Perigee Table
Finding Moon's Age
Draper's drawing re Lunar meridian

25.421
13.0649802 72 | 332.130100000
261 29960544
708304945 60
653249013 60
550559320 00
522599210 88
27960109120
26129960544
18301485760

18.63
13.0649802 72 | 243.412300000
130 64980272
112762497280
104519842176
8242655 1040
7838988 1632
403666940 80
391949408 16
11717532640

11.84
13.0649802 72 | 154.694500000
130 64980272
240446972 80
130649802 72
109979712 0080
104519842 176
5277327 9040
5225992 1088
51335795 20

5.81
13.0649802 72 | 75.976700000
65 324901360
1065179864 00
1045198421 76
19981442240

24.81
13.0649802 72 | 324.193900000
261 29960544
628944294560
522599210 88
106343734720
104519842 176
1823892 5440

18.02
13.0649802 72 | 235.476100000
130 64980272
104826297280
104519842 176
3064551 0400

11.23
13.0649802 72 | 146.758300000
130 64980272
161084972 80
130649802 72
30435170 080
26129960 544
4305209 5360

4.44
13.0649802 72 | 58.040500000
52 259921088
5780578 9120
5225992 1088
554586 8032

34.26
13.0649802 72 | 316.257700000
261 29960544
549580945 60
522599210 88
26981734720
26129960544
8517741760

17.41
13.0649802 72 | 227.539900000
130 64980272
968900977 280
914548619 04
54352353760
52259921088
2092432672 0

10.62
13.0649802 72 | 138.823000000
130 64980272
81773197280
78389881632
3842111168 0

3.84
13.0649802 72 | 50.104300000
39 19494081 6
1100935918 40
1045198421 76
55737496640

23.59
13.0649802 72 | 308.321500000
261 29960544
470218945 60
391949408 16
78269537440
65324901360
12944636080 0

16.80
13.0649802 72 | 219.603800000
130 64980272
889539972 80
783898816 32
1056411564 80
1045198421 76
11213143040

10.01
13.0649802 72 | 130.886000000
130 64980272
2361972800 0

3.22
13.0649802 72 | 42.168200000
39 19494081 6
2973259184 0
26129960544
3602631296 0

22.99
13.0649802 72 | 300.385400000
261 29960544
390857945 60
261299605 44
12955834016 0
11758482244 8
1197351771 20

16.20
13.0649802 72 | 211.667600000
130 64980272
810177972 80
783898816 32
2627915648 0
2612996054 4
1959359360

9.41
13.0649802 72 | 122.949800000
117 58482244 8
536497775 520
522599210 88
13898544320

26.20
13.0649802 72 | 34.232000000
261 29960544
810203945 60
783898816 32
2630512928 0
2612996054 4
17516873 60

22.38
13.0649802 72 | 292.449200000
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311495945 60
261299605 44
501963401 60
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1100139934 40

15.59
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775669592 00
653249013 60
12242057 8400

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13.0649802 72 | 295.013600000
261 29960544
337139945 60
261299605 44
758403401 60
653249013 60
1051548880 00

25.43
13.0649802 72 | 332.295800000
261 29960544
709961945 60
653249013 60
567129320 00
522599210 88
44530109120

21.77
13.0649802 72 | 284.513000000
261 29960544
232133945 60
130649802 72
1014841428 80
914548619 04
1002928097 60

21.77
13.0649802 72 | 284.513000000
261 29960544
232133945 60
130649802 72
1014841428 80
914548619 04
1002928097 60
914548619 04

14.98
13.0649802 72 | 195.795200000
130 64980272
651453972 80
522599210 88
1288547619 20
1175848224 48
1126993947 20

8.19
13.0649802 72 | 107.077400000
104 51984216
25579557 8240
1306498027 2
1251059796 80

1.45
13.0649802 72 | 18.359600000
130 64980272
529461972 80
522599210 88
68624761 920

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X 39194940816
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106~~86~~2.809453536
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82466.1554~~76864~~

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5947
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15651.846365856

Chapter III

1. Lunar Observation and Rasohal Reckoning.
2. Translation Period and Waxing Period
3. The Ancient Jewish Phasis
4.

27.554457663 | 103.00000000 | 3
8266372989

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1924542337 0
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271267739 2

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6362701 10

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1102183065 2
95816934 80
82663729 89

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1377728831 5
186271168 50
165327459 78

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1928820364 1
1796359 0

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2204386130 4
89633860 960

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1166084674 0
1102183065 2
69901608 80
55109153 26

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153355842 5

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220436613 04

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57718543 60

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22766024 55

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360 3 10,080
360 16 2160
360 5760
360 30 10800
360 43 10080 1440 15480
360 56 2160 1800 20160
366 70 25200
360 83 10080 2880 29880
360 96 2160 3240 34560
109 360 6540 327 39240
123 360 7380 369 44280
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149 360 8940 447 53640
162 360 9720 486 58320
176 360 10560 528 63360

189 360 11340 567 68040
202 360 12120 606 72720
215 360 12900 645 77400
229 360 13740 687 82440
242 360 14520 726 87120
255 360 15300 765 91800
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321 360 19260 963 115560

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168355.3357~~84992~~

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173137.1185~~64544~~

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182674.5541~~63104~~

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187443.2719~~62384~~

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192225.0547~~41936~~

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196993.7725~~4121~~6

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39194940816
104519842176
10883.128566576

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468
104519842176
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52259921088
6114.410767296

13.064980272
103
39194940816
13064980272
1345.692968016

"As Jesus still sat at the well-side, He looked upon the fields of grain that

Long ☾ + Lunations in Century + No. degrees over × No. of cent.

