INTERPOLATION OF MOONRISE, MOONSET

FOR LONGITUDE

Add if longitude *west*
Subtract if longitude *east*

Longi-tude	Diff.* 05	10	15	20	25	30
°	m	m	m	m	m	m
0	00	00	00	00	00	00
20	01	01	02	02	03	03
40	01	02	03	04	06	07
60	02	03	05	07	08	10
80	02	04	07	09	11	13
100	03	06	08	11	14	17
120	03	07	10	13	17	20
140	04	08	12	16	19	23
160	04	09	13	18	22	27
180	05	10	15	20	25	30

Longi-tude	Diff.* 35	40	45	50	55	60
°	m	m	m	m	m	m
0	00	00	00	00	00	00
15	03	03	04	04	05	05
30	06	07	08	08	09	10
45	09	10	11	12	14	15
60	12	13	15	17	18	20
75	15	17	19	21	23	25
90	18	20	22	25	28	30
105	20	23	26	29	32	35
120	23	27	30	33	37	40
135	26	30	34	38	41	45
150	29	33	38	42	46	50
165	32	37	41	46	50	55
180	35	40	45	50	55	60

Longi-tude	Diff.* 65	70	75	80	85	90
°	m	m	m	m	m	m
0	00	00	00	00	00	00
10	04	04	04	04	05	05
20	07	08	08	09	09	10
30	11	12	12	13	14	15
40	14	16	17	18	19	20
50	18	19	21	22	24	25
60	22	23	25	27	28	30
70	25	27	29	31	33	35
80	29	31	33	36	38	40
90	32	35	38	40	42	45
100	36	39	42	44	47	50
110	40	43	46	49	52	55
120	43	47	50	53	57	60
130	47	51	54	58	61	65
140	51	54	58	62	66	70
150	54	58	62	67	71	75
160	58	62	67	71	76	80
170	61	66	71	76	80	85
180	65	70	75	80	85	90

*When negative, *subtract* correction if longitude *west*, and *add* if *east*.

STAR INDEX, 2018

No.	Name	Mag	SHA	Dec
			° ′	° ′
1 *	*Alpheratz* †	2·1	357 40	N 29 11
2	*Ankaa*	2·4	353 12	S 42 12
3 *	*Schedar*	2·2	349 37	N 56 38
4 *	*Diphda* †	2·0	348 52	S 17 53
5 *	*Achernar*	0·5	335 24	S 57 09
6 *	*Hamal* †	2·0	327 57	N 23 33
7 *	*Acamar*	3·2	315 16	S 40 14
8 *	*Menkar* †	2·5	314 11	N 4 10
9 *	*Mirfak*	1·8	308 35	N 49 55
10 *	*Aldebaran* †	0·9	290 45	N 16 33
11 *	*Rigel* †	0·1	281 09	S 8 11
12 *	*Capella*	0·1	280 29	N 46 01
13	*Bellatrix* †	1·6	278 28	N 6 22
14	*Elnath* †	1·7	278 08	N 28 37
15	*Alnilam* †	1·7	275 43	S 1 12
16 *	*Betelgeuse* †	0·1-1·2	270 58	N 7 24
17 *	*Canopus*	−0·7	263 55	S 52 42
18 *	*Sirius* †	−1·5	258 31	S 16 45
19	*Adhara* †	1·5	255 10	S 29 00
20 *	*Procyon* †	0·4	244 56	N 5 11
21 *	*Pollux* †	1·1	243 24	N 27 59
22	*Avior*	1·9	234 17	S 59 34
23 *	*Suhail*	2·2	222 50	S 43 30
24 *	*Miaplacidus*	1·7	221 39	S 69 48
25 *	*Alphard* †	2·0	217 53	S 8 44
26 *	*Regulus* †	1·4	207 40	N 11 53
27 *	*Dubhe*	1·8	193 48	N 61 39
28 *	*Denebola* †	2·1	182 30	N 14 28
29 *	*Gienah* †	2·6	175 49	S 17 39
30 *	*Acrux*	1·3	173 05	S 63 12
31	*Gacrux*	1·6	171 57	S 57 13
32 *	*Alioth*	1·8	166 18	N 55 52
33 *	*Spica* †	1·0	158 28	S 11 15
34 *	*Alkaid*	1·9	152 56	N 49 13
35	*Hadar*	0·6	148 43	S 60 28
36	*Menkent*	2·1	148 04	S 36 27
37 *	*Arcturus* †	0·0	145 53	N 19 05
38 *	*Rigil Kentaurus*	−0·3	139 47	S 60 54
39	*Zubenelgenubi* †	2·8	137 02	S 16 07
40 *	*Kochab*	2·1	137 20	N 74 05
41 *	*Alphecca* †	2·2	126 08	N 26 39
42 *	*Antares* †	1·0	112 22	S 26 28
43	*Atria*	1·9	107 21	S 69 03
44	*Sabik* †	2·4	102 09	S 15 45
45 *	*Shaula*	1·6	96 17	S 37 07
46 *	*Rasalhague* †	2·1	96 03	N 12 33
47	*Eltanin*	2·2	90 45	N 51 29
48	*Kaus Australis*	1·9	83 39	S 34 22
49 *	*Vega*	0·0	80 37	N 38 48
50 *	*Nunki* †	2·0	75 54	S 26 16
51 *	*Altair* †	0·8	62 05	N 8 55
52 *	*Peacock*	1·9	53 14	S 56 40
53 *	*Deneb*	1·3	49 29	N 45 21
54 *	*Enif* †	2·4	33 44	N 9 58
55	*Al Na'ir*	1·7	27 39	S 46 52
56 *	*Fomalhaut* †	1·2	15 20	S 29 31
57	*Markab* †	2·5	13 35	N 15 18

