 17.6	05.3	134 17.4	16.5
03	232 05.6	257 01.6	09.8	304 43.0	04.4	101 20.1	05.3	149 19.7	16.5
04	247 08.1	272 01.2	08.9	319 43.8	04.3	116 22.6	05.3	164 22.0	16.5
05	262 10.5	287 00.8	07.9	334 44.6	04.1	131 25.1	05.3	179 24.3	16.6
06	277 13.0	302 00.3	S11 06.9	349 45.3	S23 04.0	146 27.6	N19 05.3	194 26.6	N22 16.6
07	292 15.5	316 59.9	06.0	4 46.1	03.9	161 30.1	05.3	209 28.9	16.6
08	307 17.9	331 59.5	05.0	19 46.9	03.7	176 32.6	05.3	224 31.2	16.6
S 09	322 20.4	346 59.0	04.0	34 47.7	03.6	191 35.1	05.3	239 33.5	16.6
U 10	337 22.9	1 58.6	03.0	49 48.4	03.5	206 37.6	05.4	254 35.8	16.6
N 11	352 25.3	16 58.2	02.1	64 49.2	03.4	221 40.1	05.4	269 38.0	16.6
D 12	7 27.8	31 57.8	S11 01.1	79 50.0	S23 03.2	236 42.6	N19 05.4	284 40.3	N22 16.7
A 13	22 30.3	46 57.3	11 00.1	94 50.7	03.1	251 45.1	05.4	299 42.6	16.7
Y 14	37 32.7	61 56.9	10 59.1	109 51.5	03.0	266 47.6	05.4	314 44.9	16.7
15	52 35.2	76 56.5	58.2	124 52.3	02.8	281 50.1	05.4	329 47.2	16.7
16	67 37.7	91 56.0	57.2	139 53.1	02.7	296 52.6	05.4	344 49.5	16.7
17	82 40.1	106 55.6	56.2	154 53.8	02.6	311 55.1	05.4	359 51.8	16.7
18	97 42.6	121 55.2	S10 55.2	169 54.6	S23 02.4	326 57.6	N19 05.4	14 54.1	N22 16.8
19	112 45.0	136 54.8	54.2	184 55.4	02.3	342 00.1	05.4	29 56.4	16.8
20	127 47.5	151 54.3	53.3	199 56.1	02.2	357 02.6	05.4	44 58.7	16.8
21	142 50.0	166 53.9	52.3	214 56.9	02.0	12 05.1	05.4	60 01.0	16.8
22	157 52.4	181 53.5	51.3	229 57.7	01.9	27 07.6	05.4	75 03.3	16.8
23	172 54.9	196 53.1	50.3	244 58.5	01.8	42 10.1	05.4	90 05.5	16.8
31 00	187 57.4	211 52.6	S10 49.3	259 59.2	S23 01.6	57 12.6	N19 05.4	105 07.8	N22 16.9
01	202 59.8	226 52.2	48.3	275 00.0	01.5	72 15.1	05.5	120 10.1	16.9
02	218 02.3	241 51.8	47.4	290 00.8	01.4	87 17.6	05.5	135 12.4	16.9
03	233 04.8	256 51.4	46.4	305 01.6	01.2	102 20.1	05.5	150 14.7	16.9
04	248 07.2	271 50.9	45.4	320 02.3	01.1	117 22.6	05.5	165 17.0	16.9
05	263 09.7	286 50.5	44.4	335 03.1	01.0	132 25.1	05.5	180 19.3	16.9
06	278 12.1	301 50.1	S10 43.4	350 03.9	S23 00.8	147 27.6	N19 05.5	195 21.6	N22 17.0
07	293 14.6	316 49.7	42.4	5 04.7	00.7	162 30.1	05.5	210 23.9	17.0
08	308 17.1	331 49.2	41.5	20 05.4	00.6	177 32.6	05.5	225 26.1	17.0
M 09	323 19.5	346 48.8	40.5	35 06.2	00.4	192 35.1	05.5	240 28.4	17.0
O 10	338 22.0	1 48.4	39.5	50 07.0	00.3	207 37.6	05.5	255 30.7	17.0
N 11	353 24.5	16 48.0	38.5	65 07.8	00.2	222 40.1	05.5	270 33.0	17.0
D 12	8 26.9	31 47.6	S10 37.5	80 08.5	S23 00.0	237 42.6	N19 05.5	285 35.3	N22 17.0
A 13	23 29.4	46 47.1	36.5	95 09.3	22 59.9	252 45.1	05.5	300 37.6	17.1
Y 14	38 31.9	61 46.7	35.5	110 10.1	59.8	267 47.6	05.5	315 39.9	17.1
15	53 34.3	76 46.3	34.5	125 10.9	59.6	282 50.1	05.5	330 42.2	17.1
16	68 36.8	91 45.9	33.5	140 11.6	59.5	297 52.6	05.5	345 44.5	17.1
17	83 39.3	106 45.5	32.5	155 12.4	59.3	312 55.1	05.5	0 46.7	17.1
18	98 41.7	121 45.0	S10 31.6	170 13.2	S22 59.2	327 57.6	N19 05.5	15 49.0	N22 17.1
19	113 44.2	136 44.6	30.6	185 14.0	59.1	343 00.1	05.6	30 51.3	17.2
20	128 46.6	151 44.2	29.6	200 14.7	58.9	358 02.5	05.6	45 53.6	17.2
21	143 49.1	166 43.8	28.6	215 15.5	58.8	13 05.0	05.6	60 55.9	17.2
22	158 51.6	181 43.4	27.6	230 16.3	58.7	28 07.5	05.6	75 58.2	17.2
23	173 54.0	196 42.9	26.6	245 17.1	58.5	43 10.0	05.6	91 00.5	17.2
Mer. Pass.	h m 11 30.2	v −0.4	d 1.0	v 0.8	d 0.1	v 2.5	d 0.0	v 2.3	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.7	S40 17.7
Achernar	335 33.1	S57 13.4
Acrux	173 18.0	S63 07.0
Adhara	255 18.9	S28 58.8
Aldebaran	290 58.8	N16 30.9
Alioth	166 27.0	N55 56.5
Alkaid	153 04.6	N49 17.7
Al Na'ir	27 54.0	S46 56.8
Alnilam	275 54.6	S 1 12.1
Alphard	218 03.8	S 8 40.4
Alphecca	126 17.5	N26 42.0
Alpheratz	357 52.3	N29 06.3
Altair	62 16.2	N 8 52.3
Ankaa	353 23.9	S42 17.5
Antares	112 36.0	S26 26.4
Arcturus	146 02.7	N19 09.8
Atria	107 45.0	S69 01.8
Avior	234 21.2	S59 31.4
Bellatrix	278 40.8	N 6 21.1
Betelgeuse	271 10.1	N 7 24.4
Canopus	263 59.8	S52 42.1
Capella	280 46.6	N46 00.2
Deneb	49 37.3	N45 17.1
Denebola	182 41.5	N14 33.2
Diphda	349 04.2	S17 58.3
Dubhe	194 00.6	N61 44.2
Elnath	278 22.9	N28 36.7
Eltanin	90 49.8	N51 28.9
Enif	33 55.3	N 9 53.1
Fomalhaut	15 33.1	S29 36.5
Gacrux	172 09.6	S57 07.9
Gienah	176 00.3	S17 33.6
Hadar	148 59.0	S60 23.2
Hamal	328 10.2	N23 28.5
Kaus Aust.	83 54.5	S34 23.0
Kochab	137 18.3	N74 08.3
Markab	13 46.7	N15 13.1
Menkar	314 23.8	N 4 06.0
Menkent	148 16.8	S36 23.1
Miaplacidus	221 41.1	S69 44.0
Mirfak	308 52.4	N49 52.4
Nunki	76 08.3	S26 17.6
Peacock	53 32.0	S56 43.4
Pollux	243 37.4	N28 01.2
Procyon	245 08.1	N 5 13.0
Rasalhague	96 13.8	N12 33.2
Regulus	207 51.8	N11 57.1
Rigel	281 19.9	S 8 12.0
Rigil Kent.	140 02.5	S60 50.8
Sabik	102 21.7	S15 43.8
Schedar	349 50.6	N56 33.2
Shaula	96 32.8	S37 06.3
Sirius	258 40.9	S16 43.3
Spica	158 39.5	S11 10.7
Suhail	222 58.2	S43 26.9
Vega	80 44.4	N38 46.8
Zuben'ubi	137 14.1	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	25 04.7	9 52
Mars	72 42.5	6 41
Jupiter	229 14.4	20 12
Saturn	277 14.6	17 01

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
29 00	178 44.5	N 3 07.8	216 50.3	12.5	S17 56.0	10.5	55.6
01	193 44.7	08.8	231 21.8	12.6	17 45.5	10.6	55.6
02	208 44.9	09.7	245 53.4	12.7	17 34.9	10.6	55.6
03	223 45.0	. . 10.7	260 25.1	12.8	17 24.3	10.7	55.5
04	238 45.2	11.7	274 56.9	12.9	17 13.6	10.8	55.5
05	253 45.4	12.7	289 28.8	12.9	17 02.8	10.8	55.5
06	268 45.6	N 3 13.6	304 00.7	13.0	S16 52.0	11.0	55.5
07	283 45.8	14.6	318 32.7	13.1	16 41.0	10.9	55.5
08	298 46.0	15.6	333 04.8	13.1	16 30.1	11.1	55.4
09	313 46.2	. . 16.6	347 36.9	13.3	16 19.0	11.1	55.4
10	328 46.4	17.5	2 09.2	13.3	16 07.9	11.2	55.4
11	343 46.6	18.5	16 41.5	13.4	15 56.7	11.2	55.4
12	358 46.7	N 3 19.5	31 13.9	13.4	S15 45.5	11.3	55.4
13	13 46.9	20.5	45 46.3	13.6	15 34.2	11.4	55.3
14	28 47.1	21.4	60 18.9	13.6	15 22.8	11.4	55.3
15	43 47.3	. . 22.4	74 51.5	13.7	15 11.4	11.5	55.3
16	58 47.5	23.4	89 24.2	13.7	14 59.9	11.5	55.3
17	73 47.7	24.4	103 56.9	13.8	14 48.4	11.6	55.3
18	88 47.9	N 3 25.3	118 29.7	13.9	S14 36.8	11.7	55.2
19	103 48.1	26.3	133 02.6	14.0	14 25.1	11.7	55.2
20	118 48.2	27.3	147 35.6	14.0	14 13.4	11.7	55.2
21	133 48.4	. . 28.2	162 08.6	14.1	14 01.7	11.9	55.2
22	148 48.6	29.2	176 41.7	14.2	13 49.8	11.8	55.2
23	163 48.8	30.2	191 14.9	14.2	13 38.0	11.9	55.2
30 00	178 49.0	N 3 31.2	205 48.1	14.3	S13 26.1	12.0	55.1
01	193 49.2	32.1	220 21.4	14.3	13 14.1	12.0	55.1
02	208 49.4	33.1	234 54.7	14.5	13 02.1	12.1	55.1
03	223 49.6	. . 34.1	249 28.2	14.4	12 50.0	12.1	55.1
04	238 49.7	35.1	264 01.6	14.6	12 37.9	12.1	55.1
05	253 49.9	36.0	278 35.2	14.6	12 25.8	12.2	55.0
06	268 50.1	N 3 37.0	293 08.8	14.7	S12 13.6	12.3	55.0
07	283 50.3	38.0	307 42.5	14.7	12 01.3	12.3	55.0
08	298 50.5	39.0	322 16.2	14.8	11 49.0	12.3	55.0
09	313 50.7	. . 39.9	336 50.0	14.8	11 36.7	12.4	55.0
10	328 50.9	40.9	351 23.8	14.9	11 24.3	12.4	55.0
11	343 51.1	41.9	5 57.7	15.0	11 11.9	12.4	54.9
12	358 51.2	N 3 42.8	20 31.7	15.0	S10 59.5	12.5	54.9
13	13 51.4	43.8	35 05.7	15.0	10 47.0	12.5	54.9
14	28 51.6	44.8	49 39.7	15.1	10 34.5	12.6	54.9
15	43 51.8	. . 45.8	64 13.8	15.2	10 21.9	12.6	54.9
16	58 52.0	46.7	78 48.0	15.2	10 09.3	12.6	54.9
17	73 52.2	47.7	93 22.2	15.3	9 56.7	12.7	54.9
18	88 52.4	N 3 48.7	107 56.5	15.3	S 9 44.0	12.7	54.8
19	103 52.6	49.6	122 30.8	15.4	9 31.3	12.7	54.8
20	118 52.7	50.6	137 05.2	15.4	9 18.6	12.8	54.8
21	133 52.9	. . 51.6	151 39.6	15.4	9 05.8	12.7	54.8
22	148 53.1	52.6	166 14.0	15.6	8 53.1	12.9	54.8
23	163 53.3	53.5	180 48.6	15.5	8 40.2	12.8	54.8
31 00	178 53.5	N 3 54.5	195 23.1	15.6	S 8 27.4	12.9	54.8
01	193 53.7	55.5	209 57.7	15.6	8 14.5	12.9	54.7
02	208 53.9	56.4	224 32.3	15.7	8 01.6	12.9	54.7
03	223 54.1	. . 57.4	239 07.0	15.8	7 48.7	12.9	54.7
04	238 54.2	58.4	253 41.8	15.7	7 35.8	13.0	54.7
05	253 54.4	3 59.3	268 16.5	15.8	7 22.8	13.0	54.7
06	268 54.6	N 4 00.3	282 51.3	15.9	S 7 09.8	13.0	54.7
07	283 54.8	01.3	297 26.2	15.8	6 56.8	13.1	54.7
08	298 55.0	02.3	312 01.0	16.0	6 43.7	13.0	54.6
09	313 55.2	. . 03.2	326 36.0	15.9	6 30.7	13.1	54.6
10	328 55.4	04.2	341 10.9	16.0	6 17.6	13.1	54.6
11	343 55.5	05.2	355 45.9	16.0	6 04.5	13.1	54.6
12	358 55.7	N 4 06.1	10 20.9	16.1	S 5 51.4	13.1	54.6
13	13 55.9	07.1	24 56.0	16.1	5 38.3	13.2	54.6
14	28 56.1	08.1	39 31.1	16.1	5 25.1	13.1	54.6
15	43 56.3	. . 09.0	54 06.2	16.2	5 12.0	13.2	54.5
16	58 56.5	10.0	68 41.4	16.1	4 58.8	13.2	54.5
17	73 56.7	11.0	83 16.5	16.3	4 45.6	13.2	54.5
18	88 56.8	N 4 11.9	97 51.8	16.2	S 4 32.4	13.2	54.5
19	103 57.0	12.9	112 27.0	16.3	4 19.2	13.2	54.5
20	118 57.2	13.9	127 02.3	16.2	4 06.0	13.3	54.5
21	133 57.4	. . 14.8	141 37.5	16.4	3 52.7	13.2	54.5
22	148 57.6	15.8	156 12.9	16.3	3 39.5	13.3	54.5
23	163 57.8	16.8	170 48.2	16.4	S 3 26.2	13.2	54.5
	SD 16.0	d 1.0	SD 15.1		15.0		14.9

SATURDAY · SUNDAY · MONDAY

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 29	Moonrise 30	Moonrise 31	Moonrise 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	02 05	03 56	05 09	08 13	07 14	06 40	06 12
N 70	02 40	04 10	05 15	07 29	06 54	06 30	06 10
68	03 04	04 22	05 20	06 59	06 38	06 22	06 08
66	03 22	04 31	05 24	06 37	06 25	06 15	06 06
64	03 36	04 38	05 27	06 19	06 14	06 09	06 05
62	03 48	04 45	05 30	06 04	06 05	06 04	06 03
60	03 58	04 50	05 33	05 52	05 56	06 00	06 02
N 58	04 06	04 55	05 35	05 41	05 49	05 56	06 01
56	04 14	04 59	05 37	05 31	05 43	05 52	06 00
54	04 20	05 03	05 39	05 23	05 37	05 49	05 59
52	04 26	05 07	05 41	05 15	05 32	05 46	05 59
50	04 31	05 10	05 42	05 09	05 28	05 43	05 58
45	04 41	05 16	05 45	04 54	05 17	05 38	05 56
N 40	04 49	05 21	05 48	04 42	05 09	05 33	05 55
35	04 55	05 25	05 50	04 32	05 02	05 29	05 54
30	05 00	05 28	05 52	04 23	04 55	05 25	05 53
20	05 08	05 34	05 56	04 07	04 44	05 19	05 51
N 10	05 13	05 38	05 59	03 53	04 34	05 13	05 50
0	05 17	05 41	06 01	03 40	04 25	05 07	05 48
S 10	05 18	05 43	06 04	03 27	04 16	05 02	05 47
20	05 19	05 44	06 06	03 13	04 06	04 56	05 45
30	05 18	05 45	06 09	02 57	03 54	04 50	05 44
35	05 16	05 45	06 11	02 48	03 48	04 46	05 43
40	05 14	05 45	06 12	02 37	03 40	04 42	05 42
45	05 11	05 45	06 14	02 24	03 31	04 37	05 40
S 50	05 07	05 45	06 17	02 09	03 21	04 31	05 39
52	05 05	05 44	06 18	02 02	03 16	04 28	05 38
54	05 03	05 44	06 19	01 54	03 10	04 25	05 37
56	05 00	05 43	06 20	01 44	03 04	04 21	05 37
58	04 57	05 42	06 22	01 34	02 57	04 18	05 36
S 60	04 53	05 42	06 23	01 22	02 49	04 13	05 35

