Moon Tables (Brown)

I.F. = +.08

Date = April 13, 31 A.D., 6:30 p.m. = 0 +31^{y} 103^{d} 6.5^{h} = 31.283 Tr.Per. = 3.19

Tab	Arg	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709	9.425	125.76	38.00	67.63	52.70	115.23	39.44	14.34	185.565	40.36	20.16	3.95
2	S.V.	− 16	+ 1	− 5	+ 4	− 8	− 9	− 4	+ 3	− 1	− 84	+ 1	− 1	+ 3
3	1931	26.0251	135.742	43.54	74.97	73.85	85.78	31.92	60.90	15.78	79.422	19.30	26.40	4.71
4	103.271	14.6792	34.199	71.40	3.18	83.43	24.03	92.43	26.99	23.25	54.000	26.07	27.60	22.50
3	−1 Per.	−29.5306	11.400	23.80	1.06	27.81	8.01	30.81	9.00	7.75	18.000	8.69	9.20	7.50
3	−Periods		141	156	116	124	128	132	100	24	251	51	38	76
	Sums	18.043	49.767	108.45	1.25	4.64	42.43	6.35	36.36	13.11	85.9	43.4	7.35	38.69

Tab	Arg	23	24	25	26	27	28	29
2	0	5.5 410.1	7.5 106.7	1.5 152.7	26.5 116.95	13.5 65.1	3.5 48.7	16.0 188.9
2	S.V.	− 2.0	− .5	− 3.8	− 3.3	+ 5.1	− .2	+ 3.5
3	1931	7.5 302.3	14.0 14.6	24.5 31.1	14. 32.50	27. 223.9	2. 62.5	7.5 202.9
4	103	10.5 211	3.5 53.	26. 51.	13.5 26.	33. 158.	4. 94	15. 87
3	0.271	324.5	90.5	102.4	76.9	140	96.4	112.1
3	−Per.	−15. − 464	−14. − 64	−25.5 − 46	−29.5 − 86	−34.5 − 179	− 9.5 − 133	−29. − 109
3	Adj.	+ .5 599	+ .5 167	+ .5 189	+ .5 142			+ 1 414
	Sums	9.0 182.9	11.5 33.3	1.5 52.4	25 21.05	4.5 234.1	0.0 168.4	10.5 71.4

Tab	Arg	30	31	32	33	34	35	36
2	0	27.0 159.631	6.5 218.10	15.0 110.15	6.5 72.70	105.0 11.47	4.0 201.97	15.0 38.5
2	S.V.	− 7.14 .004	− .9	+ 6.1	− .3	− 3.9	− 2.67	+ 2.1
3	1931	19.5 160.286	7. 194.57	24.5 209.9	11.0 4.45	192.5 8.26	2. 27.75	12.5 90.9
4	103	20. 222	14. 240	7.5 43	14.0 80	103. 0.	6.5 201.	7.5 15
3	0.271	178.75	159.25	181.45	53.08	7.58	150.03	63.4
3	−Per.	−27.5 − 36	−14.5 − 156	−31.5 − 209	−29.5 − 6	−205.5 − 11	− 9.5 − 63	−15.5 − 95.
3	Adj.	+ .5 330	+ 1 588	.5 335	+ 1. 196		+ .5 − 277	
	Sums	12. 311.53	14. 67.02	16. 6.60	3. 7.93	195. 12.41	3.5 238.1	4.0 19.9

Tab	Arg	37	38	39	40	41	42	43
2	0	9.5 0.1	3.0 92.6	5.0 21.9	4.0 19.43	144.0 0.4	8.0 81.6	2.5 36.0
2	S.V.	+ 1.4	− 3.8	− .2	+ .05	+ .8	+ 3.2	− 1.3
3	1931	5. 247.9	6.5 75.7	5.5 5.5	5.5 291.50	119.5 17.9	19. 124.5	1. 156.4
4	103	12 189	3. 132.	4. 1.	7.5 160	103 0.	22 111.	11.5 157.
3	0.271	214.5	162	16.8	168.45	11.4	82.3	102.4
3	−Per.	−10. − 67	− 7. − 76	− 5.5 − 20	−13.5 − 66	− 173 − 13	−26.5 − 115	− 9. − 41
3	Adj.	+ .5 396	+ .5 299		+ .5 311		+ .5 152	+ 1. 189
	Sums	7. 122.9	6. 83.5	3. 5.	4. 262.43	20.5 4.5	23. 135.6	7. 31.5

Tab	Arg	44	45	46	47	53	54	55
2	0	5.0 140.7	7.0 97.5	1.5 50.7	31.0 14.37	8.0 15.5	11.5 42.2	10.0 62.27
2	S.V.	− .2	+ .7	− .7	− .03	− .3	− .3	− .92
3	1931	1. 111.9	4. 124.5	5.5 63.6	88.5 10.91	14. 38.9	26.5 5.	12.5 127.05
4	103	3.5 131.	7.5 53.	7. 22.	103. 0.	32. 14.	14. 2.	6. 41.
3	0.271	97	72	36.8	13.54	21.1	25.5	70.41
3	−Per.	− 7. − 29	− 9.5 − 8.	− 6.5 − 47.		−35. − 32.	−29.5 − 15.	
3	Adj.	+1. 179	+ 1. 266	+ .5 68	+ .5 − 25.	+ .5 39.	+ .5 47	+ 1. − 260.
	Sums	3.5 93.4	10. 73.7	1.5 10.4	223 13.79	19.5 18.2	23 12.4	29.5 39.81

Tab	Arg	56	57	58	59	60	61	62
2	0	7.5 68.5	12.5 49.3	349.4	126.0 3.67	4.5 16.0	23.0 14.7	2.5 141
2	S.V.	− .3	+ .6	+ .9	− .53	− 2.6	− 2.3	− 3
3	1931	1.5 1.6	6.5 96.3	279.9	153. 2.3	1.5 91.5	2. 50.5	8. 28
4	103	11.5 51.	6.5 82.	103	103 0	13.5 105.	19. 30.	6. 180
3	0.271	43.3	60.7	.3	3.	92.6	28.7	111
3	−Per.	− 10. − 21.	− 16 − 5.		− 188. − 2.	−14.5 − 125.	−27.5 − 43.	− 9.5 − 64
3	Adj.	+ .5 80	+ 1. 224			.5 171	+ .5 53	+ .5 205
	Sums	1.0 42.1	10.5 59.9	733.5	6. 4.44	5.5 6.5	17. 25.6	7.5 188

Tab	Arg	71	72	73	74	76	77	82
2	0	27.0 106.42	15.0 35.84	4.0 202.0	5.5 48.6	3.0 18.3	9.5 0.0	6257
2	S.V.	− 4.77	+ 1.99	− 2.7	− .2	− .8	+ .2	+ 0
3	1931	19.5 106.36	0.5 99.05	4. 251.2	11.5 14.	1. 33.2	7.5 43.4	1329
4	103	20. 148	7.5 14.	6.5 201.	10.5 25.	3. 26.	12. 31.	103
3	0.271	119.16	59.04	150.1	38.5	32.	35.2	
3	−Per.	−27.5 − 24.		− 9.5 − 63	−15. − 55.	− 7. − 15.	−10. − 11.	− 6800
3	Adj.	+ .5 220	+ .5 −109.	+1. 554		+ .5 59	+ .5 65	
	Sums	12. 207.2	23.5 100.9	6. 184	12.5 70.9	0.5 34.7	19.5 22.8	889

Tab	Arg	83	84	L	−ℓ	Ω		
2	0	6178	6185	295401	1192540	310177		
2	S.V.	+ 2	+ 2	− 83	+ 86	+ 426		
3	1931	4933	3218	153150	1225860	560322		
4	103	103	103	997808	19635	41308		
3	0.271			12847	52	109		
3	−Per.	− 6800	− 6800	− 1296000	−1296000	912342		
3	Adj.			163123	1142173			
	Sums	4416	2708					

Moon's parallax on April 12, 6:30 p.m., 31 A.D. G.M.T. Date = $0 + 31^{y} + 102^{d}\ 6.5^{h} = 31.2801$

Tab.	Arg.	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709	9.425	125.76	38.00	67.63	52.70	115.23	39.44	14.34	185.563	40.36	20.16	3.95
2	S.V.	− 16	+ 1	− 5	+ 4	− 8	− 9	− 4	+ 3	− 1	− 84	+ 1	− 1	+ 3
3	1931	26.0251	135.742	43.54	74.97	73.85	85.78	31.92	60.9	15.78	79.422	19.3	26.4	4.71
4	102^{d}.271	13.6792	34.199	71.40	3.18	83.43	24.03	92.43	26.99	23.25	54.	26.07	27.60	22.50
3	−Per.	29.5306												
3	−Per.													
	Sums	17.043												

Tab.	Arg.	71	72	73	74	76	77	33
2	0	$27^{d}\ 106.42^{c}$	15. 35.84	4. 202.0	5.5 48.6	3. 18.3	9.5 0.0	6.5 72.70
2	S.V.	− 4.77	+ 1.99	− 2.7	− .2	− .8	+ .2	− .3
3	1931	19.5 106.36	0.5 99.05	4. 251.2	11.5 14.	1. 33.2	7.5 43.4	11. 4.45
4	102^{d}	19. 148.	6.5 14	5.5 201.	9.5 25.	2. 26.	11. 31	13. 80
3	0^{d}.271	119.16	59.04	150	38.5	32	35.2	53.08
3	−Per.	−27.5 _ 24	(31.5) (68)	−9.5 _ 63	−15. _ 55.	−7. _ 15	−10. 11	−29.5 _ 6.
3	Adj.	.5 220	+.5 −109	+1. 554		+.5 59	+.5 65	+1. 196.
	Sums	11. 207.2	22.5 100.9	5. 184.5	11.5 70.9	6.5 49.7	8.5 22.8	2. 7.93

117 =

	V Tab	Arg.	2.0	Date 2.5	3.0	
	1	61.17	174	172	169	✓
	2	132.25	339	362	384	✓ 71
	3	2.31	48	57	68	✓ 33
	4	32.45	65	68	70	✓ 72
	5	50.44	5	6	8	✓ 73
	6	37.16	6	6	5	✓ 74
	7	45.36	4	3	2	✓ 76
	Sum		641	674	703	77
16	10	103.9	116	110	104	✓
17	11	1.12	8	9	9	✓
18	12	16.6	3	3	2	✓
19	13	46.2	44	51	58	✓
	Sum		812	847	876	
	I.F. −.28 =		− 9			
	k(1st sum − 595) =		+ 4			
	Σ_8 = sum		842			

102

V Tab	Arg. at Date		Value	
15	11.	207.2	4366	+.5
16	2.	7.9	4729	
17	22.5	100.9	3365	+1.1
18	5.	184.5	20	
19	11.5	70.9	235	
21	6.5	49.7	58	
22	8.5	22.8	99	
Sum			12872	
k(Tab 19 − 200)			0	
9 (Const.)			9	
Σ_8			838	
Σ_9 = sum			13719	=
Tab. 24,			54′ 35″	=
" Parallax			54.6	

104

V Tab	Arg. at Date		Value
15	13.	207.2	2340
16	4.	7.9	2490
17	24.5	100.9	4712
18	7.	184.5	334 ✓
19	13.5	70.9	362 ✓
21	1.5	34.7	30
22	0.5	11.8	117 ✓
Sum			10385
k(Tab.19 − 200)			8
9 (Const.)			9
Σ_8			838
Σ_9 = sum			11240
Tab. 24,			54′ 10″ =
" Parallax			54.2

105 Apogee

V Tab	Arg. at Date		Value
15	14.	207.2	2494
16	5.	7.9	1407
17	25.5	100.9	5363
18	8.	184.5	517
19	14.5	70.9	390
21	2.5	34.7	8
22	1.5	11.8	94
Sum			10273
k(Tab.19 − 200)			9
9 (Const.)			9
Σ_8			838
Σ_9 = sum			11129
Tab. 24			54′ 1″
" Parallax			54.02

106

V Tab	Arg. at Date		Value	
15	15	207.2	3422	+.5
16	6	7.9	606	
17	26.5	100.9	5964	+1.1
18	9.	184.5	614	
19	15.5	70.9	386	
21	3.5	34.7	0	
22	2.5	11.8	40	
Sum			11032	
k(Tab.19 − 200)			9	
9 (Const.)			9	
Σ_8			838	
Σ_9			11888	
Tab. 24			54′ 12″	=
" Parallax			54.2	

117 April 27

V Tab	Arg. at Date		Value	
15	26.	143.	38830	+.5
16	16.5	77.4	4820	
17	6.	1.1	5257	
18	0.5	254.8	488	
19	11.	66.2	194	
21	0.0	46.5	57	
22	3.	46.8	31	
Sum			49877	
k(Tab.19 − 200)			0	
9 (Const.)			9	
Σ_8			842	
Σ_9			50528	
Tab. 24			60′ 44″	=
" Parallax			60.7	

118 April 28

V Tab	Arg. at Date		Value	
15	27.	143	39706	+.5
16	17.5	77.4	3719	
17	7.	1.1	4600	
18	1.5	254.8	398	
19	12.	66.2	271	
21	1.	46.5	40	
22	4	46.8	6	
Sum			48740	
k(Tab.19 − 200)			3	
9 (Const.)			9	
Σ_8			842	
Σ_9			49594	
Tab. 24			60′ 34″	=
" Parallax			60.6	

119 April 29

V Tab	Arg. at Date		Value
15	28	143	39376
16	18.5	77.4	2512
17	8.	1.1	3924
18	2.5	254.8	200
19	13.	66.2	336
21	2.	46.5	15
22	5.	46.8	2
Sum			40365
k(Tab.19 − 200)			6
9 (Const.)			9
Σ_8			842
Σ_9			47222
Tab. 24			60′ 10″
" Parallax			60.2

Date = April 27, 3:00 p.m., 31 A.D. = $0 + 31^{y}\ 117^{d}\ 3^{h}$ G.M.T. = 31.321

Tab	Arg.	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709	9.425	125.76	38.00	67.63	52.70	115.23	39.44	14.34	185.563	40.36	20.16	3.95
	S.V.	− 16	+ 1	− 5	+ 4	− 8	− 9	− 4	+ 3	− 1	− 84	+ 1	− 1	+ 3
	1931	26.0251	135.742	43.54	74.97	73.85	85.78	31.92	60.9	15.78	79.422	19.3	26.40	4.71
4	117.125	28.5332	34.199	71.40	3.18	83.43	24.03	92.43	26.99	23.25	54.	26.07	27.60	22.50
	−1 Per	59.0612	22.800	47.60	2.12	55.62	16.02	61.62	18.	15.50	36.	17.38	18.40	15.00
	−Per		+141	156	116	248	128.	264	100	48.	251	102.	76	
	Sums	2.366	61.167	132.25	2.31	32.45	50.44	37.16	45.36	20.86	103.9	1.12	16.55	46.19

−.28 = I.F.

Tab	Arg.	71	72	73	74	76	77	33	
2	0	27. 106.42	15. 35.84	4. 202.0	5.5 48.6	3. 18.3	9.5 0.0	6.5 72.70	
	S.V	− 4.78	+ 1.99	− 2.7	− .2	− .8	+ .2	− .3	
	1931	19.5 106.36	0.5 99.05	4. 251.2	11.5 14.	1. 33.2	7.5 43.4	11. 4.45	
	117	34. 148.	21.5 14.	11. 138.	9. 41.	10. 11.	16. 20.	28. 80.	
†	0.125	55	27.25	69.3	17.8	14.8	16.2	24.5	
	−Per	−55. _ 48	−31.5 _ 68.	−19. _ 126	15. 55	14. 30	30. 33	−29.5 _ 6.	
	Adj	+.5 220	+.5 109	.5 277				.5 98	
	Sums	26. 143 ✓	6. 1.13 ✓	0.5 254.8 ✓	11. 66.2 ✓	0.0 46.5 ✓	3. 46.8 ✓	16.5 77.35	✓

Drop last two digits from III

III Tab	Arg.	17.5	Date 18.0	18.5	
1	50	57	54	51	✓
2	108	8	6	4	✓
3	1	3	2	2	✓
4	5	11	11	12	✓
5	42	9	6	5	✓
6	6	10	11	11	✓
7	36	2	3	3	✓
Sum		100	93	88	✓
16	86	58	58	58	✓
19	39	10	10	10	✓
Sum		168	161	156	✓
I.F. k x 1st sum	0		+ 5		✓
Σ_1 = sum			166		✓
40	4	262	228		✓
41	20.5	4	96		✓
42	23.	136	67		✓
43	7.	32	54		✓
44	3.5	93	0		✓
45	10.	74	18		✓
46	1.5	10	4		✓
47	223.	14	160		✓
Σ_{10}			75		✓
Σ_3 Sum			868		✓
Σ_3 Tab.47 x k			7		✓

III Tab	Arg. at Date		Value	
23	9.	183	33	✓
24	11.5	33	35	✓
25	1.5	52	211	✓
26	25	21	230	✓
27	4.5	234	338	✓
28	0.	168	29	✓
29	10.5	71	11	✓
Sum			887	✓
30	12.	311.5+.8	36229	✓
31	14.	67+1.3	4680	✓ 16
32	16.	6.6+3.4	15	✓ 17
33	3.	8	67	✓ 18
34	195	12	421	✓ 19
35	3.5	238	39	✓
36	4.	20	30	✓
37	7.	123	30	✓
38	6.	84	24	✓
39	3.	5	0	✓
			163123	✓
Σ_2 Sum			205545	✓
Σ_2 k x 1st sum			41	✓
Σ_3			875	
Longitude = sum			206461	✓
" Tab. 5, II			57°21′1″	✓

Drop one digit from IV & V

IV Tab	Arg.	17.5	Date 18.0	18.5	
1	49.8	116	114	111	✓
2	108.	37	32	28	✓
3	1.	44	43	40	✓
4	4.6	13	14	15	✓
5	42	16	13	11	✓
6	6.4	11	11	12	✓
7	36	6	7	8	✓
Sum		243	234	225	✓
12	85.9	152	154	157	✓
13	43.4	140	139	139	✓
14	7.4	1	1	2	✓
15	38.7	153	161	168	✓
Sum		689	689	691	✓
I.F. +.08 x k x 1st sum =			0 11		
Σ_4 = sum			700		✓
Σ_2			205586		
P34 ÷ 10			45		4416 ✓
P35 (P34 − 10^3) ÷ 10			− 6		✓
19 + 9k			19		✓
− ☊			1142173		
S = sum			13485.17		✓
			12960		✓

525.17 = ✓ units 100″

IV Tab	Arg.	17.5	Date 18.0	18.5	
1 34	50	27	27	28	
2 35	108	19	18	17	
3 36	1	22	24	26	
4 37	5	4	3	3	
5 38	42	4	4	3	
16 43	86	62	62	63	
Sum		138	138	140	
I.F. .08 x 1			0		
− Consts.			− 129		
(84) P36 ÷ 10			= − 39		
−388 x .1 / 10 P36 x 37 ÷ 10			= − 4		
Sum = C			− 34		= Σ_6

VI Tab.	Arg.	Value	
P22 ÷ 100	889	13	82
P23 ÷ 100	1927.9	21	
P24 ÷ 100	2088.4	17	
24 + 9k =		24	
Σ_{10} = sum		75	

I.F. = + .08
For Tab. P23 VI
Date = 1900 − 31 = −1869
7 Per. = 7 x 270.95 = 1896.65
Arg. = 1896.65 + 31.283 = 1927.93
k = −.0000248 x −1869 = .0464

Dropping of digits from VI indicated by divisors 10 & 100

For Tab. P24 VI
Date = 31.283
8 Per. = 8 x 257.14 = 2057.12
Arg. = 2057.12 + 31.283 = 2088.4

Interpolating Factor
If D = 16.353, I.F. = 2 x (16.5 − 16.353) = −.29
If D = 16.653, I.F. = 2 x (16.653 − 16.5) = +.31
If D = 17.022, I.F. = 2 x (.022) = +.04

IV Tab	Arg. at Date		Value	
53 19	19.5	18.2	19	✓
54 20	23	12.4	130	✓
55 21	29.5	39.8	9888	✓
56 22	1.	42	64	✓
57 23	10.5	59.9	32	✓
58 24	733.5		105	✓
59 25	6.	4.4	883	✓
60 26	5.5	6.5	99	✓
61 27	17.	25.6	88	✓
62 28	7.5	188.	29	✓
Sum			11337	✓
− Consts.			− 6980	✓
k (1st two lines − 340)			− 9	✓
Σ_5 = sum			4348	✓
Tab. 33, Arg. S = +			46599	✓
525.17				
Σ_7 = sum			50947	✓
$\Sigma_7 \times C \div 10^5$ =			− 17 = 50930	✓
Latitude = sum			5093.″0	✓
" Tab. 5, II			+1° 24′ 53″	✓

V Tab	Arg	17.5	Date 18.0	18.5	
1	50	136	133	129	
2	108.5	112	94	78	
3	1	234	223	211	
4	4.6	59	61	63	
5	42	6	8	10	
6	6	14	14	14	
7	36	8	8	8	
Sum		569	541	513	
10	85.9	111	113	114	16
11	43.4	12	12	12	17
12	7.4	13	14	15	18
13	38.7	162	156	149	19
Sum		867	836	803	
I.F. .08 x 32 = + 3					
k (1st sum − 595) = − 1					
Σ_8 = sum		838			

V Tab	Arg. at Date		Value	
71 15	12.	207.7	2968	+.5 (9)
33 16	3.	7.9	3668	
72 17	23.5	102	4037	+1.1
73 18	6.	184	142	
74 19	12.5	70.9	308	
76 21	0.5	34.7	52	
77 22	9.5	22.8	119	
Sum			11294	
k (Tab. 19 − 200)			+ 5	
9 (Const.)			+ 9	
Σ_8			838	
Σ_9 = sum			12146	
Tab. 24, Tab. Arg.				
" Parallax			54′ 19.″8 = 54′.3	

Drop 1 digit from figures in Table 24, V

Moon

$\omega = 23^\circ 41' 30''$ $\quad \lambda = 57^\circ 21' 1''$ $\quad \beta = +1^\circ 24' 53''$ $\quad$ Apr. 13, 31 A.D., 6:30 p.m. G.M.T.

1 $\sin\delta = \sin\omega \sin\lambda \cos\beta + \cos\omega \sin\beta$
2 $\cos\delta \sin a = \cos\omega \sin\lambda \cos\beta - \sin\omega \sin\beta$
3 $\cos\delta \cos a = \cos\beta \cos\lambda$

1. $\log \sin\omega = 9.6040257$ $\quad \log\cos\omega = 9.9617632$
$\log\sin\lambda = 9.9253041$ $\quad \log\sin\beta = 8.3925044$
$\log\cos\beta = 9.9998676$ $\quad 8.3542676$ ✓
9.5291974 ✓ $\quad .0226083$ ✓
$.3382185$
$+ \ .0226083$ antilog
$.3608268$ "

$\therefore \sin\delta =$ $\quad \log\sin\delta = 9.5572988$ ✓
$\sin\delta = 21^\circ 9' 4''$ ✓

2 $\log\cos\omega = 9.9617632$ ✓
$\log\sin\lambda = 9.9253041$ $\quad \log\sin\omega = 9.6040257$
$\log\cos\beta = 9.9998676$ $\quad \log\sin\beta = 8.3925044$
9.8869349 $\quad 7.9965301$
$.7707879$ $\quad$ antilog $\quad .0099204$
$- \ .0099204$
$.7608675$ $\quad = \log \ 9.8813091$
$\log\cos\delta = 9.9697107$
$\log\sin a = 9.9115984$
$a = 54^\circ 40' 9''$

3 $\log\cos\delta = 9.9697107$ $\quad \log\cos\beta = 9.9998676$ ✓
$\log\cos a = 9.7621496$ $\quad \log\cos\lambda = 9.7319928$ ✓
9.7318603 $\quad 9.7318604$

---

4 $\cos t_\leftmoon = \cos(90^\circ 50' - 54'.33)\sec\delta \sec\phi - \tan\delta \tan\phi$
$= 89^\circ 55' 40'' = p$ ✓

$\delta = 21^\circ 9' 4''$
$\phi = 31^\circ 46'$

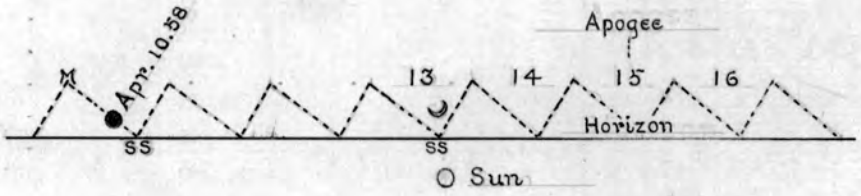
$\log\cos p = 7.1005481$ ✓ $\quad \log\tan\delta = 9.5875910$ ✓
$\log\sec\delta = 0.0302897$ ✓ $\quad \log\tan\phi = 9.7918458$ ✓
$\log\sec\phi = 0.0704793$ ✓ $\quad 9.3794368$
7.2013171 ✓ $\quad .2395724$ ✓
$.0015897$ ✓

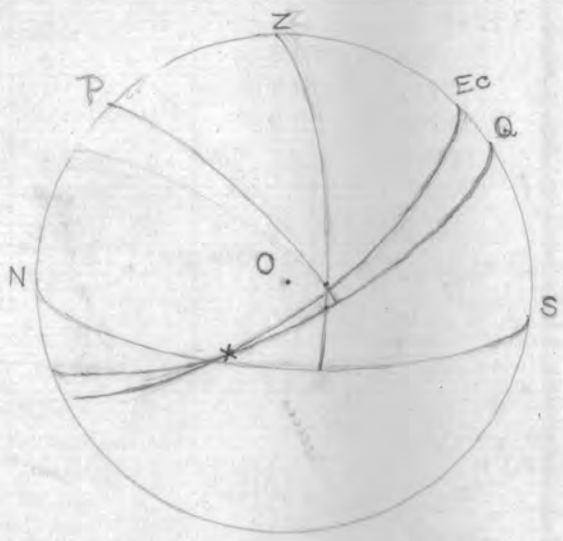
$\cos t_\leftmoon = - \ \dfrac{.2395724}{.2379827} = \log\cos 9.3765454$ ✓ $\quad p = 180 - (76^\circ 13' 7'') =$
$t_\leftmoon = 103^\circ 46' 53''$
$a = 54\ 40\ 9$
$158^\circ 27' 2'' =$

Sidereal Time

6:30 p.m. $= \tau = 9^h 51^m 36^s =$ T + time + L

☾ $a + t = 10^h 33^m 47^s$
☉ $\tau = 9 \ 51 \ 36$
$+ \quad 42^m 11^s =$ diff.
$2 \ 20 \ 54$
$3^h 3^m 5^s =$
time from ss to ms





p.m.