* Stars used in Pub. No. 249 (AP 3270) Vol. 1.
† Stars that may be used with Vols. 2 and 3.

Extracts from the *Air Almanac* 2004.

For A4,
from F3 (flap) = Front Inside Cover

STARS, 2004

No.	Name		Mag	SHA	Dec
				° ′	° ′
7*	*Acamar*		3·1	315 24	S 40 17
5*	*Achernar*		0·6	335 32	S 57 13
30*	*Acrux*		1·1	173 18	S 63 07
19	*Adhara*	†	1·6	255 18	S 28 59
10*	*Aldebaran*	†	1·1	290 57	N 16 31
41*	*Alphecca*	†	2·3	126 17	N 26 42
1*	*Alpheratz*	†	2·2	357 51	N 29 07
51*	*Altair*	†	0·9	62 15	N 8 53
2	*Ankaa*		2·4	353 22	S 42 17
42*	*Antares*	†	1·2	112 35	S 26 27
37*	*Arcturus*	†	0·2	146 02	N 19 10
43	*Atria*		1·9	107 43	S 69 02
22	*Avior*		1·7	234 21	S 59 31
13	*Bellatrix*	†	1·7	278 40	N 6 21
16*	*Betelgeuse*	†	0·1-1·2	271 09	N 7 25
9*	*Mirfak*		1·9	308 51	N 49 53
50*	*Nunki*	†	2·1	76 07	S 26 18
52*	*Peacock*		2·1	53 30	S 56 43
21*	*Pollux*	†	1·2	243 36	N 28 01
20*	*Procyon*	†	0·5	245 07	N 5 13
46*	*Rasalhague*	†	2·1	96 13	N 12 33
26*	*Regulus*	†	1·3	207 51	N 11 57
11*	*Rigel*	†	0·3	281 19	S 8 12
38*	*Rigil Kent.*		0·1	140 02	S 60 51
44	*Sabik*	†	2·6	102 21	S 15 44
3*	*Schedar*		2·5	349 49	N 56 34
45*	*Shaula*		1·7	96 31	S 37 07
18*	*Sirius*	†	−1·6	258 40	S 16 43

For A10, from daily pages 45 and 46.