Foundation of all almanacs today:

mean motion 13.17

Jan 0.5 G.C.T 1900

Brown

Mean ☾ = 270° 26′ 11.″71 + 1336 307° 53′ 26.″06 t_c + 7.″14 t_c^2 + 0.″0068 t_c^3

long. ☉ = 334 19 46.40 + 11 109 02′ .0252 " − 37.17 " − 0.0450 t_c^3

Foundation of Brown's work on the moon

Mean anomaly

☾ − ☉ = 296° 6′ 25.″31 + 1325 198° 51′ 23.″54 t_c + 44.″31 t_c^2 + .″052 t_c^3

Lunations

page

$\frac{m}{v}$ = Δdays to be added to date gives date of perigee

(1) t_c				(3)			(3b)		(3a)			(4)		J.D.N.	(6) 360 − x = m		
	°	′	″				′	″				′	″		°		
0	296	6	25.31	Jan 0.5	1900				44.258	− 198		50	39.28	2415020	296.107031	1611557	
−1	97	15	46.03	Dec 30.5	1799		50	39.282						2378495	97.262786		
−2	258	26	35.05	Dec 29.5	1699		49	55.128	44.206	− 37		39	50.26	2341970	258.443069		
−3	59	38	52.08	Dec 29.5	1599		48	11.078	44.154	− 236		27	33.73	2305445	59.647800		
−4	220	52	36.78	Dec 19.5	1499		48	27.132	44.102	− 75		13	48.53	2268920	220.876883		
−5	22	7	48.86	19.5	1399		47	43.290	44.050	− 273		58	36.45	2232395	22.130239		
−6	183	24	28.00	19.5	1299		46	59.552	43.998	− 112		41	57.31	2195870	183.407778		
−7	344	42	33.88	19.5	1199		46	15.918	43.946	− 311		23	51.43	2159345	344.709411		
−8	146	2	6.21		1099		45	32.388	43.894	− 150		4	19.10	2122820	146.035058		
−9	307	23	4.65		999		44	48.962	43.842	− 348		43	20.66	2086295	307.384675		
−10	108	45	28.91		899		44	5.640	43.790	− 187		20	56.40	2049770	108.758031		
11	270	9	18.67		799		43	22.422	43.738	− 25		57	6.64	2013245	270.155186		
12	71	34	33.61		699		42	39.308	43.686	− 224		31	51.70	1976720	71.576003		
−13	233	1	13.53		599		41	56.298	43.634	− 63		5	11.78	1940195	233.020425		
−14	34	29	17.82		499		41	13.392	43.582	− 261		37	7.49	1903670	34.488283		
−15	195	58	46.46		399		40	30.590	43.530	− 100		7	38.85	1867145	195.979572		
−16	357	29	39.04		299		39	47.892	43.478	− 298		36	46.27	1830620	357.494178		
−17	159	1	55.24		199		39	5.298	43.426	− 137		4	30.07	1794095	159.032011		
−18	320	35	34.77	Dec 19.5	99		38	22.808	43.374	− 335		30	50.54	1757570	320.592992		
−19	122	10	37.29	2 B.C.	1		37	40.422	43.322	− 173		55	48.02	1721045	122.177025		
−20	283	47	2.51	102 B.C.	−101		36	58.140	43.270	− 12		19	22.80	1684520	283.784031		
−21	85	24	50.11		−201		36	15.962	43.218	− 210		41	35.20	1647995	85.413919		
−22	247	3	59.77		−301		35	33.888	43.166	− 49		2	25.54	1611470	247.066603		
−23	48	44	31.20		−401		34	51.918	43.114	− 247		21	54.11	1574945	48.740000		
−24	210	26	24.06		−501		34	10.052	43.062	− 85		40	1.25	1538420	210.440017		
−25	12	9	38.06	Dec 19.5	−601		33	28.290	43.010	− 283		56	47.25	1501895	12.160577		

$m = (x - 360°)$

$2\left(\frac{}{4} - \frac{}{4}\right) + \frac{}{2} \quad \frac{}{8} - \frac{}{8} - \frac{}{2} - \frac{}{8} - \frac{}{8} = N$

$X = 8N + 7$

4	3	7
2	1	15
1	0	28
		31
		39
		45

April 8 = ☉
7
6
5
4
3
2
1
31
30
29
28
27
26

198·681
122·199
240·868
99·142

1	41
2	42
3	43
4	44
5	45
6	46
7	47
8	48
9	49
10	50
11	51
12	52
13	53
14	54
15	55
16	56
17	57
18	58
19	59
20	60
21	61
22	62
23	63
24	64
25	65
26	66
27	67
28	68
29	69
30	70
31	71
32	72
33	73
34	74
35	75

Δ days + date = date of Perigee

29 AD = 31 × 13.25 = no. of periods
397.5
4.01
d

(integer no. of P) × 27.554570...