Constants — Arguments (Newcomb) — 26 A.D., 6:00 G.M.T.

	Mercury I	Venus II	Mars III	Jupiter IV	Saturn V	Moon VI	Earth VII	VIII	IX	k	Mean Obliquity ε	(a)	
Tab. I 0	23.4	89.14	145.42	150.70	30.9	21.87	1.6	10.0	9.0	-1.822	+ 14′ 35.51	+2.08	M 131.64
" II 1926	6.2	154.94	128.46	147.33	22.2	28.25	0.8	5.2	1.5	-0.611	23 26 56.08		5.37
" V													
" VI						+ 8.61		11.55	11.59				
Total	29.6	244.08	273.88	298.03	53.1	58.73	2.4	26.75	22.09	-2.433	23 41 31.59		g 126.27
Per. of Arg.	24	180	180	180		30		24	12				
	5.6	64.08	93.88	118.03		28.73		2.75	10.09				

Variables

Moon's Age

	M	A	D	U	B	N	C	D	L	τ
Tab. I 0	31.3185	320.50	6.805	4.01	4.3	6253.0	5.08	6.2	-1° 47′ 46.17	-h 7m 11s.078
" II 1926	3.0722	500.32	18.391	5.36	2.9	4802.4	4.19	13.29	0 33 25.59	2 15.539
" III	97	97	97	97	97	97	97	97	14 26 28.05	0 57 45.870
" IV	.25	.25	.25	.25	.2	.2	.25	.25	14 47.08	59.139
" V										
Total	131.6407	918.07	122.446	106.62	104.4	11152.6	106.52	116.74	13 26 54.55 ✓	53 49.47 ✓
Per. of Arg.		583.92	118.122	81.64	96.8	6798.4	81.80	109.29		
		334.15 ✓	4.324 ✓	24.98 ✓	7.6 ✓	4354.2 ✓	24.72 ✓	7.45		

$f_n = f_0 + n\Delta' + \frac{n(n-1)}{2}\Delta''$ **Longitude** n = ratio = $\frac{6.27}{8} = .7837$

$f_0 = 25.08$ g

		112	120	128	136
Tab. VII, Arg. I		.05	.05	.06	.06
" VIII " II		4.95	4.90	4.85	4.83
" IX " III		3.41	3.18	2.96	2.74
" X " IV		16.65	15.96	15.37	14.89
" XI " V		.92	.99	1.06	1.14
Σ		25.98	25.08	24.30	23.66
			−.60		
	Δ′		−.9	−.78	−.64
	Δ″		−.12	−.14	
Sum for g = 126.27			24.48		
	D	3	4	5	6
Tab. XIII, Arg. VI		.43	.51	.61	.65
" XIV, " VII		.24	.26	.27	.29
Σ		.67	.77	87	.94
			+.03		
	Δ′		+.10	+.10	+.07
	Δ″				
Σ for D = 4.32			+.80		

L	13° 26 54.55
Tabs. VII to XI	24.48
" XIII and XIV	.80
" XII, Arg. A 334.15	.04
" XV, " D 4.324	9.49
" XVI, " M 131.64	3 53.04 −13.88 X
" XVII, " M	1 33 50.83 −16.79
Nut	
λ	

17 full centuries + .74 cent. + $\frac{365-97}{36500}$ Cent. =

(−17.734 X − 17.734) X .003 +

Latitude

	g				
Tab. XXVIII, Arg.	II				
" XXIX, "	V				
Σ					
	Δ′				
Σ for g =					
Tab. XXVIII & XXIX					
" XXX, Arg. VIII & U					
" XXXI, " B					
Latitude					

Nutation — In Long. (δψ) — In Ob. (δε)

	In Long. (δψ)	In Ob. (δε)
Tab. XXXII, Arg. N	−11.07	− 7.07
" XXXIII, δay + k	− 3.01	+ .33
" XXXIV, D and IX	− .20	
" XXXV, D and IX		+ .03
" XXXVI, D and VI	+ .01	
" XXXVII, C	+ .02	+ .01
Σ for Nut	−14.25	− 6.7

Sidereal Time

δ ÷ 15 = −.95 τ = 53m 49.47

Nut. R.A = Time = 6h 00m

2h 20 54		6 53 49
28 08	L	2 20 54
1 52 46	Sid. T. at J. =	9 14 43
	$a_\zeta + t_\zeta$	8 46 35
		28′ 08″

ω = _____ $\lambda_\odot$ = _____ $\beta_\odot$ = _____

1 $\sin\delta = \sin\omega \sin\lambda \cos\beta + \cos\omega \sin\beta$

2 $\cos\delta \sin a = \cos\omega \sin\lambda \cos\beta - \sin\omega \sin\beta$

3 $\cos\delta \cos a = \cos\beta \cos\lambda$

1. log sin ω = _____ log cos ω = _____
   log sin λ = _____ log sin β = _____
   log cos β = _____
   _____ antilog
   _____ "
   sin δ = _____ log sin δ = _____
   ∴ δ = _____

2. log cos ω = _____
   log sin λ = _____ log sin ω = _____
   log cos β = _____ log sin β = _____
   _____ antilog
   _____ = log _____
   log cos δ = _____
   log sin a = _____
   ∴ a = _____

3. log cos δ = _____ log cos β = _____
   log cos a = _____ log cos λ = _____

$a_\zeta - a_\odot$ = _____

Obliquity of Ecliptic

ε (Tables I and II)	
(a) × fraction of cent.	
δε	
ε	

Drop last two digits from III

Drop one digit from IV & V

26 A.D.
6:00 p.m. G.M.T.

III Tab	Arg.	16.5	Date 17.0	17.5	
1	48	62	59	57	✓
2	37	7	9	11	✓
3	52	4	4	4	✓
4	16	5	6	7	✓
5	58	7	5	4	✓
6	76	12	12	11	✓
7	78	11	11	10	✓
Sum		108	106	104	✓
16	225	49	47	45	✓
19	30	12	13	13	✓
Sum		169	166	182	✓
I.F.	−.16		+ 1		✓
k × 1st sum			+ 5		
Σ_1 = sum			172		✓
40	9.0 141		235		✓
41	95.0 0		3		✓
42	19.0 45		31		✓
43	14.5 179		18		✓
44	5.5 80		8		✓
45	17.5 16		12		✓
46	4.0 23		1		✓
47	217.5 3		119		✓
Σ_{10}			74		
Σ_3 { Sum			673		✓
Σ_3 { Tab. 47 × k			6		✓

III Tab	Arg. at Date		Value	
23	8.0	268	9	✓
24	10.0	100	21	✓
25	14.0	145	8	✓
26	11.0	8	49	✓
27	19.5	163	22	✓
28	4.5	156	0	✓
29	22.0	99	32	✓
Sum	30000 − 5189		141	✓
30	26.5	71.1 + .8	24811	✓
31	12.5	288 + 1.3	4127	✓
32	29.0	54.1 + 3.4	8538	✓
33	1.5	82	100	✓
34	11.0	2	420	✓
35	8.0	72	309	✓
36	1.0	59	58	✓
37	10.5	24	77	✓
38	5.5	169	20	✓
39	5.5	12	4	✓
			93177	
Σ_2 { Sum			131782	
Σ_2 { k × 1st sum			7	
Σ_3			679	✓
Longitude = sum			132468″	
« Tab. 5, II			36° 47′ 48″	

IV Tab	Arg.	16.5	Date 17.0	17.5	
1	48	113	111	110	✓
2	37	56	61	67	✓
3	51.5	20	21	23	✓
4	16.4	7	8	10	✓
5	58	13	10	8	✓
6	76	12	11	11	✓
7	78.5	16	15	14	✓
Sum		237	237	243	
12	225	154	154	152	✓
13	15	50	50	51	✓
14	7	0	0	1	✓
15	30	77	87	97	✓
Sum		518	528	544	
I.F.	−.16 × 13		− 2		
k × 1st sum =			+ 11		
Σ_4 = sum			+ 537		
Σ_2			131789		
P34 ÷ 10			+ 33		83 (2583)
P35 (P34 − 10^3) ÷ 10			− 7		
19 + 9k			19		
− Ω			792915		
S = sum			925286″		
			9252.86″		units 100″

IV Tab	Arg.	16.5	Date 17.0	17.5	
1	34 48	26	26	26	✓
2	35 37	17	17	18	✓
3	36 52	21	18	16	✓
4	37 16	3	2	2	✓
5	38 58	4	4	3	✓
16	43 225	77	77	77	✓
Sum		148	144	142	
I.F.	−.16	+ 0			
− Consts.		− 129			
P36 ÷ 10		= + 33	✓		84 (874)
P36 × 37 ÷ 10		= + 3	✓		
Sum = C		+ 51	= Σ_6		✓

VI Tab.	Arg.	Value
P22 ÷ 100	5857	13
P23 ÷ 100	1922.9	19
P24 ÷ 100	2083.4	18
24 + 9k =		24
Σ_{10} = sum		74

I.F. = (17.0 − 16.9188) × 2 = − .16
For Tab. P23 VI
Date = 1900 − 26 = 1874
7 Per. = 7 × 270.95 = 1896.65
Arg. = 1896.65 + 26.2664 = 1922.916

k = .0000248 × 1874 = .0465

Dropping of digits from VI indicated by divisors 10 & 100

For Tab. P24 VI
Date = 26.2664
8 Per. = 8 × 257.14 = 2057.12
Arg. = 2057.12 + 26.2664 = 2083.386

Interpolating Factor
If D = 16.353, I.F. = 2 × (16.5 − 16.353) = −.29
If D = 16.653, I.F. = 2 × (16.653 − 16.5) = +.31
If D = 17.022, I.F. = 2 × (.022) = +.04

IV Tab	Arg. at Date		Value	
53	19	29.0 4.1	327	✓
54	20	30.0 × 0.6	220	
55	21	5.0 92.6	7952	✓
56	22	2.5 79.6	31	✓
57	23	5.0 65.1	31	✓
58	24	1091[d]	40	✓
59	25	56.0 4.6	315	✓
60	26	1.5 156.6	517	✓
61	27	27.0 0.0	491	✓
62	28	0.5 181	36	
	Sum		9960	✓
	− Consts.		− 6980	✓
	k (1st two lines − 340)		+ 10	✓
	Σ_5 = sum		+2990	✓
9252.86	Tab. 33, Arg. S =		− 180505	✓
	Σ_7 = sum		− 177515	✓
	$\Sigma_7 \times C \div 10^5$		− 91	
	=		− 177606	
	Latitude = sum		17760.″6	
	« Tab. 5, II		− 4° 56′ 0.″6	

V Tab	Arg	16.5	Date 17.0	17.5	
1	48	134	135	134	✓
2	36.9	336	360	382	✓
3	51.5	77	92	107	✓
4	16.4	62	64	67	✓
5	58	8	10	12	✓
6	76	6	6	6	✓
7	78.5	3	2	2	✓
Sum		626	669	710	✓
10	225	83	79	76	✓
11	14.6	24	24	24	✓
12	7	10	11	12	✓
13	30	172	173	174	✓
Sum		915	956	996	
I.F.	−.16 × 41		= − 7 = 949		
k (1st sum − 595) =			+ 1		
Σ_8 = sum			950		

V Tab	Arg. at Date		Value	
71	15	26.5 46.9 + .5	39198	✓
33	16	1.5 81.6	4841	✓
72	17	5.0 48.7 + 1.1	5740	✓
73	18	0.5 233	565	✓
74	19	12.0 10.2	241	✓
76	21	7.5 8	49	✓
77	22	2.5 61	44	✓
	Sum		50678	✓
	k (Tab. 19 − 200)		.2	
	9 (Const.)		9	
	Σ_8		950	
	Σ_9 = sum		51639	
	Tab. 24, Tab. Arg.			
	« Parallax		60′ 55″	

Drop 1 digit from figures in Table 24, V

Latitude and Longitude (L & β) are independent of observer's position
Altitude, azimuth and hour angle are functions of time and observer's position.

Moon

26 A.D. 18 p.m. 97th d.
April 7, 6:00 p.m. G.M.T.

$\omega = 23^\circ 41' 30''$ $\quad \lambda_\mathbb{C} = 36^\circ 47' 48''$ $\quad \beta_\mathbb{C} = -4^\circ 56' 1''$

1 $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$
2 $\cos\delta\sin a = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$
3 $\cos\delta\cos a = \cos\beta\cos\lambda$

1 $\log\sin\omega = 9.6040257$ $\quad \log\cos\omega = 9.9617632$
$\log\sin\lambda = 9.7774102$ $\quad \log\sin\beta = \underline{8.9345055}_n$
$\log\cos\beta = \underline{9.9983879}$ $\quad\quad 8.8962687_n$
9.3798238 $\quad\quad -.0787533$
$+ .2397859$
$- \underline{.0787533}$ add to mantissa of first five figures the remainder decimal × difference
$\sin\delta = .1610326$ $\quad \log\sin\delta = 9.2069140$
$\therefore \delta = 9^\circ 16' 0.''1$ ✓

2 $\log\cos\omega = 9.9617632$
$\log\sin\lambda = 9.7774102$ $\quad \log\sin\omega = 9.6040257$
$\log\cos\beta = \underline{9.9983879}$ $\quad \log\sin\beta = \underline{8.9345055}_n$
9.7375613 $\quad\quad 8.5385312_n$
$+ .5464637$ $\quad\quad -.0345566$
$+ \underline{.0345566}$
$.5810203$ $\quad = \log\ 9.7641913$
$\log\cos\delta = \underline{9.9942948}$ ✓
$\log\sin a = 9.7698965$
$a = \underline{36^\circ 3' 54''} = 2^h 24^m 14^s$

3 $\log\cos\delta = 9.9942948$ $\quad \log\cos\beta = 9.9983879$
$\log\cos a = \underline{9.9075990}$ $\quad \log\cos\lambda = \underline{9.9035057}$
9.9018938 $\quad\quad 9.9018936$

---

4 $\cos t_\mathbb{C} = \cos(90^\circ 50' - \pi_\mathbb{C})\sec\delta\sec\phi - \tan\delta\tan\phi$
$89^\circ 49' 5'' = p$

$\delta = 9^\circ 16' 0''$
$\phi = 31^\circ 46'$

$\log\cos p = 7.5018154$ $\quad \log\tan\delta = 9.2126109$
$\log\sec\delta = 0.0057052$ $\quad \log\tan\phi = \underline{9.7918458}$
$\log\sec\phi = \underline{0.0704793}$ $\quad\quad 9.0044567$
7.5779999 $\quad\quad .1010315_n$
$.0037844$ anti.
$- \underline{.1010315}$
$.0972471_n = \log\cos t_\mathbb{C} = 8.9878766_n$

$\therefore t_\mathbb{C} = 90 + (90^\circ - 84^\circ 25' 9.''5) =$
$95^\circ 34' 50.''5$
$a = \underline{36\ \ 3\ \ 54}$
$131^\circ 38' 44.''5 = 8^h 46^m 35^s = t_\mathbb{C} + a_\mathbb{C}$

---

5 $\tan m = \tan a\cos C$
$\cos c = \cos a\sec m\cos(b-m)$

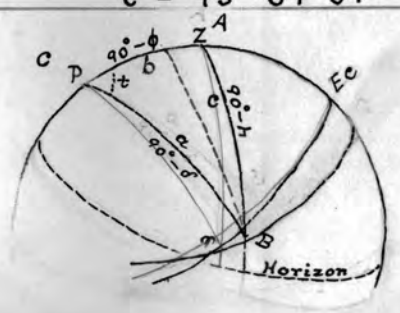
$a = 90^\circ - (9^\circ 16') = 80^\circ 44'$
$C = 95^\circ 34' 51''$
$b = 90 - (31^\circ 46') = 58^\circ 14'$

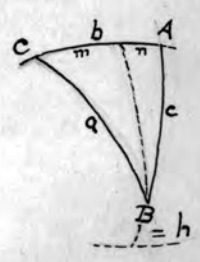
$\log\tan a = 0.7873891$
$\log\cos C = \underline{8.9878679}_n = -\cos C(84^\circ 25' 10'')$
$\log\tan m = 9.7752570_n$
$\therefore m = 149^\circ 12' 16''$
$b - m = -90^\circ 58' 16''$

$\log\cos a = 9.2069059$
$\log\cos(b-m) = \underline{8.2291255}_n$
$\log\sec m = \underline{0.0660070}_n$
$\log\cos c = 7.5020384$
$\therefore c = 89^\circ 49' 4.''7$
$c = 90 - h$
$\therefore h = 90^\circ - (89^\circ 49' 4.''7) = 10' 55''$

O.K. O.K.

Tr. Per. = 1.49
Moon
April 7, 26 A.D., 6:00 p.m. G.M.T.
Conj. = April 6:28, J.C.T. 8:21
$\phi = 31^\circ 46'$
$L = 36^\circ 47' 48''$
$\beta = -4^\circ 56' 1''$
$\pi = 60' 55''$
$a = 36^\circ 3' 54''$
$\delta = 9^\circ 16' 0.''1$
$h = 10' 55''$ + ✓
$t = 95^\circ 34' 51''$





1	2	3	4	5	6	7	12	16	17	18	19
47.992	348.89	51.54	264.42	185.82	208.13	78.47	60.56	475.909	116.65	82.95	29.72
(48)	312	(52)	248	128	132		48	251	102	76	(30)
	36.89		16.42	57.82	76.13		12.56	224.909	14.65	6.95	
	(37)			(58)				(225)	(15)	(7)	

23
38.0
30.0
8.0

1197.4
928.7
267.7

24
23.5
14.0
9.5
+ .5
10.0

330.7
64
266.7
167
99.7

25
39.0
25.5
13.5
.5
14.0

379.7
46
333.7
189
144.7

26
40.0
29.5
10.5
+ .5
11.0

295.76
86
149.76
142
7.76

27
59.5
34.5
19.0
.5
19.5

600.2
179
421.2
258
163.2

28
14.0
9.5
4.5

288.5
133
155.5

29
50.5
29.0
21.5
+ .5
22.0

414.7
109
305.7
207
98.7

30
53.0
27.5
25.5
1
26.5

767.121
36
731.121
660
71.121

31
26.5
14.5
12.0
+ .5
12.5

738.02
156
582.02
294
288.02

32
60.0
31.5
28.5
.5
29.0

598.12
209
389.12
335
54.12

33
30.0
29.5
0.5
+ 1
1.5

283.60
6
277.60
196
81.60

34
215.5
205.0
10.5
+ .5
11.0

27.30
11
16.30
14
2.30

35
16.5
9.5
7.0
+ 1.
8.0

689.40
63
626.40
554
72.40

36
32.0
31
1.0

248.9
190
58.9

37
30.0
20
10.0
.5
10.5

554.4
134
420.4
396
24.4

38
19.0
14.0
5.0
+ .5
5.5

620.4
152
468.4
299
169.4

39
16.5
11
5.5

51.7
40
11.7

40
22.0
13.5
8.5
.5
9.0

518.09
66
452.03
311
141.03

41
268.0
173
95.0

13.3
13
0.3

42
45.0
26.5
18.5
+ .5
19.0

311.9
115
196.9
152
44.9

43
23.5
9.0
14.5

221.0
42.1
178.9

44
19.0
14.
5.0
+ .5
5.5

316.9
58
258.9
179
79.9

45
26.0
9.5
16.5
+ 1.
17.5

289.8
8
281.8
266
15.8

46
10.0
- 6.5
3.5
+ .5
4.0

138.4
47
91.4
68
23.4

47
217.0
.5
217.5

28.22
25
3.2

53
63.5
35
28.5
+ .5
29.0

75.1
32
43.1
39
4.1

54
29.0
+ 1
30.0

94.6
- 94
0.6

55
68.5
64
4.5
.5
5.0

369.42
146.77
222.65
130
92.65

56
32.0
30
2.0
.5
2.5

222.6
63
159.6
80
79.6

57
36.0
32
4.0
+ 1.
5.0

299.1
10
289.1
224
65.1

58
1091.4
.3
1091

59
244.0
188
56.0

6.65
2
4.65

60
16.0
14.5
1.5

283.8
127.2
156.6

61
54.0
27.5
26.5
.5
27.0

95.8
43
52.8
53
0.0

62
19.5
19
0.5

309
128
181

71
53.0
27.5
25.5
1
26.5

510.91
24
486.91
440
46.91

72
68.0
63
5.0

184.71
136
48.71

73
19.0
19
0.0
.5
0.5

636.0
126
510.0
277
233.0

74
26.5
15
11.5
+ .5
12.0

136.2
55
81.2
- 71
10.2

76
20.5
14.0
6.5
1
7.5

156.1
30
126.1
118
8.1

77
32.5
30
2.5

94.2
39
461.2

82
12657
6800
5857

83
9383
6800
2583

84
7674
3800
3874

L
1389177
1296000
93177

ß
2088917
1296000
792917

ω
1473535
1296000
177535

26 A.D.

200.527
2
401.054 = 1 day
97 2
2807378
360548
3890212 38

26 A.D.

(D) 26.2664
.000051
26.2664
1313320
-.0013395864

(1) 26.2664
+ .00003
.000787992
+.001

(2) 26.2664
- .0016
1575984
262664
-.04202624

(3) 26.2664
+ .0013
787992
262664
.03414632

(4) 26.2664
- .0026
1575984
525328
.06829264

(5) 26.2664
- .0028
2101312
525328
.07354592

(6) 26.2664
- .0014
1050656
262664
.03677296

(7) 26.2664
+ .0011
262664
262664
.02889304

(12) 26.2664
- .0002
.00525328

(16) 26.2664
- .00269
2363976
1575984
525328
.070656616

(17) 26.2664
+ .0002
.00525328

(18) 26.2664
- .0003
.00787992

(19) 26.2664
+ .0011
262664
262664
.02889304

(23) 26.2664
- .065
1313320
1575984
1.7073160

(24) 26.2664
- .016
1575984
262664
.4202624

(25) 26.2664
- .121
262664
525328
262664
-3.1782344

(26) 26.2664
- .1069
2363976
1575984
262664
2.80787816

(27) 26.2664
+ .163
787992
1575984
262664
4.2814232

(28) 26.2664
- .056
1575984
1313320
1.4709184

(29) 26.2664
+ .111
262664
262664
262664
+2.9155704

(30) 26.2664
- .22838
2101312
787992
2101312
525328
525328
5.998720432

(31) 26.2664
- .0298
2101312
2363976
525328
-.78273872

(32) 26.2664
+ .195
1313320
2363976
262664
5.1219480

(33) 26.2664
- .01
.262664

(34) 26.2664
- .1252
525328
1313320
525328
262664
3.28855328

(35) 26.2664
- .0852
525328
1313320
2101312
2.23789728

(36) 26.2664
+ .068
2101312
1575984
1.7861152

(37) 26.2664
+ .045
1313320
1050656
1.1819880

(38) 26.2664
- .122
525328
525328
262664
3.2045008

(39) 26.2664
- .007
-.1838648

(40) 26.2664
+ .0015
1313320
262664
.03939960

(41) 26.2664
+ .026
1575984
525328
.6829264

(42) 26.2664
+ .104
1050656
262664
2.7317056

(43) 26.2664
- .043
787992
1050656
1.1294552

(44) 26.2664
- .008
-.2101312

(45) 26.2664
+ .024
1050656
525328
+.6303936

(46) 26.2664
- .023
787992
525328
-.6041272

(47) 26.2664
+ .0011
262664
262664
+.02889304

(53) 26.2664
- .01
.262664

(54) Same

(55) 26.2664
- .0295
1313320
2363976
525328
-.77485880

(56) 26.2664
- .011
262664
262664
-.2889304

(57) 26.2664
+ .02
+.525328

(58) 26.2664
+ .028
2101312
525328
+.7354592

(59) 26.2664
- .017
1838648
262664
-.4465288

(60) 26.2664
- .082
525328
2101312
-2.1538448

(61) 26.2664
- .075
1313320
1838648
-1.9699800

(62) 26.2664
- .11
262664
262664
-2.889304

(71) 26.2664
- .1526
1575984
525328
1313320
262664
4.00825264

(72) 26.2664
+ .0635
1313320
787992
1575984
+1.66791640

(B)