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 29	Moonset 30	Moonset 31	Moonset 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 03	20 17	22 13	11 50	14 21	16 23	18 17
N 70	18 57	20 02	21 35	12 33	14 40	16 31	18 16
68	18 52	19 50	21 10	13 01	14 54	16 37	18 15
66	18 47	19 41	20 51	13 22	15 05	16 42	18 15
64	18 44	19 33	20 36	13 39	15 15	16 46	18 14
62	18 41	19 26	20 24	13 53	15 23	16 49	18 14
60	18 38	19 20	20 13	14 04	15 30	16 53	18 13
N 58	18 35	19 16	20 05	14 14	15 36	16 55	18 13
56	18 33	19 11	19 57	14 23	15 42	16 58	18 12
54	18 31	19 07	19 51	14 31	15 46	17 00	18 12
52	18 30	19 04	19 45	14 37	15 51	17 02	18 12
50	18 28	19 01	19 40	14 44	15 55	17 04	18 11
45	18 25	18 54	19 29	14 57	16 03	17 08	18 11
N 40	18 22	18 49	19 21	15 08	16 10	17 11	18 10
35	18 19	18 45	19 15	15 17	16 16	17 14	18 10
30	18 17	18 41	19 09	15 25	16 21	17 16	18 09
20	18 14	18 36	19 01	15 39	16 30	17 20	18 09
N 10	18 11	18 32	18 56	15 51	16 38	17 24	18 08
0	18 08	18 29	18 53	16 02	16 46	17 27	18 08
S 10	18 05	18 26	18 51	16 13	16 53	17 31	18 07
20	18 03	18 25	18 50	16 25	17 01	17 34	18 06
30	18 00	18 23	18 51	16 38	17 09	17 38	18 06
35	17 58	18 23	18 52	16 46	17 15	17 41	18 05
40	17 56	18 23	18 54	16 55	17 20	17 43	18 05
45	17 54	18 23	18 57	17 05	17 27	17 46	18 04
S 50	17 52	18 24	19 01	17 17	17 35	17 50	18 04
52	17 50	18 24	19 03	17 23	17 38	17 51	18 03
54	17 49	18 24	19 05	17 29	17 42	17 53	18 03
56	17 48	18 25	19 08	17 36	17 46	17 55	18 03
58	17 46	18 25	19 11	17 44	17 51	17 57	18 02
S 60	17 45	18 26	19 15	17 52	17 57	17 59	18 02

Day	SUN Eqn. of Time 00h m s	SUN Eqn. of Time 12h m s	SUN Mer. Pass. h m	MOON Mer. Pass. Upper h m	MOON Mer. Pass. Lower h m	MOON Age d	MOON Phase %
29	[illegible]	[illegible]	12 05	09 51	22 14	26	10
30	[illegible]	[illegible]	12 05	10 35	22 57	27	5
31	[illegible]	[illegible]	12 04	11 17	23 38	28	2

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
27 00	179 17.2	N23 20.8	212 55.2	12.5	N21 20.5	8.2	54.3
01	194 17.0	20.7	227 26.7	12.5	21 28.7	8.1	54.4
02	209 16.9	20.6	241 58.2	12.4	21 36.8	8.1	54.4
03	224 16.8	20.5	256 29.6	12.3	21 44.9	7.9	54.4
04	239 16.6	20.5	271 00.9	12.3	21 52.8	7.9	54.4
05	254 16.5	20.4	285 32.2	12.2	22 00.7	7.7	54.4
06	269 16.4	N23 20.3	300 03.4	12.1	N22 08.4	7.7	54.4
07	284 16.2	20.2	314 34.5	12.0	22 16.1	7.5	54.4
08	299 16.1	20.1	329 05.5	12.0	22 23.6	7.5	54.4
F 09	314 16.0	20.0	343 36.5	11.9	22 31.1	7.4	54.4
R 10	329 15.8	19.9	358 07.4	11.8	22 38.5	7.2	54.5
I 11	344 15.7	19.8	12 38.2	11.8	22 45.7	7.2	54.5
D 12	359 15.6	N23 19.7	27 09.0	11.7	N22 52.9	7.1	54.5
A 13	14 15.5	19.6	41 39.7	11.6	23 00.0	6.9	54.5
Y 14	29 15.3	19.5	56 10.3	11.5	23 06.9	6.9	54.5
15	44 15.2	19.4	70 40.8	11.5	23 13.8	6.7	54.5
16	59 15.1	19.3	85 11.3	11.4	23 20.5	6.7	54.5
17	74 14.9	19.2	99 41.7	11.3	23 27.2	6.5	54.5
18	89 14.8	N23 19.1	114 12.0	11.3	N23 33.7	6.4	54.5
19	104 14.7	19.0	128 42.3	11.2	23 40.1	6.3	54.6
20	119 14.5	18.9	143 12.5	11.1	23 46.4	6.3	54.6
21	134 14.4	18.8	157 42.6	11.0	23 52.7	6.1	54.6
22	149 14.3	18.7	172 12.6	11.0	23 58.8	6.0	54.6
23	164 14.2	18.6	186 42.6	10.9	24 04.8	5.8	54.6
28 00	179 14.0	N23 18.5	201 12.5	10.9	N24 10.6	5.8	54.6
01	194 13.9	18.4	215 42.4	10.7	24 16.4	5.7	54.6
02	209 13.8	18.3	230 12.1	10.8	24 22.1	5.5	54.7
03	224 13.6	18.1	244 41.9	10.6	24 27.6	5.4	54.7
04	239 13.5	18.0	259 11.5	10.6	24 33.0	5.3	54.7
05	254 13.4	17.9	273 41.1	10.5	24 38.3	5.2	54.7
06	269 13.2	N23 17.8	288 10.6	10.5	N24 43.5	5.1	54.7
07	284 13.1	17.7	302 40.1	10.4	24 48.6	5.0	54.7
S 08	299 13.0	17.6	317 09.5	10.3	24 53.6	4.8	54.7
A 09	314 12.9	17.5	331 38.8	10.2	24 58.4	4.7	54.8
T 10	329 12.7	17.4	346 08.0	10.2	25 03.1	4.6	54.8
U 11	344 12.6	17.3	0 37.2	10.2	25 07.7	4.5	54.8
R 12	359 12.5	N23 17.1	15 06.4	10.1	N25 12.2	4.4	54.8
D 13	14 12.3	17.0	29 35.5	10.0	25 16.6	4.2	54.8
A 14	29 12.2	16.9	44 04.5	10.0	25 20.8	4.1	54.8
Y 15	44 12.1	16.8	58 33.5	9.9	25 24.9	4.0	54.8
16	59 11.9	16.7	73 02.4	9.8	25 28.9	3.8	54.9
17	74 11.8	16.6	87 31.2	9.8	25 32.7	3.8	54.9
18	89 11.7	N23 16.4	102 00.0	9.7	N25 36.5	3.6	54.9
19	104 11.6	16.3	116 28.7	9.7	25 40.1	3.4	54.9
20	119 11.4	16.2	130 57.4	9.7	25 43.5	3.4	54.9
21	134 11.3	16.1	145 26.1	9.5	25 46.9	3.2	54.9
22	149 11.2	16.0	159 54.6	9.6	25 50.1	3.1	55.0
23	164 11.0	15.8	174 23.2	9.4	25 53.2	3.0	55.0
29 00	179 10.9	N23 15.7	188 51.6	9.5	N25 56.2	2.8	55.0
01	194 10.8	15.6	203 20.1	9.4	25 59.0	2.7	55.0
02	209 10.7	15.5	217 48.5	9.3	26 01.7	2.6	55.0
03	224 10.5	15.3	232 16.8	9.3	26 04.3	2.4	55.0
04	239 10.4	15.2	246 45.1	9.2	26 06.7	2.3	55.1
05	254 10.3	15.1	261 13.3	9.2	26 09.0	2.2	55.1
06	269 10.2	N23 15.0	275 41.5	9.2	N26 11.2	2.0	55.1
07	284 10.0	14.8	290 09.7	9.1	26 13.2	1.9	55.1
08	299 09.9	14.7	304 37.8	9.1	26 15.1	1.8	55.1
S 09	314 09.8	14.6	319 05.9	9.0	26 16.9	1.6	55.1
U 10	329 09.6	14.4	333 33.9	9.0	26 18.5	1.5	55.2
N 11	344 09.5	14.3	348 01.9	9.0	26 20.0	1.3	55.2
D 12	359 09.4	N23 14.2	2 29.9	8.9	N26 21.3	1.2	55.2
A 13	14 09.3	14.0	16 57.8	8.9	26 22.5	1.1	55.2
Y 14	29 09.1	13.9	31 25.7	8.9	26 23.6	1.0	55.2
15	44 09.0	13.8	45 53.6	8.8	26 24.6	0.8	55.2
16	59 08.9	13.6	60 21.4	8.8	26 25.4	0.6	55.3
17	74 08.8	13.5	74 49.2	8.8	26 26.0	0.5	55.3
18	89 08.6	N23 13.4	89 17.0	8.7	N26 26.5	0.4	55.3
19	104 08.5	13.2	103 44.7	8.8	26 26.9	0.3	55.3
20	119 08.4	13.1	118 12.5	8.7	26 27.2	0.1	55.3
21	134 08.2	13.0	132 40.2	8.6	26 27.3	0.1	55.4
22	149 08.1	12.8	147 07.8	8.7	26 27.2	0.2	55.4
23	164 08.0	12.7	161 35.5	8.6	N26 27.0	0.3	55.4
	SD 15.8	d 0.1	SD 14.8		14.9		15.0

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

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

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
27	02 51	02 [illegible]	12 03	10 08	22 32	27	5
28	03 04	03 [illegible]	12 03	10 57	23 23	28	2
29	03 [illegible]	03 [illegible]	12 03	11 50	24 16	29	0

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2003 JUNE 30, JULY 1, 2 (MON., TUES., WED.)

UT	ARIES	VENUS −3.9		MARS −1.5		JUPITER −1.8		SATURN +0.0	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
30 00	277 39.0	193 56.6	N23 00.7	299 18.2	S13 40.3	137 12.2	N16 16.4	184 01.3	N22 36.2
01	292 41.5	208 55.7	00.9	314 19.8	40.1	152 14.2	16.3	199 03.5	36.2
02	307 43.9	223 54.9	01.2	329 21.5	40.0	167 16.2	16.1	214 05.6	36.2
03	322 46.4	238 54.0 . .	01.4	344 23.1 . .	39.8	182 18.2 . .	16.0	229 07.7 . .	36.2
04	337 48.9	253 53.2	01.6	359 24.7	39.6	197 20.2	15.8	244 09.8	36.2
05	352 51.3	268 52.3	01.9	14 26.3	39.5	212 22.2	15.7	259 11.9	36.2
06	7 53.8	283 51.5	N23 02.1	29 28.0	S13 39.3	227 24.1	N16 15.5	274 14.0	N22 36.2
07	22 56.3	298 50.6	02.3	44 29.6	39.1	242 26.1	15.4	289 16.1	36.2
08	37 58.7	313 49.8	02.5	59 31.2	39.0	257 28.1	15.3	304 18.2	36.2
M 09	53 01.2	328 48.9 . .	02.8	74 32.8 . .	38.8	272 30.1 . .	15.1	319 20.4 . .	36.2
O 10	68 03.7	343 48.1	03.0	89 34.5	38.6	287 32.1	15.0	334 22.5	36.2
N 11	83 06.1	358 47.2	03.2	104 36.1	38.5	302 34.1	14.8	349 24.6	36.2
D 12	98 08.6	13 46.4	N23 03.4	119 37.7	S13 38.3	317 36.1	N16 14.7	4 26.7	N22 36.1
A 13	113 11.1	28 45.5	03.7	134 39.4	38.1	332 38.1	14.5	19 28.8	36.1
Y 14	128 13.5	43 44.7	03.9	149 41.0	38.0	347 40.1	14.4	34 30.9	36.1
15	143 16.0	58 43.8 . .	04.1	164 42.6 . .	37.8	2 42.1 . .	14.2	49 33.0 . .	36.1
16	158 18.4	73 43.0	04.3	179 44.3	37.6	17 44.1	14.1	64 35.1	36.1
17	173 20.9	88 42.1	04.5	194 45.9	37.5	32 46.0	13.9	79 37.3	36.1
18	188 23.4	103 41.3	N23 04.7	209 47.5	S13 37.3	47 48.0	N16 13.8	94 39.4	N22 36.1
19	203 25.8	118 40.4	05.0	224 49.2	37.2	62 50.0	13.6	109 41.5	36.1
20	218 28.3	133 39.6	05.2	239 50.8	37.0	77 52.0	13.5	124 43.6	36.1
21	233 30.8	148 38.7 . .	05.4	254 52.4 . .	36.8	92 54.0 . .	13.3	139 45.7 . .	36.1
22	248 33.2	163 37.9	05.6	269 54.1	36.7	107 56.0	13.2	154 47.8	36.1
23	263 35.7	178 37.0	05.8	284 55.7	36.5	122 58.0	13.0	169 49.9	36.1
1 00	278 38.2	193 36.2	N23 06.0	299 57.4	S13 36.3	138 00.0	N16 12.9	184 52.0	N22 36.1
01	293 40.6	208 35.3	06.2	314 59.0	36.2	153 02.0	12.8	199 54.2	36.1
02	308 43.1	223 34.5	06.4	330 00.6	36.0	168 04.0	12.6	214 56.3	36.1
03	323 45.6	238 33.6 . .	06.6	345 02.3 . .	35.9	183 05.9 . .	12.5	229 58.4 . .	36.1
04	338 48.0	253 32.7	06.8	0 03.9	35.7	198 07.9	12.3	245 00.5	36.1
05	353 50.5	268 31.9	07.0	15 05.6	35.6	213 09.9	12.2	260 02.6	36.1
06	8 52.9	283 31.0	N23 07.2	30 07.2	S13 35.4	228 11.9	N16 12.0	275 04.7	N22 36.1
07	23 55.4	298 30.2	07.4	45 08.9	35.2	243 13.9	11.9	290 06.8	36.0
T 08	38 57.9	313 29.3	07.6	60 10.5	35.1	258 15.9	11.7	305 08.9	36.0
U 09	54 00.3	328 28.5 . .	07.8	75 12.2 . .	34.9	273 17.9 . .	11.6	320 11.1 . .	36.0
E 10	69 02.8	343 27.6	08.0	90 13.8	34.8	288 19.9	11.4	335 13.2	36.0
S 11	84 05.3	358 26.8	08.2	105 15.5	34.6	303 21.9	11.3	350 15.3	36.0
D 12	99 07.7	13 25.9	N23 08.4	120 17.1	S13 34.5	318 23.9	N16 11.1	5 17.4	N22 36.0
A 13	114 10.2	28 25.1	08.6	135 18.8	34.3	333 25.8	11.0	20 19.5	36.0
Y 14	129 12.7	43 24.2	08.8	150 20.4	34.1	348 27.8	10.8	35 21.6	36.0
15	144 15.1	58 23.4 . .	09.0	165 22.1 . .	34.0	3 29.8 . .	10.7	50 23.7 . .	36.0
16	159 17.6	73 22.5	09.2	180 23.7	33.8	18 31.8	10.5	65 25.8	36.0
17	174 20.0	88 21.6	09.4	195 25.4	33.7	33 33.8	10.4	80 28.0	36.0
18	189 22.5	103 20.8	N23 09.6	210 27.0	S13 33.5	48 35.8	N16 10.2	95 30.1	N22 36.0
19	204 25.0	118 19.9	09.7	225 28.7	33.4	63 37.8	10.1	110 32.2	36.0
20	219 27.4	133 19.1	09.9	240 30.4	33.2	78 39.8	09.9	125 34.3	36.0
21	234 29.9	148 18.2 . .	10.1	255 32.0 . .	33.1	93 41.7 . .	09.8	140 36.4 . .	36.0
22	249 32.4	163 17.4	10.3	270 33.7	32.9	108 43.7	09.6	155 38.5	36.0
23	264 34.8	178 16.5	10.5	285 35.3	32.8	123 45.7	09.5	170 40.6	36.0
2 00	279 37.3	193 15.6	N23 10.7	300 37.0	S13 32.6	138 47.7	N16 09.3	185 42.8	N22 36.0
01	294 39.8	208 14.8	10.8	315 38.7	32.4	153 49.7	09.2	200 44.9	35.9
02	309 42.2	223 13.9	11.0	330 40.3	32.3	168 51.7	09.0	215 47.0	35.9
03	324 44.7	238 13.1 . .	11.2	345 42.0 . .	32.1	183 53.7 . .	08.9	230 49.1 . .	35.9
04	339 47.2	253 12.2	11.4	0 43.7	32.0	198 55.7	08.7	245 51.2	35.9
05	354 49.6	268 11.4	11.5	15 45.3	31.8	213 57.6	08.6	260 53.3	35.9
06	9 52.1	283 10.5	N23 11.7	30 47.0	S13 31.7	228 59.6	N16 08.5	275 55.4	N22 35.9
W 07	24 54.5	298 09.6	11.9	45 48.7	31.5	244 01.6	08.3	290 57.5	35.9
E 08	39 57.0	313 08.8	12.1	60 50.3	31.4	259 03.6	08.2	305 59.7	35.9
D 09	54 59.5	328 07.9 . .	12.2	75 52.0 . .	31.2	274 05.6 . .	08.0	321 01.8 . .	35.9
N 10	70 01.9	343 07.1	12.4	90 53.7	31.1	289 07.6	07.9	336 03.9	35.9
E 11	85 04.4	358 06.2	12.6	105 55.3	30.9	304 09.6	07.7	351 06.0	35.9
S 12	100 06.9	13 05.3	N23 12.7	120 57.0	S13 30.8	319 11.6	N16 07.6	6 08.1	N22 35.9
D 13	115 09.3	28 04.5	12.9	135 58.7	30.7	334 13.5	07.4	21 10.2	35.9
A 14	130 11.8	43 03.6	13.1	151 00.4	30.5	349 15.5	07.3	36 12.3	35.9
Y 15	145 14.3	58 02.8 . .	13.2	166 02.0 . .	30.4	4 17.5 . .	07.1	51 14.4 . .	35.9
16	160 16.7	73 01.9	13.4	181 03.7	30.2	19 19.5	07.0	66 16.6	35.9
17	175 19.2	88 01.1	13.5	196 05.4	30.1	34 21.5	06.8	81 18.7	35.9
18	190 21.7	103 00.2	N23 13.7	211 07.1	S13 29.9	49 23.5	N16 06.7	96 20.8	N22 35.8
19	205 24.1	117 59.3	13.9	226 08.8	29.8	64 25.5	06.5	111 22.9	35.8
20	220 26.6	132 58.5	14.0	241 10.4	29.6	79 27.4	06.4	126 25.0	35.8
21	235 29.0	147 57.6 . .	14.2	256 12.1 . .	29.5	94 29.4 . .	06.2	141 27.1 . .	35.8
22	250 31.5	162 56.7	14.3	271 13.8	29.3	109 31.4	06.1	156 29.2	35.8
23	265 34.0	177 55.9	14.5	286 15.5	29.2	124 33.4	05.9	171 31.4	35.8
Mer. Pass.	h m 5 24.6	v −0.9	d 0.2	v 1.7	d 0.2	v 2.0	d 0.1	v 2.1	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.5	S40 17.1
Achernar	335 32.6	S57 12.9
Acrux	173 18.4	S63 07.1
Adhara	255 19.1	S28 58.5
Aldebaran	290 58.7	N16 31.0
Alioth	166 27.3	N55 56.1
Alkaid	153 04.8	N49 18.1
Al Na'ir	27 53.1	S46 56.5
Alnilam	275 54.7	S 1 11.9
Alphard	218 04.1	S 8 40.1
Alphecca	126 17.3	N26 42.1
Alpheratz	357 51.7	N29 06.4
Altair	62 15.6	N 8 52.6
Ankaa	353 23.3	S42 17.1
Antares	112 35.6	S26 26.5
Arcturus	146 02.7	N19 10.0
Atria	107 44.1	S69 02.2
Avior	234 22.0	S59 31.3
Bellatrix	278 40.8	N 6 21.2
Betelgeuse	271 10.1	N 7 24.5
Canopus	264 00.2	S52 41.8
Capella	280 46.6	N46 00.1
Deneb	49 36.5	N45 17.4
Denebola	182 41.7	N14 33.3
Diphda	349 03.7	S17 58.0
Dubhe	194 01.3	N61 44.3
Elnath	278 22.9	N28 36.6
Eltanin	90 49.3	N51 29.3
Enif	33 54.6	N 9 53.3
Fomalhaut	15 32.4	S29 36.2
Gacrux	172 09.9	S57 08.2
Gienah	176 00.5	S17 33.7
Hadar	148 59.0	S60 23.6
Hamal	328 09.8	N23 28.6
Kaus Aust.	83 53.8	S34 23.0
Kochab	137 18.6	N74 08.8
Markab	13 46.1	N15 13.3
Menkar	314 23.5	N 4 06.2
Menkent	148 16.8	S36 23.4
Miaplacidus	221 42.4	S69 44.0
Mirfak	308 52.1	N49 52.2
Nunki	76 07.6	S26 17.6
Peacock	53 30.9	S56 43.4
Pollux	243 37.7	N28 01.2
Procyon	245 08.3	N 5 13.1
Rasalhague	96 13.4	N12 33.4
Regulus	207 52.0	N11 57.2
Rigel	281 19.9	S 8 11.8
Rigil Kent.	140 02.4	S60 51.2
Sabik	102 21.2	S15 43.8
Schedar	349 49.7	N56 33.0
Shaula	96 32.2	S37 06.5
Sirius	258 41.0	S16 43.1
Spica	158 39.5	S11 10.8
Suhail	222 58.7	S43 26.8
Vega	80 43.9	N38 47.2
Zuben'ubi	137 14.0	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	274 58.0	11 06
Mars	21 19.2	4 00
Jupiter	219 21.8	14 46
Saturn	266 13.9	11 39