411.
413.

Page 28 Tables of the Moon
Book II, Chapter I
Ernest W. Brown
Yale, 1919.

C - Γ'

V° Var per day

Period

1900	13.°064992650	$\frac{360}{V}$ = 27.d 5545 5052	
1800	.064991977		
1700	91307		
1600	90639		
1500	89973		
1400	89310		
1300	88649		
1200	87990		
1100	87334		
1000	86680		
900	86029		
800	85380		
700	84733		
600	84089		
500	83447		
400	82807		
300	82170		
200	81535	27.5545 7395	135
100	80902	27.5545 7530	134
0 = 1 B.C.	80272	27.5545 7663	133
-100	13.0 64979645	27.55457796	

(?)

multiply

4/13.

$f_n = f_0 + n\Delta' + \frac{n(n-1)}{2}\Delta''$

solve the equation for (t)

6:30 2^h 21'

$\cos t_c = \cos(90° 50' - \pi_c) \sec\delta \sec\varphi - \tan\delta \tan\varphi$

add $\alpha_c + t_c$ = Sidereal time at the time of moonset.

find the Local civil time when the local sidereal time equals $\alpha_c + t_c$ by the following procedure.

Find from Newcomb's tables the sid. time for the corresponding G.C.T. then add $2^h\ 20.^m9$ for the local Jerusalem sid. Time call this J.

Then $J - \alpha_c - t_c = {}^{25'}_{0}\Delta(1.032)$ = apprx civil time interval is the sidereal interval from the local assumed time to the true local time of phenomena.

Repeat all the above for, the sun and the local civil times of sunset and moonset gives the interval between them. take from almanac.

A lot of work which may be shortened a little by using the approximate formula for t_α or $t_\odot$ as follows:

$\cos(t + q) = -\tan\varphi \tan\delta$

where q is $+ 0.^m3$ for the moon and $- 3.^m5$ for the sunset.

Glen H. Draper

Computed by Glenn Draper, Associate Astronomer, U.S. Naval Observatory

Moonset occurs when the sidereal time equals $H_c + \alpha_c$ where $\cos H_c = -\tan\phi \tan\delta + \sin(\pi - sd - 34')\sec\phi \sec\delta$.

For Jerusalem $\phi = +31°46'$; $\log\tan\phi = 9.79185$; $\log\sec\phi = 0.0705$

$\lambda = -2^h 20.^m 9$ st. corr. $= -23.^s 15$

S.T. for Jerusalem Mean Noon from ~~page~~ B.N.A. page 201 for year 1844.

Oct 12 $= 13^h 24^m 37.^s 83 - 23.^s 15 = 13^h 24.^m 24$

Oct 13 $= 13\ 28\ 34.38 - 23.15 = 13\ 28.19$

From page 211 we have as a first approx. (from phase.) for moonset

5: 20.9 P.M. Jer. Time or 3 P.M. G.C.T. which gives

$\alpha_c = 13^h 40.^m 59$

$\delta = -13°\ 48'.2$

$\log\tan\delta = 9.39038_n$

$\therefore \log\cos H_c = 9.18243$

$H_c = 5^h\ 24.^m 98$

$\alpha_c = 13\ \ 40.59$

$\Sigma = 19^h\ \ 5.57$

S.T. $= \begin{cases} 13^h & 24.^m 24 \\ 5 & 20.90 \\ & 0.88 \\ \hline 18 & 46.02 \end{cases}$

$\Sigma - ST = +\ 0^h\ 19.^m 55$

Second Approximation :— $5^h\ 40.^m 9$ P.M. J.T. $= 3^h 20^m$ P.M. G.C.T.

$\alpha_c = 13^s\ 41.^m 40$

$\delta = -13°\ 51'.8$

$\log\tan\delta = 9.79185 + 9.39234_n = 9.18419$ (10')

$\log\sin(\pi - sd - 34') = 7.4637$

$\log\sec\delta = 0.0705 + 0.0128 = 7.5470$

S.T. $\begin{cases} 13 & 24.24 \\ 5 & 40.90 \\ & .93 \\ \hline 19 & 5.07 \end{cases}$

$H_c = 5^h\ 24.^m 02$

$\alpha_c = 13\ \ 41.40$

$\Sigma = \alpha_c + H_c = 19^h\ 5.^m 42$

.15283
352
.15635 = $\cos H$

$\Sigma - S.T. = +\ 0.^m 35$ ∴ Moonset at Jer. Oct. 12, 1844 at 5:41 P.M.

Moonset Jerusalem October 13

Moonset Greenwich October 12 & 13.

Oct. 12 = 13' 17" = Equation of time

Oct. 13 = 13' 32" = equation of time

Nov. 16, 1925 - 12^h N. - 15^h 40^m 27^s ≠ Oct. 12 - 1844 - 10^h P.M. - 13^h 57^m 41^s

Nov. 16

$F_n = F_0 + n\Delta' + \frac{n(n-1)\Delta''}{2}$

$= 1.44 + 94.24 + \frac{1.44}{96.18}$

Moon sunset date

If moonset is given in J.C.T. subtract L and get G.C.T. for phenomenon = time for moon table.