(73) 26.2664
- .085
1313320
2101312
-2.2326440

(74) 26.2664
- .008
-.2101312

(76) 26.2664
- .024
1050656
525328
-.6303936

(77) 26.2664
+ .007
+.1838648

(82) 26.2664
+ .01
.262664

(83) 26.2664
+ .05
+1.313320

(84) Same

(L) 26.2664
- 2.6395
1313320
2363976
787992
1575984
525328
-69.33016280

(88) 26.2664
+ 2755
1313320
1313320
1838648
525328
+72.3639320

26.2664
+13.64
1050656
1575984
787992
262664
358.273696

Moon Tables (Brown)

Date = 26 A.D. April 7, 18:00 p.m. G.M.T. Conj. = April 6.28, J.C.T. Tr.Per. = 1.49
= 0 + 26^y 97^d 6:00 = 26.2664

Tab	Arg.	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709	9.425	125.76	38.00	67.63	52.70	115.23	39.44	14.34	185.565	40.36	20.16	3.95
2	S.V.	− 13	+ 1	− 4	+ .3	− 7	− 7	− 4	+ 3	− 1	− .07	+ 1	− 1	+ 3
3	1926	1.3910	4.367	151.77	10.33	113.43	109.16	0.51	12.01	22.98	236.414	50.21	35.20	3.24
4	97.25	8.6582	34.199	71.40	3.18	83.43	24.03	92.43	26.99	23.25	54.000	26.07	27.60	22.50
3	−1 Per.													
3	−Periods			312		248	128	132		48	251	102	76	
	Sums	16.9188	47.99	36.9	51.5	16.42	57.8	76.13	78.47	12.56	224.91	14.65	6.95	29.72
		16.5 17.0 17.5												

Tab	Arg	23	24	25	26	27	28	29
2	0	5.5 410.1	7.5 106.7	1.5 152.7	26.5 116.95	13.5 65.1	3.5 48.7	16.0 188.9
2	S.V.	− 1.7	− .4	− 3.2	− 2.8	+ 4.3	− 1.5	+ 2.9
3	1926	12.5 410.3	4.5 23.4	17.5 84.2	6.0 24.61	13.0 243.8	2.5 103.3	25.5 31.9
4	97.0	20.0 76	11.5 117	20.0 51	7.5 26	27.0 158	8.0 49	9.0 87
3	.25	300	84	95	71	129	89	104
3	−Per.	−30 − 928	14.0 − 64	23.5 − 46	−29.5 − 86	− 34.5 − 179	− 9.5 − 133	−29.0 − 109
3	Adj.		+ . 167	+ .5 189	+ .5 142	+ .5 258		+ .5 207
	Sums	8.0 267.7	10.0 99.7	14.0 144.7	11.0 7.76	19.5 163.2	4.5 155.5	22.0 98.7

Tab	Arg	30	31	32	33	34	35	36
2	0	27.0 159.631	6.5 218.10	15.0 110.15	6.5 72.70	105.0 11.47	4.0 201.97	15.0 38.5
2	S.V.	− 5.999	− .78	+ 5.12	− .26	− 3.29	− 2.24	+ 1.8
3	1926	12.0 226.489	12.0 133.70	12.0 62.85	15.5 82.16	13.5 12.12	2.5 86.67	0.0 39.6
4	97.0	14.0 222	8.0 240	33.0 252	8.0 60	97.0 0.	10.0 264	17.0 110
3	.25	165	147	168	49	7	139	39
3	−Per.	−27.5 − 36	−14.5 − 156	−31.5 − 209	−29.5 − 6	−205.0 11	− 9.5 − 63	−31.0 190
3	Adj.	+ 1. 660	+ .5 294	+ .5 335	+ 1. 196	+ .5 14	+ 1. 554	
	Sums	26.5 71.1	12.5 288	29.0 54.1	1.5 81.6	11.0 2.3	8.0 72.4	1.0 58.9

Tab	Arg	37	38	39	40	41	42	43
2	0	9.5 0.1	3.0 92.6	5.0 21.9	4.0 19.43	144.0 0.4	8.0 81.6	2.5 36.0
2	S.V.	+ 1.2	− 3.2	− .2	+ .04	+ .7	+ 2.7	− 1.1
3	1926	4.5 99.1	5.0 97.0	2.0 4.0	3.0 116.56	27.0 1.2	21.0 40.6	6.0 81.0
4	97.0	16.0 256	11.0 284	9.5 10	15.0 226	97.0 0.0	16.0 111	15.0 9.
3	.25	198	150	16	156	11	76	95
3	−Per.	−20.0 − 134	−14.0 − 152	−11.0 − 40	−13.5 66	−173 13.	−26.5 115	− 9.0 41
3	Adj.	+ .5 396	+ .5 299		+ .5 311		+ .5 152	
	Sums	10.5 24.4	5.5 169.4	5.5 11.7	9.0 141	95 0.3	19.0 44.9	14.5 178.9

Tab	Arg	44	45	46	47	53	54	55
2	0	5.0 140.7	7.0 97.5	1.5 50.7	31.0 14.37	8.0 15.5	11.5 42.2	10.0 62.27
2	S.V.	− .2	+ .6	− .6	+ .03	− .3	− .3	− .77
3	1926	2.0 76.4	8.0 63.7	0.5 53.3	89.0 0.82	29.5 25.9	9.5 26.7	26.5 128.15
4	97.0	12.0 10	11.0 61	8.0 1	97.0 0.	26.0 14.	8.0 2	32.0 114
3	.25	90	67	34	13	20	24	65
3	−Per.	−14.0 − 58	− 9.5 8	− 6.5 − 47		−35.0 − 32		− 64 − 146
3	Adj.	+ .5 179	+ 1 − 266	+ .5 68	+ .5 − 25	+ .5 39	+ 1. − 94	+ .5 130
	Sums	5.5 79.9	17.5 15.8	4.0 23.4	217.5 3.2	29.0 4.1	30.0 0.6	5.0 92.6

Tab	Arg	56	57	58	59	60	61	62
2	0	7.5 68.5	12.5 49.3	349.4	126.0 3.67	4.5 16.0	23.0 14.7	2.5 141
2	S.V.	− .3	+ .5	+ .7	− .45	− 2.2	− 2	− 3
3	1926	9.0 42.4	7.0 106.3	644.3	21.0 0.43	4.0 76.8	18.0 26.1	7.0 29
4	97.0	15.5 72	16.5 87	97	97.0 0	7.5 105	13.0 30	10.0 39
3	.25	40	56		3	86	27	103
3	−Per.	−30.0 − 63	−32.0 − 10		−188.0 − 2	−14.5 − 125	−27.5 − 43	−19.0 − 128
3	Adj.	+ .5 80	+ 1 224	− .3			+ .5 53	
	Sums	2.5 79.6	5.0 65.1	1091	56.0 4.6	1.5 156.6	27.0 0.0	0.5 181

Tab	Arg	71	72	73	74	76	77	82
2	0	27.0 106.42	15.0 35.84	4.0 202.0	5.5 48.6	3.0 18.3	9.5 0.0	6257
2	S.V.	− 4.01	+ 1.67	− 2.2	− .2	− .6	+ .2	+ .3
3	1926	12.0 150.5	20.0 10.20	5.0 33.2	1.0 42.8	6.5 52.4	7.0 19.0	6303
4	97.0	14.0 148	33.0 82	10.0 264	20.0 9	11.0 56	16.0 42	97
3	.25	110	55	139	36	30	33	
3	−Per.	−27.5 − 24	−63 − 136	−19.0 − 126	−15.0 − 55	−14.0 − 30	−30.0 − 33	− 6800
3	Adj.	1 440		+ .5 277	+ .5 71	1. 118		
	Sums	26.5 46.9	5.0 48.7	0.5 233	12.0 10.2	7.5 8.1	2.5 61.2	5857

Tab	Arg	83	84	L	−☊	☋
2	0	6178	6185	295401	1192540	310177
2	S.V.	+ 1	+ 1	− 69	+ 72	+ 358
3	1926	3107	1391	368788	877763	1123998
4	97.0	97	97	713198	18492	38902
3	.25			11859	48	100
3	−Per.	6800	6800	− 1296000	−1296000	1296000
3	Adj.					
	Sums	2583	874	93177	792915	177535

Drop last two digits from III

III Tab	Arg.	17.0	Date 17.5	18.0	
1	44	58	56	53	✓
2	11	11	12	13	✓
3	64	2	2	2	✓
4	102	31	29	27	✓
5	26	18	16	14	✓
6	50	3	3	3	✓
7	87	10	10	9	✓
Sum		133	128	121	✓
16	190	20	20	20	✓
19	44	6	7	7	✓
Sum		159	155	148	
I.F. +.12 x 5			+ 1		✓
k x 1st sum			6		
Σ_1 = sum			162		✓
40	10.0	297	467		✓
41	103.0	16	11		✓
42	24.5	73	75		✓
43	5.5	55	13		✓
44	6.5	65	11		✓
45	10.0	114	19		✓
46	3.0	29	0		✓
47	207.0	15	62		✓
Σ_{10}			76		✓
Σ_3 Sum			896		✓
Σ_3 Tab.47 x k			3		✓

III Tab	Arg. at Date		Value	
23	9.0	389	40	✓
24	10.5	6	24	✓
25	10.5	71	15	✓
26	8.0	115	120	
27	26.0	185	217	
(28)	4.5	170	1	
29	26.0	37	52	
Sum	30000 − 19089		469	
30	23.0	270.1+.8	10911	
31	13.5	78.6+1.3	4502	✓
32	2.0	233.2+3.4	8702	✓
33	2.5	12	82	✓
34	159.5	6	254	✓
35	7.0	240	228	✓
36	6.0	77	6	✓
37	2.0	393	41	✓
38	4.0	262	5	
(39)	5.0	32	4	
			85130	
Σ_2 Sum			110334	
Σ_2 k x 1st sum			22	
Σ_3			899	
Longitude = sum			111255	
« Tab. 5, II			30° 54′ 15″	

Drop one digit from IV & V 27 A.D.

IV Tab	Arg.	17.0	Date 17.5	18.0	
1	43.8	98	96	94	✓
2	10.5	44	44	45	✓
3	64	14	13	13	✓
4	102	35	32	29	✓
5	25.9	29	26	23	✓
6	49.9	4	4	4	✓
7	86.5	15	14	13	✓
Sum		239	229	221	✓
12	189.9	200	193	187	✓
13	16.9	55	56	57	✓
14	3.4	2	1	1	✓
15	43.7	169	175	179	✓
Sum		665	654	645	
I.F. +.12 x 10 =			+ 1		
k x 1st sum =			31		
Σ_4 = sum			686		✓
Σ_2			110356		✓
P34 ÷ 10 (83)			16		✓
P35 (P34 − 10^3) ÷ 10			− 9		✓
19 + 9k			19		✓
− Ω			887594		✓
S = sum			998662″	=	
			9986.62	= units 100″	

IV Tab	Arg.	17.0	Date 17.5	18.0	
1 34	43.8	24	24	25	✓
2 35	10.5	31	30	28	✓
3 36	64	23	20	18	✓
4 37	102	5	5	5	✓
5 38	25.9	5	5	4	✓
16 43	189.9	48	47	45	✓
Sum		136	131	125	
I.F. +.12 x −5 =			− 1		
− Consts.			− 129		
P36 ÷ 10 (84) =			20		
P36 x 37 ÷ 10 =			2		
Sum = C			+ 23	= Σ_6	✓

VI Tab.	Arg.	Value	
P22 ÷ 100 (82)	6212	14	✓
P23 ÷ 100	1923.9	20	✓
P24 ÷ 100	2084.4	18	✓
24 + 9k =		24	✓
Σ_{10} = sum		76	✓

I.F. = +.12
For Tab. P23 VI
Date = 1900 − 27 = 1873
7 Per. = 7 x 270.95 = 1896.65
Arg. = 1896.65 + 27.239 = 1923.889
k = .0000248 x 1873 = .0465

Dropping of digits from VI indicated by divisors 10 & 100

For Tab. P24 VI
Date = 27.239
8 Per. = 8 x 257.14 = 2057.12 ✓
Arg. = 2057.12 + 27.239 = 2084.359 ✓

Interpolating Factor
If D = 16.353, I.F. = 2 x (16.5 − 16.353) = −.29
If D = 16.653, I.F. = 2 x (16.653 − 16.5) = +.31
If D = 17.022, I.F. = 2 x (.022) = +.04

IV Tab	Arg. at Date		Value	
53 19	29.5	35.5	358	✓
54 20	29.0	9.2	219	✓
55 21	5.0	72.5	8020	✓
56 22	3.0	66.4	23	✓
57 23	7.5	69.6	0	
58 24	1446.8		100	✓
59 25	35.0	0.23	620	✓
60 26	0.0	66.8	615	✓
61 27	19.0	24.6	184	✓
62 28	8.0	136	33	✓
Sum			10172	
− Consts.			− 6980	
k (1st two lines − 340)			+ 11	
Σ_5 = sum			3203	
9986.62 Tab. 33, Arg. S =			− 183698	
Σ_7 = sum			− 180495	
Σ_7 x C ÷ 10^5			− 42	
=			− 180537	=
Latitude = sum			18053.″7	=
« Tab. 5, II			− 5° 0′ 54″	✓

V Tab	Arg	17.0	Date 17.5	18.0	
1 71	43.8	127	128	127	✓
2 33	10.5	342	352	360	✓
3 72	64.3	38	44	52	✓
4 73	102.14	48	47	47	✓
5 74	25.9	11	8	7	✓
6 76	49.9	9	10	10	✓
7 77	86.5	3	2	2	✓
Sum		578	591	605	
10	189.9	131	132	132	✓
11	16.9	27	27	27	✓
12	3.4	6	7	8	✓
13	43.7	147	140	132	
Sum		889	897	904	
I.F. = +.12			= + 1		
k (1st sum − 595) =			+ 1		
Σ_8 = sum			899		951

V Tab	Arg. at Date		Value	
15	23.0	179.6	30546	+ .5 = 180.1 ✓
16	2.5	11.8	4205	
17	10.0	65.6	2440	+ 1.1 = 66.7 ✓
18	9.5	186.5	616	✓
19	13.0	24.4	318	✓
21	6.0	26.0	50	✓
22	5.0	2.2	1	✓
Sum			38176	
k (Tab. 19 − 200)			.6	
9 (Const.)			9	
Σ_8			899	
Σ_9 = sum			39090	✓
Tab. 24, Tab. Arg.				
« Parallax			58′ 49″	✓

Drop 1 digit from figures in Table 24, V

Moon (a & δ) 27 A.D.

6:16 p.m. G.M.T.
ω = 23° 41′ 30″
λ = 30 54 15
β = −5 0 54
point of time

1 $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$
2 $\cos\delta\sin a = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$
3 $\cos\delta\cos a = \cos\beta\cos\lambda$

1 log sin ω = 9.6040257 ✓ log cos ω = 9.9617632 ✓
log sin λ = 9.7106281 ✓ log sin β = 8.9415936 n
log cos β = 9.9983343 8.9033568
9.3129881 .0800492 anti
.2055834 anti
− .0800492
sin δ = .1255342
log sin δ = 9.0987620
δ = 7° 12′ 42″

2 log cos ω = 9.9617632 ✓ log sin ω = 9.6040257 ✓
log sin λ = 9.7106281 ✓ log sin β = 8.9415936 n
log cos β = 9.9983343 8.5456193
9.6707256 .0351252
+ .4685173
.0351252
cos δ sin a = .5036425 = log 9.7021224
log cos δ = 9.9965507°
log sin a = 9.7055717 = 30° 30′ 29″ = 2h 2m 1.7s = a
(a and d are nearly independent of observer's position)

3 log cos δ = 9.9965507° log cos β = 9.9983343 ✓
log cos a = 9.9352847 log cos λ = 9.9335012 ✓
9.9318354 9.9318355

4 $\cos t_\odot = \cos(90° 50' - \pi_\odot)\sec\delta\sec\phi - \tan\delta\tan\phi$
89° 51′ 11″ = p

δ = 7° 12′ 42″ { based on λ and β and ω
φ = 31° 46′ & now joined to geographical latitude

log cos p = 7.4090301 log tan δ = 9.1022150
log sec δ = 0.0034493 log tan φ = 9.7918458
log sec φ = 0.0704793 8.8940608 n
7.4829587 .0783539 n

.0030406
.0783539 n
.0753133 n = cos t⊙ = log cos 8.8768716 n

∴ t⊙ = 90 + (90 − 85° 40′ 51″) = (based on ω, λ, β, δ, & φ &
94° 19′ 9″ = 6h 17m 16.6s = t
2 2 1.7 (R.A.⊙)
8 19 18.3 = S.T. at ms on 87th day of yr. at 6:16 p.m. G.M.T.

2h 20m 54 8 8 50 22 actual S.T.
31 4 8 19 18
1 49 50 31′ 4″

5 $\tan m = \tan a\cos C$
$\cos c = \cos a\sec m\cos(b-m)$

a = 90° − (7° 12′ 42″) =
82° 47′ 18″
C = 94° 19′ 9″
b = 58° 14′

log tan a = 0.8977850
log cos C = 8.8768716 n
∴ log tan m = 9.7746566 n
m = 149° 14′ 22″ (30° 45′ 38″)
b − m = −91° 0′ 22″ (88° 59′ 38″)

log cos a = 9.0987657 ✓
log cos (b − m) = 8.2445007 n 5010
log sec m = 0.2912522 n .0658490
log cos c = 7.6345186
c = 89° 45′ 11″ 89 51 19
∴ h = 14′ 49″

Tr. Per. = 1.93
Moon
March 28, 27 A.D. 6:16 p.m. G.M.T.
Conj. = March 26.83, J.C.T.
φ = 31° 46′
L = 30° 54′ 15
β = −5° 0′ 54″
π = 58′ 49″ ck
a = 30° 30′ 29″
δ = 7° 12′ 42″
h = 14′ 49″ 8′ 41″
t = 94° 19′ 9″

27 A.D. Mar. 28, 87 th day, 6:16 p.m. G.M.T. Conj = Mar. 26.83, J.C.T. **Sun**

Constants — Arguments (Newcomb)

	Mercury I	Venus II	Mars III	Jupiter IV	Saturn V	Moon VI	Earth VII	VIII	IX	k	Mean Obliquity ε	(a)	
Tab. I 0	23.4	89.14	145.42	150.70	30.9	21.87	1.6	10.0	9.0	−1.822	+ 14 35.51	+2.08	M 121.39
" II 1927	9.8	87.53	44.16	162.51	24.3	24.07	0.0	3.2	6.2	−0.853	23° 26 55.61		5.37
" V													
" VI						8.61 ✓		11.6 ✓	11.7				
Total	33.2	176.67 ✓	189.58	313.21	55.2 ✓	54.55	1.6 ✓	24.8	26.9				g 116.02 ✓
Per. of Arg.	24		180	180		30.		24	24				
	9.2 ✓		9.58 ✓	133.21 ✓		24.55 ✓		0.8 ✓	2.9 ✓	−2.675 ✓	23° 41′ 31.12 ✓	+2.08 ✓	

Variables

Moon's Age

	M	A	D	U	B	N	C	D	L	τ
Tab. I 0	31.3185	320.50	6.805	4.01	4.3	6253.0	5.08	6.2	−1° 47′ 46.17	−h 7m 11.078
" III 1927	2.8126	281.40	29.024	16.60	12.8	5167.4	1.09	9.45	0 19 6.19	1 18.246
" III	87	87.	87.	87.	87.	87	87.	87.	4 35 4.74	0 18 20.316
" IV	.261	.26	.261	.26	.2	.2	.26	.26	15 26.51 ✓	1 1.767 ✓
" V										
Total	121.3921 ✓	689.16	123.090	107.87	104.3	11507.6	93.43	102.91	3 21 51.27	0 13 29.251 ✓
Per. of Arg.		583.92	118.122 ✓	81.64 ✓	96.8	6798.4	81.80	81.96		
		105.24 ✓	4.968 ✓	26.23	7.5 ✓	4709.2	11.63	20.95 ✓		

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

Longitude

	104	112	120	128
Tab. VII, Arg. I	4	5	5	5
" VIII " II	975	960	945	927
" IX " III	470	447	422	396
" X " IV	2202	2108	2012	1917
" XI " V	75	79	84	90
Σ	37.26	35.99 = f_0	34.68	33.35
		− .66		
n = .5025				
Δ′ = −1.31		−1.27	−1.31	−1.33
Δ″ = −.06/2		−.04	−.02	
Sum for g = 116.02		35.33		
D	3	4	5	6
Tab. XIII, Arg. VI	18	22	27	33
" XIV, " VII	28	30	31	33
Σ	.46	.52 = f_0	.58	.66
		.05		
Δ′ = +.06		+ .06	+ .06	+ .08
Δ″		.00	+ .02	
Σ for D = 4.968		.57		

L + 3 21 51.27 ✓

Tabs. VII to XI	35.33 ✓	
" XIII and XIV	.57 ✓	− 17 cent.
" XII, Arg. A	15.09 ✓	− .0076 c.
" XV, " D	10.28 ✓	− .73 c.
" XVI, " M	+ 4 19.24	−15.44 × −16.79
" XVII, " M	+ 1 44 0.67 ✓	
Nut	− 14.93	
λ	5° 10′ 57.52	

17 whole centuries + .73 century + $\frac{365-87}{36500}$ c. =
−17.7376 × −17.7376 × .003 + (−17.7376) = −16.79

Latitude

g	104	112	120	128
Tab. XXVIII, Arg. II	+ 15	+ 13	11	9
" XXIX, " V	+ 7	+ 7	+ 8	9
Σ	.22	.20	.19	18
		− .01		
Δ′		−2	−1	−1
Σ for g = 116.02		+ .19		
Tab. XXVIII & XXIX		+ .19		
" XXX, Arg. VIII & U		− .56		
" XXXI, " B		+ .02		
Latitude		− s.35		

Nutation — In Long. (δψ) In Ob. (δε)

	In Long. (δψ)	In Ob. (δε)
Tab. XXXII, Arg. N	− 14.64	− 4.75
" XXXIII, δay + k	− .08	+ .43
" XXXIV, D and IX	− .18	
" XXXV, D and IX		+ .06
" XXXVI, D and VI	− .06	
" XXXVII, C	+ .03	+ .01
Σ for Nut	− 14.93	− 4.50

Sidereal Time

δψ ÷ 15	= − s.995	τ =	0h 13m 29s.251
Log	= 9.9978	Nut. R.A. =	− .911
Log cos ε	9.9617	R.A. Mean ⊙	13m 28s.34
Sum	9.9595		6 16
Nut. in R.A. =	− .9109	Sid. T =	6h 29m 28s ⊙
			2 20 54 =
			8h 50m 22s =

J.S.T. at assumed time

Obliquity of Ecliptic

ε (Tables I and II) _____
(a) × fraction of cent. _____
δε _____
ε _____

ω = 23° 41′ 30″ λ⊙ = 5° 10′ 58″ β⊙ = − 0s.35

1 $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$
2 $\cos\delta\sin\alpha = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$
3 $\cos\delta\cos\alpha = \cos\beta\cos\lambda$

1. log sin ω = 9.6040257 log cos ω = 9.9617632
log sin λ = 8.9558476 log sin β = 4.6855749
log cos β = 0.0000000 4.6473381 n
8.5598733 .0000044 n
− .0362972 antilog
− .0000044 "
sin δ = −.0362928 log sin δ = 8.5598205
∴ δ = 2° 4′ 47″.5 north

2 log cos ω = 9.9617632
log sin λ = 8.9558476 log sin ω = 9.6040257
log cos β = 0.0000000 log sin β = 4.6855749
8.9176108 4.2896006
.0827201 antilog .0000019 n
.0000019
.0827220 = log 8.9176210
log cos δ = 9.9997138
log sin α = 8.9179072
∴ α = 4° 44′ 33″

3 log cos δ = 9.9997138 log cos β = 0.0000000
log cos α = 9.9985070 log cos λ = 9.9982208
9.9982208 9.9982208

$a_\zeta - a_\odot$ = 30 30 29
4 44 53
25 45 36 = 25°.76 = 1h.717 (S.T.)
1.002
1h 46m

$$
\begin{array}{r}
.0465 \\
\times\ \ 108 \\
\hline
3720 \\
465 \\
\hline
5.0220
\end{array}
$$

$$-3 - 4 = -7$$

$$
\begin{array}{r}
-13.5 \\
\times\ -.16 \\
\hline
210 \\
35 \\
\hline
.560
\end{array}
$$

$$
\begin{array}{r}
119 \\
\times\ .0465 \\
\hline
595 \\
714 \\
476 \\
\hline
5.5335
\end{array}
$$

118.86

60)13246 (220 7

120

124

120

469

420

60)2209 (36 49 49

180

409

360

49

.49

Moonset occurs when moon's S.T. = $a_☾ + t_☾$ = S.T. of moonset. 8:00 p.m. + J.E.T.