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
30 00	179 07.9	N23 12.5	176 03.1	8.6	N26 26.7	0.4	55.4
01	194 07.7	12.4	190 30.7	8.6	26 26.3	0.6	55.4
02	209 07.6	12.3	204 58.3	8.6	26 25.7	0.8	55.4
03	224 07.5	12.1	219 25.9	8.6	26 24.9	0.9	55.5
04	239 07.4	12.0	233 53.5	8.5	26 24.0	1.0	55.5
05	254 07.2	11.8	248 21.0	8.5	26 23.0	1.2	55.5
06	269 07.1	N23 11.7	262 48.5	8.6	N26 21.8	1.3	55.5
07	284 07.0	11.5	277 16.1	8.5	26 20.5	1.4	55.5
08	299 06.9	11.4	291 43.6	8.5	26 19.1	1.6	55.6
M 09	314 06.7	11.2	306 11.1	8.5	26 17.5	1.8	55.6
O 10	329 06.6	11.1	320 38.6	8.5	26 15.7	1.9	55.6
N 11	344 06.5	11.0	335 06.1	8.5	26 13.8	2.0	55.6
D 12	359 06.4	N23 10.8	349 33.6	8.5	N26 11.8	2.2	55.6
A 13	14 06.2	10.7	4 01.1	8.5	26 09.6	2.3	55.7
Y 14	29 06.1	10.5	18 28.6	8.5	26 07.3	2.4	55.7
15	44 06.0	10.4	32 56.1	8.5	26 04.9	2.6	55.7
16	59 05.9	10.2	47 23.6	8.5	26 02.3	2.8	55.7
17	74 05.7	10.1	61 51.1	8.5	25 59.5	2.8	55.7
18	89 05.6	N23 09.9	76 18.6	8.5	N25 56.7	3.1	55.8
19	104 05.5	09.7	90 46.1	8.5	25 53.6	3.1	55.8
20	119 05.4	09.6	105 13.6	8.5	25 50.5	3.3	55.8
21	134 05.2	09.4	119 41.1	8.6	25 47.2	3.5	55.8
22	149 05.1	09.3	134 08.7	8.5	25 43.7	3.6	55.8
23	164 05.0	09.1	148 36.2	8.6	25 40.1	3.7	55.8
1 00	179 04.9	N23 09.0	163 03.8	8.5	N25 36.4	3.9	55.9
01	194 04.8	08.8	177 31.3	8.6	25 32.5	4.0	55.9
02	209 04.6	08.7	191 58.9	8.6	25 28.5	4.1	55.9
03	224 04.5	08.5	206 26.5	8.6	25 24.4	4.3	55.9
04	239 04.4	08.3	220 54.1	8.7	25 20.1	4.5	55.9
05	254 04.3	08.2	235 21.8	8.6	25 15.6	4.5	56.0
06	269 04.1	N23 08.0	249 49.4	8.7	N25 11.1	4.7	56.0
07	284 04.0	07.8	264 17.1	8.7	25 06.4	4.9	56.0
T 08	299 03.9	07.7	278 44.8	8.7	25 01.5	5.0	56.0
U 09	314 03.8	07.5	293 12.5	8.8	24 56.5	5.1	56.0
E 10	329 03.6	07.4	307 40.3	8.7	24 51.4	5.3	56.1
S 11	344 03.5	07.2	322 08.0	8.8	24 46.1	5.4	56.1
D 12	359 03.4	N23 07.0	336 35.8	8.9	N24 40.7	5.5	56.1
A 13	14 03.3	06.9	351 03.7	8.8	24 35.2	5.7	56.1
Y 14	29 03.2	06.7	5 31.5	8.9	24 29.5	5.8	56.2
15	44 03.0	06.5	19 59.4	8.9	24 23.7	5.9	56.2
16	59 02.9	06.4	34 27.3	9.0	24 17.8	6.1	56.2
17	74 02.8	06.2	48 55.3	8.9	24 11.7	6.2	56.2
18	89 02.7	N23 06.0	63 23.2	9.0	N24 05.5	6.4	56.2
19	104 02.5	05.9	77 51.2	9.1	23 59.1	6.4	56.3
20	119 02.4	05.7	92 19.3	9.1	23 52.7	6.7	56.3
21	134 02.3	05.5	106 47.4	9.1	23 46.0	6.7	56.3
22	149 02.2	05.3	121 15.5	9.1	23 39.3	6.9	56.3
23	164 02.1	05.2	135 43.6	9.2	23 32.4	7.0	56.3
2 00	179 01.9	N23 05.0	150 11.8	9.3	N23 25.4	7.1	56.4
01	194 01.8	04.8	164 40.1	9.2	23 18.3	7.3	56.4
02	209 01.7	04.6	179 08.3	9.3	23 11.0	7.3	56.4
03	224 01.6	04.5	193 36.6	9.4	23 03.7	7.6	56.4
04	239 01.5	04.3	208 05.0	9.4	22 56.1	7.6	56.4
05	254 01.3	04.1	222 33.4	9.4	22 48.5	7.8	56.5
06	269 01.2	N23 03.9	237 01.8	9.4	N22 40.7	7.9	56.5
W 07	284 01.1	03.8	251 30.2	9.6	22 32.8	8.0	56.5
E 08	299 01.0	03.6	265 58.8	9.5	22 24.8	8.1	56.5
D 09	314 00.9	03.4	280 27.3	9.6	22 16.7	8.3	56.5
N 10	329 00.7	03.2	294 55.9	9.7	22 08.4	8.4	56.6
E 11	344 00.6	03.0	309 24.6	9.6	22 00.0	8.5	56.6
S 12	359 00.5	N23 02.8	323 53.2	9.8	N21 51.5	8.6	56.6
D 13	14 00.4	02.7	338 22.0	9.7	21 42.9	8.8	56.6
A 14	29 00.3	02.5	352 50.7	9.9	21 34.1	8.8	56.6
Y 15	44 00.1	02.3	7 19.6	9.8	21 25.3	9.0	56.7
16	59 00.0	02.1	21 48.4	10.0	21 16.3	9.1	56.7
17	73 59.9	01.9	36 17.4	9.9	21 07.2	9.2	56.7
18	88 59.8	N23 01.7	50 46.3	10.0	N20 58.0	9.4	56.7
19	103 59.7	01.6	65 15.3	10.1	20 48.6	9.4	56.8
20	118 59.6	01.4	79 44.4	10.1	20 39.2	9.6	56.8
21	133 59.4	01.2	94 13.5	10.1	20 29.6	9.7	56.8
22	148 59.3	01.0	108 42.6	10.2	20 19.9	9.8	56.8
23	163 59.2	00.8	123 11.8	10.3	N20 10.1	9.9	56.8
	SD 15.8	d 0.2	SD 15.2		15.3		15.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	▭
N 70	▭	▭	▭	▭	▭	▭	04 06
68	▭	▭	▭	▭	▭	▭	05 06
66	////	////	00 13	▭	▭	03 20	05 40
64	////	////	01 40	▭	02 07	04 10	06 04
62	////	////	02 16	01 46	03 04	04 41	06 23
60	////	01 02	02 42	02 25	03 37	05 05	06 39
N 58	////	01 48	03 02	02 53	04 01	05 23	06 52
56	////	02 16	03 18	03 14	04 20	05 39	07 04
54	00 57	02 38	03 32	03 32	04 37	05 52	07 14
52	01 39	02 56	03 44	03 47	04 51	06 04	07 22
50	02 06	03 10	03 55	04 00	05 03	06 14	07 30
45	02 50	03 40	04 17	04 27	05 28	06 36	07 47
N 40	03 20	04 02	04 35	04 48	05 48	06 53	08 01
35	03 43	04 20	04 49	05 06	06 05	07 07	08 12
30	04 02	04 35	05 02	05 21	06 19	07 20	08 22
20	04 30	05 00	05 24	05 47	06 43	07 41	08 39
N 10	04 53	05 20	05 43	06 10	07 05	08 00	08 54
0	05 11	05 38	06 00	06 30	07 24	08 17	09 08
S 10	05 28	05 55	06 17	06 51	07 44	08 34	09 22
20	05 44	06 12	06 36	07 13	08 05	08 53	09 37
30	06 00	06 30	06 57	07 39	08 29	09 14	09 54
35	06 09	06 41	07 09	07 55	08 43	09 26	10 04
40	06 18	06 52	07 23	08 12	09 00	09 40	10 15
45	06 28	07 06	07 39	08 34	09 19	09 57	10 28
S 50	06 40	07 21	08 00	09 00	09 44	10 18	10 44
52	06 45	07 29	08 09	09 14	09 56	10 27	10 51
54	06 51	07 37	08 20	09 29	10 09	10 38	10 59
56	06 57	07 46	08 33	09 46	10 25	10 51	11 09
58	07 03	07 56	08 47	10 08	10 43	11 05	11 19
S 60	07 11	08 07	09 04	10 35	11 05	11 22	11 31

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 30	Moonset 1	Moonset 2	Moonset 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	▭	▭	▭
N 70	▭	▭	▭	▭	▭	▭	02 02
68	▭	▭	▭	▭	▭	▭	01 01
66	23 44	////	////	▭	▭	00 58	00 26
64	22 26	////	////	▭	00 19	00 07	(00 01 / 23 55)
62	21 51	////	////	23 22	23 35	23 41	23 42
60	21 25	23 04	////	22 49	23 12	23 24	23 31
N 58	21 05	22 19	////	22 24	22 52	23 10	23 22
56	20 49	21 50	////	22 05	22 36	22 58	23 13
54	20 35	21 29	23 09	21 48	22 23	22 47	23 06
52	20 23	21 11	22 27	21 34	22 11	22 38	22 59
50	20 13	20 57	22 01	21 22	22 00	22 30	22 53
45	19 50	20 28	21 17	20 56	21 38	22 12	22 40
N 40	19 33	20 05	20 47	20 35	21 19	21 57	22 29
35	19 18	19 48	20 24	20 18	21 04	21 44	22 19
30	19 05	19 33	20 06	20 04	20 51	21 33	22 11
20	18 43	19 08	19 37	19 38	20 28	21 14	21 57
N 10	18 25	18 48	19 15	19 17	20 08	20 58	21 44
0	18 07	18 30	18 56	18 56	19 50	20 42	21 32
S 10	17 50	18 13	18 39	18 36	19 31	20 26	21 20
20	17 32	17 56	18 23	18 14	19 11	20 09	21 07
30	17 11	17 37	18 07	17 48	18 48	19 50	20 52
35	16 59	17 27	17 59	17 33	18 34	19 38	20 43
40	16 45	17 15	17 49	17 16	18 18	19 25	20 33
45	16 28	17 02	17 39	16 55	17 59	19 09	20 22
S 50	16 08	16 46	17 28	16 28	17 36	18 50	20 07
52	15 58	16 39	17 23	16 15	17 24	18 41	20 01
54	15 47	16 31	17 17	16 00	17 11	18 30	19 53
56	15 35	16 22	17 11	15 43	16 56	18 18	19 45
58	15 21	16 12	17 04	15 21	16 38	18 05	19 35
S 60	15 04	16 01	16 57	14 54	16 16	17 48	19 24

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
30	03 28	03 34	12 04	12 43	00 16	01	1
1	03 40	03 46	12 04	13 37	01 10	02	3
2	03 52	03 58	12 04	14 30	02 04	03	8