If you do not have moonset time take 6:00 p.m. Greenwich and use it which is same + L at Jerusalem.

Sun

Sun is moving so slowly but should

$2\frac{1}{2}$ 30 A.D. at equator $2^h\ 27^m$

March 25 6:15 $2\frac{1}{2}$

6:22 6:

1844	Apr 18				Apr 19			
φ	+ 31°	46′	+ 51°	28′	+ 31°	46′	+ 51°	28′
λ	− 2ʰ	20.9	0	0	− 2ʰ	20.9	0	0
Local Time	6	44.9	7	40.	7	50.9	8	54
GMT	4	24.0			5	30.0		
δ_c	+ 17	29.3	+ 17	52.6	+ 20	10.6	+ 20	28.3
d		5.3		5.3		5.3		5.3
D		8		12		9		13
table A	+	457	+	954	+	527	+	1119
Sid T.	− 1	46.8	− 1	46.8	− 1	50.7	− 1	50.7
table III	—	7	—	1.3	—	9	—	1.5
Σ	− 1	2.3	− 0	12.7	− 0	58.9	− 0	0.3
dD		− 4		− 6		− 5		− 7
$\alpha_c + 6^h$	8	24.7	8	31.3	9	15.8	9	22.8
Moonset	7	22.0	8	18.0	8	16.4	9	21.8

G.M.T.	5	0.0	8	18.0	5	54.0	9	20.0
δ_c	+ 17	33.7	+ 17	57.8	+ 20	12.3	+ 20	30.4
table A	+	453	+ 1	36.2	+	528	+ 1	52.1
Sid T.	− 1	46.8	− 1	46.8	− 1	50.7	− 1	50.7
table III		− 8		− 1.4		− 1.0		− 1.5
Σ	− 1	2.3	—	12.0	—	58.9		− 1
dD		− 4		− 6		− 5		− 7
$\alpha_c + 6^h$	8	25.9	8	32.5	9	16.6	9	23.7
Moonset.	7	23.2	8	19.9	8	17.2	9	22.9

Moonset T. defined as the instant moon's upper limb is on the apparent horizon

1844	Oct 12		Oct 13	
φ	+ 31° 46′	+ 51° 28′	+ 31° 46′	+ 51° 28′
λ	− 2h 20.9m	0 0	− 2h 20.9	0 0
Local Time	5 40.9	5 0	6 30.9	6 0
G.M.T.	3 20.0	5 0	4 10.0	6 0
$\delta_{\mathbb{C}}$	− 13 55.4	−14° 9.7′	− 17 50.0	− 18° 4.9′
d	10.0	10.0	10.1	10.1
D	.08	.12	.08	.13
Table A	− 3.54	− 7.40	− 4.61	− 9.97
Sid Time	− 13 24.6	− 13 24.6	− 13 28.6	− 13 28.6
Table III	− .5	− .8	− .7	− .9
Σ	− 14 0.5	− 14 39.4	− 14 15.4	− 15 9.2
dD	− .8	− 1.2	− .8	− 1.3
$\alpha_{\mathbb{C}}$ + 6h	19 41.4	19 45.5	20 43.1	20 47.8
Moonset	5 40.1	5 4.9	6 26.9	5 37.3

G.M.T.	3 19.2	5 4.8	4 6	5 40.0
$\delta_{\mathbb{C}}$	− 13 51.6	− 14 10.6	− 17 49.5	− 18 2.2
table A	− 3.53	− 7.41	− 4.61	− 9.66
Sid Time	− 13 24.6	− 13 24.6	− 13 28.6	− 13 28.6
table III	− .6	− .8	− .7	− .9
Σ	− 14 0.5	− 14 39.5	− 14 15.4	− 15 6.1
dD	− .8	− 1.2	− .8	− 1.3
$\alpha_{\mathbb{C}}$ + 6h	19 41.4	19 45.6	20 42.9	20 46.9
Moonset	5 40.1	5 4.9	6 26.7	5 39.5