$\cos t_☾ = \cos(90° 50' - \pi_☾) \sec d \sec \phi - \tan \delta \tan \phi$

$\pi_☾ = 58' 49''$

$90° \quad 59' \quad 60''$

$50' \quad 60''$

$58' \quad 49''$

$89° \quad 51' \quad 11''$

$\phi = 31° 46'$

$\delta = 7° 12' 42''$

$\cos 89° 51' 11'' =$

$\log \cos = 7.4090231$ (3 0 1)

$\log \sec \delta = 0.0034493$

$\log \sec \phi = 0.0704793$

$7.4829517 =$

$\log \tan \delta = 9.1022150$

$\log \tan \phi = 9.7918458$

8.8940608

$= .0783539$ anti

$- .0030405$

$- .0783539$

$.0753134_{1}\eta =$

$9.9295207 = \cos \phi$

$0.0704793 = \sec \phi$

$\log \cos t_☾ = 8.8768722_{\eta} = 86° 34' 10'' =$

$90° \quad 59' \quad 60''$

$3° 25' 50'' + 90 =$

$93° 25' 50'' \doteq t$

$30 \quad 30 \quad 29 = R.A.$

$a_☾ + t_☾ = 123° 56' 19'' =$ S.T. of moonset

(arc)

56.316

123.9386

$4.1.3128$

$8^h 15^m 45^s$

$8^h 50 \quad 28 =$ S.T.

Newcomb

$13^m 28^s$

$6^h 16$

$6^h 29^m 28^s$

$2^h 21$

$8^h 50 \quad 28 = J$

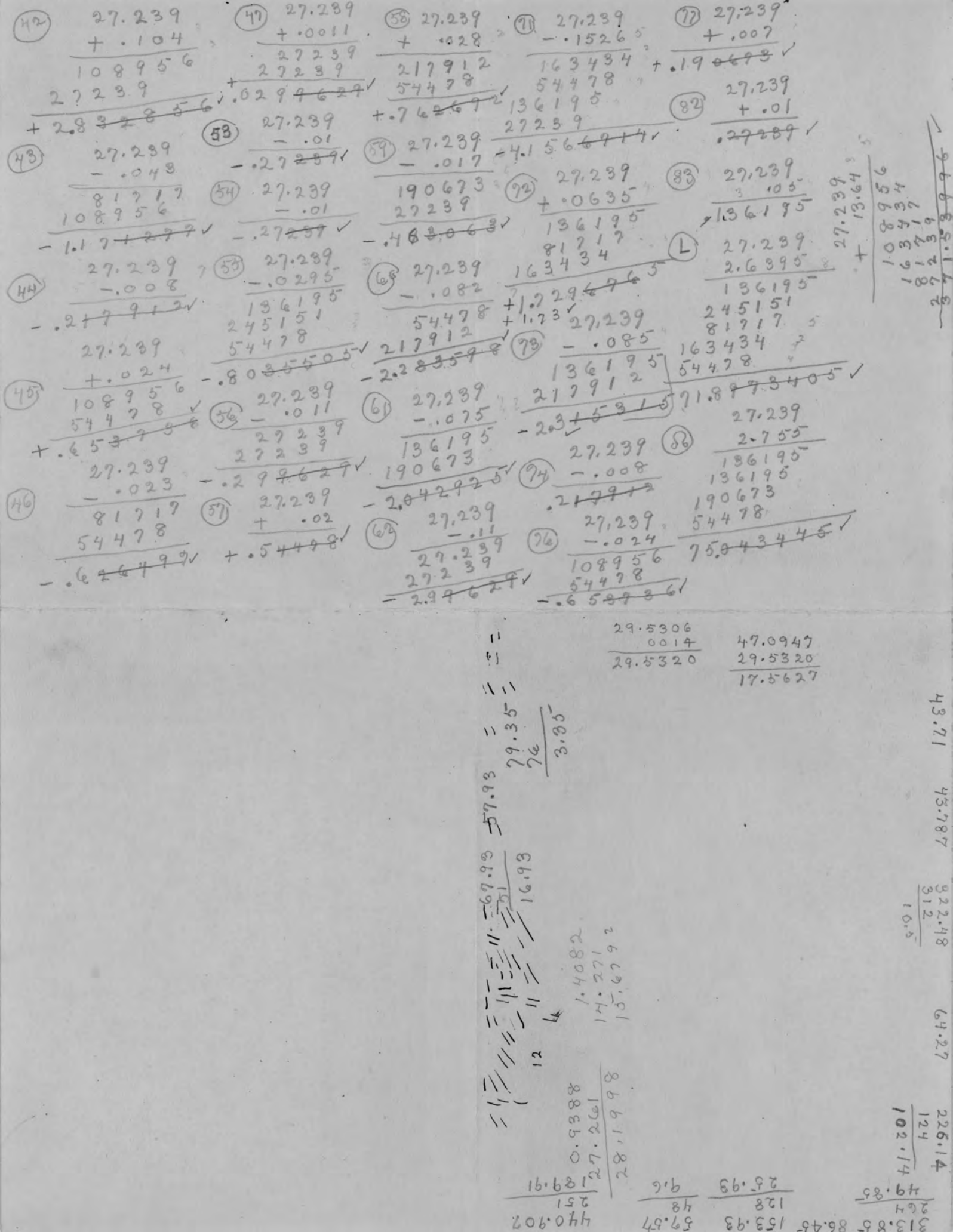
$8^h 15 \quad 45$

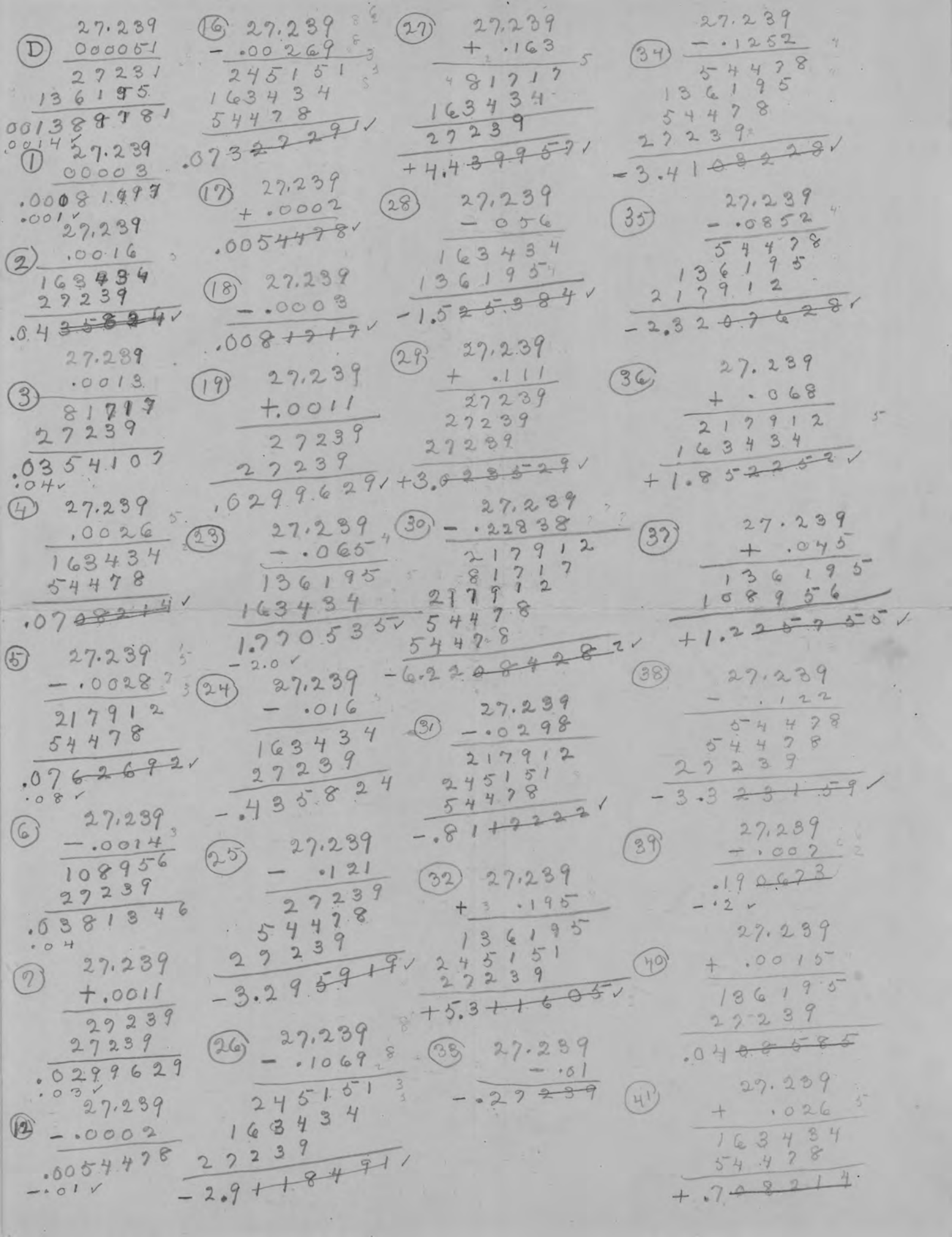
$34^m 43^s$

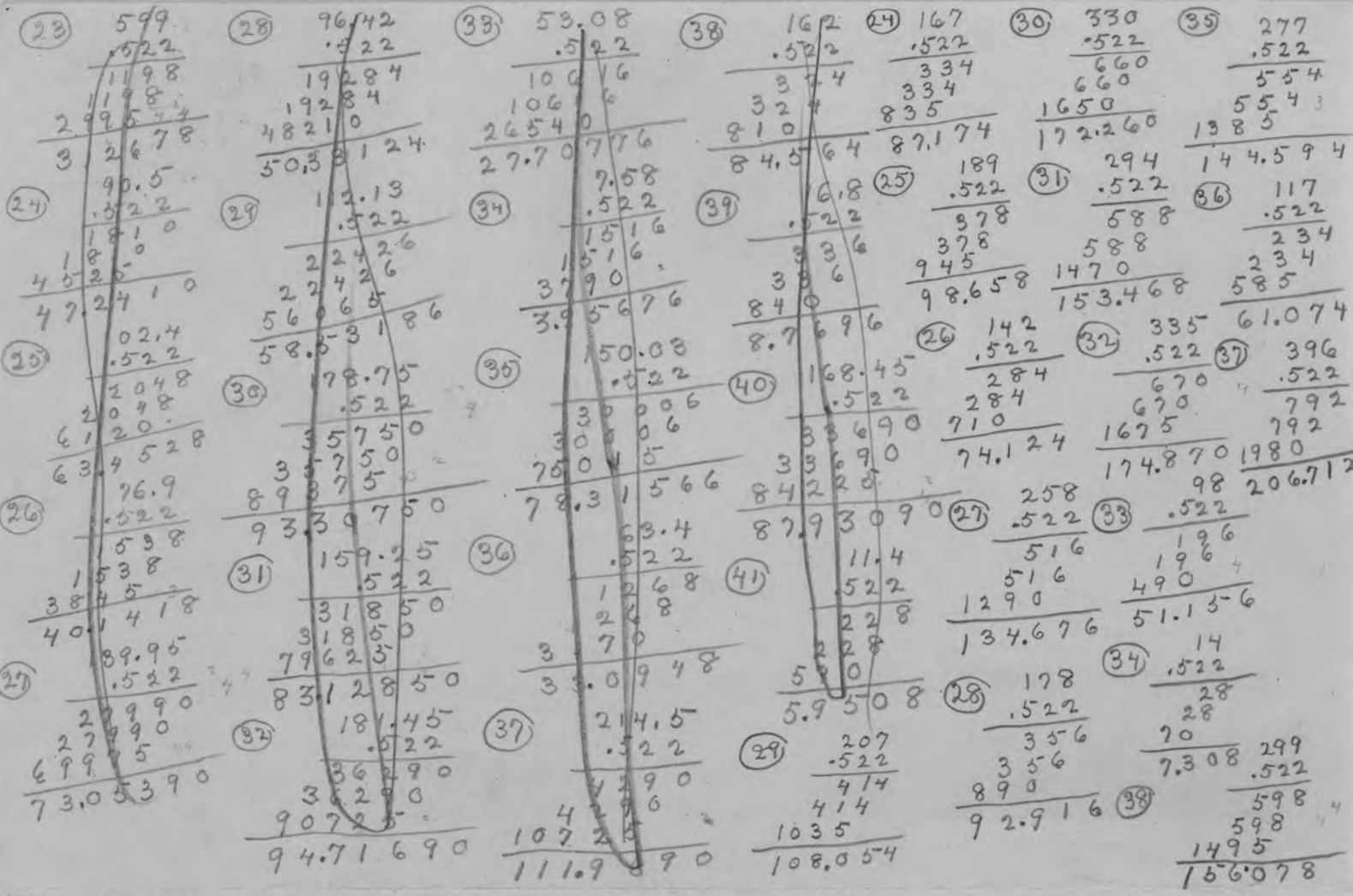
April

April 7,

A







= 1927

	d		
D =	12.0240		
1 =	0.162		
2 =	125.36		
3 =	23.05		
4 =	75.15		
5 =	77.28		
6 =	106.23		
7 =	19.98		
12 =	19.99		
16 =	201.415		
17 =	1.49		
18 =	31.60		
19 =	17.23		
23 =	8.5	56.3	
24 =	0.5	29.4	
25 =	24.0	7.2	
26 =	13.0	128.59	
27 =	30.0	1.8	
28 =	2.0	166.4	
29 =	10.0	63.9	
30 =	19.0	88.448	−41 (a)
31 =	8.0	55.87	+18 (a)
32 =	27.0	108.86	
33 =	26.5	10.22	+6 (a)
34 =	173.0	1.15	
35 =	2.0	185.69	
36 =	15.0	55.7	
37 =	6.5	68.0	
38 =	6.5	107.9	
39 =	0.0	14.9	
40 =	0.5	200.55	
41 =	45.0	17.1	
42 =	9.5	102.6	
43 =	6.5	142.1	
44 =	6.0	29.3	
45 =	1.5	17.9	
46 =	3.0	10.3	
47 =	88.5	12.84	
53 =	5.0	24.9	
54 =	18.5	34.8	
55 =	4.5	32.13	
56 =	9.5	6.4	
57 =	3.5	103.3	
58 =	1009.3		
59 =	9.5	1.41	
60 =	12.0	154.7	
61 =	20.0	50.2	
62 =	5.0	57	
71 =	19.0	58.47	
72 =	3.0	66.17	
73 =	4.5	132.2	
74 =	12.0	55.9	
76 =	1.0	39.6	
77 =	9.0	13.1	
82 =	6668		
83 =	8472		
84 =	1756		
L =	834573	+4 (a)	
−86 =	947344	0	
ϖ =	1270382		

(add $\frac{1}{200}$ of value for year from cf. p. 19 | P 29, Sect. VI, and subtract 0.c10)

(over)

24.0 15 9.0 (23) 853.4 464 389.4

24.0 14 10.0 .5 10.5 (24) 236.9 64 172.9 167. 5.9

33.5 25.5 10.0 .5 10.5 (25) 306.3 46 260.3 189 71.3

66.5 59. 7.5 .5 8.0 (26) 428.75 172 256.75 142 114.75

60.5 34.5 26.0 (27) 364.0 179 185.0

13.5 9.5 4.0 .5 4.5 (28) 310.5 133 177.5 178 0.0

54.0 29.0 25.0 1 26.0 (29) 559.9 109 450.9 414 36.9

77.5 55. 22.5 .5 23. (30) 672.119 22 600.119 330 270.12

27.5 14.5 13.0 .5 13.5 (31) 528.63 156 372.63 294 78.63

65.0 63.0 2.0 (32) 651.18 418 233.18

60.5 59.0 1.5 1. 2.5 (33) 219.81 12 207.81 19.6 11.81

365.0 205.5 159.5 (34) 16.52 11 5.52

16.0 9.5 6.5 .5 7.0 (35) 579.93 63 516.93 277 239.93

37.0 31 6.0 (36) 267.2 190 77.2

32.0 30 2.0 (37) 594.0 201 393.0

18.0 14 4.0 (38) 414.3 152 262.3

16.0 11 5.0 (39) 71.8 40 31.8

23.0 13.5 9.5 .5 10.0 (40) 674.36 66 608.36 311 297.36

276.0 173.0 103.0 (41) 29.1 13 16.1

50.5 26.5 24.0 .5 24.5 (42) 340.3 115 225.3 152 73.3

23.0 18. 5.0 .5 5.5 (43) 325.6 82 243.6 189 54.6

20.0 14.0 6.0 .5 6.5 (44) 302.2 58 244.2 179 65.2

19.0 9.5 9.5 .5 10.0 (45) 254.5 8 246.5 133 113.5

16.0 13.0 3.0 (46) 122.9 94 28.9

206.5 .5 207 (47) 40.29 25 15.29

29.0 .5 29.5 (53) 74.5 39 35.5

57.5 29.5 28.0 1 29.0 (54) 118.2 15 103.2 94 9.2

36.5 32. 4.5 .5 5.0 (55) 275.46 73 202.46 130 72.46

33.0 30 3.0 (56) 129.4 63 66.4

38.5 32 6.5 1 7.5 (57) 303.6 10 293.6 224 69.6

(58) 1446.8

222.5 188. 34.5 .5 35. (59) 7.23 2 5.23 5 0.23

29.0 29 0.0 (60) 316.8 250 66.8

74.0 55.0 19.0 (61) 110.6 86 24.6

17.0 9.5 7.5 .5 8.0 (62) 405 64 341 205 136

77.5 55 22.5 .5 23.0 (71) 447.57 48 399.57 220 179.57

41.0 31.5 9.5 .5 10.0 (72) 242.68 68 174.68 109 65.68

18.5 9.5 9.0 5 9.5 (73) 526.5 63 463.5 277 186.5

27.5 15.0 12.5 .5 13.0 (74) 150.4 55 95.4 71 24.4

12.5 2 5.5 .5 6.0 (76) 100.0 15 85.0 59 26.0

34.5 30 4.5 .5 5.0 (77) 100.2 33 67.2 65 2.2

(82) 13012 6800 6212

(83) 9737 6800 2937

(84) 8028 6800 1228

(L) 1381130 1296000 85130

(−88) 2183594 1296000 887594

(Ω) 1615927 1296000 319927

27 A.D.

27 A.D.

1670823
5-1
1670872

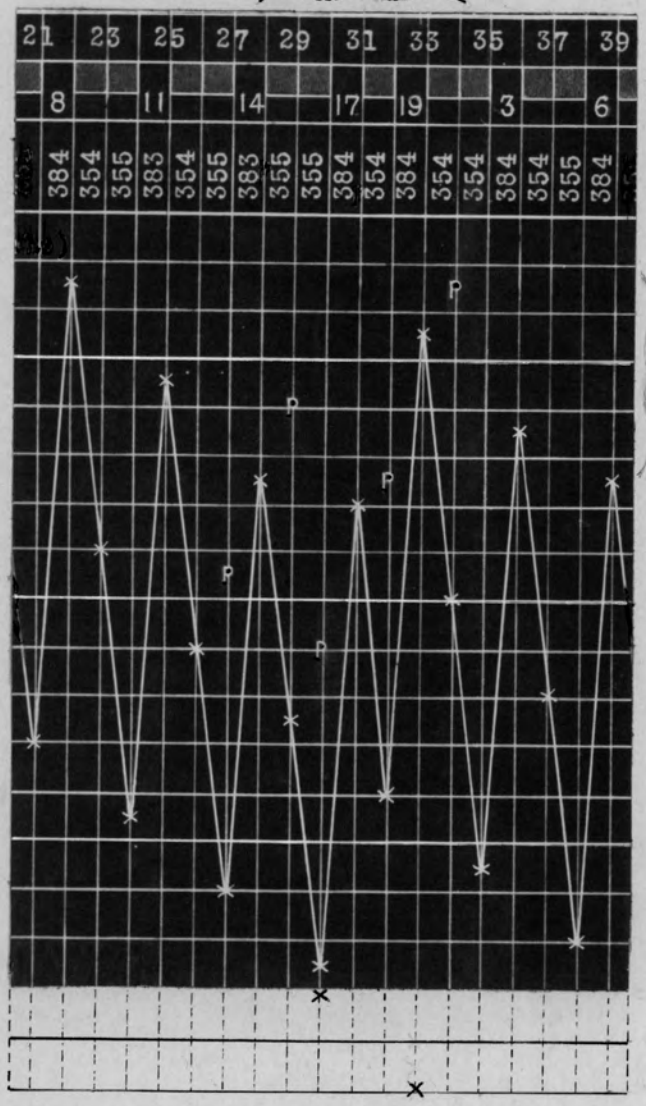
389
.13 2
1167
389
50,57 2

167077
5124
16195.3+2
2
16195.1
2691.91
4.498

91
5450

NINETEEN YEAR CYCLE FOR 1 NISAN IN CRUCIFIXION PERIOD
(1 Nisan follows the new moon of barley harvest)

"Midst"
of
seventieth week



Conj = Mar. 26.83 J.C.T.

Moon Tables (Brown)

Date = 27 A.D. March 28, 6:16 p.m. G.M.T. (sunset) = 0 + 27^{y} 87^{d} 6.26^{h} G.M.T. = 27.239 Tr. Per. = 1.93

Tab	Arg.	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709	9.425	125.76	38.00	67.63	52.70	115.23	39.44	14.34	185.565	40.36	20.16	3.95
2	S.V.	− .0014	+ .001	− .04	+ .04	− .07	− .08	− .04	+ .03	− .01	− .073	+ .01	− .01	+ .03
3	1927	12.0240	0.162	125.36	23.05	75.15	77.28	106.23	19.98	19.99	201.415	1.49	31.60	17.23
4	87^{d}.261	28.1998	22.799	47.60	2.12	55.62	16.02	61.62	18.00	15.50	36.000	17.38	18.40	15.00
3	−1 Per.	− 29.5306	11.400	23.80	1.06	27.81	8.01	30.81	9.00	7.75	18.000	8.69	9.20	7.50
3	−Periods			−312		−124	−128	−264		−48	−251	−51	−76	
	Sums	17.5627	43.79	10.5	64.27	102.14	25.9	49.9	86.5	9.6	189.91	16.93	3.35	43.71

17.0 17.5 18.0

Tab	Arg	23	24	25	26	27	28	29
2	0	5.5 410.1	7.5 106.7	1.5 152.7	26.5 116.95	13.5 65.1	3.5 48.7	16.0 188.9
2	S.V.	− 2.	− .4	− 3.3	− 2.91	+ 4.4	− 1.5	+ 3.0
3	1927	8.5 56.3	0.5 29.4	24.0 7.2	19.0 128.59	30.0 1.8	2.0 166.4	10.0 63.9
4	87^{d}.0	10.0 76.	16.0 14.0	10.0 51.0	27.0 112.	17.0 158.	8.0 4.	28.0 196.
3	0^{d}.261	313	87.2	98.7	74.12	134.7	92.9	108.1
3	−Per. Adj.	−15.0 − 464	−14.0 − 64.	−25.5 − 46	−59.0 − 172	−34.5 − 179	− 9.5 133.	−29.0 − 109
	Sums	9.0 389.4	10.5 5.9	10.5 71.3	8.0 114.75	26.0 185.0	4.0 177.5	26.0 36.9

Tab	Arg	30	31	32	33	34	35	36
2	0	27.0 159.631	6.5 218.10	15.0 110.15	6.5 72.70	105.0 11.47	4.0 201.97	15.0 38.5
2	S.V.	− 6.22	− .81	+ 5.3	− .27	− 3.41	− 2.32	+ 1.9
3	1927	19.0 88.448	8.0 55.87	27.0 108.86	26.5 10.22	173.0 1.15	2.0 185.69	15.0 55.7
4	87^{d}.0	31.5 258.	13.0 102.	28.0 252.	27.5 86.	87.0 0.	10. 50.	7.0 110.
3	0^{d}.261	172.26	153.47	174.87	51.16	7.31	144.59	61.1
3	−Per. Adj.	−55.0 − 72	−14.5 −156	−31.5 − 209	−59.0 − 12	−205.5 − 11	− 9.5 − 63	−31.0 − 190
	Sums	23.0 270.12	13.5 78.6	2.0 233.2	2.5 11.8	159.5 5.52	7.0 239.9	6.0 77.2

Tab	Arg	37	38	39	40	41	42	43
2	0	9.5 0.1	3.0 92.6	5.0 21.9	4.0 19.43	144.0 0.4	8.0 81.6	2.5 36.0
2	S.V.	+ 1.2	− 3.3	− .2	+ .04	+ .7	+ 2.8	− 1.2
3	1927	6.5 63.0	6.5 107.9	0.0 14.9	0.5 200.55	45.0 17.1	9.5 102.6	6.5 142.1
4	87^{d}.0	16.0 323.0	8.5 61.	11.0 19.	18.5 292.	27. 0	33. 74.	14. 50.
3	0^{d}.261	206.7	156.1	16.7	162.34	10.9	79.3	98.7
3	−Per. Adj.	−30. − 201	−14. − 152	−11.0 − 40	−13.5 − 66	−173.0 − 13.	−26.5 115	−18.0 − 82
	Sums	2.0 393.0	4.0 262.3	5.0 31.8	10.0 297.4	103.0 16.1	24.5 73.3	5.5 54.6

Tab	Arg	44	45	46	47	53	54	55
2	0	5.0 140.7	7.0 97.5	1.5 50.7	31.0 14.37	8.0 15.5	11.5 42.2	10.0 62.27
2	S.V.	− .2	+ .7	− .6	+ .03	− .3	− .3	− .80
3	1927	6.0 29.3	1.5 17.9	3.0 10.3	88.5 12.84	5.0 24.9	18.5 34.8	4.5 32.13
4	87^{d}.0	9.0 39.	10.5 69.	11.5 27.	87. 0.	16.0 14.	27.5 17.	25.0 119.
3	0^{d}.261	93.4	69.4	35.5	13.05	20.4	24.5	67.86
3	−Per. Adj.	−14.0 − 58	−9.5 − 8	−13.0 − 94			−29.5 − 15.	−32.0 − 73.
	Sums							

Tab	Arg	56	57	58	59	60	61	62
2	0	7.5 68.5	12.5 49.3	349.4	126.0 3.67	4.5 16.0	23.0 14.7	2.5 141
2	S.V.	− .3	+ .5	+ .8	− .46	− 2.2	− 2.0	− 3
3	1927	9.5 6.4	3.5 103.3	1009.3	9.5 1.41	12.0 154.7	20.0 50.2	5.0 57
4	87^{d}.0	16.0 13.	22.5 92.	87.	87.	12.5 59.	31.0 20.	9.5 103
3	0^{d}.261	41.8	58.5	.3	2.61	89.3	27.7	107
3	−Per. Adj.	−30 − 63	−32 − 10		−188.0 2	−29 − 250	−55.0 − 86	−9.5 − 64
	Sums							

Tab	Arg	71	72	73	74	76	77	82
2	0	27 106.42	15.0 35.84	4.0 202.0	5.5 48.6	3.0 18.3	9.5 0.0	6257
2	S.V.	− 4.16	+ 1.72	− 2.3	− .2	− .7	+ .2	0
3	1927	19.0 58.47	3.0 66.17	4.5 132.2	12.0 55.9	1.0 39.6	9.0 13.1	6668
4	87^{d}.0	31.5 173.	23.0 82.	10.0 50.	10.0 9.	8.5 12.	16.0 53.	87
3	0^{d}.261	114.84	56.90	144.6	37.1	30.8	33.9	
3	−Per. Adj.	−55.0 − 48	−31.5 − 68	−9.5 − 63	−15.0 − 55	−7.0 − 15	−30 − 38.	− 6800
	Sums							

Tab	Arg	83	84	L	−☊	☋		
2	0	6178	6185	295401	1192540	310177		
2	S.V.	1	1	− 72	+ 75	+ 372		
3	1927	3472	1756	834573	974344	1270382		
4	87^{d}.0	87	87	238847	16585	34892		
3	0^{d}.261			12381	50	105		
3	−Per. Adj.	− 6800	− 6800	− 1296000	−1296000			
	Sums							

Tr. Per. = 1.09

Moon Tables (Brown)

Date = 28 A.D. April 14 sunset = 0 + 28^{y} 104^{d} 6^{h} G.M.T. = 28.2848 I.F. = +.31
6:30 p.m.