2003 JULY 3, 4, 5 (THURS., FRI., SAT.)

UT	ARIES	VENUS −3.9		MARS −1.5		JUPITER −1.8		SATURN +0.0		STARS		
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Name	SHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
3 00	280 36.4	192 55.0	N23 14.6	301 17.2	S13 29.0	139 35.4	N16 05.8	186 33.5	N22 35.8	Acamar	315 24.4	S40 17.3
01	295 38.9	207 54.2	14.8	316 18.9	28.9	154 37.4	05.6	201 35.6	35.8	Achernar	335 32.5	S57 12.9
02	310 41.4	222 53.3	14.9	331 20.5	28.8	169 39.4	05.5	216 37.7	35.8	Acrux	173 18.5	S63 07.3
03	325 43.8	237 52.4	15.1	346 22.2	28.6	184 41.3	05.3	231 39.8	35.8	Adhara	255 19.1	S28 58.5
04	340 46.3	252 51.6	15.2	1 23.9	28.5	199 43.3	05.2	246 41.9	35.8	Aldebaran	290 58.7	N16 31.0
05	355 48.8	267 50.7	15.4	16 25.6	28.3	214 45.3	05.0	261 44.0	35.8			
06	10 51.2	282 49.9	N23 15.5	31 27.3	S13 28.2	229 47.3	N16 04.9	276 46.2	N22 35.8	Alioth	166 27.3	N55 56.8
07	25 53.7	297 49.0	15.7	46 29.0	28.1	244 49.3	04.7	291 48.3	35.8	Alkaid	153 04.8	N49 18.1
T 08	40 56.2	312 48.1	15.8	61 30.7	27.9	259 51.3	04.6	306 50.4	35.8	Al Na'ir	27 53.1	S46 56.5
H 09	55 58.6	327 47.3	16.0	76 32.4	27.8	274 53.3	04.4	321 52.5	35.8	Alnilam	275 54.7	S 1 11.9
U 10	71 01.1	342 46.4	16.1	91 34.1	27.6	289 55.2	04.3	336 54.6	35.8	Alphard	218 04.1	S 8 40.3
R 11	86 03.5	357 45.5	16.2	106 35.7	27.5	304 57.2	04.1	351 56.7	35.7			
S 12	101 06.0	12 44.7	N23 16.4	121 37.4	S13 27.3	319 59.2	N16 04.0	6 58.8	N22 35.7	Alphecca	126 17.3	N26 42.3
D 13	116 08.5	27 43.8	16.5	136 39.1	27.2	335 01.2	03.8	22 00.9	35.7	Alpheratz	357 51.6	N29 06.4
A 14	131 10.9	42 43.0	16.6	151 40.8	27.1	350 03.2	03.7	37 03.1	35.7	Altair	62 15.6	N 8 52.6
Y 15	146 13.4	57 42.1	16.8	166 42.5	26.9	5 05.2	03.5	52 05.2	35.7	Ankaa	353 23.2	S42 17.1
16	161 15.9	72 41.2	16.9	181 44.2	26.8	20 07.1	03.4	67 07.3	35.7	Antares	112 35.6	S26 26.5
17	176 18.3	87 40.4	17.0	196 45.9	26.7	35 09.1	03.2	82 09.4	35.7			
18	191 20.8	102 39.5	N23 17.2	211 47.6	S13 26.5	50 11.1	N16 03.1	97 11.5	N22 35.7	Arcturus	146 02.7	N19 10.0
19	206 23.3	117 38.6	17.3	226 49.3	26.4	65 13.1	02.9	112 13.6	35.7	Atria	107 44.1	S69 02.2
20	221 25.7	132 37.8	17.4	241 51.0	26.2	80 15.1	02.8	127 15.7	35.7	Avior	234 22.0	S59 31.2
21	236 28.2	147 36.9	17.6	256 52.7	26.1	95 17.1	02.6	142 17.9	35.7	Bellatrix	278 40.7	N 6 21.2
22	251 30.6	162 36.0	17.7	271 54.4	26.0	110 19.0	02.5	157 20.0	35.7	Betelgeuse	271 10.1	N 7 24.5
23	266 33.1	177 35.2	17.8	286 56.1	25.8	125 21.0	02.3	172 22.1	35.7			
4 00	281 35.6	192 34.3	N23 17.9	301 57.8	S13 25.7	140 23.0	N16 02.2	187 24.2	N22 35.7	Canopus	264 00.2	S52 41.7
01	296 38.0	207 33.5	18.1	316 59.6	25.6	155 25.0	02.0	202 26.3	35.7	Capella	280 46.5	N46 00.1
02	311 40.5	222 32.6	18.2	332 01.3	25.4	170 27.0	01.8	217 28.4	35.7	Deneb	49 36.5	N45 17.4
03	326 43.0	237 31.7	18.3	347 03.0	25.3	185 29.0	01.7	232 30.5	35.6	Denebola	182 41.7	N14 33.3
04	341 45.4	252 30.9	18.4	2 04.7	25.2	200 30.9	01.5	247 32.7	35.6	Diphda	349 03.7	S17 58.0
05	356 47.9	267 30.0	18.5	17 06.4	25.0	215 32.9	01.4	262 34.8	35.6			
06	11 50.4	282 29.1	N23 18.7	32 08.1	S13 24.9	230 34.9	N16 01.2	277 36.9	N22 35.6	Dubhe	194 01.3	N61 44.3
07	26 52.8	297 28.3	18.8	47 09.8	24.8	245 36.9	01.1	292 39.0	35.6	Elnath	278 22.9	N28 36.6
08	41 55.3	312 27.4	18.9	62 11.5	24.6	260 38.9	00.9	307 41.1	35.6	Eltanin	90 49.3	N51 29.3
09	56 57.8	327 26.5	19.0	77 13.2	24.5	275 40.9	00.8	322 43.2	35.6	Enif	33 54.6	N 9 53.3
F 10	72 00.2	342 25.7	19.1	92 15.0	24.4	290 42.8	00.6	337 45.3	35.6	Fomalhaut	15 32.3	S29 36.2
R 11	87 02.7	357 24.8	19.2	107 16.7	24.2	305 44.8	00.5	352 47.5	35.6			
I 12	102 05.1	12 23.9	N23 19.3	122 18.4	S13 24.1	320 46.8	N16 00.3	7 49.6	N22 35.6	Gacrux	172 10.0	S57 08.2
D 13	117 07.6	27 23.1	19.4	137 20.1	24.0	335 48.8	00.2	22 51.7	35.6	Gienah	176 00.5	S17 33.7
A 14	132 10.1	42 22.2	19.6	152 21.8	23.8	350 50.8	16 00.0	37 53.8	35.6	Hadar	148 59.1	S60 23.6
Y 15	147 12.5	57 21.3	19.7	167 23.5	23.7	5 52.7	15 59.9	52 55.9	35.6	Hamal	328 09.8	N23 28.6
16	162 15.0	72 20.5	19.8	182 25.3	23.6	20 54.7	59.7	67 58.0	35.6	Kaus Aust.	83 53.8	S34 23.0
17	177 17.5	87 19.6	19.9	197 27.0	23.5	35 56.7	59.6	83 00.1	35.6			
18	192 19.9	102 18.7	N23 20.0	212 28.7	S13 23.3	50 58.7	N15 59.4	98 02.3	N22 35.5	Kochab	137 18.7	N74 08.8
19	207 22.4	117 17.9	20.1	227 30.4	23.2	66 00.7	59.3	113 04.4	35.5	Markab	13 46.0	N15 13.3
20	222 24.9	132 17.0	20.2	242 32.2	23.1	81 02.7	59.1	128 06.5	35.5	Menkar	314 23.5	N 4 06.2
21	237 27.3	147 16.1	20.3	257 33.9	22.9	96 04.6	59.0	143 08.6	35.5	Menkent	148 16.8	S36 23.4
22	252 29.8	162 15.3	20.4	272 35.6	22.8	111 06.6	58.8	158 10.7	35.5	Miaplacidus	221 42.4	S69 44.0
23	267 32.3	177 14.4	20.5	287 37.3	22.7	126 08.6	58.7	173 12.8	35.5			
5 00	282 34.7	192 13.5	N23 20.6	302 39.1	S13 22.6	141 10.6	N15 58.5	188 14.9	N22 35.5	Mirfak	308 52.1	N49 52.2
01	297 37.2	207 12.7	20.7	317 40.8	22.4	156 12.6	58.4	203 17.1	35.5	Nunki	76 07.6	S26 17.6
02	312 39.6	222 11.8	20.7	332 42.5	22.3	171 14.5	58.2	218 19.2	35.5	Peacock	53 30.9	S56 43.4
03	327 42.1	237 10.9	20.8	347 44.3	22.2	186 16.5	58.1	233 21.3	35.5	Pollux	243 37.7	N28 01.2
04	342 44.6	252 10.1	20.9	2 46.0	22.1	201 18.5	57.9	248 23.4	35.5	Procyon	245 08.3	N 5 13.1
05	357 47.0	267 09.2	21.0	17 47.7	21.9	216 20.5	57.8	263 25.5	35.5			
06	12 49.5	282 08.3	N23 21.1	32 49.5	S13 21.8	231 22.5	N15 57.6	278 27.6	N22 35.5	Rasalhague	96 13.4	N12 33.4
07	27 52.0	297 07.5	21.2	47 51.2	21.7	246 24.4	57.4	293 29.7	35.5	Regulus	207 52.0	N11 57.2
S 08	42 54.4	312 06.6	21.3	62 52.9	21.6	261 26.4	57.3	308 31.9	35.5	Rigel	281 19.9	S 8 11.8
A 09	57 56.9	327 05.7	21.4	77 54.7	21.4	276 28.4	57.1	323 34.0	35.4	Rigil Kent.	140 02.5	S60 51.2
T 10	72 59.4	342 04.9	21.5	92 56.4	21.3	291 30.4	57.0	338 36.1	35.4	Sabik	102 21.2	S15 43.8
U 11	88 01.8	357 04.0	21.5	107 58.1	21.2	306 32.4	56.8	353 38.2	35.4			
R 12	103 04.3	12 03.1	N23 21.6	122 59.9	S13 21.1	321 34.3	N15 56.7	8 40.3	N22 35.4	Schedar	349 49.7	N56 33.1
D 13	118 06.7	27 02.3	21.7	138 01.6	20.9	336 36.3	56.5	23 42.4	35.4	Shaula	96 32.2	S37 06.5
A 14	133 09.2	42 01.4	21.8	153 03.4	20.8	351 38.3	56.4	38 44.5	35.4	Sirius	258 41.0	S16 43.1
Y 15	148 11.7	57 00.5	21.9	168 05.1	20.7	6 40.3	56.2	53 46.7	35.4	Spica	158 39.5	S11 10.8
16	163 14.1	71 59.6	21.9	183 06.8	20.6	21 42.3	56.1	68 48.8	35.4	Suhail	222 58.7	S43 26.8
17	178 16.6	86 58.8	22.0	198 08.6	20.5	36 44.2	55.9	83 50.9	35.4			
18	193 19.1	101 57.9	N23 22.1	213 10.3	S13 20.3	51 46.2	N15 55.8	98 53.0	N22 35.4	Vega	80 43.9	N38 47.2
19	208 21.5	116 57.0	22.2	228 12.1	20.2	66 48.2	55.6	113 55.1	35.4	Zuben'ubi	137 14.0	S16 03.4
20	223 24.0	131 56.2	22.2	243 13.8	20.1	81 50.2	55.5	128 57.2	35.4		SHA	Mer. Pass.
21	238 26.5	146 55.3	22.3	258 15.6	20.0	96 52.2	55.3	143 59.3	35.4		° ′	h m
22	253 28.9	161 54.4	22.4	273 17.3	19.9	111 54.1	55.2	159 01.5	35.4	Venus	270 58.7	11 10
23	268 31.4	176 53.6	22.4	288 19.1	19.7	126 56.1	55.0	174 03.6	35.3	Mars	20 22.3	3 52
	h m									Jupiter	218 47.4	14 37
Mer. Pass.	5 12.8	v −0.9	d 0.1	v 1.7	d 0.1	v 2.0	d 0.2	v 2.1	d 0.0	Saturn	265 48.6	11 29

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
3 00	178 59.1	N23 00.6	137 41.1	10.3	N20 00.2	10.0	56.9
01	193 59.0	00.4	152 10.4	10.3	19 50.2	10.1	56.9
02	208 58.8	00.2	166 39.7	10.4	19 40.1	10.2	56.9
03	223 58.7	23 00.0	181 09.1	10.4	19 29.9	10.3	56.9
04	238 58.6	22 59.8	195 38.5	10.5	19 19.6	10.5	56.9
05	253 58.5	59.6	210 08.0	10.5	19 09.1	10.5	57.0
06	268 58.4	N22 59.4	224 37.5	10.6	N18 58.6	10.7	57.0
07	283 58.3	59.3	239 07.1	10.6	18 47.9	10.7	57.0
08	298 58.1	59.1	253 36.7	10.7	18 37.2	10.9	57.0
09	313 58.0	58.9	268 06.4	10.7	18 26.3	10.9	57.1
10	328 57.9	58.7	282 36.1	10.8	18 15.4	11.1	57.1
11	343 57.8	58.5	297 05.9	10.8	18 04.3	11.1	57.1
12	358 57.7	N22 58.3	311 35.7	10.9	N17 53.2	11.3	57.1
13	13 57.6	58.1	326 05.6	10.9	17 41.9	11.3	57.1
14	28 57.4	57.9	340 35.5	10.9	17 30.6	11.5	57.2
15	43 57.3	57.7	355 05.4	11.0	17 19.1	11.5	57.2
16	58 57.2	57.5	9 35.4	11.1	17 07.6	11.7	57.2
17	73 57.1	57.3	24 05.5	11.1	16 55.9	11.7	57.2
18	88 57.0	N22 57.1	38 35.6	11.1	N16 44.2	11.8	57.2
19	103 56.9	56.9	53 05.7	11.2	16 32.4	11.9	57.3
20	118 56.8	56.6	67 35.9	11.2	16 20.5	12.0	57.3
21	133 56.6	56.4	82 06.1	11.3	16 08.5	12.1	57.3
22	148 56.5	56.2	96 36.4	11.3	15 56.4	12.2	57.3
23	163 56.4	56.0	111 06.7	11.3	15 44.2	12.3	57.4
4 00	178 56.3	N22 55.8	125 37.0	11.4	N15 31.9	12.3	57.4
01	193 56.2	55.6	140 07.4	11.4	15 19.6	12.5	57.4
02	208 56.1	55.4	154 37.8	11.5	15 07.1	12.5	57.4
03	223 55.9	55.2	169 08.3	11.5	14 54.6	12.6	57.4
04	238 55.8	55.0	183 38.8	11.6	14 42.0	12.7	57.5
05	253 55.7	54.8	198 09.4	11.6	14 29.3	12.7	57.5
06	268 55.6	N22 54.6	212 40.0	11.6	N14 16.6	12.9	57.5
07	283 55.5	54.4	227 10.6	11.7	14 03.7	12.9	57.5
08	298 55.4	54.1	241 41.3	11.7	13 50.8	13.0	57.6
09	313 55.3	53.9	256 12.0	11.8	13 37.8	13.1	57.6
10	328 55.2	53.7	270 42.8	11.7	13 24.7	13.1	57.6
11	343 55.0	53.5	285 13.5	11.9	13 11.6	13.3	57.6
12	358 54.9	N22 53.3	299 44.4	11.8	N12 58.3	13.3	57.6
13	13 54.8	53.1	314 15.2	11.9	12 45.0	13.3	57.7
14	28 54.7	52.8	328 46.1	11.9	12 31.7	13.5	57.7
15	43 54.6	52.6	343 17.0	12.0	12 18.2	13.5	57.7
16	58 54.5	52.4	357 48.0	12.0	12 04.7	13.6	57.7
17	73 54.4	52.2	12 19.0	12.0	11 51.1	13.6	57.7
18	88 54.3	N22 52.0	26 50.0	12.0	N11 37.5	13.7	57.8
19	103 54.1	51.8	41 21.0	12.1	11 23.8	13.8	57.8
20	118 54.0	51.5	55 52.1	12.1	11 10.0	13.9	57.8
21	133 53.9	51.3	70 23.2	12.1	10 56.1	13.9	57.8
22	148 53.8	51.1	84 54.3	12.2	10 42.2	13.9	57.9
23	163 53.7	50.9	99 25.5	12.2	10 28.3	14.1	57.9
5 00	178 53.6	N22 50.6	113 56.7	12.2	N10 14.2	14.0	57.9
01	193 53.5	50.4	128 27.9	12.2	10 00.2	14.2	57.9
02	208 53.4	50.2	142 59.1	12.2	9 46.0	14.2	57.9
03	223 53.3	50.0	157 30.3	12.3	9 31.8	14.2	58.0
04	238 53.1	49.7	172 01.6	12.3	9 17.6	14.4	58.0
05	253 53.0	49.5	186 32.9	12.3	9 03.2	14.3	58.0
06	268 52.9	N22 49.3	201 04.2	12.4	N 8 48.9	14.5	58.0
07	283 52.8	49.0	215 35.6	12.3	8 34.4	14.4	58.1
08	298 52.7	48.8	230 06.9	12.4	8 20.0	14.5	58.1
09	313 52.6	48.6	244 38.3	12.4	8 05.5	14.6	58.1
10	328 52.5	48.4	259 09.7	12.4	7 50.9	14.6	58.1
11	343 52.4	48.1	273 41.1	12.4	7 36.3	14.7	58.1
12	358 52.3	N22 47.9	288 12.5	12.4	N 7 21.6	14.7	58.2
13	13 52.2	47.7	302 43.9	12.4	7 06.9	14.8	58.2
14	28 52.0	47.4	317 15.3	12.5	6 52.1	14.8	58.2
15	43 51.9	47.2	331 46.8	12.4	6 37.3	14.8	58.2
16	58 51.8	47.0	346 18.2	12.5	6 22.5	14.9	58.2
17	73 51.7	46.7	0 49.7	12.5	6 07.6	14.9	58.3
18	88 51.6	N22 46.5	15 21.2	12.5	N 5 52.7	15.0	58.3
19	103 51.5	46.3	29 52.7	12.5	5 37.7	15.0	58.3
20	118 51.4	46.0	44 24.2	12.4	5 22.7	15.0	58.3
21	133 51.3	45.8	58 55.6	12.5	5 07.7	15.1	58.4
22	148 51.2	45.5	73 27.1	12.5	4 52.6	15.1	58.4
23	163 51.1	45.3	87 58.6	12.5	N 4 37.5	15.2	58.4
	SD 15.8	d 0.2	SD 15.6		15.7		15.8

THURSDAY

FRIDAY

SATURDAY

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	06 29	09 00	11 15
N 70	▭	▭	▭	04 06	06 59	09 12	11 17
68	▭	▭	▭	05 06	07 22	09 22	11 18
66	////	////	00 38	05 40	07 39	09 31	11 20
64	////	////	01 46	06 04	07 53	09 38	11 21
62	////	////	02 20	06 23	08 04	09 43	11 22
60	////	01 10	02 45	06 39	08 14	09 49	11 23
N 58	////	01 52	03 04	06 52	08 23	09 53	11 23
56	////	02 20	03 21	07 04	08 30	09 57	11 24
54	01 04	02 41	03 34	07 14	08 37	10 01	11 25
52	01 43	02 58	03 46	07 22	08 43	10 04	11 25
50	02 09	03 13	03 57	07 30	08 48	10 07	11 26
45	02 53	03 42	04 19	07 47	09 00	10 13	11 27
N 40	03 22	04 04	04 36	08 01	09 09	10 18	11 28
35	03 45	04 21	04 51	08 12	09 18	10 23	11 28
30	04 03	04 36	05 03	08 22	09 25	10 27	11 29
20	04 31	05 01	05 25	08 39	09 37	10 34	11 30
N 10	04 54	05 21	05 44	08 54	09 48	10 40	11 31
0	05 12	05 38	06 01	09 08	09 58	10 45	11 33
S 10	05 29	05 55	06 18	09 22	10 08	10 51	11 34
20	05 44	06 12	06 36	09 37	10 18	10 57	11 35
30	06 00	06 30	06 56	09 54	10 30	11 04	11 36
35	06 09	06 41	07 09	10 04	10 37	11 08	11 37
40	06 18	06 52	07 22	10 15	10 45	11 12	11 38
45	06 28	07 05	07 39	10 28	10 54	11 17	11 39
S 50	06 39	07 21	07 59	10 44	11 05	11 23	11 40
52	06 44	07 28	08 08	10 51	11 10	11 26	11 40
54	06 50	07 36	08 19	10 59	11 16	11 29	11 41
56	06 56	07 45	08 31	11 09	11 22	11 32	11 41
58	07 02	07 54	08 45	11 19	11 28	11 36	11 42
S 60	07 09	08 06	09 02	11 31	11 36	11 40	11 43