PM Local Mean Time

A.D.	1 = 2 B.C.	2 q_0	3 Interval from Dec. 19.5-IV 0.5 and on	4 ÷ "3" by 27.55457663	5 "4" × 360°	6 "3" × V°	7 Subtract "5" from "6"	8 = q Add "7" to "2"	9 Subtract "8" from 360	10 ÷ "q" by V°	11 Add "10" to IV 0.5		
−1	Apr 0.5			Lunations									
−1	Dec. 19.5	122.177025	−263	−9	−3240°	−3436.08	98						
0	=(1 B.C.)		= 103	3	1080	1345.69	29 265.69	29 27.8699	332.1301	25.421	IV 25.92		
1	Apr. 0.5		468	16	5760	6114.41	07 354.41	07 116.5877	243.4123	18.630	IV 19.13	Apr 14	
2	" "		833	30	10800	10888.12	85 83.128	5 205.3055	154.6945	11.843	IV 12.34	Apr 4	
3	" "		1198	43	15480	15651.84	63 171.846	3 294.0233	75.9767	5.81	IV 6.31	Apr 23	
4	" "		1564	56	20160	20433.62	91 273.629	1 35.8061	324.1939	24.81	IV 25.31	Apr 11	A
5	" "		1929	70	25200	25202.34	69 2.346	9 124.5239	235.4761	18.02	IV 18.52	Apr 1	
6	" "		2294	83	29880	29971.06	47 91.064	7 213.2417	146.7583	11.23	IV 11.73	Apr 20	
7	" "		2659	96	34560	34739.78	25 179.782	5 301.9595	58.0405	4.44	IV 4.94	Apr 9	
8	" "		3025	109	39240	39521.56	53 281.565	3 43.7423	316.2577	24.26	IV 24.76	Mar 28	
9	" "		3390	123	44280	44290.28	31 10.283	1 132.4601	227.5399	17.41	IV 17.91	Apr 16	p
10	" "		3755	136	48960	49059.00	00 99.000	0 221.1770	138.8230	10.62	IV 11.12	Apr 5	
11	" "		4120	149	53640	53827.71	87 187.718	7 309.8957	50.1043	3.84	IV 4.34	Mar 26	
12	" "		4486	162	58320	58609.50	15 289.501	5 51.6785	308.3215	23.59	IV 24.09	Apr 13	A
13	" "		4851	176	63360	63378.21	92 18.219	2 140.3962	219.6038	16.80	IV 17.30	Apr 2	A
14	" "		5216	189	68040	68146.93	70 106.937	0 229.1140	130.8860	10.01	IV 10.51	Apr 21	
15	" "		5581	202	72720	72915.65	48 195.654	8 317.8318	42.1682	3.22	IV 3.72	Apr 11	
16	" "		5947	215	77400	77697.43	76 297.437	6 59.6146	300.3854	22.99	IV 23.49	Mar 30	
17	" "		6312	229	82440	82466.15	64 26.155	4 148.3324	211.6676	16.20	IV 16.70	Apr 18	p
18	" "		6677	242	87120	87234.87	32 114.873	2 237.0502	122.9498	9.41	IV 9.91	Apr 7	p
19	" "		7042	255	91800	92003.59	10 203.591	0 325.7680	34.2320	26.20	IV 26.70	Mar 27	
20	" "		7408	268	96480	96785.37	38 305.373	8 67.5508	292.4492	22.38	IV 22.88	Apr 14	
21	" "		7773	282	101520	101554.09	16 34.091	6 156.2686	203.7314	15.59	IV 16.09	Apr 4	A
22	" "		8138	295	106200	106322.80	94 122.809	4 244.9864	115.0136	8.80	IV 9.30	Apr 23	A
23	" "		8503	308	110880	111145.52	72 265.527	2 387.7042	27.7042	25.43	IV 25.93	Apr 12	A
24	" "		8869	321	115560	115873.31	00 313.310	0 75.4870	284.5130	21.77	IV 22.27	Apr 1	
25	" "		9234	335	120600	120642.02	78 42.027	8 164.2048	195.7952	14.98	IV 15.48	Apr 19	
26	" "		9599	348 ×	125280	125410.74	56 130.745	6 252.9226	107.0774	8.19	IV 8.69	Apr 8	p
27	" "		9964	361 ×	129960	130179.46	34 219.469	4 341.6404	18.3596	1.45	IV 1.95	Mar 29	p
28	" "		10330	374 ×	134640	134961.24	62 321.246	2 83.4232	276.5768	21.16	IV 21.66	Apr 15	
29	" "		10695	388 ×	139680	139729.96	40 49.964	0 172.1410	187.8590	14.37	IV 14.87	Apr 5	
30	" "		11060	401 ×	144360	144498.68	18 138.681	8 260.8588	99.1412	7.58	IV 8.08	Mar 26	A
31	" "		11425	414 ×	149040	149267.39	96 227.399	6 349.5766	10.4234	.72	IV 1.22	Apr 14	A
32	" "		11791	427	153720	154049.18	23 329.182	3 91.3595	268.6407	20.56	IV 21.06	Apr 2	
33	" "		12156	441	158760	158817.90	01 57.900	1 180.0771	179.9229	13.77	IV 14.27	Apr 21	
34	" "		12521	454	163440	163586.61	79 146.617	9 268.7949	91.2051	6.98	IV 7.48	Apr 10	p
35	" "		12886	467	168120	168355.33	57 235.335	7 357.5127	2.4873	.19	IV .69	Mar 30	p
36	" "		13252	480	172800	173137.11	85 337.118	5 99.2955	260.7045	19.95	IV 20.45	Apr 17	
37	" "		13617	494	177840	177905.83	63 65.836	3 188.0133	171.9867	13.16	IV 13.66	Apr 6	
38	" "		13982	507	182520	182674.55	41 154.554	1 276.7311	83.2689	6.37	IV 6.87	Mar 27	
39	" "		14347	520	187200	187443.27	19 243.271	9 365.4489	5.4489		IV	Apr 15	
40	" "		14713	533	191880	192225.05	47 345.054	7 107.2317	252.7683	19.34	IV 1.84	Apr 4	A
41	" "		15078	547	196920	196993.77	25 73.772	5 195.9495	164.0505	12.55	IV 13.05	Apr 23	
42	" "		15443	560	201600	201762.49	03 162.490	3 284.6673	75.3327			Apr 12	P
43	" "		15808	573	206280	206531.20	81 251.208	1 13.3851	346.6149			Apr 1	P
44	" "		16174	586	210960	211312.99	09 352.990	9 115.1679	244.8321			Apr 19	
45	" "		16539	600	216000	216081.70	87 81.708	7 203.8857	156.1143			Apr 8	
46	" "		16904	613	220680	220850.42	65 170.426	5 292.6035	67.3965			Mar 28	
47	" "		17269	626	225360	225579.94	93 219.949	3 342.1263	17.8737	1.363	IV 1.86	Apr 16	A
48	" "		17635	640	230400							Apr 5	
49	" "		18000	653	235080							Mar 26	
50	" "		18365	666	239760							Apr 14	P