Tab	Arg.	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709^{d}	9.425^{c}	125.76^{c}	38.00^{c}	67.63^{c}	52.70^{c}	115.23^{c}	39.44^{c}	14.34^{c}	185.563^{c}	40.36^{c}	20.16^{c}	3.95^{c}
2	S.V.	− 14	+ 1	− 5	+ 4	− 7	− 8	− 4	+ 3	− 1	− .076	+ .01	− .01	+ .03
3	1928	23.6569	136.957	98.96	35.76	36.87	45.40	79.95	27.97	17.00	166.417	3.77	28.00	31.23
4	104.271	15.6792	34.199	71.40	3.18	83.43	24.03	92.43	26.99	23.25	54.000	26.07	27.60	22.50
3	−1 Per.	− 29.5306	+ 11.400	23.80	1.06	27.81	8.01	30.81	9.00	7.75	18.000	8.69	9.20	7.50
3	−Periods		−141	−312. (2)	−116	−124	−128	−264 (2)	−100	− 48 (2)	−251	−51	−76 (2)	−76
	Sums	16.675	50.982	7.87	78.04	91.67	2.06	54.38	3.43	14.33	172.904	27.90	8.95	65.21

16.5 17.0 17.5

Tab	Arg	23	24	25	26	27	28	29
2	0	5.5^{d} 410.1^{c}	7.5^{d} 106.7^{c}	1.5^{d} 152.7^{c}	26.5^{d} 116.95^{c}	13.5^{d} 65.1^{c}	3.5^{d} 48.7^{c}	16.0^{d} 188.9^{c}
2	S.V.	− 2.0	− .5	− 3.4	− 3.02	+ 4.6	− 1.6	+ 3.1
3	1928	5.0 301.3	11.5 99.5	5.5 73.2	21.5 90.57	12.5 96.8	3.0 51.4	24.5 204.9
4	104.0^{d}	11.5 211	4.5 53	27.0 51.0	14.5 26	34.0 158.	5.0 94.	16.0 87.
3	0.271^{d}	324.5	90.5	102.4	76.9	140	96.4	112.1
3	−Per.	−15.0 − 464	− 14.0 − 64	− 25.5 − 46	− 59.0 − 172	− 34.5 − 179	− 9.5 133	− 29.0 − 109
3	Adj.	+ .5 − 599	+ .5 − 167	+ .5 − 189		+ .5 − 258		+ 1.0 − 414
	Sums	7.5 181.9	10.0 118.2	9.0 140.9	3.5 135.40	26 27.5	2.0 155.9	28.5 73

Tab	Arg	30	31	32	33	34	35	36
2	0	27.0^{d} 159.631^{c}	6.5^{d} 218.10^{c}	15.0^{d} 110.15^{c}	6.5^{d} 72.70^{c}	105.0^{d} 11.47^{c}	4.0^{d} 201.97^{c}	15.0^{d} 38.5^{c}
2	S.V.	− 6.46	− .84	+ 5.5	− .28	− 3.54	− 2.4	+ 1.9
3	1928	26.5 280.407	4.5 272.05	11.0 280.87	8.5 30.28	127.0 7.18	3.0 7.70	15.0 93.7
4	104.0^{d}	21.0 222	15.0 240.	8.5 43.	15.0 80.	104.0 0.	7.5 201.	8.5 15.
3	0.271^{d}	178.75	159.25	181.45	53.08	7.58	150.03	63.4
3	−Per.	−55.0 − 72	−14.5 −156	−31.5 −209	−29.5 − 6	−205.5 11	−9.5 − 63	− 31.0 190
3	Adj.	+ 1. −660	+ 1. −588	+ .5 −335	+ 1. −196		+ .5 − 277	
	Sums	20.5 102.33	12.5 144.6	3.5 77	1.5 33.8	130.5 11.7	5.5 218.3	7.5 22.5

Tab	Arg	37	38	39	40	41	42	43
2	0	9.5^{d} 0.1^{c}	3.0^{d} 92.6^{c}	5.0^{d} 21.9^{c}	4.0^{d} 19.43^{c}	144.0^{d} 0.4^{c}	8.0^{d} 81.6^{c}	2.5^{d} 36.0^{c}
2	S.V.	+ 1.3	− 3.5	− .2	+ .04	+ .7	+ 2.9	− 1.2
3	1928	9.5 27.0	2.0 42.9	5.0 14.8	13.0 39.53	64.5 12.1	26.0 127.6	8.5 14.2
4	104.0^{d}	13.0 189.	4.0 132.	5.0 1.	8.5 160.	104.0	23.0 111.	12.5 157.
3	0.271^{d}	214.5	162	16.8	168.45	11.4	82.3	102.4
3	−Per.	−20 134	− 7.0 − 76	−11.0 − 40	−13.5 − 66	−173.0 − 13	− 53.0 − 230	−18.0 − 82
3	Adj.		+ .5 − 299		.5 311		+ .5 − 152	+ .5 − 189
	Sums	12 297.9	2.5 51	4.0 14.3	12.5 10.5	139.5 11.6	4.5 23.4	6.0 37.4

Tab	Arg	44	45	46	47	53	54	55
2	0	5.0^{d} 140.7^{c}	7.0^{d} 97.5^{c}	1.5^{d} 50.7^{c}	31.0^{d} 14.37^{c}	8.0^{d} 15.5^{c}	11.5^{d} 42.2^{c}	10.0^{d} 62.27^{c}
2								
2	S.V.	− .2	+ .7	− .7	+ .03	− .3	− .3	− .83
3	1928	3.5 132.2	5.0 113.0	6.0 35.4	89.0 24.85	17.0 16.9	28.5 42.8	15.5 9.11
4	104.0^{d}	4.5 131.	8.5 53.	8.0 22.	104.0 0.	33.0 14.	15.0 2	7.0 41.
3	0.271^{d}	97	72	36.8	13.54	21.1	25.5	70.41
3	−Per.	− 7.0 − 29	−19.0 − 16	−13.0 94		−35.0 32	− 29.5 − 15	−32.0 73
3	Adj.	+ 1. − 358	+ 1. − 266		+ 1. − 50		+ 1. − 94	
	Sums	7.0 113.7	2.5 54.2	2.5 50.2	225 2.79	23 35.2	26.5 3.2	0.5 109

or 224 52.8

Tab	Arg	56	57	58	59	60	61	62
2	0	7.5^{d} 68.5^{c}	12.5^{d} 49.3^{c}	349.4^{d}	126.0^{d} 3.67^{c}	4.5^{d} 16.0^{c}	23.0^{d} 14.7^{c}	2.5^{d} 141^{c}
2	S.V.	− .3	+ .6	+ .8	− .48	− 2.3	− 2.1	− 3
3	1928	0.5 29.5	1.0 100.3	1375.4	187.0 4.38	6.5 107.6	23.5 21.3	4.0 85
4	104.0^{d}	12.5 51.	7.5 82.	104.	104.	14.5 105.	20.0 30.	7.0 180
3	0.271^{d}	43.3	60.7	.3	3	92.6	28.7	111
3	−Per.	−20.0 − 42	−16.0 − 5		−376.0 − 4	−14.5 − 125	− 55.0 − 86	9.5 − 64
3	Adj.	+ .5 − 80	+ 1. − 224		+ .5 − 5	+ .5 − 171		+ 1. − 410
	Sums	1.0 70	6 63.9	1829.9	41.5 1.6	11.5 22.9	11.5 6.6	5 40

Tab	Arg	71	72	73	74	76	77	82
2	0	27.0^{d} 106.42^{c}	15.0^{d} 35.84^{c}	4.0^{d} 202.0^{c}	5.5^{d} 48.6^{c}	3.0^{d} 18.3^{c}	9.5^{d} 0.0^{c}	6257.^{d}
2	S.V.	− 4.31	+ 1.80	− 2.4	− .2	− .7	+ .2	+ 0
3	1928	26.5 186.44	19.0 81.14	5.0 231.2	9.0 13.9	3.5 41.7	1.5 61.2	234
4	104.0^{d}	21.0 148.	8.5 14.	7.5 201.	11.5 25.	4.0 26.	13.0 31.	104
3	0.271^{d}	119.16	59.04	150	38.5	32	35.2	
3	−Per.	− 55.0 48	− 31.5 − 68	− 9.5 − 63	−15.0 − 55	− 7.0 − 15	− 20.0 − 22	
3	Adj.	+ 1. 440	+ .5 −109	+ 1. − 554		+ .5 − 59	+ .5 − 65	
	Sums	20.5 67.7	11.5 14.8	8 164.8	11 70.8	4.0 43.3	4.5 40.6	6595.^{d}

Tab	Arg	83	84	L	−☊	☋		
2	0	6178.^{d}	6185.^{d}	295401"	1192540"	310177"		
2	S.V.	+ 1	+ 1	− 75	+ 78	+ 386		
3	1928	3838	2122	51794	1017116	121168		
4	104.0^{d}	104	104	1045243	19826	41710		
3	0.271^{d}			12847	52	109		
3	−Per.	− 6800	− 6800	− 1296000	−1296000			
3	Adj.							
	Sums	3321	1612	109210	933612	473550 =	131° 32' 50	

Tr. Per. = 1.09 — 104th day 6:30 p.m. G.M.T. — Conj = April 13.68 J.C.T.

Sun

Constants 28 A.D., April 14, sunset — Arguments (Newcomb)

	Mercury I	Venus II	Mars III	Jupiter IV	Saturn V	Moon VI	Earth VII	Moon VIII	Moon IX	Mean Obliquity k	Mean Obliquity ε	(a)	
Tab. I 0	23.4	89.14	145.42	150.70	30.9	21.87	1.6	10.0	9.0	−1.822	+ 14′ 35.51″	+2.″08	M 139.14
" II 1928	13.5	20.13	139.86	177.68	26.3	22.04	1.3	1.1	10.8	−0.095	23° 26′ 55.14″		5.37
" V													g 133.77
" VI						8.61		11.4	11.6				
Total	36.9	109.27	285.28	328.38	57.2	52.52	2.9	22.5	31.4	−1.917	23° 41′ 30.65″		
Per. of Arg.	24		180	180		30		12	24				
	12.9		105.28	148.38		22.52		10.5	7.4				

Variables

Moon's Age

	M	A	D	U	B	N	C	D	L	T
Tab. I 0	31.3185	320.50	6.805	4.01	4.3	6253.0	5.08	6.2	− 1° 47′ 46.″17	− 7h 11m 11.078s
" II 1928	3.5529	63.48	11.126	1.63	23.7	5533.4	12.62	6.61	1 3 55.12	+ 4 17.508
" III	104	104	104	104	104	104	104	104	21 20 26.36	1 25 21.757
" IV	.271	.27	.271	.27	.2	.2	.27	.27	16 1.01	1 4.067
" V										h m s
Total	139.1424	488.25	122.202	109.91	132.2	11890.6	121.97	117.08	20° 52′ 36.″32	1 23 32.254
Per. of Arg.			118.122	108.85	129.1	6798.4	109.07	109.09		
			4.08	1.06	3.1	5092.2	12.90	7.99		

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

Longitude ⊙ — Nutation — In Long. (δψ) In Ob. (δε)

g	120	128	136	144
Tab. VII, Arg. I	4	4	4	4
" VIII " II	813	790	770	747
" IX " III	442	418	393	367
" X " IV	2326	2259	2180	2093
" XI " V	72	76	82	88
Σ	36.57	35.47	34.29	32.99
		− .84		
Δ′		−1.10	−1.18	−1.30
Δ″		+8	+.12	
Sum for g = 133.77		34.63		

D	3	4	5	6
Tab. XIII, Arg. VI	23	21	23	27
" XIV, " VII	21	23	24	26
Σ	44	44	47	53
Δ′	− 0	+ 3	+ 6	
Δ″		+3		
Σ for D = 4.08		.44		

L	
	20° 52′ 36.″32
Tabs. VII to XI	34.63
" XIII and XIV	.44
" XII, Arg. A (4.58.25)	12.17
" XV, " D (4.08)	9.09
" XVI, " M (139.14)	+ 3 29.29 (12.″48 × −16.77)
" XVII, " M	1 24 36.50
Nut	− 17.69
λ	22° 21′ 20.″75

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

Latitude

g 109.37	120	128	136	144
Tab. XXVIII, Arg. II	+ .27	+ .27	+ .26	+ .25
" XXIX, " V 52.2	− .06	− .07	− .08	− .09
Σ	+ .21	+ .20	+ .18	+ .16
		− .01		
Δ′		−1	−2	−2
Σ for g = 133.77		.19		
		″		
Tab. XXVIII & XXIX		+ .19		
" XXX, Arg. VIII & U		− .50		
" XXXI, " B		+ .01		
Latitude ⊙		″ − .30		

Nutation	In Long. (δψ)	In Ob. (δε)
Tab. XXXII, Arg. N	−16.″69	−1.67
" XXXIII, δay + k	− .75	+ .26 (P′ + δε)
" XXXIV, ☽ and IX	− .20	
" XXXV, ☽ and IX		+ .02
" XXXVI, D and VI	− .06	
" XXXVII, C	+ .01	+ .02
Σ for Nut	−17.69	−1.37

Sidereal Time

T = 1h 23m 32.254s

Nut in R.A.

Time 6 30
7 53 32
2 20 54
9 14 26

Obliquity of Ecliptic

ε (Tables I and II)	23° 41′ 30.″65
(a) × fraction of cent. (.28)	.58
δε	− 1.37
ε	23° 41′ 29.″86 = 30″

ω = 23° 41′ 30″ — λ⊙ = 22° 21′ 22″ (20.75) — β⊙ = −0.″3

1 $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$

2 $\cos\delta\sin\alpha = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$

3 $\cos\delta\cos\alpha = \cos\beta\cos\lambda$

1. log sin ω = 9.6040257 — log cos ω = 9.9617632
log sin λ = 9.5801971 — log sin β = 4.6855749 n
log cos β = 0.0000000 — 4.6473381
9.1842228 — .0000044.39
sub .1528350 antilog
.0000044.4 "
sin δ = .1528305 — log sin δ = 9.1842100
∴ δ = 8° 47′ 27.″5

2 log cos ω = 9.9617632
log sin λ = 9.5801971 — log sin ω = 9.6040257
log cos β = 0.0000000 — log sin β = 4.6855749
9.5419603 — 4.2896006
.3483055 antilog — .0000019.5
.0000019.5
.3483075 = log 9.5419626
log cos δ = 9.9948678
log sin α = 9.5470948
(1032/1362) ∴ α = 20° 38′ 13.″5

3 log cos δ = 9.9948678 — log cos β = 0.0000000
log cos α = 9.9711977 — log cos λ = 9.9660655
9.9660655 — 9.9660655
(200/559)

$a_\zeta - a_\odot$ = 35° 28′ 4.8
− 20 38 13.
14° 49′ 52″ = 14.8311° =
0h.9887 (s.t.)
× 1.032 = 1h 1m 13s (civ.t.)
= time of moonset after sunset on equator

Fraction of century = .28 ? for Obliquity

April 14 = 104 th day

Should same ω be used for sun and moon

$\chi = 1.9$ how use ?

$\Delta' \& \Delta''$

What date for nutation ?

How much shall I subtract for nutation in 0 century

Moon's Place on March 25, 30 A.D., sunset.
Date = 0 + $30^{y}\,84^{d}\,18^{h}$ = $30^{y}\,84^{d}\,6^{h}$ G.M.T. = 30.231
"ss" = 6:15 Tr. Per. = 2.92

Tab	Arg.	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709^{d}	9.425^{c}	125.76^{c}	38.00^{c}	67.63^{c}	52.70^{c}	115.23^{c}	39.44^{c}	14.34^{c}	185.563^{c}	40.36^{c}	20.16^{c}	3.95^{c}
2	S.V.	− 15	+ 1	− 5	+ 4	− 8	− 8	− 4	+ 3	− 3	− 81	+ 1	− 1	+ 3
3	1930	15.3922	199.947	69.95	62.25	112.13	117.66	58.20	52.92	18.77	114.420	17.02	30.00	66.71
4	$84^{d}.25$	25.1888	22.799	47.60	2.12	55.62	16.02	61.62	18.00	15.50	36.000	17.38	18.40	15.00
3	−1 Per.	−29.5306	+11.400	23.80	1.06	27.81	8.01	30.81	9.00	7.75	18.000	8.69	9.20	7.50
3	−Periods		−141.	−156.	−116	−124.	−128.	−132.	−100.	− 24.	−251.	− 51.	− 38.	−76.
	Sums	17.9198	42.572	111.06	103.47	15.11	66.31	1.82	19.39	8.35	102.90	32.46	1.75	17.19

Tab	Arg.	23	24	25	26	27	28	29
2	0	5.5^{d} 410.1^{c}	7.5^{d} 106.7^{c}	1.5^{d} 152.7^{c}	26.5^{d} 116.95^{c}	13.5^{d} 65.1^{c}	3.5^{d} 48.7^{c}	16.0^{d} 188.9^{c}
2	S.V.	− 2.	− .5	− 3.7	− 3.24	+ 4.9	− 1.7	+ 3.4
3	1930	12.0 57.3 ✓	3.5 111.6 ✓	18.0 108.1 ✓	6.5 70.52 ✓	10.5 207.9 ✓	2.0 177.5 ✓	23.0 170.9
4	$84^{d}.0$	7.0 76.	13. 14.	7.0 51.	24.0 112.	14.0 158.	5.0 4.	25.0 196.
3	$0^{d}.25$	300.	84.	95.	71	129	89.	104.
3	−Per	−15. 464.	−14. 64.	−25.5 46.	−29.5 86	−34.5 179	−9.5 133	− 29 109.
3	Adj.		+ .5 −167	+ .5 −189	+ .5 −142	+ .5 − 258	+ .5 178	+ 1. − 414
	Sums	9.5 377.4	10.5 84.8	1.5 168.1	28.0 139.23	4.0 127.9	1.5 6.5	7.0 31.2

Tab	Arg	30	31	32	33 p.101	34	35	36
2	0	$27^{d}.0$ 159.631^{c}	6.5^{d} 218.10^{c}	15.0^{d} 110.15^{c}	6.5^{d} 72.70^{c}	105.0^{d} 11.47^{c}	4.0^{d} 201.97^{c}	15.0^{d} 38.5^{c}
2	S.V.	− 6.925 −.004	− .90	+ 5.91	− .30	− 3.80	− 2.58	+ 2.1
3	1930	12.5 298.326 ✓	11.0 272.40 ✓	9.5 163.89 ✓	0.0 76.40 ✓	33.5 5.23 ✓	2.0 205.73 ✓	13.5 52.9 ✓
4	$84^{d}.0$	28.5 258.	10.0 102.	20.0 252.	24.5 86.	84.0 0.	7.0 50.	4.0 110.
3	$0^{d}.25$	165.	147.	168.	49	7	139	89
3	−Per.	−27.5 36	−14.5 156	−31.5 209	−29.5 6	−205.5 11	−9.5 63	−15.5 95
3	Adj.	1. 660	+ .5 −294	+ .5 − 335	+ 1. − 196		+ .5 277	
	Sums	14.0 142.03	13.5 288.60	13.5 155.95	2.5 81.80	17.0 8.90	4.0 254.12	11.5 72.5

Tab	Arg	37	38	39	40	41	42	43
2	0	9.5^{d} 0.1^{c}	3.0^{d} 92.6^{c}	5.0^{d} 21.9^{c}	4.0^{d} 19.43^{c}	144.0^{d} 0.4^{c}	8.0^{d} 81.6^{c}	2.5^{d} 36.0^{c}
2	S.V.	+ 1.4	− 3.7	− .2	+ .05	+ .8	+ 3.2	− 1.3
3	1930	3.0 283.9	5.0 64.8 ✓	1.5 5.6 ✓	8.0 207.51 ✓	101.5 2.0 ✓	3.5 99.6 ✓	0.5 95.3
4	$84^{d}.0$	13.0 323.	5.5 61.	8.0 19.	15.5 292.	84. 0.	30. 74.	11.0 50.
3	$0^{d}.25$	198	150.	16.	156.	11.	76.	95.
3	−Per	−10.0 67	− 7.0 76.	−5.5 20.	−13.5 66	−173. 13.	−26.5 115.	− 9.0 41
3	Adj.	+ .5 − 396			+ .5 311		+ .5 − 152	+ .5 − 189
	Sums	6.0 276.4	6.5 288.7	3.5 22.3	1.0 231.99	156.5 1.2	15.5 67.4	5.5 45.0

Tab	Arg	44	45	46	47	53	54	55
2	0	5.0^{d} 140.7^{e}	7.0^{d} 97.5^{e}	1.5^{d} 50.7^{e}	31.0^{d} 14.37^{c}	8.0^{d} 15.5^{e}	11.5^{d} 42.2^{c}	10.0 62.27
2	S.V.	− .2	+ .7	− .7	+ .03	− .3	− .3	− .89
3	1930	4.5 9.0 ✓	1.5 29.3 ✓	3.5 38.5 ✓	88.5 23.89 ✓	3.5 7.9 ✓	17.0 43.9 ✓	3.0 20.07
4	$84^{d}.0$	6.0 39.	7.5 69.	8.5 27.	84.0 0	13.0 14.	24.5 17.	19.0 114.
3	$0^{d}.25$	90.	67.	34.	13	20.	24.	65.
3	−Per.	−7.0 29	−9.5 8	−6.5 47			−29.5 15	− 32.0 73.
3	Adj.	+ .5 −179	+ .5 −133		+ 1. − 50	+ .5 − 39	+ 1. − 94	+ .5 −130
	Sum	2.0 41.5	7.0 122.5	.5 55.5	204.5 1.29	25.0 18.1	24.5 17.8	0.5 57.45