(DAY 023) GREENWICH
2004 JANUARY 23 (FRIDAY)

Lat.	A. M. Moon-rise	A. M. Diff.	P. M. Moon-set	P. M. Diff.
N			N	
°	h m	m	h m	m
72	13 25	*	14 37	*
70	12 04	*	15 56	*
68	11 24	*	16 34	*
66	10 57	−13	17 00	+68
64	10 36	−05	17 20	60
62	10 18	00	17 36	55
60	10 04	+03	17 50	51
58	09 52	06	18 01	49
56	09 41	08	18 11	46
54	09 31	09	18 20	45
52	09 23	11	18 28	43
50	09 15	12	18 35	41
45	08 59	15	18 49	39
40	08 45	17	19 01	36
35	08 34	19	19 12	35
30	08 24	21	19 21	33
20	08 06	23	19 36	30
10	07 51	25	19 49	28
0	07 37	27	20 02	26
10	07 22	29	20 14	24
20	07 07	31	20 27	22
30	06 49	34	20 42	19
35	06 38	35	20 50	18
40	06 26	37	21 00	15
45	06 12	39	21 11	13
50	05 55	42	21 24	11

For A9, from page A160

A160 STARS, 2004 JANUARY — JUNE

Magnitude Vis.	Magnitude S–4	Name and Number		SHA	JAN.	FEB.	MAR.	APR.	MAY	JUNE	Declination	JAN.	FEB.	MAR.	APR.	MAY	JUNE
				°	′	′	′	′	′	′	°	′	′	′	′	′	′
3·1	3·2	γ Ursæ Minoris		**129**	49·4	48·9	48·3	48·0	47·9	48·0	**N 71**	48·8	48·8	48·8	48·9	49·1	49·2
3·1	2·8	γ Trianguli Aust.		**130**	11·6	11·0	10·4	10·0	09·8	09·8	**S 68**	41·4	41·4	41·5	41·7	41·8	42·0
2·7	2·4	β Libræ		**130**	42·0	41·7	41·5	41·3	41·2	41·2	**S 9**	23·9	24·0	24·0	24·1	24·0	24·0
2·8	2·4	β Lupi		**135**	18·5	18·2	17·9	17·7	17·6	17·6	**S 43**	08·8	08·9	09·0	09·1	09·2	09·3
2·9	3·2	α Libræ	39	**137**	13·8	13·5	13·3	13·2	13·1	13·1	**S 16**	03·5	03·6	03·6	03·7	03·7	03·7
2·2	4·3	β Ursæ Minoris	40	**137**	19·7	19·1	18·5	18·1	18·1	18·3	**N 74**	08·0	08·0	08·0	08·1	08·3	08·4
2·6	3·9	ε Bootis		**138**	42·8	42·5	42·3	42·1	42·1	42·1	**N 27**	03·2	03·2	03·1	03·2	03·3	03·4
2·9	2·5	α Lupi		**139**	27·5	27·1	26·8	26·6	26·5	26·5	**S 47**	24·1	24·2	24·3	24·4	24·5	24·6
0·1	0·9	α Centauri	38	**140**	02·4	02·0	01·6	01·4	01·3	01·3	**S 60**	50·8	50·9	51·0	51·2	51·3	51·4
2·6	2·3	η Centauri		**141**	03·9	03·6	03·4	03·2	03·1	03·1	**S 42**	10·3	10·4	10·5	10·6	10·7	10·8
3·0	3·3	γ Bootis		**141**	56·6	56·3	56·1	55·9	55·9	55·9	**N 38**	17·2	17·1	17·1	17·2	17·4	17·5
0·2	1·9	α Bootis	37	**146**	02·5	02·3	02·1	01·9	01·9	01·9	**N 19**	09·5	09·5	09·4	09·5	09·6	09·6
2·3	3·5	θ Centauri	36	**148**	16·5	16·2	16·0	15·9	15·8	15·8	**S 36**	23·2	23·3	23·4	23·5	23·6	23·7
0·9	0·3	β Centauri	35	**148**	58·8	58·4	58·1	57·9	57·8	57·9	**S 60**	23·3	23·3	23·5	23·6	23·8	23·9
3·1	2·7	ζ Centauri		**151**	03·5	03·1	02·9	02·7	02·7	02·7	**S 47**	18·3	18·4	18·5	18·6	18·7	18·8

In correcting for longitude to give the UT, it is sufficiently accurate to add or subtract 24^h, changing the Greenwich date by one day, to find the following or preceding phenomenon.