Brown formulae

		(ω)		Julian D.N.			360 x 13	348 x 360 =	4591 / 27.554 Lunations
Dec 19.5	− 1 A.D.	g = 122.°177025	J.D.N.	1721045.					
Apr 0.5	26	252.9175		1730644.	9599	Δg =	125410.°7405	− 125280°	348
"	27	341.6352		1009	9964		130179.4582	− 129960	361
"	28	83.4177		375	10330	Periods	134961.2407	− 134640	374
"	29	172.1353		740	10695	in days	139729.9583	− 139680	388
"	30	260.8529		2105	11060	Divide by	144498.6759	− 144360	401
"	31	349.5705		470	11425	27.554	149267.3935	− 149040	414

Subtract from 360°

360°

8.196	107.°0825		130.°7405
1.406	18.3648		219.4582
21.170	276.5823		321.2407
14.379	187.8647		49.9583
7.589	99.1471		138.6759
0.798	10.4295		227.3935

Divide by moon's average daily motion in degrees

add to

	Apr 8.696	AD 26 (25) ω	Civil Time	26	Conj. = Apr. 6.28	Tr. Per. 1.49
	1.906	27 ω	Perigee Dates	27	conj. = Mar. 26.83	1.93
15 to 28	21.670	28 ω	midway	28	conj. = Apr. 13	1.09
5 to 18	14.879	29 ω	sec. half	29	conj. = Apr. 2.82	1.95
26 to 8	8.089	30 ap at conj.		30	conj. = Mar. 22.84	2.93
	1.298	31 ap at new moon		31	conj. = Apr. 10.58	3.19
		32 ap				
Apr.	14.27	33 ap	sec. half			

45

22

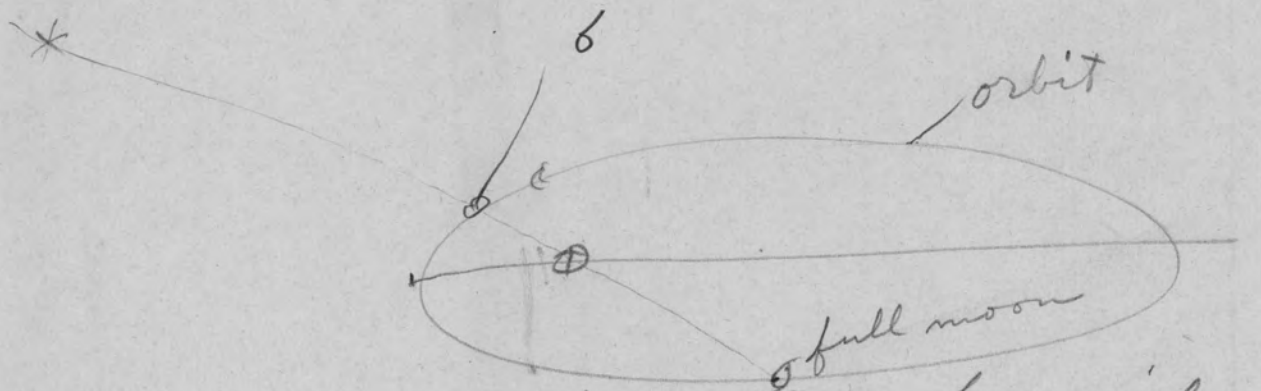
44
27

36	76
37	77
38	78
39	79
40	80

draw an ellipse

draw line of apsides (thru longest diameter

that is thru point of perigee to apogee.