Tab	Arg	56	57	58	59	60	61	62
2	0	7.5^{d} 68.5^{e}	12.5^{d} 49.3^{e}	349.4^{d}	126.0^{d} 3.67	4.5^{d} 16.0^{c}	23.0^{d} 14.7^{c}	2.5^{d} 141
2	S.V.	− .3	+ .6	+ .9	− .52	− 2.35	− 2.3	− 3
3	1930	1.0 37.6 ✓	10.0 99.3 ✓	2105.4 ✓	164.5 1.33 ✓	8.0 138.5 ✓	0.0 26.4 ✓	0.0 141 ✓
4	$84^{d}.0$	13.0 13.	19.5 92.	84.3	84.0 0.	9.5 59.	28.0 20.	6.5 103
3	$0^{d}.25$	40.	56.		3	86.	27.	103
3	−Per	−10.0 21	−16.0 5	− 2190.5	−188.0 2	−14.5 125.	− 27.5 43	
3	Adj		+ 1. −224		+ .5 − 5	+ .5 − 171		+ 1 − 410
	Sums	2.0 36.8	11.0 63.2	349.5	187.0 0.48	8.0 1.0	23.5 42.8	10.0 75

Tab	Arg	71	72	73	74	76	77	82
2	0	$27^{d}.0$ 106.42^{c}	15.0^{d} 35.84^{c}	4.0^{d} 202.0^{c}	5.5^{d} 48.6^{c}	3.0^{d} 18.3^{c}	9.5^{d} 0.0^{c}	6257^{d}
2	S.V.	− 4.63	+ 1.98	− 2.6 ✓	− .2 ✓	− .7 ✓	+ .2 ✓	+ 0
3	1930	12.5 198.39 ✓	17.5 43.08 ✓	4.5 152.2 ✓	0.5 1.0 ✓	6.5 46.0 ✓	5.5 49.4 ✓	964 ✓
4	$84^{d}.0$	28.5 172	20. 82.	7.0 50.	7.0 9.	5.5 12.	13.0 53.	84
3	$0^{d}.25$	110	55.	139	36.	30.	33	
3	−Per.	−27.5 24	−31.5 68	−9.5 63	+ .5 − 71	−7.0 15.	−10.0 11	− 6800
3	Adj.	+ 1. − 440	+ .5 −109	+ .5 − 277		+ .5 − 59	+ .5 − 65	
	Sums	14.0 94.20	21.5 40.84	6.5 200.6	13.5 23.4	8.5 31.6	8.5 48.6	505^{d}

Tab	Arg	83	84	L	$-\delta$	ϖ	
2	0	6178^{d}	6185^{d}	295401"	1192540"	310177"	
2	S.V	+ 2	+ 2	− 80 (a)	+ 84	+ 414 (a)	
				− 0 (b)	+ 0		
3	1930	4568 ✓	2852 ✓	983364 ✓	1156279 ✓	413938 ✓	
4	$84^{d}.0$	84	84	96542	16013	33789 =	2 × 200".527 ×
3	$0^{d}.25$			11959	48	100	84.25
3	−Per.	−6800	−6800	− 1296000	− 1296000	− 1296000	
3	Adj.						
	Sums	4032^{d}	2323^{d}	91086	1068964	758418	
					296° 56′ 4"	210° 40′ 18"	

Drop last two digits from Section III

III Tab	Arg.	$17^{d}.5$	Date $18^{d}.0$	$18^{d}.5$
1	43	55"	53"	50"
2	111	8	6	5
3	104	2	2	1
4	15	7	8	10
5	66	3	3	3
6	2	12	12	13
7	19	2	3	3
Sum		×89	87	85
16	103	52	54	56
19	17	12	12	11
Sum		153	153	152
Int. fact. −.16			0	
k × 1st. sum			4	
Σ_1 = Sum			157	
40	1.0	232	747	
41	156.5	1	101	
42	15.5	67	6	
43	5.5	45	13	
44	2.0	42	4	
45	7.0	123	12	
46	0.5	56	7	
47	204.5	1	49	
Σ_{10}			75	
Σ_3 { Sum			1171	
Tab. 47 × k +			2	

III Tab	Arg. at Date		Value
23	$9^{d}.5$	377	63
24	10.5	85	26
25	1.5	168	207
26	28.0	139	292
27	4.0	128	357
28	1.5	7	23
29	7.0	31	31
Sum		−2100	× 999
30	$14^{d}.0$	142 + .8	27880
31	13.5	288.6 + 1.3	4643
32	13.5	155.9 + 3.4	427
33	2.5	82	71
34	17.0	9	403
35	4	254	13
36	1.5	73	54
37	6.0	276	14
38	6.5	289	29
39	3.5	22	1
L			91086
Σ_2 { Sum			125620
k × 1st sum			46
Σ_3			1173
Longitude = sum			126839
" Tab. 5 II			35° 13′ 59" ✓

I.F. = −.16
For Tab. P 23 VI
Date = 1900 − 30 = −1870
7 Per. = 7 × 270.95 = 1896.65
Arg. = 1896.65 + 30.23 = 1926.88

k = −.0000248 × −1870 = +.0464

For Tab. P 24 VI
Date = 1900 − 30 = −1870
8 Per. = 8 × 257.14 = 2057.12
Arg. = 2057.12 + 30.23 = $2087^{y}.35$

Drop 1 digit from tables of Sections IV and V

IV Tab	Arg	$17^{d}.5$	Date $18^{d}.0$	$18^{d}.5$
1	42.6	93	91	88
2	111.	35	30	25
3	103.5	32	27	22
4	15	10	12	14
5	66.3	7	8	9
6	1.8	11	12	12
7	19.4	8	8	8
Sum		×196	188	178
16 12	102.9	156	161	169
17 13	32.5	141	141	142
18 14	1.8	2	2	2
19 15	17.2	25	30	35
Sum		520	522	526
Int. fact. −.16 =			− 0	
k × 1st sum			+ 9	
Σ_4 = sum			531	
Σ_2			132499	
P 34 ÷ 10			+ 123	
P 35 (P 34 − 10^3) ÷ 10			− 1	
19 + 9k			19	
− S			1068964	
S = sum			1202035"	

IV Tab	Arg.	$17^{d}.5$	Date $18^{d}.0$	$18^{d}.5$
1	34 42.6	24"	25"	26"
2	35 111.	21	20	18
3	36 103.5	25	26	26
4	37 15	2	2	2
5	38 66	2	2	2
16	43 102.9	88	87	85
Sum		163	162	159
Int. fact.		−.16	− 0	
− Consts.			− 129	
P 36 ÷ 10			− 26	
P 36 × P 37 ÷ 10			− 3	
Sum = C			+ 4 = Σ_6	

82 = 505^{d}
P 34 = 83 = 4032^{d}
P 35 = Date
P 36 = 84 = 2323^{d}

VI Tab.	Arg.	Value
P 22 ÷ 100	505	14
P 23 ÷ 100	1926.9	20
P 24 ÷ 100	2087.4	17
24 + 9k =	0	24
Σ_{10} = Sum		75

"The dropping of digits from the tables of Sect. VI is indicated by the divisors 10 or 100."

IV Tab	Arg. at Date		Value
53 19	$25^{d}.0$	$18^{c}.1$	177×
54 20	24.5	17.8	164×
55 21	0.5	57.5	10508
56 22	2.0	36.8	46
57 23	11.0	63.2	43
58 24	349.5		321
59 25	187.0	0.5	893
60 26	8.0	1.	13
61 27	23.5	42.8	403
62 28	10.0	75.	39
Sum			12607
− Consts			− 6980
k (1st two lines − 340)			− 0
Σ_5 = sum			+ 5627
Tab. 33, Arg. S =			− 81413
Σ_7 = sum			− 75786
$\Sigma_7 \times C \div 10^5$ =			− 64800
			− 10986
Latitude = sum			− 10986
" Tab. 5, II			− 8° 3′ 6"

= 12020.35 units

= 5 × 12960"
= 7578".6 = − 2° 6′ 18".6

V Tab	Arg.	$17^{d}.5$	Date $18^{d}.0$	$18^{d}.5$
1	42.6	128	127	125
2	111	114	94	78
3	103.5	153	137	123
4	15.	65	67	69
5	66.3	17	21	23
6	1.8	13	13	13
7	19.4	8	8	8
Sum		×498	467	439
16 10	102.9	100	102	102
17 11	32.5	25	24	24
18 12	1.8	5	6	6
19 13	17.2	127	134	141
Sum		755	733	712
Int. fact. −.16			− 3	
k (1st sum − 595)			− 5	
Σ_8 = sum			725	

V Tab	Arg. at Date		Value
71 15	$14^{d}.0$ .5 + 94	$^{c}.18$	2380
33 16	2.5	81.8	3810
72 17	21.5	1.1 + 40.85	2552
73 18	6.5	200.6	240
74 19	13.5	23.4	346
76 21	8.5	31.6	34
77 22	8.5	48.6	105
Sum			9467
k (Tab. 19 − 200)			+ 7
9 (Const.)			9
Σ_9			725
Σ_9 = sum			10208
Tab. 24, Tab. Arg.			54′ 0"
" Parallax			

Drop 1 digit from figures in Table 24, V

Moon

1. $\sin\delta = \sin\omega \sin\lambda \cos\beta + \cos\omega \sin\beta$
2. $\cos\delta \sin a = \cos\omega \sin\lambda \cos\beta - \sin\omega \sin\beta$
3. $\cos\delta \cos a = \cos\beta \cos\lambda$

Obliquity in 30 A.D. = $23^\circ\ 26'\ 54''$
$14\ 36$
$\omega = 23^\circ\ 41'\ 30''$
$\lambda = 35^\circ\ 13'\ 59''$
$\beta = -3^\circ\ 3'\ 6'' - 2^\circ\ 6'\ 18''$
$9.9997069 = \log\cos\beta$ ✓
$8.5650318_n = \log\sin\beta$ ✓

I $\log\sin\delta = 9.6040257\ (\sin\omega)$ ✓
$9.7611033\ (\sin\lambda)$ ✓
$9.9997069\ (\cos\beta)$ ✓
$9.3648359 =$
$.2316516$ antilog
subtract $.0336353$
$.1980163$
$\therefore \sin\delta = +9.2967010 =$ north or south?
$11^\circ\ 25'\ 16''$

$\cos\omega = 9.9617632$ ✓
$\sin\beta = 8.5650318\ n$ ✓
$8.5267950_n = .0336353$ antilog (2.7)
$\cos\lambda = 9.9121222$ ✓
$\cos\delta = 9.9913141$ ✓

II $\cos\omega = 9.9617632$ ✓
$\sin\lambda = 9.7611033$ ✓
$\cos\beta = 9.9997069$ ✓
9.7225734
$.5279265$ (4.5)
add $.0147590.2$
$.5426855 = 9.7345482$
$9.9913141\ (\cos\delta)$
$9.7432341\ (\sin a)$
$\therefore a = 33^\circ\ 37'\ 3.6'' = {}^h 2\ {}^m 14\ {}^s 28$

$\sin\omega = 9.6040257$ ✓
$\sin\beta = 8.5650318$ ✓
$8.1690575_n = .0147590.2$ ✓
antilog

III Proof

$\cos\delta = 9.9913141$
$\cos a = 9.9205150$
9.9118291

$\cos\beta = 9.9997069$ ✓
$\cos\lambda = 9.9121222$ ✓
9.9118291

Dec. 11, 1942
2.E.D.

IV $\cos t(H_\odot) = \sin 54' \sec\delta \sec\phi - \tan\delta \tan\phi$
($t = H_\odot$ of moon at moonset)
$= \cos(90^\circ 50' - 34') = Z =$ moon's zenith distance at time of moonset

$a = 33^\circ\ 37'\ 3.6'' = 2^h\ 14^m.5$
$\delta = 11^\circ\ 25'\ 16''$
$\phi = 31^\circ\ 46'$
Par. $= 54'$

$\cos t = 7.0657860$

$\log\sin 54' = 8.1961020$
$\log\sec\delta = .0086861$
$\log\sec\phi = .0704793$
8.2752674
$.0188481$ anti.
$.1250944\ n$
$-.1062463$
$\log\cos t = 9.0263138_n = 96^\circ\ 5'\ 58''\ (83^\circ\ 54'\ 2''_n)$
$= 6^h\ 27^m\ 58^s$

$\log\tan\delta = 9.3053919$
$\log\tan\phi = 9.7918458$
9.0972377
$.1250944_n$

$\log\sin 54' = 8.1961020$
$\log\cos\delta = 9.9913139$
$\log\tan\delta = 9.3053919$
$\log\sec\delta = .0086861$
$\log\sec\phi = .0704793$
$\log\tan\phi = 9.7918458$

$2\ 14\ 28$
$8\ 41\ 26$
$8\ 23\ 34$
$17'\ 52''$ arc
$2\ 20\ 54$
$2\ 38\ 46$
$-\ 51$
$1\ 47\ 46$

$.105 = P35$
$230 = P34$
$1000 - 230 = -770$
$-77 \times .105 = -8.085$
$-8 \div 10 = -.8 = -1$

Date = March 25, 30 A.D., 6:15 p.m. G.M.T. $6^h 15 = 0^d.26$ 84th day Sun

Constants — Arguments (Newcomb)

	Mercury I	Venus II	Mars III	Jupiter IV	Saturn V	Moon VI	Earth VII	VIII	IX	k	Mean Obliquity ε	(a)	
Tab. I 0	23.4	89.14	145.42	150.70	30.9	21.87	1.6	10.0	9.0	−1.822	+ 0° 14′ 35.51	±2.08	M 118.61
" II 1930	20.8	65.32	151.27	28.02	30.4	15.82	1.8	9.3	2.1	− .579	23 26 54.21		− 5.37
" V													g 113.24
" VI						6.45	5.8	− .6	−0.3				
Total	44.2	154.46	296.69										
Per. of Arg.	24		180										
	20.2		116.69										

Variables

	Moon's Age M	A	D	U	B	N	C	☽	L	τ
Tab. I 0										
" II 19										
" III										
" IV										
" V										
Total										
Per. of Arg.										

Longitude

Tab. VII, Arg. I				
" VIII " II				
" IX " III				
" X " IV				
" XI " V				
Σ				
Δ′				
Δ″				
Sum for g =				
D				
Tab. XIII, Arg. VI				
" XIV, " VII				
Σ				
Δ′				
Δ″				
Σ for D =				
L				
Tabs. VII to XI				
" XIII and XIV				
" XII, Arg. A				
" XV, " D				
" XVI, " M				
" XVII, " M				
Nut				
λ				

Latitude

	g				
Tab. XXVIII, Arg.	II				
" XXIX, "	V				
Σ					
Δ′					
Σ for g =					
Tab. XXVIII & XXIX					
" XXX, Arg. VIII & U					
" XXXI, " B					
Latitude					

Nutation

	In Long. (δψ)	In Ob. (δε)
Tab. XXXII, Arg. N		
" XXXIII, day + k		
" XXXIV, ☽ and IX		
" XXXV, ☽ and IX		
" XXXVI, D and VI		
" XXXVII, C		
Σ for Nut		

Sidereal Time

Obliquity of Ecliptic

ε (Tables I and II) _____

(a) × fraction of cent. _____

δε _____

ε _____

ω = _____ $\lambda_\odot$ = _____ $\beta_\odot$ = _____

1 $\sin\delta = \sin\omega \sin\lambda \cos\beta + \cos\omega \sin\beta$

2 $\cos\delta \sin\alpha = \cos\omega \sin\lambda \cos\beta - \sin\omega \sin\beta$

3 $\cos\delta \cos\alpha = \cos\beta \cos\lambda$

1. log sin ω = _____ log cos ω = _____
   log sin λ = _____ log sin β = _____
   log cos β = _____
   _____ antilog
   _____ "
   sin δ = _____ log sin δ = _____
   ∴ δ = _____

2 log cos ω = _____
   log sin λ = _____ log sin ω = _____
   log cos β = _____ log sin β = _____
   _____ antilog
   = log _____
   log cos δ = _____
   log sin α = _____
   ∴ α = _____

3 log cos δ = _____ log cos β = _____
   log cos α = _____ log cos λ = _____

$\alpha_\leftarrow - \alpha_\odot$ = _____

Drop last two digits from III

III Tab	Arg.	17.5	Date 18.0	18.5	
1	43	55	53	50	✓
2	111	8	6	5	✓
3	104	2	2	1	✓
4	15	7	8	10	✓
5	66	3	3	3	✓
6	2	12	12	13	✓
7	19	2	3	3	✓
Sum		89	87	85	✓
16	103	52	54	56	✓
19	17	12	12	11	✓
Sum		153	153	152	✓
I.F. −.14 k x 1st sum			0 4		✓
Σ_1 = sum			157		✓
40	1. 238		746		✓
41	156.5 1		101		✓
42	15.5 70		6		✓
43	5.5 48		13		✓
44	2 44		4		✓
45	7 124		12		✓
46	0.5 56		7		✓
47	204.5 1		49		✓
Σ_{10}			75		✓
Σ_3 { Sum			1170		✓
Σ_3 { Tab.47 x k			2		✓

(6.5 36)

III Tab	Arg. at Date		Value	
23	9.5	388	63	✓
24	10.5	88	26	✓
25	1.5	171	207	✓
26	28.5	0.2	292	✓
27	4.	133	357	✓
28	1.5	9.5	23	✓
29	7.	35.2	31	✓
Sum			999	✓
30	14.	149 + .85	27829	✓
31	14.	0.6 + 1.3	4647	✓
32	13.5	161.95 + 3.4	424	✓
33	2.5	84.	71	✓
34	17.	9.	403	✓
35	4.	259	13	✓
36	1.5	74.5	54	✓
37	6.	284.4	14	✓
38	6.5	294	29	✓
39	3.5	22.3	1	✓
			91560	✓
Σ_2 { Sum			126044	✓
Σ_2 { k x 1st sum			46	✓
Σ_3			1172	✓
Longitude = sum			127262	
" Tab. 5, II			35°21'2"	

Drop one digit from IV & V

IV Tab	Arg.	17.5	Date 18.0	18.5	
1	42.6	92	91	88	✓
2	111	35	30	26	✓
3	103.5	32	26	21	✓
4	15.	10	12	14	✓
5	66.3	7	8	9	✓
6	1.8	12	12	13	✓
7	19.4	7	8	9	✓
Sum		195	187	180	✓
16 12	102.9	156	161	168	✓
17 13	32.5	142	142	142	✓
18 14	1.8	2	2	1	✓
19 15	17.2	26	30	36	✓
Sum		521	522	527	✓
I.F. −.14 k x 1st sum =			0 + 9		
Σ_4 = sum			531		✓
Σ_2			126090		✓
P34 ÷ 10			+ 23		✓
P35 (P34 − 10^3) ÷ 10			− 8		✓
19 + 9k			19		✓
− ß			1068965		✓
S = sum			1195620		✓
			11956.2		✓ = units 100"

IV Tab	Arg.	17.5	Date 18.0	18.5	
1 34	42.6	24	25	26	✓
2 35	111	20	19	18	✓
3 36	103.5	26	26	26	✓
4 37	15	2	2	2	✓
5 38	66	3	2	2	✓
16 43	102.9	88	87	85	✓
Sum		163	161	159	
I.F. −.14			0		
− Consts.			− 129		✓
P36 ÷ 10			= − 26		✓
P36 x 37 ÷ 10			= − 3		
Sum = C			+ 3		✓ = Σ_6

VI Tab.	Arg.	Value
P22 ÷ 100	505	14
P23 ÷ 100	1926.9	20
P24 ÷ 100	2087.4	17
24 + 9k =		24
Σ_{10} = sum		75

Dropping of digits from VI indicated by divisors 10 & 100

I.F. = −.14
For Tab. P23 VI
Date = 1900 − 30 = − 1870
7 Per. = 7 x 270.95 = 1896.65
Arg. = 1896.65 + 30.231 = 1926.88
k = −.0000248 x −1870 = +.0464

For Tab. P24 VI
Date = 1900 − 30 = −1870
8 Per. = 8 x 257.14 = 2057.12
Arg. = 2057.12 + 30.23 = 2087.35

Interpolating Factor
If D = 16.353, I.F. = 2 x (16.5 − 16.353) = −.29
If D = 16.653, I.F. = 2 x (16.653 − 16.5) = +.31
If D = 17.022, I.F. = 2 x (.022) = +.04

March 25, 6:15 p.m.

IV Tab	Arg. at Date		Value	
53 19	25.	18.1	177	✓
54 20	24.5	17.8	164	✓
(32. 4.34) 55 21	0.5	60.45	10507	✓
56 22	2.	38.8	46	✓
57 23	11.	65.2	43	✓
58 24	349.4		321	✓
59 25	187.	0.5	893	✓
60 26	8.	4.	13	✓
61 27	23.5	43.8	403	✓
62 28	10.	79.	39	✓
Sum			12606	✓
− Consts.			− 6980	
k (1st two lines − 340)			0	
Σ_5 = sum			+ 5626	✓
(11956.2) Tab. 33, Arg. S =			− 86544	✓
Σ_7 = sum			− 80918	=
Σ_7 x C ÷ 10^5 =			− 2	=
			8092"0	=
Latitude = sum			2° 14'	
" Tab. 5, II			52"	

V Tab	Arg	17.5	Date 18.0	18.5	
1	42.6	128	127	125	✓ 71
2	111.1	114	94	78	✓ 33
3	103.5	153	137	123	✓ 72
4	15.11	65	67	68	✓ 73
5	66.3	18	21	24	✓ 74
6	1.8	14	14	13	✓ 76
7	19.4	8	8	8	✓ 77
Sum		500	468	439	✓
10	102.9	101	102	102	✓
11	32.5	25	25	25	✓
12	1.8	5	6	7	✓
13	17.2	128	135	142	✓
Sum		759	736	715	✓
I.F. −.14 x −22 =			+ 3		
k (1st sum − 595) =			− 4		
Σ_8 = sum			735		✓

V Tab	Arg. at Date		Value	
71 15	14.	98.2	2383	+.5 ✓
33 16	2.5	83.8	3798	✓
72 17	21.5	42.8	2558	+1.1 ✓
73 18	6.5	205.6	242	✓
74 19	13.5	24.4	347	✓
76 21	1.5	17.6	33	✓
77 22	8.5	49.6	105	✓
Sum			9466	✓
k (Tab. 19 − 200)			7	
9 (Const.)			9	
Σ_8			735	
Σ_9 = sum			10217	=
Tab. 24, Tab. Arg.			54'.05"	=
" Parallax			54'.00	apogee

Drop 1 digit from figures in Table 24, V

30 A.D. March 25, 6:15 p.m. Tr. Per. = 2.19 days

$\omega = 23^\circ 41' 30''$ $L = 35^\circ 21' 2''$ (λ) $\beta = -2^\circ 14' 52''$ $\pi = 54'.0$

1. $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$
2. $\cos\delta\sin\alpha = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$
3. $\cos\delta\cos\alpha = \cos\beta\cos\lambda$

1. log sin ω = 9.6040257 ✓ log cos ω = 9.9617632 ✓
log sin λ = 9.7623615 ✓ log sin β = 8.5935193 n ✓
log cos β = 9.9996657 ✓ 8.5552825 ✓
9.3660529 .0359155
.2323019.7 ✓ antilog
− .0359155 "
sin δ = .1963865 log sin δ = 9.2931117
δ = 11° 19′ 33″

2. log cos ω = 9.9617632 ✓
log sin λ = 9.7623615 ✓ log sin ω = 9.6040257 ✓
log cos β = 9.9996657 ✓ log sin β = 8.5935193 ✓
9.7237904 8.1975450 n
.5294079 antilog .0157595.9 ✓
+ .0157595.9
.5451675 = log 9.7365299
log cos δ = 9.9914594
log sin α = 9.7450705
α = 33° 46′ 45″ = 2h 15m 6s.98

3 log cos δ = 9.9914594 log cos β = 9.9996657
log cos α = 9.9196982 log cos λ = 9.9114918 ✓
9.9111576 9.9111575

---

4 $\cos t_\zeta = \cos(90^\circ 50' - 54'.0)\sec\delta\sec\phi - \tan\delta\tan\phi$ $\delta = 11^\circ 19' 33''$ +
$89^\circ 56' = z$ $\phi = 31^\circ 46'$

log cos z = 7.0657860 log tan δ = 9.3016563
log sec δ = 0.0085408 log tan φ = 9.7918458
log sec φ = 0.0704793 9.0935021
7.1448061 .1240230
.0013957
.1240230
$\cos t_\zeta = -.1226273 = \log\cos 9.0885871_n =$
$180 - (82^\circ 57' 22'') =$
$t_\zeta = 97^\circ 2' 38''$
α = 33 46 45
130 49 23 =
☾ α+t = 8h 43m 18s
☉ τ = 8 38 37
4 55 = diff.
2 20 54
2 25 49

Latitude

g	104	112	120	128
Tab. XXVIII, Arg. II	−19	−19	−18	−16
" XXIX, " IV	−17	−18	−18	−17
Σ	−36	−37	−36	−33
		− 0		
Δ′		−1	+1	+3
Sum for g = 113.23		−".37		

Tab. XXVIII and XXIX	−".37
" XXX, Arg. VIII and U	−.27 ×
" XXXI, " B	+.01
	−".63

Latitude ☉

Sun

1 $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$

2 $\cos\delta\sin a = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$

3 $\cos\delta\cos a = \cos\beta\cos\lambda$

$\omega = 23^\circ\ 41'\ 35''$ 30 A.D.
$\lambda_\odot = 2\ 31\ 35.37$
$\beta_\odot = -0\ 0\ 0.63$

Logs −
$\log\sin\lambda = 8.6428028$
$\log\cos\lambda = 9.9995805$
$\log\sin\omega = 9.6040497$
$\log\cos\omega = 9.9617586$
$\log\sin\beta = 4.6855749_n$
$\log\cos\beta = 0.0000000$
$\log\sin\delta = 8.2467447$
$\log\cos\delta = 9.9999324$
$\log\sin a = 8.6046554$
$\log\cos a = 9.9996481$

1 $\sin\delta =$

$\log\sin\omega = 9.6040497$ $\quad \log\cos\omega = 9.9617586$
$\log\sin\lambda = 8.6428028$ $\quad \log\sin\beta = 4.6855749_n$
$\log\cos\beta = 0.0000000$ $\quad 4.6473335_n$
$8.2468525 = \quad -.0000044$
$.0176544$ antilog
$-\ .0000044$ "
$\sin\delta = .0176500 =$
$\log\sin\delta = 8.2467447$
$\delta = 1^\circ\ 0'\ 41''$

2 $\cos\delta\sin a =$

$\log\cos\omega = 9.9617586$ $\quad \log\sin\omega = 9.6040497$
$\log\sin\lambda = 8.6428028$ $\quad \log\sin\beta = 4.6855749_n$
$\log\cos\beta = 0.0000000$ $\quad 4.2896246_n =$
$8.6045614 = \quad -.0000019$ antilog
$.0402316$ antilog
$+\ .0000019$
$.0402335$ " $= \log 8.6045878$ sub.
$\log\cos\delta = 9.9999324$
$\log\sin a = 8.6046554 = 2^\circ\ 18'\ 22''$ (a)

$\log\cos\delta = 9.9999324$ $\quad \log\cos\beta = 0.0000000$
$\log\cos a = 9.9996481$ $\quad \log\cos\lambda = 9.9995805$
9.9995805 $\quad 9.9995805$

$a_\leftmoon - a_\odot = 33^\circ\ 37'\ 4''$
$2\ 18\ 22$
$31^\circ\ 18'\ 32'' = 31.^\circ308 = 2.^h0872$ = moon's sid. time interval
$\times 1.032 = 2.1539$ (civ.t.) from ss to ms on the equator
$= 2^h\ 9^m\ 14^s$

= civil time required for moon to move given sidereal time interval when moon is in apogee (March 25, 30 A.D.)