Examples. The UT of beginning of morning twilight and sunrise for longitudes E.$135°39'$, and of sunset and end of evening twilight for longitude W.$115°13'$, are required in latitude N.$33°20'$ on 2004 January 1.

		Twilight	Sunrise		Sunset	Twilight
Page A6, nearest date Jan. 2		h m	h m		h m	h m
Latitude N.$33°20'$ (interpolate)		06 37	07 04		17 04	17 31
Longitude (page A166)	E.$135°39'$	–9 03	–9 03	W.$115°13'$	+ 7 41	+ 7 41
UT		21 34	22 01		00 45	01 12

Civil twilight begins and ends when the Sun is $6°$ below the horizon; this is an arbitrary condition, and other depressions of the Sun consistent with the degrees of illumination required should be used for planning purposes. Different levels of illumination can be defined to correspond to other depressions and, in particular, nautical twilight begins and ends when the Sun is $12°$ below the horizon. The degree of illumination at the beginning and end of nautical twilight (in good conditions and in the absence of other illumination) is such that general outlines of ground objects are visible, although the horizon is probably indistinct, all detailed operations have become impossible and all the navigational stars can be seen.

The graphs on pages A146–A150 enable the times to be found for any twilight which corresponds to a depression of the Sun of less than $12°$.

12. *Moonrise and Moonset.* Since the interval between successive moonrises or moonsets varies (and is generally greater than 24^h), times of rise or set must be interpolated from their tabular values on the meridian of Greenwich to the meridian of the observer. Interpolation from UT to LMT may be accomplished by using the half-daily differences tabulated in the column headed “Diff." and table, “Interpolation of Moonrise, Moonset for Longitude", printed on the flap (F4). The table is entered with Diff. and longitude, and the reduction to LMT, selected without interpolation, is applied to the tabular UT with the same sign as the Diff. for west longitudes and with the opposite sign for east longitudes. This interpolation cannot be made in extreme conditions, when a symbol (*) is given in the Diff. column.

It may happen that an interpolated time so found is for the day before or after that required, in which case the time on the date required can be determined by adding, or subtracting, twice the Diff. and advancing, or decreasing, the date by a day. Each month there will be one day (near last quarter) on which there is no moonrise, and another (near first quarter) on which there is no moonset; when this happens for the Greenwich meridian, the time of the next phenomenon is listed twice, the first time with a value greater than 24^h to indicate that the phenomenon occurs on the following day. This is done to provide a starting point for the calculation of the times of the phenomena in other longitudes.

Examples. The UT of moonrise and moonset are required for (i) latitude N.$55°00'$, longitude E.$173°37'$ and (ii) latitude S.$25°10'$, longitude W.$53°55'$, on 2004 January 23.

		(i) Moonrise	(i) Moonset		(ii) Moonrise	(ii) Moonset
2004 Jan. 23 (daily pages, A7)		d h m m	d h m m		d h m m	d h m m
Latitude	N.$55°00'$	Jan. 23 09 36 09	Jan. 23 18 16 45	S.$25°10'$	Jan. 23 06 58 33	Jan. 23 20 35 20
Table (flap F4)		– 10	– 45		+ 12	+ 7
LMT		Jan. 23 09 26	Jan. 23 17 31		Jan. 23 07 10	Jan. 23 20 42
Long. (p. A166)	E.$173°37'$	– 11 34	– 11 34	W.$53°55'$	+ 3 36	+ 3 36
UT		Jan. 22 21 52	Jan. 23 05 57		Jan. 23 10 46	Jan. 24 00 18
Twice Diff.		+ 18				– 40
UT + or – 1 day		Jan. 23 22 10				Jan. 22 23 38

The example (ii) Moonset shows that no moonset occurs in this position on January 23.