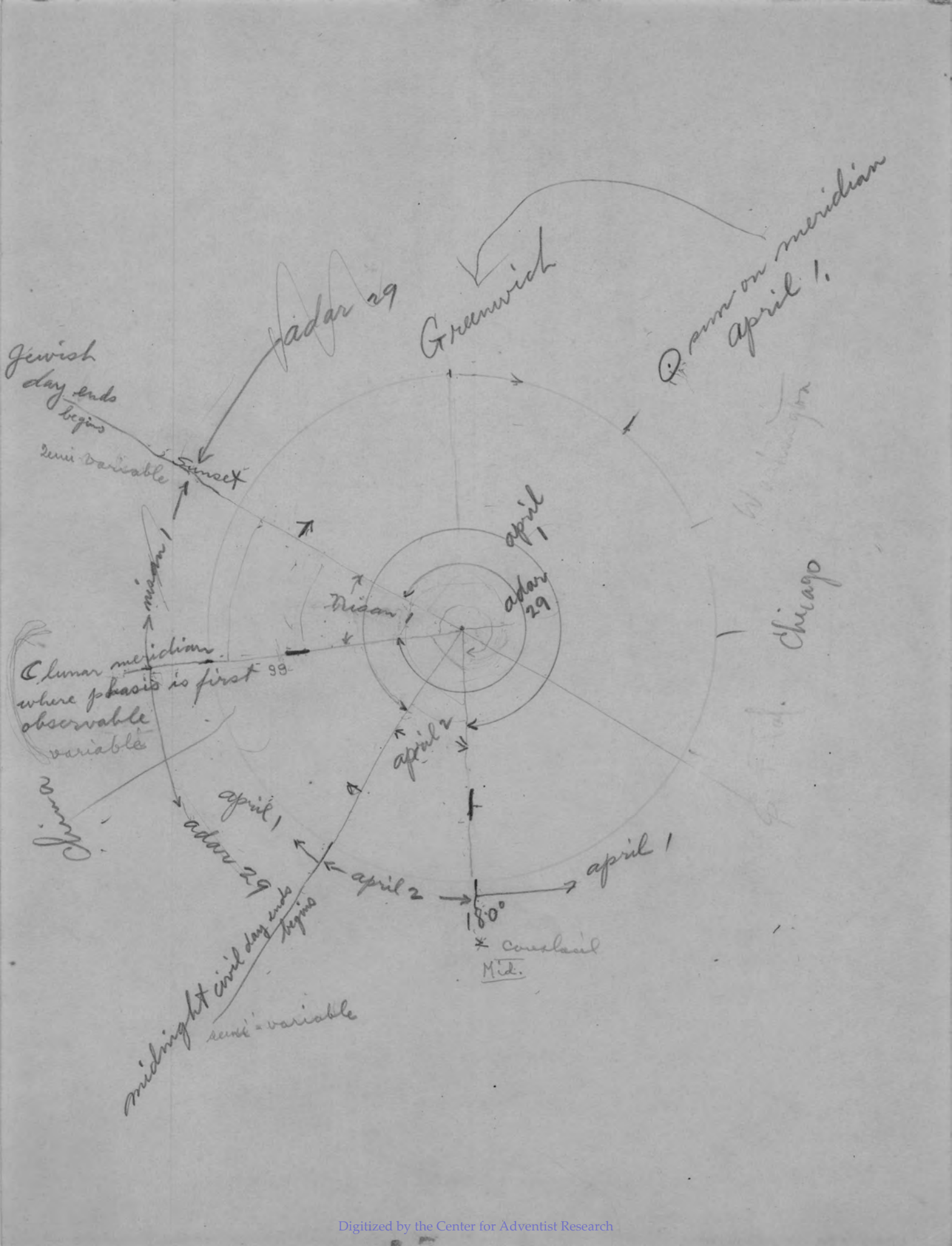


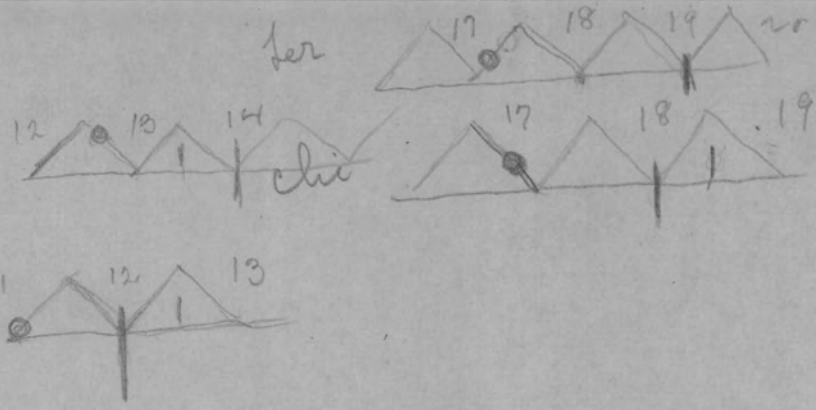
place earth on line of apsides

Place sun

draw line three centers

Draper's drawing to illustrate perigee and apogee





17.44 17.3 1.02 56 22 1.33

24

569
547
22

27.55457663 | 15443.00000000 | 560
13777288315
1665711 6850
1653274 5978
212437 08720

| 15808.00000000 | 573
13777 288315
2030711 6850
1928820 3641
1018913 2090
826637 2989

| 16174.00000000 | 586
13777 288315
2396711 6850
2204365 1304
1923465 5460

| 16539.00000000 | 600
16532745978
625402200

| 16904.00000000 | 613
16532745978
371254 0220
275545 7663
957082 5570

| 17269.00000000 | 626
16532745978
7362540220
5510915326
1851624 8940

27.55457663 | 17635.00000000 | 646
16532745978
1102254 0220
1102183 0652
2756709 5680

~~13.064980272 | 17.87370000 | 1.36~~
~~13 064980272~~
~~4808897280~~
~~3919440816~~
889456 7640
898881632

13.064980272 | 17.873700000 | 1.368
13 064980272
4808719 7280
3919494 0816
889225 64640
783898 81632
1053268 30080