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	01 25	00 36	(00 02 / 23 32)
N 70	▭	▭	▭	02 02	00 53	(00 21 / 23 57)	23 35
68	▭	▭	▭	01 01	00 29	(00 09 / 23 52)	23 37
66	23 25	////	////	00 26	(00 10 / 23 58)	23 48	23 38
64	22 21	////	////	(00 01 / 23 55)	23 50	23 45	23 40
62	21 47	////	////	23 42	23 42	23 42	23 41
60	21 23	22 57	////	23 31	23 36	23 39	23 42
N 58	21 03	22 15	////	23 22	23 30	23 37	23 43
56	20 48	21 48	////	23 13	23 25	23 35	23 44
54	20 34	21 27	23 03	23 06	23 20	23 33	23 45
52	20 22	21 10	22 24	22 59	23 16	23 31	23 45
50	20 12	20 55	21 59	22 53	23 12	23 30	23 46
45	19 50	20 27	21 16	22 40	23 04	23 26	23 48
N 40	19 32	20 05	20 46	22 29	22 57	23 23	23 49
35	19 18	19 47	20 24	22 19	22 51	23 21	23 50
30	19 05	19 32	20 05	22 11	22 46	23 19	23 51
20	18 44	19 08	19 37	21 57	22 37	23 15	23 52
N 10	18 25	18 48	19 15	21 44	22 28	23 11	23 54
0	18 08	18 30	18 57	21 32	22 20	23 08	23 55
S 10	17 51	18 14	18 40	21 20	22 13	23 04	23 56
20	17 33	17 57	18 24	21 07	22 04	23 01	23 58
30	17 12	17 39	18 08	20 52	21 54	22 57	23 59
35	17 00	17 28	18 00	20 43	21 49	22 54	24 00
40	16 46	17 17	17 51	20 33	21 42	22 51	24 01
45	16 30	17 04	17 41	20 22	21 35	22 48	24 02
S 50	16 10	16 48	17 29	20 07	21 26	22 44	24 04
52	16 01	16 41	17 24	20 01	21 21	22 42	24 04
54	15 50	16 33	17 19	19 53	21 17	22 40	24 05
56	15 38	16 24	17 13	19 45	21 11	22 38	24 06
58	15 24	16 15	17 07	19 35	21 06	22 36	24 07
S 60	15 07	16 03	17 00	19 24	20 59	22 33	24 08

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
3	04 07	04 [illegible]	12 04	15 20	02 55	04	14
4	04 [illegible]	03 [illegible]	12 04	16 09	03 45	05	23
5	03 [illegible]	[illegible]	12 05	16 57	04 33	06	32

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UT	ARIES	VENUS −3.9		MARS −1.6		JUPITER −1.8		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
6 00	283 33.9	191 52.7	N23 22.5	303 20.8	S13 19.6	141 58.1	N15 54.9	189 05.7	N22 35.3
01	298 36.3	206 51.8	22.6	318 22.6	19.5	157 00.1	54.7	204 07.8	35.3
02	313 38.8	221 51.0	22.6	333 24.3	19.4	172 02.1	54.5	219 09.9	35.3
03	328 41.2	236 50.1	22.7	348 26.1	19.3	187 04.0	54.4	234 12.0	35.3
04	343 43.7	251 49.2	22.8	3 27.8	19.2	202 06.0	54.2	249 14.2	35.3
05	358 46.2	266 48.3	22.8	18 29.6	19.0	217 08.0	54.1	264 16.3	35.3
06	13 48.6	281 47.5	N23 22.9	33 31.3	S13 18.9	232 10.0	N15 53.9	279 18.4	N22 35.3
07	28 51.1	296 46.6	22.9	48 33.1	18.8	247 12.0	53.8	294 20.5	35.3
08	43 53.6	311 45.7	23.0	63 34.9	18.7	262 13.9	53.6	309 22.6	35.3
S 09	58 56.0	326 44.9	23.1	78 36.6	18.6	277 15.9	53.5	324 24.7	35.3
U 10	73 58.5	341 44.0	23.1	93 38.4	18.5	292 17.9	53.3	339 26.8	35.3
N 11	89 01.0	356 43.1	23.2	108 40.1	18.4	307 19.9	53.2	354 29.0	35.3
D 12	104 03.4	11 42.2	N23 23.2	123 41.9	S13 18.2	322 21.8	N15 53.0	9 31.1	N22 35.3
A 13	119 05.9	26 41.4	23.3	138 43.7	18.1	337 23.8	52.9	24 33.2	35.2
Y 14	134 08.4	41 40.5	23.3	153 45.4	18.0	352 25.8	52.7	39 35.3	35.2
15	149 10.8	56 39.6	23.4	168 47.2	17.9	7 27.8	52.5	54 37.4	35.2
16	164 13.3	71 38.8	23.4	183 49.0	17.8	22 29.8	52.4	69 39.5	35.2
17	179 15.7	86 37.9	23.5	198 50.7	17.7	37 31.7	52.2	84 41.7	35.2
18	194 18.2	101 37.0	N23 23.5	213 52.5	S13 17.6	52 33.7	N15 52.1	99 43.8	N22 35.2
19	209 20.7	116 36.2	23.6	228 54.3	17.5	67 35.7	51.9	114 45.9	35.2
20	224 23.1	131 35.3	23.6	243 56.0	17.4	82 37.7	51.8	129 48.0	35.2
21	239 25.6	146 34.4	23.6	258 57.8	17.2	97 39.6	51.6	144 50.1	35.2
22	254 28.1	161 33.5	23.7	273 59.6	17.1	112 41.6	51.5	159 52.2	35.2
23	269 30.5	176 32.7	23.7	289 01.4	17.0	127 43.6	51.3	174 54.3	35.2
7 00	284 33.0	191 31.8	N23 23.8	304 03.1	S13 16.9	142 45.6	N15 51.2	189 56.5	N22 35.2
01	299 35.5	206 30.9	23.8	319 04.9	16.8	157 47.6	51.0	204 58.6	35.2
02	314 37.9	221 30.1	23.8	334 06.7	16.7	172 49.5	50.9	220 00.7	35.2
03	329 40.4	236 29.2	23.9	349 08.5	16.6	187 51.5	50.7	235 02.8	35.1
04	344 42.8	251 28.3	23.9	4 10.2	16.5	202 53.5	50.5	250 04.9	35.1
05	359 45.3	266 27.4	23.9	19 12.0	16.4	217 55.5	50.4	265 07.0	35.1
06	14 47.8	281 26.6	N23 24.0	34 13.8	S13 16.3	232 57.4	N15 50.2	280 09.2	N22 35.1
07	29 50.2	296 25.7	24.0	49 15.6	16.2	247 59.4	50.1	295 11.3	35.1
08	44 52.7	311 24.8	24.0	64 17.4	16.1	263 01.4	49.9	310 13.4	35.1
M 09	59 55.2	326 24.0	24.1	79 19.1	16.0	278 03.4	49.8	325 15.5	35.1
O 10	74 57.6	341 23.1	24.1	94 20.9	15.9	293 05.3	49.6	340 17.6	35.1
N 11	90 00.1	356 22.2	24.1	109 22.7	15.7	308 07.3	49.5	355 19.7	35.1
D 12	105 02.6	11 21.3	N23 24.1	124 24.5	S13 15.6	323 09.3	N15 49.3	10 21.9	N22 35.1
A 13	120 05.0	26 20.5	24.2	139 26.3	15.5	338 11.3	49.2	25 24.0	35.1
Y 14	135 07.5	41 19.6	24.2	154 28.1	15.4	353 13.2	49.0	40 26.1	35.1
15	150 10.0	56 18.7	24.2	169 29.9	15.3	8 15.2	48.8	55 28.2	35.1
16	165 12.4	71 17.8	24.2	184 31.6	15.2	23 17.2	48.7	70 30.3	35.0
17	180 14.9	86 17.0	24.2	199 33.4	15.1	38 19.2	48.5	85 32.4	35.0
18	195 17.3	101 16.1	N23 24.2	214 35.2	S13 15.0	53 21.1	N15 48.4	100 34.5	N22 35.0
19	210 19.8	116 15.2	24.3	229 37.0	14.9	68 23.1	48.2	115 36.7	35.0
20	225 22.3	131 14.4	24.3	244 38.8	14.8	83 25.1	48.1	130 38.8	35.0
21	240 24.7	146 13.5	24.3	259 40.6	14.7	98 27.1	47.9	145 40.9	35.0
22	255 27.2	161 12.6	24.3	274 42.4	14.6	113 29.1	47.8	160 43.0	35.0
23	270 29.7	176 11.7	24.3	289 44.2	14.5	128 31.0	47.6	175 45.1	35.0
8 00	285 32.1	191 10.9	N23 24.3	304 46.0	S13 14.4	143 33.0	N15 47.4	190 47.2	N22 35.0
01	300 34.6	206 10.0	24.3	319 47.8	14.3	158 35.0	47.3	205 49.4	35.0
02	315 37.1	221 09.1	24.3	334 49.6	14.2	173 37.0	47.1	220 51.5	35.0
03	330 39.5	236 08.3	24.3	349 51.4	14.1	188 38.9	47.0	235 53.6	35.0
04	345 42.0	251 07.4	24.4	4 53.2	14.0	203 40.9	46.8	250 55.7	35.0
05	0 44.5	266 06.5	24.4	19 55.0	13.9	218 42.9	46.7	265 57.8	34.9
06	15 46.9	281 05.6	N23 24.4	34 56.8	S13 13.8	233 44.9	N15 46.5	280 59.9	N22 34.9
07	30 49.4	296 04.8	24.4	49 58.6	13.7	248 46.8	46.4	296 02.1	34.9
T 08	45 51.8	311 03.9	24.4	65 00.4	13.6	263 48.8	46.2	311 04.2	34.9
U 09	60 54.3	326 03.0	24.4	80 02.2	13.5	278 50.8	46.0	326 06.3	34.9
E 10	75 56.8	341 02.1	24.4	95 04.0	13.4	293 52.7	45.9	341 08.4	34.9
S 11	90 59.2	356 01.3	24.4	110 05.8	13.4	308 54.7	45.7	356 10.5	34.9
D 12	106 01.7	11 00.4	N23 24.4	125 07.6	S13 13.3	323 56.7	N15 45.6	11 12.6	N22 34.9
A 13	121 04.2	25 59.5	24.3	140 09.4	13.2	338 58.7	45.4	26 14.8	34.9
Y 14	136 06.6	40 58.6	24.3	155 11.3	13.1	354 00.6	45.3	41 16.9	34.9
15	151 09.1	55 57.8	24.3	170 13.1	13.0	9 02.6	45.1	56 19.0	34.9
16	166 11.6	70 56.9	24.3	185 14.9	12.9	24 04.6	45.0	71 21.1	34.9
17	181 14.0	85 56.0	24.3	200 16.7	12.8	39 06.6	44.8	86 23.2	34.8
18	196 16.5	100 55.2	N23 24.3	215 18.5	S13 12.7	54 08.5	N15 44.6	101 25.3	N22 34.8
19	211 18.9	115 54.3	24.3	230 20.3	12.6	69 10.5	44.5	116 27.5	34.8
20	226 21.4	130 53.4	24.3	245 22.1	12.5	84 12.5	44.3	131 29.6	34.8
21	241 23.9	145 52.5	24.3	260 24.0	12.4	99 14.5	44.2	146 31.7	34.8
22	256 26.3	160 51.7	24.2	275 25.8	12.3	114 16.4	44.0	161 33.8	34.8
23	271 28.8	175 50.8	24.2	290 27.6	12.2	129 18.4	43.9	176 35.9	34.8
	h m								
Mer. Pass.	5 01.0	v −0.9	d 0.0	v 1.8	d 0.1	v 2.0	d 0.2	v 2.1	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.4	S40 17.2
Achernar	335 32.5	S57 12.9
Acrux	173 18.5	S63 07.3
Adhara	255 19.1	S28 58.5
Aldebaran	290 58.7	N16 31.0
Alioth	166 27.3	N55 56.8
Alkaid	153 04.8	N49 18.1
Al Na'ir	27 53.1	S46 56.5
Alnilam	275 54.6	S 1 11.9
Alphard	218 04.1	S 8 40.3
Alphecca	126 17.4	N26 42.3
Alpheratz	357 51.6	N29 06.4
Altair	62 15.6	N 8 52.6
Ankaa	353 23.2	S42 17.1
Antares	112 35.6	S26 26.5
Arcturus	146 02.7	N19 10.0
Atria	107 44.1	S69 02.2
Avior	234 22.0	S59 31.2
Bellatrix	278 40.7	N 6 21.2
Betelgeuse	271 10.1	N 7 24.5
Canopus	264 00.2	S52 41.7
Capella	280 46.5	N46 00.1
Deneb	49 36.5	N45 17.4
Denebola	182 41.7	N14 33.4
Diphda	349 03.7	S17 58.0
Dubhe	194 01.3	N61 44.3
Elnath	278 22.9	N28 36.6
Eltanin	90 49.3	N51 29.3
Enif	33 54.6	N 9 53.3
Fomalhaut	15 32.3	S29 36.1
Gacrux	172 10.0	S57 08.1
Gienah	176 00.5	S17 33.7
Hadar	148 59.1	S60 23.6
Hamal	328 09.8	N23 28.6
Kaus Aust.	83 53.8	S34 23.0
Kochab	137 18.7	N74 08.8
Markab	13 46.0	N15 13.3
Menkar	314 23.4	N 4 06.2
Menkent	148 16.8	S36 23.4
Miaplacidus	221 42.4	S69 43.9
Mirfak	308 52.0	N49 52.2
Nunki	76 07.6	S26 17.6
Peacock	53 30.8	S56 43.4
Pollux	243 37.7	N28 01.2
Procyon	245 08.3	N 5 13.1
Rasalhague	96 13.4	N12 33.5
Regulus	207 52.1	N11 57.2
Rigel	281 19.9	S 8 11.8
Rigil Kent.	140 02.5	S60 51.2
Sabik	102 21.2	S15 43.8
Schedar	349 49.7	N56 33.1
Shaula	96 32.2	S37 06.5
Sirius	258 41.0	S16 43.1
Spica	158 39.5	S11 10.7
Suhail	222 58.7	S43 26.8
Vega	80 43.9	N38 47.2
Zuben'ubi	137 14.0	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	266 58.8	11 15
Mars	19 30.1	3 43
Jupiter	218 12.6	14 27
Saturn	265 23.5	11 19

UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
6 00	178 51.0	N22 45.1	102 30.1	12.5	N 4 22.3	15.1	58.4
01	193 50.9	44.8	117 01.6	12.5	4 07.2	15.3	58.4
02	208 50.7	44.6	131 33.1	12.5	3 51.9	15.2	58.5
03	223 50.6	. . 44.3	146 04.6	12.5	3 36.7	15.2	58.5
04	238 50.5	44.1	160 36.1	12.5	3 21.5	15.3	58.5
05	253 50.4	43.8	175 07.6	12.4	3 06.2	15.4	58.5
06	268 50.3	N22 43.6	189 39.0	12.5	N 2 50.8	15.3	58.5
07	283 50.2	43.4	204 10.5	12.5	2 35.5	15.4	58.6
08	298 50.1	43.1	218 42.0	12.4	2 20.1	15.3	58.6
S 09	313 50.0	. . 42.9	233 13.4	12.5	2 04.8	15.4	58.6
U 10	328 49.9	42.6	247 44.9	12.4	1 49.4	15.5	58.6
N 11	343 49.8	42.4	262 16.3	12.4	1 33.9	15.4	58.6
D 12	358 49.7	N22 42.1	276 47.7	12.4	N 1 18.5	15.5	58.7
A 13	13 49.6	41.9	291 19.1	12.4	1 03.0	15.4	58.7
Y 14	28 49.5	41.6	305 50.5	12.3	0 47.6	15.5	58.7
15	43 49.4	. . 41.4	320 21.8	12.4	0 32.1	15.5	58.7
16	58 49.3	41.1	334 53.2	12.3	0 16.6	15.6	58.7
17	73 49.2	40.9	349 24.5	12.3	N 0 01.0	15.5	58.8
18	88 49.1	N22 40.6	3 55.8	12.3	S 0 14.5	15.5	58.8
19	103 49.0	40.4	18 27.1	12.2	0 30.0	15.6	58.8
20	118 48.8	40.1	32 58.3	12.3	0 45.6	15.5	58.8
21	133 48.7	. . 39.8	47 29.6	12.2	1 01.1	15.6	58.9
22	148 48.6	39.6	62 00.8	12.1	1 16.7	15.5	58.9
23	163 48.5	39.3	76 31.9	12.2	1 32.2	15.6	58.9
7 00	178 48.4	N22 39.1	91 03.1	12.1	S 1 47.8	15.6	58.9
01	193 48.3	38.8	105 34.2	12.1	2 03.4	15.5	58.9
02	208 48.2	38.6	120 05.3	12.1	2 18.9	15.6	59.0
03	223 48.1	. . 38.3	134 36.4	12.0	2 34.5	15.5	59.0
04	238 48.0	38.0	149 07.4	12.0	2 50.0	15.6	59.0
05	253 47.9	37.8	163 38.4	11.9	3 05.6	15.6	59.0
06	268 47.8	N22 37.5	178 09.3	11.9	S 3 21.2	15.5	59.0
07	283 47.7	37.3	192 40.2	11.9	3 36.7	15.5	59.0
08	298 47.6	37.0	207 11.1	11.8	3 52.2	15.6	59.1
M 09	313 47.5	. . 36.7	221 41.9	11.8	4 07.8	15.5	59.1
O 10	328 47.4	36.5	236 12.7	11.8	4 23.3	15.5	59.1
N 11	343 47.3	36.2	250 43.5	11.7	4 38.8	15.5	59.1
D 12	358 47.2	N22 35.9	265 14.2	11.6	S 4 54.3	15.5	59.1
A 13	13 47.1	35.7	279 44.8	11.6	5 09.8	15.4	59.2
Y 14	28 47.0	35.4	294 15.4	11.6	5 25.2	15.5	59.2
15	43 46.9	. . 35.1	308 46.0	11.5	5 40.7	15.4	59.2
16	58 46.8	34.9	323 16.5	11.5	5 56.1	15.4	59.2
17	73 46.7	34.6	337 47.0	11.4	6 11.5	15.4	59.2
18	88 46.6	N22 34.3	352 17.4	11.4	S 6 26.9	15.3	59.3
19	103 46.5	34.1	6 47.8	11.3	6 42.2	15.3	59.3
20	118 46.4	33.8	21 18.1	11.2	6 57.5	15.4	59.3
21	133 46.3	. . 33.5	35 48.3	11.2	7 12.9	15.2	59.3
22	148 46.2	33.3	50 18.5	11.2	7 28.1	15.3	59.3
23	163 46.1	33.0	64 48.7	11.0	7 43.4	15.2	59.3
8 00	178 46.0	N22 32.7	79 18.7	11.1	S 7 58.6	15.2	59.4
01	193 45.9	32.4	93 48.8	10.9	8 13.8	15.1	59.4
02	208 45.8	32.2	108 18.7	10.9	8 28.9	15.1	59.4
03	223 45.7	. . 31.9	122 48.6	10.9	8 44.0	15.1	59.4
04	238 45.6	31.6	137 18.5	10.7	8 59.1	15.0	59.4
05	253 45.5	31.3	151 48.2	10.7	9 14.1	15.0	59.4
06	268 45.4	N22 31.1	166 17.9	10.7	S 9 29.1	15.0	59.5
07	283 45.3	30.8	180 47.6	10.5	9 44.1	14.9	59.5
T 08	298 45.2	30.5	195 17.1	10.5	9 59.0	14.9	59.5
U 09	313 45.1	. . 30.2	209 46.6	10.5	10 13.9	14.8	59.5
E 10	328 45.0	29.9	224 16.1	10.3	10 28.7	14.7	59.5
S 11	343 44.9	29.7	238 45.4	10.3	10 43.4	14.8	59.5
D 12	358 44.8	N22 29.4	253 14.7	10.2	S10 58.2	14.6	59.6
A 13	13 44.7	29.1	267 43.9	10.1	11 12.8	14.6	59.6
Y 14	28 44.6	28.8	282 13.0	10.1	11 27.4	14.6	59.6
15	43 44.5	. . 28.5	296 42.1	10.0	11 42.0	14.5	59.6
16	58 44.4	28.2	311 11.1	9.9	11 56.5	14.4	59.6
17	73 44.3	28.0	325 40.0	9.8	12 10.9	14.4	59.6
18	88 44.2	N22 27.7	340 08.8	9.8	S12 25.3	14.4	59.6
19	103 44.1	27.4	354 37.6	9.6	12 39.7	14.2	59.7
20	118 44.1	27.1	9 06.2	9.6	12 53.9	14.2	59.7
21	133 44.0	. . 26.8	23 34.8	9.5	13 08.1	14.1	59.7
22	148 43.9	26.5	38 03.3	9.4	13 22.2	14.1	59.7
23	163 43.8	26.2	52 31.7	9.4	S13 36.3	14.0	59.7
	SD 15.8	d 0.3	SD	16.0		16.1	16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
°	h m	h m	h m	h m	h m	h m	h m
N 72				11 15	13 30	16 00	
N 70				11 17	13 22	15 38	18 26
68				11 18	13 16	15 20	17 43
66	////	////	00 55	11 20	13 10	15 06	17 14
64	////	////	01 53	11 21	13 05	14 55	16 52
62	////	////	02 25	11 22	13 02	14 45	16 35
60	////	01 18	02 49	11 23	12 58	14 37	16 21
N 58	////	01 58	03 08	11 23	12 55	14 30	16 09
56	////	02 24	03 24	11 24	12 52	14 24	15 58
54	01 12	02 45	03 37	11 25	12 50	14 18	15 49
52	01 48	03 01	03 49	11 25	12 48	14 13	15 41
50	02 13	03 16	03 59	11 26	12 46	14 09	15 34
45	02 55	03 44	04 21	11 27	12 42	13 59	15 18
N 40	03 24	04 05	04 38	11 28	12 38	13 51	15 06
35	03 47	04 23	04 52	11 28	12 35	13 44	14 55
30	04 05	04 38	05 05	11 29	12 32	13 38	14 46
20	04 33	05 02	05 26	11 30	12 28	13 27	14 30
N 10	04 54	05 21	05 44	11 31	12 24	13 18	14 16
0	05 13	05 39	06 01	11 33	12 20	13 10	14 03
S 10	05 29	05 55	06 18	11 34	12 17	13 02	13 50
20	05 45	06 12	06 36	11 35	12 13	12 53	13 37
30	06 00	06 30	06 56	11 36	12 09	12 43	13 21
35	06 09	06 40	07 08	11 37	12 06	12 37	13 12
40	06 18	06 51	07 22	11 38	12 03	12 31	13 02
45	06 27	07 04	07 38	11 39	12 00	12 24	12 51
S 50	06 38	07 20	07 57	11 40	11 56	12 15	12 37
52	06 43	07 27	08 07	11 40	11 55	12 11	12 30
54	06 49	07 34	08 17	11 41	11 53	12 06	12 23
56	06 54	07 43	08 29	11 41	11 51	12 01	12 15
58	07 01	07 53	08 43	11 42	11 49	11 56	12 06
S 60	07 08	08 04	08 59	11 43	11 46	11 50	11 56

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 6	Moonset 7	Moonset 8	Moonset 9
°	h m	h m	h m	h m	h m	h m	h m
N 72				(00 02) (23 32)	23 00	22 16	
N 70				23 35	23 11	22 41	21 45
68				23 37	23 20	23 01	22 30
66	23 10	////	////	23 38	23 28	23 16	23 00
64	22 15	////	////	23 40	23 35	23 29	23 23
62	21 43	////	////	23 41	23 40	23 40	23 41
60	21 20	22 49	////	23 42	23 45	23 50	23 56
N 58	21 01	22 11	////	23 43	23 50	23 58	24 09
56	20 45	21 45	////	23 44	23 54	24 05	00 05
54	20 32	21 24	22 56	23 45	23 57	24 12	00 12
52	20 20	21 08	22 20	23 45	24 00	00 00	00 18
50	20 10	20 54	21 56	23 46	24 03	00 03	00 23
45	19 49	20 25	21 14	23 48	24 10	00 10	00 35
N 40	19 32	20 04	20 45	23 49	24 15	00 15	00 44
35	19 17	19 47	20 23	23 50	24 20	00 20	00 53
30	19 05	19 32	20 05	23 51	24 24	00 24	01 00
20	18 44	19 08	19 37	23 52	24 31	00 31	01 13
N 10	18 25	18 48	19 15	23 54	24 38	00 38	01 24
0	18 09	18 31	18 57	23 55	24 44	00 44	01 35
S 10	17 52	18 14	18 41	23 56	24 50	00 50	01 45
20	17 34	17 58	18 25	23 58	24 56	00 56	01 57
30	17 14	17 40	18 09	23 59	25 03	01 03	02 10
35	17 02	17 30	18 01	24 00	00 00	01 08	02 17
40	16 48	17 18	17 52	24 01	00 01	01 12	02 26
45	16 32	17 06	17 43	24 02	00 02	01 18	02 36
S 50	16 12	16 50	17 32	24 04	00 04	01 25	02 49
52	16 03	16 43	17 27	24 04	00 04	01 28	02 54
54	15 53	16 36	17 21	24 05	00 05	01 31	03 01
56	15 41	16 27	17 16	24 06	00 06	01 35	03 08
58	15 27	16 17	17 09	24 07	00 07	01 40	03 16
S 60	15 11	16 06	17 02	24 08	00 08	01 44	03 25

Day	SUN Eqn. of Time 00h m s	SUN Eqn. of Time 12h m s	SUN Mer. Pass. h m	MOON Mer. Pass. Upper h m	MOON Mer. Pass. Lower h m	MOON Age d	MOON Phase %
6			12 05	17 44	05 20	07	43
7			12 05	18 32	06 08	08	55
8			12 05	19 22	06 57	09	66

2003 JULY 6, 7, 8 (SUN., MON., TUES.)

UT	ARIES	VENUS −3.9		MARS −1.6		JUPITER −1.8		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
6 00	283 33.9	191 52.7	N23 22.5	303 20.8	S13 19.6	141 58.1	N15 54.9	189 05.7	N22 35.3
01	298 36.3	206 51.8	22.6	318 22.6	19.5	157 00.1	54.7	204 07.8	35.3
02	313 38.8	221 51.0	22.6	333 24.3	19.4	172 02.1	54.5	219 09.9	35.3
03	328 41.2	236 50.1	22.7	348 26.1	19.3	187 04.0	54.4	234 12.0	35.3
04	343 43.7	251 49.2	22.8	3 27.8	19.2	202 06.0	54.2	249 14.2	35.3
05	358 46.2	266 48.3	22.8	18 29.6	19.0	217 08.0	54.1	264 16.3	35.3
06	13 48.6	281 47.5	N23 22.9	33 31.3	S13 18.9	232 10.0	N15 53.9	279 18.4	N22 35.3
07	28 51.1	296 46.6	22.9	48 33.1	18.8	247 12.0	53.8	294 20.5	35.3
08	43 53.6	311 45.7	23.0	63 34.9	18.7	262 13.9	53.6	309 22.6	35.3
S 09	58 56.0	326 44.9	23.1	78 36.6	18.6	277 15.9	53.5	324 24.7	35.3
U 10	73 58.5	341 44.0	23.1	93 38.4	18.5	292 17.9	53.3	339 26.8	35.3
N 11	89 01.0	356 43.1	23.2	108 40.1	18.4	307 19.9	53.2	354 29.0	35.3
D 12	104 03.4	11 42.2	N23 23.2	123 41.9	S13 18.2	322 21.8	N15 53.0	9 31.1	N22 35.3
A 13	119 05.9	26 41.4	23.3	138 43.7	18.1	337 23.8	52.9	24 33.2	35.2
Y 14	134 08.4	41 40.5	23.3	153 45.4	18.0	352 25.8	52.7	39 35.3	35.2
15	149 10.8	56 39.6	23.4	168 47.2	17.9	7 27.8	52.5	54 37.4	35.2
16	164 13.3	71 38.8	23.4	183 49.0	17.8	22 29.8	52.4	69 39.5	35.2
17	179 15.7	86 37.9	23.5	198 50.7	17.7	37 31.7	52.2	84 41.7	35.2
18	194 18.2	101 37.0	N23 23.5	213 52.5	S13 17.6	52 33.7	N15 52.1	99 43.8	N22 35.2
19	209 20.7	116 36.2	23.6	228 54.3	17.5	67 35.7	51.9	114 45.9	35.2
20	224 23.1	131 35.3	23.6	243 56.0	17.4	82 37.7	51.8	129 48.0	35.2
21	239 25.6	146 34.4	23.6	258 57.8	17.2	97 39.6	51.6	144 50.1	35.2
22	254 28.1	161 33.5	23.7	273 59.6	17.1	112 41.6	51.5	159 52.2	35.2
23	269 30.5	176 32.7	23.7	289 01.4	17.0	127 43.6	51.3	174 54.3	35.2
7 00	284 33.0	191 31.8	N23 23.8	304 03.1	S13 16.9	142 45.6	N15 51.2	189 56.5	N22 35.2
01	299 35.5	206 30.9	23.8	319 04.9	16.8	157 47.6	51.0	204 58.6	35.2
02	314 37.9	221 30.1	23.8	334 06.7	16.7	172 49.5	50.9	220 00.7	35.2
03	329 40.4	236 29.2	23.9	349 08.5	16.6	187 51.5	50.7	235 02.8	35.1
04	344 42.8	251 28.3	23.9	4 10.2	16.5	202 53.5	50.5	250 04.9	35.1
05	359 45.3	266 27.4	23.9	19 12.0	16.4	217 55.5	50.4	265 07.0	35.1
06	14 47.8	281 26.6	N23 24.0	34 13.8	S13 16.3	232 57.4	N15 50.2	280 09.2	N22 35.1
07	29 50.2	296 25.7	24.0	49 15.6	16.2	247 59.4	50.1	295 11.3	35.1
08	44 52.7	311 24.8	24.0	64 17.4	16.1	263 01.4	49.9	310 13.4	35.1
M 09	59 55.2	326 24.0	24.1	79 19.1	16.0	278 03.4	49.8	325 15.5	35.1
O 10	74 57.6	341 23.1	24.1	94 20.9	15.9	293 05.3	49.6	340 17.6	35.1
N 11	90 00.1	356 22.2	24.1	109 22.7	15.7	308 07.3	49.5	355 19.7	35.1
D 12	105 02.6	11 21.3	N23 24.1	124 24.5	S13 15.6	323 09.3	N15 49.3	10 21.9	N22 35.1
A 13	120 05.0	26 20.5	24.2	139 26.3	15.5	338 11.3	49.2	25 24.0	35.1
Y 14	135 07.5	41 19.6	24.2	154 28.1	15.4	353 13.2	49.0	40 26.1	35.1
15	150 10.0	56 18.7	24.2	169 29.9	15.3	8 15.2	48.8	55 28.2	35.1
16	165 12.4	71 17.8	24.2	184 31.6	15.2	23 17.2	48.7	70 30.3	35.0
17	180 14.9	86 17.0	24.2	199 33.4	15.1	38 19.2	48.5	85 32.4	35.0
18	195 17.3	101 16.1	N23 24.2	214 35.2	S13 15.0	53 21.1	N15 48.4	100 34.5	N22 35.0
19	210 19.8	116 15.2	24.3	229 37.0	14.9	68 23.1	48.2	115 36.7	35.0
20	225 22.3	131 14.4	24.3	244 38.8	14.8	83 25.1	48.1	130 38.8	35.0
21	240 24.7	146 13.5	24.3	259 40.6	14.7	98 27.1	47.9	145 40.9	35.0
22	255 27.2	161 12.6	24.3	274 42.4	14.6	113 29.1	47.8	160 43.0	35.0
23	270 29.7	176 11.7	24.3	289 44.2	14.5	128 31.0	47.6	175 45.1	35.0
8 00	285 32.1	191 10.9	N23 24.3	304 46.0	S13 14.4	143 33.0	N15 47.4	190 47.2	N22 35.0
01	300 34.6	206 10.0	24.3	319 47.8	14.3	158 35.0	47.3	205 49.4	35.0
02	315 37.1	221 09.1	24.3	334 49.6	14.2	173 37.0	47.1	220 51.5	35.0
03	330 39.5	236 08.3	24.3	349 51.4	14.1	188 38.9	47.0	235 53.6	35.0
04	345 42.0	251 07.4	24.4	4 53.2	14.0	203 40.9	46.8	250 55.7	35.0
05	0 44.5	266 06.5	24.4	19 55.0	13.9	218 42.9	46.7	265 57.8	34.9
06	15 46.9	281 05.6	N23 24.4	34 56.8	S13 13.8	233 44.9	N15 46.5	280 59.9	N22 34.9
07	30 49.4	296 04.8	24.4	49 58.6	13.7	248 46.8	46.4	296 02.1	34.9
T 08	45 51.8	311 03.9	24.4	65 00.4	13.6	263 48.8	46.2	311 04.2	34.9
U 09	60 54.3	326 03.0	24.4	80 02.2	13.5	278 50.8	46.0	326 06.3	34.9
E 10	75 56.8	341 02.1	24.4	95 04.0	13.4	293 52.7	45.9	341 08.4	34.9
S 11	90 59.2	356 01.3	24.4	110 05.8	13.4	308 54.7	45.7	356 10.5	34.9
D 12	106 01.7	11 00.4	N23 24.4	125 07.6	S13 13.3	323 56.7	N15 45.6	11 12.6	N22 34.9
A 13	121 04.2	25 59.5	24.3	140 09.4	13.2	338 58.7	45.4	26 14.8	34.9
Y 14	136 06.6	40 58.6	24.3	155 11.3	13.1	354 00.6	45.3	41 16.9	34.9
15	151 09.1	55 57.8	24.3	170 13.1	13.0	9 02.6	45.1	56 19.0	34.9
16	166 11.6	70 56.9	24.3	185 14.9	12.9	24 04.6	45.0	71 21.1	34.9
17	181 14.0	85 56.0	24.3	200 16.7	12.8	39 06.6	44.8	86 23.2	34.8
18	196 16.5	100 55.2	N23 24.3	215 18.5	S13 12.7	54 08.5	N15 44.6	101 25.3	N22 34.8
19	211 18.9	115 54.3	24.3	230 20.3	12.6	69 10.5	44.5	116 27.5	34.8
20	226 21.4	130 53.4	24.3	245 22.1	12.5	84 12.5	44.3	131 29.6	34.8
21	241 23.9	145 52.5	24.3	260 24.0	12.4	99 14.5	44.2	146 31.7	34.8
22	256 26.3	160 51.7	24.2	275 25.8	12.3	114 16.4	44.0	161 33.8	34.8
23	271 28.8	175 50.8	24.2	290 27.6	12.2	129 18.4	43.9	176 35.9	34.8
Mer. Pass.	h m 5 01.0	v −0.9	d 0.0	v 1.8	d 0.1	v 2.0	d 0.2	v 2.1	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.4	S40 17.2
Achernar	335 32.5	S57 12.9
Acrux	173 18.5	S63 07.3
Adhara	255 19.1	S28 58.5
Aldebaran	290 58.7	N16 31.0
Alioth	166 27.3	N55 56.8
Alkaid	153 04.8	N49 18.1
Al Na'ir	27 53.1	S46 56.5
Alnilam	275 54.6	S 1 11.9
Alphard	218 04.1	S 8 40.3
Alphecca	126 17.4	N26 42.3
Alpheratz	357 51.6	N29 06.4
Altair	62 15.6	N 8 52.6
Ankaa	353 23.2	S42 17.1
Antares	112 35.6	S26 26.5
Arcturus	146 02.7	N19 10.0
Atria	107 44.1	S69 02.2
Avior	234 22.0	S59 31.2
Bellatrix	278 40.7	N 6 21.2
Betelgeuse	271 10.1	N 7 24.5
Canopus	264 00.2	S52 41.7
Capella	280 46.5	N46 00.1
Deneb	49 36.5	N45 17.4
Denebola	182 41.7	N14 33.4
Diphda	349 03.7	S17 58.0
Dubhe	194 01.3	N61 44.3
Elnath	278 22.9	N28 36.6
Eltanin	90 49.3	N51 29.3
Enif	33 54.6	N 9 53.3
Fomalhaut	15 32.3	S29 36.1
Gacrux	172 10.0	S57 08.1
Gienah	176 00.5	S17 33.7
Hadar	148 59.1	S60 23.6
Hamal	328 09.8	N23 28.6
Kaus Aust.	83 53.8	S34 23.0
Kochab	137 18.7	N74 08.8
Markab	13 46.0	N15 13.3
Menkar	314 23.4	N 4 06.2
Menkent	148 16.8	S36 23.4
Miaplacidus	221 42.4	S69 43.9
Mirfak	308 52.0	N49 52.2
Nunki	76 07.6	S26 17.6
Peacock	53 30.8	S56 43.4
Pollux	243 37.7	N28 01.2
Procyon	245 08.3	N 5 13.1
Rasalhague	96 13.4	N12 33.5
Regulus	207 52.1	N11 57.2
Rigel	281 19.9	S 8 11.8
Rigil Kent.	140 02.5	S60 51.2
Sabik	102 21.2	S15 43.8
Schedar	349 49.7	N56 33.1
Shaula	96 32.2	S37 06.5
Sirius	258 41.0	S16 43.1
Spica	158 39.5	S11 10.7
Suhail	222 58.7	S43 26.8
Vega	80 43.9	N38 47.2
Zuben'ubi	137 14.0	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	266 58.8	11 15
Mars	19 30.1	3 43
Jupiter	218 12.6	14 27
Saturn	265 23.5	11 19