Should be 6:15

March 25, sunset, 30 A.D. **Arguments** (Simon Newcomb) **Sun**

6:00 p.m. G.M.T.

Constant	Mercury I	Venus II	Mars III	Jupiter IV	Saturn V	Moon's Anomaly VI	Earth's Anomaly VII	VIII	IX	k	Mean Obliquity ε	(a)	
Tab. I 0	23.4	89.14	145.42	150.70	30.9	21.87	1.6	10.0	9.0	− 1.822	+ ° 14′ 35.″51	+ 2.″08	M 118.61
" II 1930	20.8	65.32	151.27	28.02	30.4	15.82	1.8	9.3	2.1	− .579	23 26 54.21		− 5.37
" V													g 113.24
" VI						6.45	5.8	− .6	−0.3	−			
Total	44.2	154.46	296.69	178.72	61.3	44.14	9.2	18.7	10.8	− 2.401	23° 41′ 29.″72	2.″08	
Per. of Arg.	24		−180		60.	30		12					
	20.2		116.69		1.3	14.14		6.7					
						(30)	(24)	(12)	(12)				

(Brown = 6.8709)

Age of Moon

Variable	M	A	D	U	B	N	C	D	L	T
Tab. I 0	31.3185	320.50	6.805	4.01	4.3	6253.0	5.08	6.2	− 1° 47′ 46.″17	− h 7 m 11.s078
" II 1930	3.0336	209.56	2.862	24.11	11.2	6263.4	6.42	12.59	0 35 16.31	+ 2 22.921
" III	84.	84.	84.	84.	84.	84.	84.	84.	1 37 39.75	+ 0 6 30.650
" IV	.26	.26	.26	.26	.3	.3	.26	.26	14 47.08	59.139
" V									15 24.04	
Total	118.6121	− 614.32	93.927	112.38	99.8	12600.7	95.76	103.05	+ 0° 39′ 56.″97	0 h 2 m 41.s632
Per. of Arg.		− 583.92	− 88.592	− 108.85	− 96.8	− 6798.4	− 81.80	− 81.96	36.96	¼h = 2.464
		30.40	5.335	3.53	3.0	5802.3	13.96	21.1	0° 40′ 33.″93	0 2 44.10

$f_n = f_0 + n\Delta' + \frac{n(n-1)}{2}\Delta''$ Longitude n = ratio of $\frac{t}{\omega}$

g	104	112 = f_0	120	128
Tab. VII, Arg. I	6	5	5	5
" VIII, " II	389	417	444	469
" IX, " III	815	818	817	811
" X, " IV	1093	1258	1412	1555
" XI, " V	60	58	57	57
Σ	2363	2556	2735	2897
		.28		
Δ'		+193 .01	+179	+162
Δ''		−14	−17	
Σ for g = 113.24		$\frac{1.29}{8} = .155 = \frac{2585}{n}$		

D	4	5	6	7
Tab. XIII, Arg. VI	94	86	81	78
" XIV, " VII	03	04	06	09
Σ	.97	.90	.87	.87
		− .01		
Δ'		−7	−3	−0
Δ''		−4	−3	
Σ for D = 5.325		.89		

L	0° 40′ 33.″93
Tabs. VII to XI	25.85
" XIII and XIV	.89
" XII, Arg. A	6.79
" XV, " D	10.71 ✓ −16.758
" XVI, " M	+ 4 24.44 −15.78 × −17.6488
" XVII, " M	1 46 14.88
Nut	(2) −15.16 2 31 57.49
☉	2° 31 42.23

(17 cent. + .69 cent. + 365 − 84 = 281 days) = $(17 \text{ cent} + .69 \text{ cent} + \frac{281}{36500} =)$

$(-17.6977 \times 17.6977 \times .003) + (-17.6977) = -16.757$

$= 15.78 \times -16.76 = 4' 24.''47$

Nutation

	In Long. ($\delta\psi$)	In Obl. ($\delta\varepsilon$)
	″ ×	″
Tab. XXXII, Arg. N	− 14.97	+ 4.18 ✓
" XXXIII, " day of yr. + k	+ .02	+ .44 ✓
" XXXIV, " D and IX	− .19 ✓	
" XXXV, " D and IX		+ .03
" XXXVI, " D and VI	− .02 ✓	
" XXXVII, " C	− .00	+ .01
Σ for Nut.	− 15.16	4.″66

Precession

× subtract $\frac{1}{1000}$ Tabs. value for each century before 1900

Mar. 25, 6:15 p.m. Sidereal Time

$\delta\psi \div 15 = -1.^{s}0106$

Log. = 0.12385$_n$

" cos ε + 9.96176

log 0.08561$_n$ = ?

Nut. in R.A. = − 1.2178

T =	0 h 2 m 41.s63
Nut. in R.A.	− 1.217
R.A. Mean ☉	0 h 2 m 40.s413
M.T.	6 15 2.464
Sid. T.	6 h 17 m 42.s88
	2 20 54
	8 38 36.88

Obliquity of the Ecliptic

ε (Tables I and II)	23° 41′ 29.″72
(a) × fraction of cent. .30	.62
$\delta\varepsilon$	+ 4.71
ε	23° 41′ 35.″05

Tab. III

Σ_1	157
40	820
41	100
42	2
43	1
44	9
45	6
46	8
47	44
Σ_{10}	75
Σ_3	1222
	2

Tab. III

23	22
24	16
25	217
26	281
27	380
28	29
29	37
	982
30	32654
31	4135
32	878
33	99
34	406
35	77
36	60
37	2
38	23
39	0
L	44125
	83441
k x 1st	46
Σ_3	1224
	84711 =

$23^\circ 31' 51''$

Tab. IV

Σ_4	531
Σ_2	83487
P 34 ÷ 10	23
P 35 x −	8
19 + 9k	19
− 8	1068775
	1152827
	11528.27 units
	100 "

Tab. IV

C = + 3

Tab. IV

19	140
20	143
21	10554
22	64
23	22
24	322
25	892
26	9
27	356
28	39
Sum	12541
−Const. −	6980
k x −	3
Σ_5 +	5558
Tab. 33 −	118410 (11528.27)
Σ_7 −	112852
C x Σ_7 ÷ 10^5 −	3
Sum −	112855 =
−	11285".5 =

$-3^\circ 8' 6''$
Latitude

Moon's Place on March 25, 30 A.D., Sunset.
Date = 0 + $30^y\ 84^d\ 18^h$ = $30^y\ 84^d\ 6^h$ G.M.T. = 30.231

Tab	Arg	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	^{d}6.8709	^{c}9.425	^{c}125.76	^{c}38.00	^{c}67.63	^{c}52.70	^{c}115.23	^{c}39.44	^{c}14.34	^{c}185.563	^{c}40.36	^{c}20.16	^{c}3.95
2	S.V	− 15	+ 1	− 5	+ 4	− 8	− 8	− 4	+ 3	− 1	− 81	+ 1	− 1	+ 3
3	1930	15.3922	19.947	69.95	62.25	112.13	117.66	58.20	52.92	18.77	114.420	17.02	30.00	66.71
4	^{d}84.25	25.1888	22.799	47.60	2.12	55.62	16.02	61.62	18.00	15.50	36.000	17.38	18.40	15.00
3	− 1 Per.	−29.5306	+11.400	23.80	1.06	27.81	8.01	30.81	9.00	7.75	18.000	8.69	9.20	7.50
3	−Periods		−141.	−156.	− 116	− 124.	− 128.	− 132.	− 100.	− 24.	− 251.	− 51.	− 38.	− 76.
	Sums	17.9198	42.572	111.06	103.47	15.11	66.31	1.82	19.39	8.35	102.90	32.46	1.75	17.19

Tab	Arg	23	24	25	26	27	28	29
2	0	^{d}5.5 ^{c}410.1	^{d}7.5 ^{c}106.7	^{d}1.5 ^{c}152.7	^{d}26.5 ^{c}116.95	^{d}13.5 ^{c}65.1	^{d}3.5 ^{c}48.7	^{d}16.0 ^{c}188.9
2	S.V.	− 2.	− .5	− 3.7	− 3.24	+ 4.9	− 1.7	+ 3.4
3	1930	12.0 57.3	3.5 111.6	18.0 108.1	6.5 70.52	10.5 207.9	2.0 177.5	23.0 170.9
4	^{d}84.0	7.0 76.	13. 14.	7.0 51.	24.0 112.	14.0 158.	5.0 4.	25.0 196.
3	^{d}0.25	300.	84.	95.	71	129	89.	104.
3	− Per	− 15. 464.	− 14. 64.	− 25.5 46.	− 29.5 86	− 34.5 179	− 9.5 133	− 29 109.
3	Adj.		+ .5 − 167	+ .5 − 189	+ .5 − 142	+ .5 − 258	+ .5 178	+ 1. − 414
	Sums	9.5 377.4	10.5 84.8	1.5 168.1	28.0 139.23	4.0 127.9	1.5 6.5	7.0 31.2

Tab	Arg	30	31	32	33	34	35	36
2	0	^{d}27.0 ^{c}159.631	^{d}6.5 ^{c}218.10	^{d}15.0 110.15	^{d}6.5 ^{c}72.70	^{d}105.0 ^{c}11.47	^{d}4.0 ^{c}201.97	^{d}15.0 ^{e}38.5
2	S.V.	− 6.925	− .90	+ 5.91	− .30	− 3.80	− 2.58	+ 2.1
3	1930	12.5 298.336	11.0 272.40	9.5 163.89	0.0 76.40	33.5 5.23	2.0 205.73	13.5 52.9
4	^{d}84.0	28.5 258.	10.0 102.	20.0 252.	24.5 86.	84.0 0.	7.0 50.	4.0 110.
3	^{d}0.25	165.	147.	168.	49	7	139	59
3	− Per.	− 27.5 36	−14.5 156	− 31.5 209	−29.5 6	−205.5 11	− 9.5 63	−15.5 95
3	Adj.	1. 660	+ .5 − 294	+ .5 − 335	+ 1. − 196		+ .5 277	
	Sums	14.0 142.03	13.5 288.60	13.5 155.95	2.5 81.81	17.0 8.90	4.0 254.12	1.5 72.5

Tab	Arg	37	38	39	40	41	42	43
2	0	^{d}9.5 ^{c}0.1	^{d}3.0 ^{e}92.6	^{d}5.0 ^{c}21.9	^{d}4.0 ^{c}19.43	^{d}144.0 ^{c}0.4	^{d}8.0 ^{c}81.6	^{d}2.5 ^{c}36.0
2	S.V.	+ 1.4	− 3.7	− .2	+ .05	+ .8	+ 3.2	− 1.3
3	1930	3.0 283.9	5.0 64.8	1.5 5.6	8.0 207.51	101.5 2.0	3.5 99.6	0.5 95.3
4	^{d}84.0	13.0 323.	5.5 61.	8.0 19.	15.5 292.	84. 0.	30. 74.	11.0 50.
3	^{d}0.25	198	150.	16.	156.	11.	76.	95.
3	− Per	−10.0 67	− 7.0 76.	− 5.5 20.	−13.5 66	−173. 13.	−26.5 115.	− 9.0 41
3	Adj.	+ .5 − 396			+ .5 311		+ .5 − 152	+ .5 − 189
	Sums	6.0 276.4	6.5 288.7	3.5 22.3	1.0 231.99	156.5 1.2	15.5 67.4	5.5 45.0

Tab	Arg	44	45	46	47	53	54	55
2	0	^{d}5.0 ^{e}140.7	7.0 ^{c}97.5	^{d}1.5 50.7	^{d}31.0 ^{c}14.37	^{d}8.0 ^{e}15.5	^{d}11.5 ^{c}42.2	10.0 62.27
2	S.V.	− .2	+ .7	− .7	+ .03	− .3	− .3	− .89
3	1930	4.5 9.0	1.5 29.3	3.5 38.5	88.5 23.89	3.5 7.9	17.0 43.9	3.0 20.07
4	^{d}84.0	6.0 39.	7.5 69.	8.5 27.	84.0 0	13.0 14.	24.5 17.	19.0 114.
3	^{d}0.25	90.	67.	34.	13	20.	24.	65.
3	− Per.	− 7.0 29	−9.5 8	−6.5 47			− 29.5 15	− 32.0 73.
3	Adj.	+ .5 − 179	+ .5 − 133		+ 1. − 50	+ .5 − 39	+ 1. − 94	+ .5 − 130
	Sum	2.0 41.5	7.0 122.5	.5 55.5	204.5 1.29	25.0 18.1	24.5 17.8	0.5 57.45

Tab	Arg	56	57	58	59	60	61	62
2	0	^{d}7.5 ^{e}68.5	^{d}12.5 ^{e}49.3	^{d}349.4	^{d}126.0 3.67	^{d}4.5 ^{c}16.0	^{d}23.0 ^{c}14.7	^{d}2.5 141
2	S.V.	− .3	+ .6	+ .9	− .52	− 2.5	− 2.3	− 3
3	1930	1.0 37.6	10.0 99.3	2105.4	164.5 1.33	8.0 138.5	0.0 26.4	0.0 141
4	^{d}84.0	13.0 13.	19.5 92.	84.3	84.0 0.	9.5 59.	28.0 20.	6.5 103
3	^{d}0.25	40.	56.		3	86.	27.	103
3	− Per	−10.0 21	− 16.0 5	− 2190.5	− 188.0 2	−14.5 125.	− 27.5 43	
3	Adj		+ 1. − 224		+ .5 − 5	+ .5 − 171		+ 1 − 410
	Sums	2.0 36.8	11.0 63.2	349.5	187.0 0.48	8.0 1.0	23.5 42.8	10.0 75

Tab	Arg	71	72	73	74	76	77	82
2	0	^{d}27.0 106.42	^{d}15.0 ^{e}35.84	^{d}4.0 ^{c}202.0	^{d}5.5 ^{c}48.6	^{d}3.0 ^{c}18.3	^{d}9.5 ^{c}0.0	6257^d
2	S.V.	− 4.63	+ 1.93	− 2.6	− .2	− .7	+ .2	+ 0
3	1930	12.5 198.39	17.5 43.08	4.5 152.2	0.5 1.0	6.5 46.0	5.5 49.4	964
4	^{d}84.0	28.5 172	20. 82.	7.0 50.	7.0 9.	5.5 12.	13.0 53.	84
3	^{d}0.25	110	55.	139	36.	30.	33	
3	− Per.	−27.5 24	−31.5 68	− 9.5 63	+ .5 − 71	−7.0 15.	−10.0 11	− 6800
3	Adj.	+ 1. − 440	+ .5 − 109	+ .5 − 277		+ .5 − 59	+ .5 − 65	
	Sums	14.0 94.18	21.5 40.85	6.5 200.6	13.5 23.4	8.5 31.6	8.5 48.6	505^d

Tab	Arg	83	84	L	−β	ϖ	
2	0	6178^d	6185	29540.1"	1192540"	310177"	
2	S.V	+ 2	+ 2	− 80 (a)	+ 84	+ 414 (a)	
3	1930	4568	2852	− 0 (b)	+ 0		
4	^{d}84.0	84	84	983364	1156279	413938	
3	^{d}0.25			96542	16013	33789 =	2 × 200."527 × 84.25
3	− Per.	−6800	− 6800	11959	48	100	
3	Adj.			− 1296000	− 1296000	− 1296000	
	Sums	4032^d	2323^d	91086	1068964	758418	
					296° 56' 4"	210° 40' 18"	

Drop last two digits from Section III

III Tab	Arg.	^{d}17.5	Date ^{d}18.0	^{d}18.5
1	43	55"	53"	50"
2	111	8	6	5
3	104	2	2	1
4	15	7	8	10
5	66	3	3	3
6	2	12	12	13
7	19	2	3	3
Sum		×89	87	85
16	103	52	54	56
19	17	12	12	11
Sum		153	153	152
Int. fact −.16			0	
k × 1st Sum			4	
Σ_1 = Sum			157	
40	1.0	232	747	
41	156.5	1	101	
42	15.5	67	6	
43	5.5	45	13	
44	2.0	42	4	
45	7.0	123	12	
46	0.5	56	7	
47	204.5	1	49	
Σ_{10}			75	
Σ_3 { Sum			1171	
Tab. 47 × k +			2	

III Tab	Arg at Date		Value
23	^{d}9.5	377	63
24	10.5	85	26
25	1.5	168	207
26	28.0	139	292
27	4.0	128	357
28	1.5	7	23
29	7.0	31	31
Sum		−2108	× 999
30	^{d}14.0	142 + .8	27892
31	13.5	288.6 + 1.3	4643
32	13.5	155.9 + 3.4	428
33	2.5	62	71
34	17.0	9	403
35	4	254	13
36	1.5	73	54
37	6.0	276	14
38	6.5	289	29
39	3.5	22	1
L			91086
Σ_2 { Sum			130345
k × 1st Sum			46
Σ_3			1173
Longitude = Sum			131564
" Tab. 5 II			36° 32' 44"

I.F. = −.16
For Tab. P 23 VI
Date = 1900 − 30 = −1870
7 Per. = 7 × 270.95 = 1896.65
Arg. = 1896.65 + 30.23 = 1926.88

k = −.0000248 × −1870 = +.0464

For Tab. P 24 VI
Date = 1900 − 30 = −1870
8 Per. = 8 × 257.14 = 2057.12
Arg. = 2057.12 + 30.23 = 2087.35

31
29
31
14
105

Long = 35° 13' 59"

Drop 1 digit from tables of Sections IV and V

IV Tab	Arg	^{d}17.5	Date ^{d}18.0	^{d}18.5
1	42.6	93	91	88
2	111.	35	30	25
3	103.5	32	27	22
4	15	10	12	14
5	66.3	7	8	9
6	1.8	11	12	12
7	19.4	8	8	8
Sum		×196	188	178
12	102.9	156	161	169
13	32.5	141	141	142
14	1.8	2	2	2
15	17.2	25	30	35
Sum		520	522	526
Int fact −.16		− 0		
k × 1st Sum		+ 9		
Σ_4 = Sum		531		
Σ_2		132499		
P34 ÷ 10		+ 23		
P35 (P34 − 10^3) ÷ 10		− 1		
19 + 9k		19		
− β		1068964		
S = Sum		1202095"		

= 12020.35 units

IV Tab	Arg	^{d}17.5	Date ^{d}18.0	^{d}18.5
34	42.6	24"	25"	26"
35	111.	21	20	18
36	103.5	25	26	26
37	15	2	2	2
38	66	2	2	2
43	102.9	88	87	85
Sum		162	162	159
Int fact		−.16	− 0	
− Consts.			− 129	
P 36 ÷ 10			− 26	
P 36 × P 37 ÷ 10			− 3	
Sum = C			+ 4 = Σ_6	

82 = 505^d
P 34 = 83 = 4032^d
P 35 = Date
P 36 = 84 = 2323^d

VI Tab.	Arg	Value
P 22 ÷ 100	505	14
P 23 ÷ 100	1926.9	20
P 24 ÷ 100	2087.4	17
24 + 9k =	0	24
Σ_{10} = Sum		75

"The dropping of digits from the tables of Sect. VI is indicated by the divisors 10 or 100."

IV Tab	Arg at Date		Value	
53	19	^{d}25.0	18.1	177"
54	20	24.5	17.8	164"
55	21	0.5	57.5	10508
56	22	2.0	36.8	46
57	23	11.0	63.2	43
58	24	349.5		321
59	25	187.0	0.5	893
60	26	8.0	1.	13
61	27	23.5	42.8	403
62	28	10.0	75.	39
Sum				12607
− Consts				− 6980
k (1st two lines − 340)				− 0
Σ_5 = Sum Tab. 33, Arg S =				+ 5627 − 81413
Σ_7 = Sum				− 75786
$\Sigma_7 \times C \div 10^5$ =				− 64800 − 10986
Latitude = Sum				− 10986
" Tab. 5, II				− 3° 3' 6"

= 5 × 12960"

V Tab	Arg	^{d}17.5	Date ^{d}18.0	^{d}18.5
1	42.6	128	127	125
2	111	114	94	78
3	103.5	153	137	123
4	15.	65	67	69
5	66.3	17	21	23
6	1.8	13	13	13
7	19.4	8	8	8
Sum		×498	467	439
10	102.9	100	102	102
11	32.5	25	24	24
12	1.8	5	6	6
13	17.2	127	134	141
Sum		755	733	712
Int fact −.16		− 3		
k (1st Sum − 595)		− 5		
Σ_8 = Sum		725		

V Tab	Arg at Date		Value
15	^{d}14.0	.5 + 94" .18	2380
16	2.5	81.8	3810
17	21.5	1.1 + 40.85	2552
18	6.5	200.6	240
19	13.5	23.4	346
21	8.5	31.6	34
22	8.5	48.6	105
Sum			9467
k (Tab. 19 − 200)			+ 7
9 (Const.)			9
Σ_9			725
Σ_9 = Sum			10208
Tab. 24, Tab. Arg			54' 0"
" Parallax			

Drop 1 digit from figures in Table 24, V

75786 = 7578."6 =
2° 6' 18."6 Latitude

30 A.D.

Moon

30 A.D. March 25 ss

1. $\sin\delta = \sin\omega\sin\lambda\cos\beta + \cos\omega\sin\beta$
2. $\cos\delta\sin a = \cos\omega\sin\lambda\cos\beta - \sin\omega\sin\beta$
3. $\cos\delta\cos a = \cos\beta\cos\lambda$

$\omega = 23^\circ\ 41'\ 30''$
$\lambda = 36^\circ\ 32'\ 44''$ $35^\circ\ 13'\ 59''$
$\beta = -3^\circ\ 3'\ 6''$ $2^\circ\ 6'\ 19''$

1. $\sin d =$

Logs

$\sin\omega = 9.6040257$	$\cos\omega = 9.9617632$	$\sin\lambda = 9.7748539$ ✓
$\sin\lambda = 9.7748539$	$\sin\beta = \underline{8.7262091}\ n$	$\cos\lambda = 9.9049230$ ✓
$\cos\beta = \underline{9.9993837}$	$8.6879723 =$	$\sin\omega = 9.6040257$ ✓
$9.3782633 =$	$-.0487497$ antilog	$\cos\omega = 9.9617632$ ✓
$.2389259$ antilog		$\sin\beta = 8.7262091\ n$ ✓
subtract $\underline{.0487497}$ "		$\cos\beta = 9.9993837$ ✓
$.1901762 =$		$\sin\delta = 9.2791561$
$\sin\delta = 9.2791561 =$		$\cos\delta = 9.9920009$
$+\ 10^\circ\ 57'\ 47''$ ✓		$\sin a = 9.7607348$ 50
		$\cos a = 9.9123065$ 57

2. $\cos\delta\sin a =$

$\cos\omega = 9.9617632$
$\sin\lambda = 9.7748539$
$\cos\beta = \underline{9.9993837}$
$9.7360008 =$
$.5445036$ antilog
add $\underline{.0213912}$ "
$.5658948 =$ log 9.7527357

$\sin\omega = 9.6040257$
$\sin\beta = \underline{8.7262091}\ n$
$8.3302348_n =$
$-.0213912$ antilog

$\underline{9.9920009}$ 7 $= \cos\delta$
9.7607348 $= \sin a$
n.q.
$\therefore a = \underline{35^\circ\ 11'\ 55''} = 2^h\ 20^m\ 48^s$

3. Proof

$\cos\delta = 9.9920009$ 7
$\cos a = \underline{9.9123065}$ 57.6
9.9043074

$\cos\beta = 9.9993837$
$\cos\lambda = \underline{9.9049230}$
9.9043067

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30 A.D. March 25 ss

4. $\cos t\ (H_\alpha) = \sin 50'\sec\delta\sec\phi - \tan\delta\tan\phi$
(H_α of moon at moonset)

S.T. (Newcomb) − moon's a = moon's t

$a = 35^\circ\ 11'\ 55''$
$\delta = 10^\circ\ 57'\ 47'' +$
$\phi = 31^\circ\ 46'$
Long. $= -2^h\ 20.^m9$
S.T. cor. $= -23.^s15$?