560
360
336 00
1680
201600

5731
4 360
34380
1719
206280

586
360
35160
1758
210960

360
600
216000

613
360
36780
1839
220680

626
360
37560
1878
225360

640
360
38400
1920
230400

653
360
39180
1959
235080

666
360
39960
1998
239760

27.554 575 30
103
82663725 90
2755457530

13.0680902
103
39204270 6
1306809 02
1346.013290 6

13.0680272
103
39204081 6
1306802 72
1846006801 6

13.0649796 45
2 2 1 103
391949389 35
1306497964 5
1345.692903485

13.0649802 72
468
104519842176
78389881632
52259921088
611441076 7296

13.0649802 72
15443
391949408 16
52259921088
52259921088
6532490 1360
1306498 0272
201762.490340496

13.0649802 72
15808
104519842176
104519842176
6532490 1360
1306498 0272
206531.208139776

13.0649802 72
16174
52259921088
9145486 1904
1306498 0272
7838988 1632
1306498 0272
211312.990919328

13.0649802 72
16539
11758482 2448
391949408 16
6532490 1360
7838988 1632
1306498 0272
216081.708718608

13.0649802 72
16904
52259921088
11758482 2448
7838988 1632
1306498 0272
220850.426517888

13.0649802 72
17269
7838988 1632
7838988 1632
2612996 0544
9145486 1904
1306498 0272
225579.949376352

225579
225360
219.

366
342.1263
17.8737

201762
201600
162.

206531
206280
251.

211312.
210960
352.

219609.
216000
3609

162.4903
122.1770
284.6673

251.2081
122.1770
373.3851
360
13.3851

352.9909
122.1770
475.1679
360
115.1679

81.7087
122.1770
203.8857

170.4265
122.1770
292.6035

219.9493
122.1770
342.1263

360
284.6673
75.3327

360
13.3851
346.6149

360
115.1679
244.8321

360
203.8857
156.1143

360.
292.6035
67.3965

337.1185
122.1770
459.2955

Finding the Moon's Age

The following pencilled note in a second-hand book on Astronomy may be of interest:

"Divide given year by 19;
Multiply remainder by 11;
Reject multiples of 30;
To this remainder add one-third plus one-quarter of the century (excluding fractions);
Add the constant 8;
Add day of month;
Add number of month (commencing with March 1, January and February being put with previous year);
From the sum deduct the century, and the remainder will be the Moon's age (reject multiples of 30) within an error of one day."

No clue is given as to the source of this rule, but I can testify to its accuracy. I have checked it against a selection of past eclipses taken from Ferguson's Astronomy, and by taking those which happened in the middle of the day the age comes correct every time for as many centuries past as I have tried it, allowing for Old Style. The following example is for 1941 June 11:

$\frac{1941}{19}$ leaves remainder of 3. Multiply by 11, giving 33. Subtract 30. To remainder 3 add 10 ($\frac{1}{3}$ plus $\frac{1}{4}$ of 19), 8, 11 and 4, totalling 36. Subtract 19, giving 17 days for age of moon on this day.

1900

For any current year, the rule amounts to deriving a constant for that year, adding the day and number of the month when the information is required, and subtracting multiples of 30. This constant is easily memorized and the operation can then be performed mentally as required. (Constant for 1941 = 2. Add 11 and 4 for June 11. Age 17 days.)

I should be very interested to know the derivation of the various processes set out above, for which I cannot at present see any reason. Perhaps someone will know the source of the rule.

Having obtained the age of the Moon from the above, its time of Southing on that day for any longitude is easily found by multiplying its age by four-fifths and subtracting a constant (12 for Greenwich). The remainder is the approximate time in hours. (Example for 1941 June 11. Age 19 days. 4/5-ths = 15.6, Subtract 12 = 03.6, i.e. 03h 36m. N.A. gives 03h 29m.) — P. Harvey.

It has ~~again~~ been proposed to locate 14 Nisan on 30 A.D. on the Jewish day of full moon, Friday, April 7, and the calendar data for a 14-Nisan passover covering the crucifixion period — 29 to 33 A.D. — have been presented in table form.[72] In diagram H (Page 30),

Found

For ~~some time~~ many the death passover was limited in a whole decade; but ~~two years.~~ ~~the problem is narrowed~~ astronomy has narrowed ~~The problem is~~ down the limits of the problem

---

[72] Olmstead, A.T., "The Chronology

It has been proposed to locate 14 Nisan in 30 A.D. on the Jewish day of full moon, Friday, April 7, and in 31 A.D., in connection, to begin 14 Nisan over 24 hours before the full moon of April 25.[72] The passover dates for a hypothetical crucifixion period of 29 to 36 A.D. are also presented in table form. Diagram H (p. 30) analyzes and compares with a true passover graph one based on the passover-full moon relation.

Demonstration 6 (Diagram H, p. 30):

● Conjunction = 1st day of each month.

San Francisco The Peerless 100-year Chinese-English Calendar 1849 to 1948. Compiled by J. Endicott Gardner. San Francisco, 1924.

105° Szechwan:
Chinese } mid to mid.

[72] Olmstead, A. T., "The Chronology of Jesus' Life," p. 4. *Anglican Theological Review*, January, 1942. Vol. XXIV.