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UT	ARIES	VENUS −3.9		MARS −1.7		JUPITER −1.8		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
9 00	286 31.3	190 49.9	N23 24.2	305 29.4	S13 12.1	144 20.4	N15 43.7	191 38.0	N22 34.8
01	301 33.7	205 49.0	24.2	320 31.2	12.1	159 22.4	43.5	206 40.2	34.8
02	316 36.2	220 48.2	24.2	335 33.1	12.0	174 24.3	43.4	221 42.3	34.8
03	331 38.7	235 47.3	24.1	350 34.9	11.9	189 26.3	43.2	236 44.4	34.8
04	346 41.1	250 46.4	24.1	5 36.7	11.8	204 28.3	43.1	251 46.5	34.8
05	1 43.6	265 45.6	24.1	20 38.5	11.7	219 30.2	42.9	266 48.6	34.8
06	16 46.1	280 44.7	N23 24.1	35 40.4	S13 11.6	234 32.2	N15 42.8	281 50.7	N22 34.7
W 07	31 48.5	295 43.8	24.0	50 42.2	11.5	249 34.2	42.6	296 52.9	34.7
E 08	46 51.0	310 42.9	24.0	65 44.0	11.4	264 36.2	42.4	311 55.0	34.7
D 09	61 53.4	325 42.1	24.0	80 45.9	11.3	279 38.1	42.3	326 57.1	34.7
N 10	76 55.9	340 41.2	24.0	95 47.7	11.3	294 40.1	42.1	341 59.2	34.7
E 11	91 58.4	355 40.3	23.9	110 49.5	11.2	309 42.1	42.0	357 01.3	34.7
S 12	107 00.8	10 39.4	N23 23.9	125 51.4	S13 11.1	324 44.1	N15 41.8	12 03.4	N22 34.7
D 13	122 03.3	25 38.6	23.9	140 53.2	11.0	339 46.0	41.7	27 05.6	34.7
A 14	137 05.8	40 37.7	23.8	155 55.0	10.9	354 48.0	41.5	42 07.7	34.7
Y 15	152 08.2	55 36.8	23.8	170 56.9	10.8	9 50.0	41.4	57 09.8	34.7
16	167 10.7	70 35.9	23.7	185 58.7	10.8	24 51.9	41.2	72 11.9	34.7
17	182 13.2	85 35.1	23.7	201 00.5	10.7	39 53.9	41.0	87 14.0	34.7
18	197 15.6	100 34.2	N23 23.7	216 02.4	S13 10.6	54 55.9	N15 40.9	102 16.2	N22 34.6
19	212 18.1	115 33.3	23.6	231 04.2	10.5	69 57.9	40.7	117 18.3	34.6
20	227 20.6	130 32.5	23.6	246 06.1	10.4	84 59.8	40.6	132 20.4	34.6
21	242 23.0	145 31.6	23.5	261 07.9	10.3	100 01.8	40.4	147 22.5	34.6
22	257 25.5	160 30.7	23.5	276 09.7	10.3	115 03.8	40.2	162 24.6	34.6
23	272 27.9	175 29.8	23.4	291 11.6	10.2	130 05.7	40.1	177 26.7	34.6
10 00	287 30.4	190 29.0	N23 23.4	306 13.4	S13 10.1	145 07.7	N15 39.9	192 28.9	N22 34.6
01	302 32.9	205 28.1	23.4	321 15.3	10.0	160 09.7	39.8	207 31.0	34.6
02	317 35.3	220 27.2	23.3	336 17.1	09.9	175 11.7	39.6	222 33.1	34.6
03	332 37.8	235 26.3	23.3	351 19.0	09.9	190 13.6	39.5	237 35.2	34.6
04	347 40.3	250 25.5	23.2	6 20.8	09.8	205 15.6	39.3	252 37.3	34.6
05	2 42.7	265 24.6	23.1	21 22.7	09.7	220 17.6	39.1	267 39.4	34.5
06	17 45.2	280 23.7	N23 23.1	36 24.5	S13 09.6	235 19.5	N15 39.0	282 41.6	N22 34.5
07	32 47.7	295 22.9	23.0	51 26.4	09.5	250 21.5	38.8	297 43.7	34.5
T 08	47 50.1	310 22.0	23.0	66 28.2	09.5	265 23.5	38.7	312 45.8	34.5
H 09	62 52.6	325 21.1	22.9	81 30.1	09.4	280 25.5	38.5	327 47.9	34.5
U 10	77 55.0	340 20.2	22.9	96 31.9	09.3	295 27.4	38.4	342 50.0	34.5
R 11	92 57.5	355 19.4	22.8	111 33.8	09.2	310 29.4	38.2	357 52.2	34.5
S 12	108 00.0	10 18.5	N23 22.7	126 35.7	S13 09.2	325 31.4	N15 38.0	12 54.3	N22 34.5
D 13	123 02.4	25 17.6	22.7	141 37.5	09.1	340 33.3	37.9	27 56.4	34.5
A 14	138 04.9	40 16.7	22.6	156 39.4	09.0	355 35.3	37.7	42 58.5	34.5
Y 15	153 07.4	55 15.9	22.5	171 41.2	08.9	10 37.3	37.6	58 00.6	34.5
16	168 09.8	70 15.0	22.5	186 43.1	08.9	25 39.2	37.4	73 02.7	34.5
17	183 12.3	85 14.1	22.4	201 45.0	08.8	40 41.2	37.3	88 04.9	34.4
18	198 14.8	100 13.2	N23 22.3	216 46.8	S13 08.7	55 43.2	N15 37.1	103 07.0	N22 34.4
19	213 17.2	115 12.4	22.3	231 48.7	08.6	70 45.2	36.9	118 09.1	34.4
20	228 19.7	130 11.5	22.2	246 50.6	08.6	85 47.1	36.8	133 11.2	34.4
21	243 22.2	145 10.6	22.1	261 52.4	08.5	100 49.1	36.6	148 13.3	34.4
22	258 24.6	160 09.8	22.1	276 54.3	08.4	115 51.1	36.5	163 15.5	34.4
23	273 27.1	175 08.9	22.0	291 56.2	08.3	130 53.0	36.3	178 17.6	34.4
11 00	288 29.5	190 08.0	N23 21.9	306 58.0	S13 08.3	145 55.0	N15 36.1	193 19.7	N22 34.4
01	303 32.0	205 07.1	21.8	321 59.9	08.2	160 57.0	36.0	208 21.8	34.4
02	318 34.5	220 06.3	21.7	337 01.8	08.1	175 58.9	35.8	223 23.9	34.4
03	333 36.9	235 05.4	21.7	352 03.7	08.1	191 00.9	35.7	238 26.0	34.4
04	348 39.4	250 04.5	21.6	7 05.5	08.0	206 02.9	35.5	253 28.2	34.4
05	3 41.9	265 03.7	21.5	22 07.4	07.9	221 04.9	35.3	268 30.3	34.3
06	18 44.3	280 02.8	N23 21.4	37 09.3	S13 07.8	236 06.8	N15 35.2	283 32.4	N22 34.3
07	33 46.8	295 01.9	21.3	52 11.2	07.8	251 08.8	35.0	298 34.5	34.3
08	48 49.3	310 01.0	21.3	67 13.0	07.7	266 10.8	34.9	313 36.6	34.3
F 09	63 51.7	325 00.2	21.2	82 14.9	07.6	281 12.7	34.7	328 38.8	34.3
R 10	78 54.2	339 59.3	21.1	97 16.8	07.6	296 14.7	34.6	343 40.9	34.3
I 11	93 56.7	354 58.4	21.0	112 18.7	07.5	311 16.7	34.4	358 43.0	34.3
D 12	108 59.1	9 57.5	N23 20.9	127 20.6	S13 07.4	326 18.6	N15 34.2	13 45.1	N22 34.3
A 13	124 01.6	24 56.7	20.8	142 22.4	07.4	341 20.6	34.1	28 47.2	34.3
Y 14	139 04.0	39 55.8	20.7	157 24.3	07.3	356 22.6	33.9	43 49.4	34.3
15	154 06.5	54 54.9	20.6	172 26.2	07.2	11 24.5	33.8	58 51.5	34.3
16	169 09.0	69 54.1	20.5	187 28.1	07.2	26 26.5	33.6	73 53.6	34.2
17	184 11.4	84 53.2	20.4	202 30.0	07.1	41 28.5	33.4	88 55.7	34.2
18	199 13.9	99 52.3	N23 20.3	217 31.9	S13 07.1	56 30.5	N15 33.3	103 57.8	N22 34.2
19	214 16.4	114 51.4	20.2	232 33.8	07.0	71 32.4	33.1	118 59.9	34.2
20	229 18.8	129 50.6	20.1	247 35.7	06.9	86 34.4	33.0	134 02.1	34.2
21	244 21.3	144 49.7	20.0	262 37.5	06.9	101 36.4	32.8	149 04.2	34.2
22	259 23.8	159 48.8	19.9	277 39.4	06.8	116 38.3	32.6	164 06.3	34.2
23	274 26.2	174 48.0	19.8	292 41.3	06.7	131 40.3	32.5	179 08.4	34.2
Mer.Pass.	h m 4 49.2	v −0.9	d 0.1	v 1.9	d 0.1	v 2.0	d 0.2	v 2.1	d 0.0

STARS

Name	SHA	Dec
	° ′	° ′
Acamar	315 24.4	S40 17.3
Achernar	335 32.5	S57 12.9
Acrux	173 18.5	S63 07.1
Adhara	255 19.1	S28 58.4
Aldebaran	290 58.7	N16 31.0
Alioth	166 27.4	N55 56.8
Alkaid	153 04.8	N49 18.1
Al Na'ir	27 53.0	S46 56.5
Alnilam	275 54.6	S 1 11.9
Alphard	218 04.1	S 8 40.3
Alphecca	126 17.4	N26 42.3
Alpheratz	357 51.6	N29 06.4
Altair	62 15.5	N 8 52.6
Ankaa	353 23.2	S42 17.0
Antares	112 35.6	S26 26.5
Arcturus	146 02.7	N19 10.0
Atria	107 44.1	S69 02.7
Avior	234 22.0	S59 31.2
Bellatrix	278 40.7	N 6 21.2
Betelgeuse	271 10.1	N 7 24.5
Canopus	264 00.2	S52 41.7
Capella	280 46.5	N46 00.1
Deneb	49 36.5	N45 17.4
Denebola	182 41.7	N14 33.4
Diphda	349 03.7	S17 58.0
Dubhe	194 01.3	N61 44.3
Elnath	278 22.9	N28 36.6
Eltanin	90 49.3	N51 29.3
Enif	33 54.6	N 9 53.4
Fomalhaut	15 32.3	S29 36.1
Gacrux	172 10.0	S57 08.1
Gienah	176 00.5	S17 33.7
Hadar	148 59.1	S60 23.6
Hamal	328 09.8	N23 28.6
Kaus Aust.	83 53.8	S34 23.0
Kochab	137 18.8	N74 08.8
Markab	13 46.0	N15 13.3
Menkar	314 23.4	N 4 06.2
Menkent	148 16.8	S36 23.4
Miaplacidus	221 42.5	S69 43.9
Mirfak	308 52.0	N49 52.2
Nunki	76 07.6	S26 17.6
Peacock	53 30.8	S56 43.4
Pollux	243 37.6	N28 01.2
Procyon	245 08.3	N 5 13.1
Rasalhague	96 13.4	N12 33.5
Regulus	207 52.1	N11 57.2
Rigel	281 19.9	S 8 11.7
Rigil Kent.	140 02.5	S60 51.2
Sabik	102 21.2	S15 43.8
Schedar	349 49.6	N56 33.1
Shaula	96 32.2	S37 06.5
Sirius	258 41.0	S16 43.1
Spica	158 39.5	S11 10.7
Suhail	222 58.7	S43 26.8
Vega	80 43.9	N38 47.2
Zuben'ubi	137 14.0	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	262 58.6	11 19
Mars	18 43.0	3 35
Jupiter	217 37.3	14 18
Saturn	264 58.5	11 09

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UT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
d h	° ′	° ′	° ′	′	° ′	′	′
9 00	178 43.7	N22 25.9	67 00.1	9.2	S13 50.3	13.9	59.7
01	193 43.6	25.7	81 28.3	9.2	14 04.2	13.8	59.7
02	208 43.5	25.4	95 56.5	9.1	14 18.0	13.8	59.8
03	223 43.4	25.1	110 24.6	8.9	14 31.8	13.7	59.8
04	238 43.3	24.8	124 52.5	8.9	14 45.5	13.6	59.8
05	253 43.2	24.5	139 20.4	8.9	14 59.1	13.5	59.8
06	268 43.1	N22 24.2	153 48.3	8.7	S15 12.6	13.4	59.8
W 07	283 43.0	23.9	168 16.0	8.6	15 26.0	13.4	59.8
E 08	298 42.9	23.6	182 43.6	8.5	15 39.4	13.3	59.8
D 09	313 42.8	23.3	197 11.1	8.5	15 52.7	13.2	59.8
N 10	328 42.7	23.0	211 38.6	8.4	16 05.9	13.1	59.8
E 11	343 42.6	22.7	226 06.0	8.2	16 19.0	13.0	59.9
S 12	358 42.5	N22 22.4	240 33.2	8.2	S16 32.0	12.9	59.9
D 13	13 42.5	22.1	255 00.4	8.1	16 44.9	12.8	59.9
A 14	28 42.4	21.8	269 27.5	7.9	16 57.7	12.7	59.9
Y 15	43 42.3	21.5	283 54.4	7.9	17 10.4	12.6	59.9
16	58 42.2	21.2	298 21.3	7.8	17 23.0	12.5	59.9
17	73 42.1	20.9	312 48.1	7.7	17 35.5	12.4	59.9
18	88 42.0	N22 20.6	327 14.8	7.6	S17 47.9	12.4	59.9
19	103 41.9	20.3	341 41.4	7.5	18 00.3	12.2	59.9
20	118 41.8	20.0	356 07.9	7.5	18 12.5	12.1	59.9
21	133 41.7	19.7	10 34.4	7.3	18 24.6	11.9	60.0
22	148 41.6	19.4	25 00.7	7.2	18 36.5	11.9	60.0
23	163 41.5	19.1	39 26.9	7.1	18 48.4	11.8	60.0
10 00	178 41.4	N22 18.8	53 53.0	7.0	S19 00.2	11.6	60.0
01	193 41.4	18.5	68 19.0	7.0	19 11.8	11.6	60.0
02	208 41.3	18.2	82 45.0	6.8	19 23.4	11.4	60.0
03	223 41.2	17.9	97 10.8	6.7	19 34.8	11.3	60.0
04	238 41.1	17.6	111 36.5	6.7	19 46.1	11.1	60.0
05	253 41.0	17.3	126 02.2	6.5	19 57.2	11.1	60.0
06	268 40.9	N22 16.9	140 27.7	6.5	S20 08.3	10.9	60.0
T 07	283 40.8	16.6	154 53.2	6.3	20 19.2	10.8	60.0
H 08	298 40.7	16.3	169 18.5	6.3	20 30.0	10.6	60.0
U 09	313 40.6	16.0	183 43.8	6.2	20 40.6	10.6	60.0
R 10	328 40.6	15.7	198 09.0	6.0	20 51.2	10.3	60.0
S 11	343 40.5	15.4	212 34.0	6.0	21 01.5	10.3	60.0
D 12	358 40.4	N22 15.1	226 59.0	5.9	S21 11.8	10.1	60.0
A 13	13 40.3	14.8	241 23.9	5.8	21 21.9	10.0	60.0
Y 14	28 40.2	14.4	255 48.7	5.7	21 31.9	9.9	60.0
15	43 40.1	14.1	270 13.4	5.6	21 41.8	9.7	60.0
16	58 40.0	13.8	284 38.0	5.5	21 51.5	9.5	60.0
17	73 39.9	13.5	299 02.5	5.5	22 01.0	9.4	60.0
18	88 39.9	N22 13.2	313 27.0	5.3	S22 10.4	9.3	60.0
19	103 39.8	12.9	327 51.3	5.3	22 19.7	9.1	60.1
20	118 39.7	12.5	342 15.6	5.1	22 28.8	9.0	60.1
21	133 39.6	12.2	356 39.7	5.1	22 37.8	8.8	60.1
22	148 39.5	11.9	11 03.8	5.0	22 46.6	8.7	60.1
23	163 39.4	11.6	25 27.8	4.9	22 55.3	8.5	60.1
11 00	178 39.3	N22 11.3	39 51.7	4.8	S23 03.8	8.3	60.1
01	193 39.2	10.9	54 15.5	4.8	23 12.1	8.2	60.1
02	208 39.2	10.6	68 39.3	4.7	23 20.3	8.1	60.0
03	223 39.1	10.3	83 03.0	4.6	23 28.4	7.9	60.0
04	238 39.0	10.0	97 26.6	4.5	23 36.3	7.7	60.0
05	253 38.9	09.6	111 50.1	4.4	23 44.0	7.5	60.0
06	268 38.8	N22 09.3	126 13.5	4.4	S23 51.5	7.4	60.0
F 07	283 38.7	09.0	140 36.9	4.3	23 58.9	7.2	60.0
R 08	298 38.7	08.7	155 00.2	4.2	24 06.1	7.1	60.0
I 09	313 38.6	08.3	169 23.4	4.1	24 13.2	6.9	60.0
D 10	328 38.5	08.0	183 46.5	4.1	24 20.1	6.7	60.0
A 11	343 38.4	07.7	198 09.6	4.0	24 26.8	6.5	60.0
Y 12	358 38.3	N22 07.4	212 32.6	4.0	S24 33.3	6.4	60.0
13	13 38.2	07.0	226 55.6	3.9	24 39.7	6.2	60.0
14	28 38.2	06.7	241 18.5	3.8	24 45.9	6.0	60.0
15	43 38.1	06.4	255 41.3	3.8	24 51.9	5.9	60.0
16	58 38.0	06.0	270 04.1	3.7	24 57.8	5.7	60.0
17	73 37.9	05.7	284 26.8	3.7	25 03.5	5.5	60.0
18	88 37.8	N22 05.4	298 49.5	3.6	S25 09.0	5.3	60.0
19	103 37.7	05.0	313 12.1	3.6	25 14.3	5.1	60.0
20	118 37.7	04.7	327 34.7	3.5	25 19.4	5.0	60.0
21	133 37.6	04.4	341 57.2	3.4	25 24.4	4.7	60.0
22	148 37.5	04.0	356 19.6	3.5	25 29.1	4.6	60.0
23	163 37.4	03.7	10 42.1	3.4	S25 33.7	4.4	59.9
	SD 15.8	d 0.3	SD 16.3		16.4		16.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m	h m
N 72							
N 70				18 26			
68				17 43			
66	////	////	01 10	17 14	19 48		
64	////	////	02 00	16 52	19 01	21 31	
62	////	////	02 31	16 35	18 31	20 26	21 57
60	////	01 27	02 54	16 21	18 08	19 52	21 14
N 58	////	02 04	03 12	16 09	17 50	19 27	20 45
56	////	02 29	03 27	15 58	17 35	19 07	20 23
54	01 20	02 49	03 40	15 49	17 22	18 50	20 05
52	01 54	03 05	03 52	15 41	17 10	18 36	19 49
50	02 17	03 19	04 02	15 34	17 00	18 23	19 36
45	02 58	03 46	04 23	15 18	16 39	17 58	19 08
N 40	03 27	04 08	04 40	15 06	16 22	17 37	18 47
35	03 49	04 25	04 54	14 55	16 08	17 21	18 29
30	04 06	04 39	05 06	14 46	15 56	17 06	18 13
20	04 34	05 03	05 27	14 30	15 35	16 41	17 47
N 10	04 55	05 22	05 45	14 16	15 17	16 20	17 24
0	05 13	05 39	06 02	14 03	15 00	16 00	17 03
S 10	05 29	05 56	06 18	13 50	14 43	15 41	16 42
20	05 45	06 12	06 36	13 37	14 25	15 20	16 20
30	06 00	06 30	06 56	13 21	14 05	14 56	15 54
35	06 08	06 40	07 07	13 12	13 53	14 42	15 39
40	06 17	06 51	07 21	13 02	13 40	14 26	15 21
45	06 26	07 03	07 36	12 51	13 24	14 06	15 00
S 50	06 37	07 18	07 56	12 37	13 05	13 42	14 33
52	06 42	07 25	08 05	12 30	12 55	13 31	14 20
54	06 47	07 33	08 15	12 23	12 45	13 18	14 05
56	06 53	07 41	08 27	12 15	12 34	13 02	13 47
58	06 59	07 50	08 40	12 06	12 21	12 45	13 26
S 60	07 06	08 01	08 56	11 56	12 05	12 23	13 00

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m	h m
N 72							
N 70				21 45			
68				22 30			
66	22 56	////	////	23 00	22 27		
64	22 08	////	////	23 23	23 14	22 53	
62	21 38	////	////	23 41	23 45	23 58	24 40
60	21 16	22 41	////	23 56	24 08	00 08	00 33
N 58	20 58	22 05	////	24 09	00 09	00 27	00 59
56	20 43	21 41	////	00 05	00 20	00 43	01 19
54	20 30	21 21	22 48	00 12	00 30	00 57	01 36
52	20 18	21 05	22 15	00 18	00 39	01 09	01 50
50	20 08	20 51	21 52	00 23	00 47	01 19	02 03
45	19 47	20 24	21 11	00 35	01 04	01 42	02 29
N 40	19 31	20 03	20 43	00 44	01 18	01 59	02 50
35	19 16	19 46	20 22	00 53	01 30	02 15	03 07
30	19 04	19 31	20 04	01 00	01 41	02 28	03 22
20	18 43	19 08	19 37	01 13	01 59	02 50	03 48
N 10	18 26	18 48	19 15	01 24	02 15	03 10	04 10
0	18 09	18 31	18 57	01 35	02 29	03 28	04 30
S 10	17 52	18 15	18 41	01 45	02 44	03 47	04 51
20	17 35	17 59	18 26	01 57	03 00	04 06	05 13
30	17 15	17 41	18 11	02 10	03 19	04 29	05 38
35	17 03	17 31	18 03	02 17	03 30	04 43	05 54
40	16 50	17 20	17 54	02 26	03 42	04 58	06 11
45	16 34	17 08	17 44	02 36	03 57	05 17	06 32
S 50	16 15	16 53	17 34	02 49	04 15	05 40	06 59
52	16 06	16 46	17 29	02 54	04 23	05 51	07 11
54	15 56	16 38	17 24	03 01	04 33	06 04	07 26
56	15 44	16 30	17 18	03 08	04 44	06 18	07 44
58	15 31	16 21	17 12	03 16	04 56	06 36	08 05
S 60	15 15	16 10	17 05	03 25	05 11	06 57	08 31

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
d	m s	m s	h m	h m	h m	d	%
9	05 05	05 10	12 05	20 16	07 49	10	76
10	05 14	05 18	12 05	21 14	08 44	11	86
11	05 23	05 27	12 05	22 15	09 44	12	93

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UT	ARIES	VENUS −3.9		MARS −1.8		JUPITER −1.8		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12 00	289 28.7	189 47.1	N23 19.7	307 43.2	S13 06.7	146 42.3	N15 32.3	194 10.5	N22 34.2
01	304 31.2	204 46.2	19.6	322 45.1	06.6	161 44.2	32.2	209 12.7	34.2
02	319 33.6	219 45.3	19.5	337 47.0	06.6	176 46.2	32.0	224 14.8	34.2
03	334 36.1	234 44.5	19.4	352 48.9	06.5	191 48.2	31.8	239 16.9	34.1
04	349 38.5	249 43.6	19.3	7 50.8	06.4	206 50.1	31.7	254 19.0	34.1
05	4 41.0	264 42.7	19.2	22 52.7	06.4	221 52.1	31.5	269 21.1	34.1
06	19 43.5	279 41.9	N23 19.1	37 54.6	S13 06.3	236 54.1	N15 31.4	284 23.3	N22 34.1
07	34 45.9	294 41.0	19.0	52 56.5	06.3	251 56.0	31.2	299 25.4	34.1
S 08	49 48.4	309 40.1	18.8	67 58.4	06.2	266 58.0	31.0	314 27.5	34.1
A 09	64 50.9	324 39.2	18.7	83 00.3	06.1	282 00.0	30.9	329 29.6	34.1
T 10	79 53.3	339 38.4	18.6	98 02.2	06.1	297 01.9	30.7	344 31.7	34.1
U 11	94 55.8	354 37.5	18.5	113 04.2	06.0	312 03.9	30.6	359 33.9	34.1
R 12	109 58.3	9 36.6	N23 18.4	128 06.1	S13 06.0	327 05.9	N15 30.4	14 36.0	N22 34.1
D 13	125 00.7	24 35.8	18.2	143 08.0	05.9	342 07.8	30.2	29 38.1	34.1
A 14	140 03.2	39 34.9	18.1	158 09.9	05.9	357 09.8	30.1	44 40.2	34.0
Y 15	155 05.7	54 34.0	18.0	173 11.8	05.8	12 11.8	29.9	59 42.3	34.0
16	170 08.1	69 33.1	17.9	188 13.7	05.7	27 13.7	29.8	74 44.5	34.0
17	185 10.6	84 32.3	17.8	203 15.6	05.7	42 15.7	29.6	89 46.6	34.0
18	200 13.0	99 31.4	N23 17.6	218 17.5	S13 05.6	57 17.7	N15 29.4	104 48.7	N22 34.0
19	215 15.5	114 30.5	17.5	233 19.4	05.6	72 19.6	29.3	119 50.8	34.0
20	230 18.0	129 29.7	17.4	248 21.4	05.5	87 21.6	29.1	134 52.9	34.0
21	245 20.4	144 28.8	17.2	263 23.3	05.5	102 23.6	29.0	149 55.1	34.0
22	260 22.9	159 27.9	17.1	278 25.2	05.4	117 25.5	28.8	164 57.2	34.0
23	275 25.4	174 27.1	17.0	293 27.1	05.4	132 27.5	28.6	179 59.3	34.0
13 00	290 27.8	189 26.2	N23 16.8	308 29.0	S13 05.3	147 29.5	N15 28.5	195 01.4	N22 33.9
01	305 30.3	204 25.3	16.7	323 31.0	05.3	162 31.4	28.3	210 03.5	33.9
02	320 32.8	219 24.4	16.6	338 32.9	05.2	177 33.4	28.2	225 05.7	33.9
03	335 35.2	234 23.6	16.4	353 34.8	05.2	192 35.4	28.0	240 07.8	33.9
04	350 37.7	249 22.7	16.3	8 36.7	05.1	207 37.3	27.8	255 09.9	33.9
05	5 40.2	264 21.8	16.2	23 38.7	05.1	222 39.3	27.7	270 12.0	33.9
06	20 42.6	279 21.0	N23 16.0	38 40.6	S13 05.0	237 41.3	N15 27.5	285 14.1	N22 33.9
07	35 45.1	294 20.1	15.9	53 42.5	05.0	252 43.2	27.4	300 16.3	33.9
08	50 47.5	309 19.2	15.7	68 44.5	04.9	267 45.2	27.2	315 18.4	33.9
S 09	65 50.0	324 18.4	15.6	83 46.4	04.9	282 47.2	27.0	330 20.5	33.9
U 10	80 52.5	339 17.5	15.4	98 48.3	04.8	297 49.1	26.9	345 22.6	33.9
N 11	95 54.9	354 16.6	15.3	113 50.2	04.8	312 51.1	26.7	0 24.7	33.8
D 12	110 57.4	9 15.7	N23 15.2	128 52.2	S13 04.7	327 53.1	N15 26.6	15 26.9	N22 33.8
A 13	125 59.9	24 14.9	15.0	143 54.1	04.7	342 55.0	26.4	30 29.0	33.8
Y 14	141 02.3	39 14.0	14.9	158 56.1	04.6	357 57.0	26.2	45 31.1	33.8
15	156 04.8	54 13.1	14.7	173 58.0	04.6	12 59.0	26.1	60 33.2	33.8
16	171 07.3	69 12.3	14.6	188 59.9	04.5	28 00.9	25.9	75 35.3	33.8
17	186 09.7	84 11.4	14.4	204 01.9	04.5	43 02.9	25.8	90 37.5	33.8
18	201 12.2	99 10.5	N23 14.2	219 03.8	S13 04.5	58 04.9	N15 25.6	105 39.6	N22 33.8
19	216 14.7	114 09.7	14.1	234 05.8	04.4	73 06.8	25.4	120 41.7	33.8
20	231 17.1	129 08.8	13.9	249 07.7	04.4	88 08.8	25.3	135 43.8	33.8
21	246 19.6	144 07.9	13.8	264 09.6	04.3	103 10.7	25.1	150 45.9	33.7
22	261 22.0	159 07.1	13.6	279 11.6	04.3	118 12.7	24.9	165 48.1	33.7
23	276 24.5	174 06.2	13.5	294 13.5	04.2	133 14.7	24.8	180 50.2	33.7
14 00	291 27.0	189 05.3	N23 13.3	309 15.5	S13 04.2	148 16.6	N15 24.6	195 52.3	N22 33.7
01	306 29.4	204 04.5	13.1	324 17.4	04.2	163 18.6	24.5	210 54.4	33.7
02	321 31.9	219 03.6	13.0	339 19.4	04.1	178 20.6	24.3	225 56.6	33.7
03	336 34.4	234 02.7	12.8	354 21.3	04.1	193 22.5	24.1	240 58.7	33.7
04	351 36.8	249 01.9	12.6	9 23.3	04.0	208 24.5	24.0	256 00.8	33.7
05	6 39.3	264 01.0	12.5	24 25.2	04.0	223 26.5	23.8	271 02.9	33.7
06	21 41.8	279 00.1	N23 12.3	39 27.2	S13 04.0	238 28.4	N15 23.7	286 05.0	N22 33.7
07	36 44.2	293 59.3	12.1	54 29.1	03.9	253 30.4	23.5	301 07.2	33.7
08	51 46.7	308 58.4	12.0	69 31.1	03.9	268 32.4	23.3	316 09.3	33.6
M 09	66 49.2	323 57.5	11.8	84 33.1	03.8	283 34.3	23.2	331 11.4	33.6
O 10	81 51.6	338 56.7	11.6	99 35.0	03.8	298 36.3	23.0	346 13.5	33.6
N 11	96 54.1	353 55.8	11.4	114 37.0	03.8	313 38.2	22.8	1 15.6	33.6
D 12	111 56.5	8 54.9	N23 11.3	129 38.9	S13 03.7	328 40.2	N15 22.7	16 17.8	N22 33.6
A 13	126 59.0	23 54.1	11.1	144 40.9	03.7	343 42.2	22.5	31 19.9	33.6
Y 14	142 01.5	38 53.2	10.9	159 42.9	03.7	358 44.1	22.4	46 22.0	33.6
15	157 03.9	53 52.3	10.7	174 44.8	03.6	13 46.1	22.2	61 24.1	33.6
16	172 06.4	68 51.5	10.5	189 46.8	03.6	28 48.1	22.0	76 26.3	33.6
17	187 08.9	83 50.6	10.4	204 48.8	03.6	43 50.0	21.9	91 28.4	33.6
18	202 11.3	98 49.7	N23 10.2	219 50.7	S13 03.5	58 52.0	N15 21.7	106 30.5	N22 33.5
19	217 13.8	113 48.9	10.0	234 52.7	03.5	73 54.0	21.5	121 32.6	33.5
20	232 16.3	128 48.0	09.8	249 54.7	03.5	88 55.9	21.4	136 34.7	33.5
21	247 18.7	143 47.1	09.6	264 56.6	03.4	103 57.9	21.2	151 36.9	33.5
22	262 21.2	158 46.3	09.4	279 58.6	03.4	118 59.8	21.1	166 39.0	33.5
23	277 23.6	173 45.4	09.2	295 00.6	03.4	134 01.8	20.9	181 41.1	33.5
	h m								
Mer. Pass.	4 37.4	*v* −0.9	*d* 0.1	*v* 1.9	*d* 0.0	*v* 2.0	*d* 0.2	*v* 2.1	*d* 0.0

STARS		
Name	SHA	Dec
	° ′	° ′
Acamar	315 24.4	S40 17.2
Achernar	335 32.4	S57 12.9
Acrux	173 18.5	S63 07.3
Adhara	255 19.1	S28 58.5
Aldebaran	290 58.6	N16 31.0
Alioth	166 27.4	N55 56.8
Alkaid	153 04.8	N49 18.1
Al Na'ir	27 53.0	S46 56.5
Alnilam	275 54.6	S 1 11.9
Alphard	218 04.1	S 8 40.3
Alphecca	126 17.4	N26 42.3
Alpheratz	357 51.6	N29 06.4
Altair	62 15.5	N 8 52.6
Ankaa	353 23.2	S42 17.0
Antares	112 35.6	S26 26.5
Arcturus	146 02.7	N19 10.0
Atria	107 44.1	S69 02.2
Avior	234 22.0	S59 31.2
Bellatrix	278 40.7	N 6 21.2
Betelgeuse	271 10.1	N 7 24.6
Canopus	264 00.2	S52 41.7
Capella	280 46.5	N46 00.0
Deneb	49 36.5	N45 17.4
Denebola	182 41.7	N14 33.4
Diphda	349 03.6	S17 58.0
Dubhe	194 01.3	N61 44.3
Elnath	278 22.9	N28 36.6
Eltanin	90 49.3	N51 29.4
Enif	33 54.5	N 9 53.4
Fomalhaut	15 32.3	S29 36.1
Gacrux	172 10.0	S57 08.1
Gienah	176 00.5	S17 33.7
Hadar	148 59.1	S60 23.6
Hamal	328 09.7	N23 28.6
Kaus Aust.	83 53.8	S34 23.0
Kochab	137 18.8	N74 08.8
Markab	13 46.0	N15 13.3
Menkar	314 23.4	N 4 06.2
Menkent	148 16.8	S36 23.4
Miaplacidus	221 42.5	S69 43.9
Mirfak	308 52.0	N49 52.2
Nunki	76 07.6	S26 17.6
Peacock	53 30.8	S56 43.4
Pollux	243 37.6	N28 01.2
Procyon	245 08.2	N 5 13.1
Rasalhague	96 13.4	N12 33.5
Regulus	207 52.1	N11 57.2
Rigel	281 19.9	S 8 11.7
Rigil Kent.	140 02.5	S60 51.2
Sabik	102 21.2	S15 43.8
Schedar	349 49.6	N56 33.1
Shaula	96 32.2	S37 06.5
Sirius	258 41.0	S16 43.1
Spica	158 39.5	S11 10.7
Suhail	222 58.7	S43 26.8
Vega	80 43.8	N38 47.2
Zuben'ubi	137 14.0	S16 03.4

	SHA	Mer. Pass.
	° ′	h m
Venus	258 58.4	11 23
Mars	18 01.2	3 26
Jupiter	217 01.6	14 08
Saturn	264 33.6	10 58

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