$\cos t =$

$8.1626808 = \sin 50'$	$9.2871548 = \tan\delta$	$\cos\delta = 9.9920009$
$0.0079991 = \sec\delta$	$\underline{9.7918458} = \tan\phi$	$\sec\delta = 0.0079991$
$\underline{0.0704793} = \sec\phi$	$9.0790006 =$	$\sec\phi = 0.0704793$
$8.2411592 =$	$.0790083$ antilog	$\tan\delta = 9.2871548$
$.0142445$ antilog		$\tan\phi = 9.7918458$
sub. $\underline{.0790083}$ "		$\sin 50' = 8.1626808$
$-.0647638 =$		

log cost $= 8.8113324_n =$ ~~$+86^\circ\ 17'\ 12''$~~
$t = 193^\circ\ 42'\ 48''$

Angles	
ω (obliquity)	$= 23^\circ\ 41'\ 30''$
λ	$= 36^\circ\ 32'\ 44''$
β	$= -3^\circ\ 3'\ 6''$
$-\Omega$	$= 1068964''$
Ω (perigee)	$= 758418'' = 210^\circ\ 40'\ 18''$
δ	$= 10^\circ\ 57'\ 47''$
a	$= 35^\circ\ 11'\ 55''$ ✓ 2 20 48 ✓
t	$= $ ~~$86^\circ\ 17'\ 12''$~~ $6^h\ 14^m\ 51^s$
ϕ	$= 31^\circ\ 46'$
Long. Jer.	$= -2^h\ 20.^m9$
S.T. cor.	$= 23.^s15$
	$= 2''.7636'' = 63^\circ\ 3'\ 56''$

I	-7^m	11,078
II	$+2$	22,921
III	0^h 6	30.650
IV	0 0	59.139
L.M.T.	6	
Υ	6 0	42
α	2 20	48
t	$3^h\ 39^m\ 54^s$	hour angle at moonset

t 6 14 51

2h 35m after 5S is moonset.

6 15 42
2 14 80
4 1 12

42.8
93.71333
31.23777
6.24788
14.8820

6 22 58
4 1 12
2 26 46

$a_\odot - a_\beta$ = (sid. int) from 9S to mS on equator

moon time interval

1.032 = factor of converting sid. time interval into civil time interval, i.e. gives for moon to move given sidereal interval when moon is in apogee.

gives civil time from sunset to moonset.

Moon Tables (Brown)

Date = March 25, 30 A.D., 6:15 p.m., G.M.T., = 0 + $30^{y}\ 84^{d}\ 6^{h}.25$ = 30.231 Tr.Per. = 2.19^{d}

Tab	Arg	D	1	2	3	4	5	6	7	12	16	17	18	19
2	0	6.8709	9.425	125.76	38.00	67.63	52.70	115.23	39.44	14.34	185.565	40.36	20.16	3.95
2	S.V.	− 15	+ 1	− 5	+ 4	− 8	− 8	− 4	+ 3	− 1	− 8	+ 1	− 1	+ 3
3	1930	15.3922	139.947	69.95	62.25	112.13	117.66	58.20	52.92	18.77	114.420	17.02	30.	66.71
4	$84^{d}.2604$	25.1992	22.799	47.60	2.12	55.62	16.02	61.62	18.	15.50	36.	17.38	18.40	15.
3	− 1 Per.	− 29.5306	+ 11.400	23.80	1.06	27.81	8.01	30.81	9.	7.75	18.	8.69	9.20	7.50
3	−Periods		− 141	− 156.		− 248	− 128	− 264	− 100	− 48	− 251	− 51	− 76	− 76
	Sums	17.9317	42.57	111.1	103.5	15.11	66.31	1.82	19.39	8.35	102.9	32.46	1.75	17.19

17.5 18.0 18.5

Tab	Arg	23	24	25	26	27	28	29
2	0	5.5 410.1	7.5 106.7	1.5 152.7	26.5 116.95	13.5 65.1	3.5 48.7	16.0 188.9
2	S.V.	− 2	− .5	− 3.7	− 3.23	+ 4.9	− 1.7	+ 3.4
3	1930	12.0 57.3	3.5 111.6	18. 108.1	6.5 70.52	10.5 207.9	2.0 177.5	23. 170.9
4	$84^{d}.0$	7. 76.	13. 14	7. 51	24 112	14. 158.	5. 4.	25 196.
3	$0^{d}.2604$	311	87.	98	74	134	92	108
3	−Per.	− 15. _ 464	− 14. _ 64	− 25.5 _ 46	− 29.5 _ 86	− 34.5 _ 179	− 9.5 _ 133	− 29 _ 109
3	Adj.		+ .5 167	+ .5 189	+ 1. 284	+ .5 258	+ .5 178	1. 414
	Sums	9.5 388.4	10.5 87.8	1.5 171.	28.5 0.24	4. 132.9	1.5 9.5	7. 35.2

Tab	Arg	30	31	32	33	34	35	36
2	0	27.0 159.631	6.5 218.10	15.0 110.15	6.5 72.70	105.0 11.47	4.0 201.97	15.0 38.5
2	S.V.	− 6.904	− .9	+ 5.91	− .3	− 3.78	− 2.58	+ 2.1
3	1930	12.5 298.326	11. 272.4	9.5 163.89	0.0 76.40	33.5 5.23	2. 205.73	13.5 52.9
4	$84^{d}.0$	28.5 258	10. 102	20. 252	24.5 86.	84	7. 50	4. 110.
3	$0^{d}.2604$	172	153	174	51	7	144	61
3	−Per.	− 27.5 _ 36	− 14.5 _ 156	− 31.5 _ 209	− 29.5 _ 6	− 205.5 _ 11	− 9.5 _ 63	− 15.5 _ 95
3	Adj.	1. 660	+ 1. 588	+ .5 335	+ 1. 196		+ .5 277	
	Sums	14. 149.05	14. 0.6	13.5 161.95	2.5 83.8	17. 8.92	4. 259.12	1.5 74.5

Tab	Arg	37	38	39	40	41	42	43
2	0	9.5 0.1	3.0 92.6	5.0 21.9	4.0 19.43	144.0 0.4	8.0 81.6	2.5 36.0
2	S.V.	+ 1.4	− 3.7	− .2	+ .04	+ .8	+ 3.1	− 1.3
3	1930	3. 283.9	5. 64.8	1.5 5.6	8. 207.51	101.5 2.	3.5 99.6	0.5 95.3
4	$84^{d}.0$	13. 323.	5.5 61	8. 19.	15.5 292.	84 0	30 74	11. 50
3	$0^{d}.2604$	206	155	16	162	11	79	98
3	−Per.	− 10. _ 67	− 7. _ 76	− 5.5 _ 20	− 13.5 _ 66	− 173 _ 13	− 26.5 _ 115	− 9. _ 41
3	Adj.	+ .5 396			+ .5 311		+ .5 152	+ .5 189
	Sums	6.0 284.4	6.5 293.7	3.5 22.3	1.0 237.98	156.5 1.2	15.5 70.3	5.5 48

Tab	Arg	44	45	46	47	53	54	55
2	0	5.0 140.7	7.0 97.5	1.5 50.7	31.0 14.37	8.0 15.5	11.5 42.2	10.0 62.27
2	S.V.	− .2	+ .7	− .7	+ .03	− .3	− .3	− .89
3	1930	4.5 9.	1.5 29.3	3.5 38.5	88.5 23.89	3.5 7.9	17. 43.9	3. 20.07
4	$84^{d}.0$	6. 39	7.5 69	8.5 27.	84 0	13. 14	24.5 17	19. 114
3	0.2604	93	69	35	13	20	24	68
3	−Per.	− 7 _ 29	− 9.5 _ 8	− 6.5 47			− 29.5 _ 15	− 32. _ 73
3	Adj.	+ .5 179	+ .5 133		+ 1. − 50	+ .5 − 39	+ 1 94	+ .5 130
	Sums	2. 44.5	7. 124.5	0.5 56.5	204.5 1.29	25. 18.4	24.5 17.8	0.5 60.45

$83^{d}.0$ = 6.5 35.5 32.0 4.34

Tab	Arg	56	57	58	59	60	61	62
2	0	7.5 68.5	12.5 49.3	349.4	126.0 3.67	4.5 16.0	23.0 14.7	2.5 141
2	S.V.	− .3	+ .6	+ .8	− .5	− 2.5	− 2.3	− 3
3	1930	1. 37.6	10. 99.3	2105.4	164.5 1.33	8. 138.5	0.0 26.4	0.0 141
4	$84^{d}.0$	13. 13	19.5 92	84	84 0.	9.5 59.	28. 20	6.5 103
3	$0^{d}.2604$	42	58	.3	3	89	28	107
3	−Per.	− 10. _ 21	− 16. _ 5	_ 2190.5	− 188. _ 2	− 14.5 _ 125	− 27.5 _ 43	
3	Adj.	+ .5 80	+ 1 224		+ .5 5	+ .5 171		+ 1. − 410
	Sums	2. 38.8	11. 65.2	349.4	187. 0.5	8. 4.	23.5 43.8	10 79

Tab	Arg	71	72	73	74	76	77	82
2	0	27.0 106.42	15.0 35.84	4.0 202.0	5.5 48.6	3.0 18.3	9.5 0.0	6257
2	S.V.	− 4.61	+ 1.92	− 2.6	− .2	− .7	+ .2	0
3	1930	12.5 198.39	17.5 43.08	4.5 152.2	0.5 1.	6.5 46.	5.5 49.4	964
4	$84^{d}.0$	28.5 172.	20. 82.	7. 50.	7. 9.	5.5 12	13. 53.	84
3	$0^{d}.2604$	114	57	144	37	31	34.	
3	−Per.	− 27.5 _ 24	− 31.5 _ 68	− 9.5 _ 63		− 7. _ 15	− 10. _ 11.	− 6800
3	Adj. +	1. 440	+ .5 109	+ .5 277	+ .5 − 71	+ .5 59	+ .5 65	
	Sums	14. 98.20	21.5 42.8	6.5 205.6	13.5 24.4	1.5 17.6	8.5 49.6	505

Tab	Arg	83	84	L	−☊	☋		
2	0	6178	6185	295401	1192540	310177		
2	S.V.	+ 2	+ 2	− 80	+ 83	+ 412		
3	1930	4568	2852	983364	1156279	413938		
4	$84^{d}.0$	84	84	96542	16013	33793	2 × 200.527″	
3	0.2604			12333	50	104	× 84.2604	
3	−Per.	− 6800	− 6800	− 1296000	−1296000			
3	Adj.			49107				
	Sums	4032	2323	91560	1068965	758424		

0.26 × whole day motion = .52 × half day motion

March 24, 6:15, p.m. March 26, 6:15, p.m. March

	V Tab.	Arg. at Date		Value
71	15	13.	98.2	2424
33	16	1.5	83.8	4832
72	17	20.5	42.8	1985
73	18	5.5	205.6	73
74	19	12.5	24.4	285
76	21	0.5	17.6	54
77	22	7.5	49.6	73
	Sum			9726
	k (Tab. 19-200)			4
	q (Const.)			9
	Σ_8			735
	Σ_q = sum			10474
	Tab. 24			54′ 3″
	" Parallax			54.03

=

	V Tab	Arg. at Date		Value
	15	15.	98.2	3124
	16	3.5	83.8	2622
	17	22.5	42.8	3189
	18	7.5	205.6	439
	19	14.5	24.4	384
	21	2.5	17.6	10
	22	9.5	49.6	121
	Sum			9889
	k (Tab. 19-200)			8
	q (Const.)			9
	Σ_8			735
	Σ_q = sum			10641
	Tab. 24			54′ 5″
	" Parallax			54.1

=

	V Tab	Arg. at Date	Value
	15		
	16		
	17		
	18		
	19		
	21		
	22		
	Sum		
	k (Tab. 19-200)		
	q (Const.)		
	Σ_8		
	Σ_q = sum		
	Tab. 24		
	" Parallax		

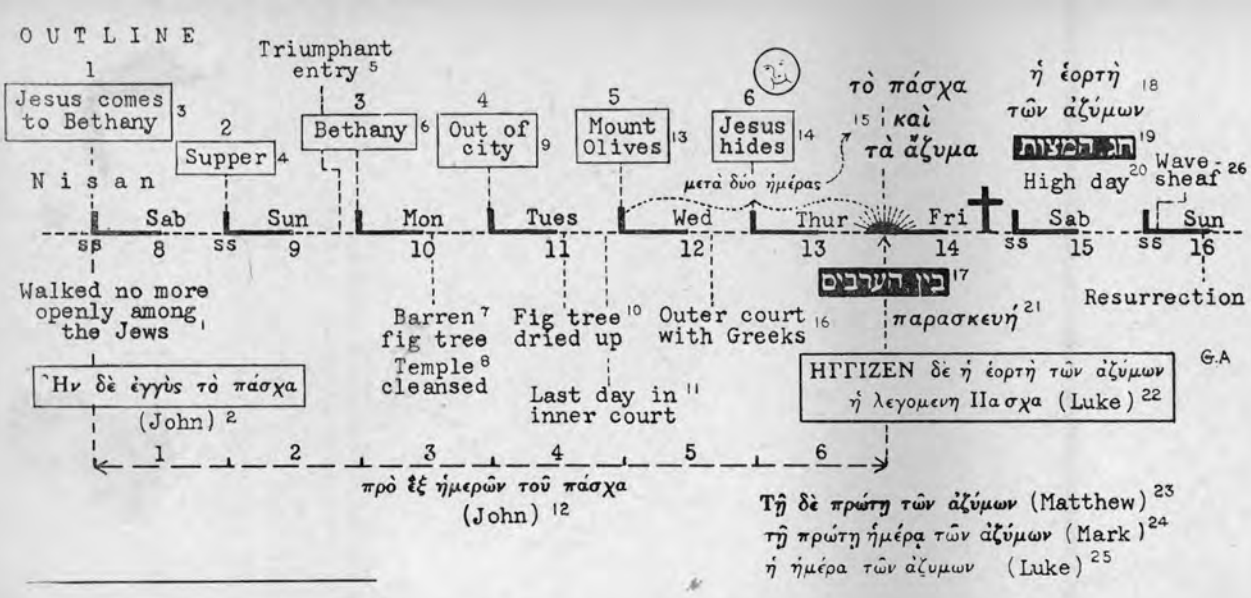
	V Tab	Arg. at Date	Value
	15		
	16		
	17		
	18		
	19		
	21		
	22		
	Sum		
	k (Tab. 19-200)		
	q (Const.)		
	Σ_8		
	Σ_q = sum		
	Tab. 24		
	" Parallax		

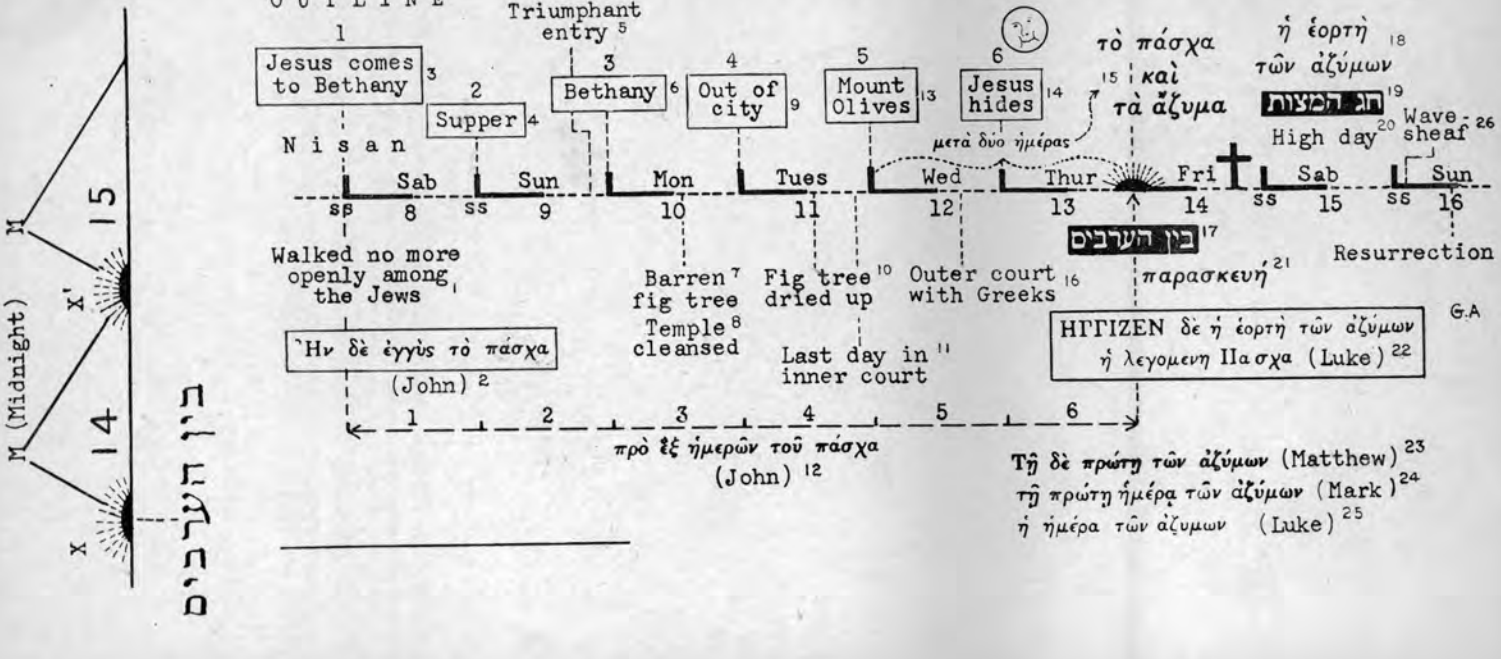
	V Tab		
71			
33			
72			
73			
74			
76			
77			

V Tab		

V Tab		

V Tab		


OUTLINE
1
Jesus comes to Bethany 3
2
Supper 4
Triumphant entry 5
3
Bethany 6
4
Out of city 9
5
Mount Olives 13
6
Jesus hides 14
τὸ πάσχα καὶ τὰ ἄζυμα 15
ἡ ἑορτὴ τῶν ἀζύμων 18
חג המצות 19
High day 20
Wave-sheaf 26
μετὰ δύο ἡμέρας
Nisan
Sab Sun Mon Tues Wed Thur Fri Sab Sun
sp 8 ss 9 10 11 12 13 14 ss 15 ss 16
בין הערבים 17
Resurrection
Walked no more openly among the Jews 1
Barren fig tree 7
Temple cleansed 8
Fig tree dried up 10
Last day in inner court 11
Outer court with Greeks 16
παρασκευή 21
G.A
Ἦν δὲ ἐγγὺς τὸ πάσχα (John) 2
ΗΓΓΙΖΕΝ δε ἡ ἑορτὴ τῶν ἀζύμων ἡ λεγομενη Πασχα (Luke) 22
1 2 3 4 5 6
πρὸ ἓξ ἡμερῶν τοῦ πάσχα (John) 12
Τῇ δὲ πρώτῃ τῶν ἀζύμων (Matthew) 23
τῇ πρώτῃ ἡμέρᾳ τῶν ἀζύμων (Mark) 24
ἡ ἡμέρα τῶν ἀζυμων (Luke) 25
M
M (Midnight)
x'
x
15
14
בין הערבים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ἡ ἡμέρα τῶν ἀζυμων (Luke) 25
M (Midnight)
M
x'
x
15
14
בין הערבים

LENGTH OF LUNAR YEAR ON VARIOUS MERIDIANS

(Reckoned from paschal full moon to paschal full moon)

19-Year Cycle	Jew. Year	Paschal Full Moon		Paschal Full Moon		* G.M.T.	** J.C.T.	*** B.C.T.	Embolismic Years
1	1838-1839	Apr. 9	$14^h\ 6^m$ to	Apr. 28	$7^h\ 24^m$ =	384 days	383 days	384 days	1
2	1839-1840	Apr. 28	"	Apr. 16	7 55 =	354 "	354 "	354 "	
3	1840-1841	Apr. 16	"	May 5	2 5 =	384 "	384 "	384 "	3
4	1841-1842	May 5	"	Apr. 24	11 27 =	354 "	355 "	354 "	
5	1842-1843	Apr. 24	"	Apr. 14	2 29 =	355 "	354 "	355 "	
6	1843-1844	Apr. 14	"	May 2	3 16 =	384 "	384 "	384 "	6
7	1844-1845	May 2	"	Apr. 21	19 12 =	354 "	355 "	355 "	
8	1845-1846	Apr. 21	"	Apr. 11	5 54 =	355 "	354 "	354 "	
9	1846-1847	Apr. 11	"	Apr. 30	1 25 =	384 "	384 "	384 "	9
10	1847-1848	Apr. 30	"	Apr. 18	2 31 =	354 "	354 "	354 "	
11	1848-1849	Apr. 18	"	May 6	19 6 =	383 "	384 "	384 "	11
12	1849-1850	May 6	"	Apr. 25	23 20 =	354 "	354 "	354 "	
13	1850-1851	Apr. 25	"	Apr. 15	10 35 =	355 "	355 "	354 "	
14	1851-1852	Apr. 15	"	May 3	10 22 =	384 "	384 "	384 "	14
15	1852-1853	May 3	"	Apr. 23	3 11 =	355 "	354 "	355 "	
16	1853-1854	Apr. 23	"	Apr. 12	17 56 =	354 "	355 "	355 "	
17	1854-1855	Apr. 12	"	May 1	16 3 =	384 "	384 "	383 "	17
18	1855-1856	May 1	"	~~May~~ Apr.	19 21 13 =	354 "	354 "	355 "	
19	1856-1857	~~May~~ Apr. 19	"	Apr.	8 21 28 =	354 "	354 "	354 "	
1	1857-1858	Apr. 8	"	Apr.	27 14 55 =	384 "	384 "	383 "	1
2	1858-1859	Apr. 27	"	Apr.	16 21 5 =	354 "	354 "	355 "	
3	1859-1860	Apr. 16	"	May	4 19 1 =	384 "	384 "	384 "	3
4	1860-1861	May 4	"	Apr.	24 10 23 =	355 "	355 "	354 "	
5	1861-1862	Apr. 24	"	Apr.	14 2 57 =	355 "	354 "	355 "	
6	1862-1863	Apr. 14	"	May	3 2 51 =	384 "	384 "	384 "	6
7	1863-1864	May 3	"	Apr.	21 13 18 =	354 "	355 "	354 "	
8	1864-1865	Apr. 21	"	Apr.	10 16 27 =	354 "	354 "	354 "	
9	1865-1866	Apr. 10	"	Apr.	29 9 23 =	384 "	383 "	384 "	9
10	1866-1867	Apr. 29	"	Apr.	18 11 6 =	354 "	355 "	354 "	
11	1867-1868	Apr. 18	"	May	6 6 36 =	384 "	383 "	384 "	11
12	1868-1869	May 6	"	Apr.	25 18 21 =	354 "	355 "	355 "	
13	1869-1870	Apr. 25	"	Apr.	15 10 26 =	355 "	355 "	354 "	
14	1870-1871	Apr. 15	"	May	4 10 59 =	384 "	384 "	384 "	14
15	1871-1872	May 4	"	Apr.	23 1 37 =	355 "	354 "	355 "	
16	1872-1873	Apr. 23	"	Apr.	12 9 51 =	354 "	355 "	354 "	
17	1873-1874	Apr. 12	"	May	1 4 9 =	384 "	383 "	384 "	17
18	1874-1875	May 1	"	Apr.	20 4 30 =	354 "	354 "	354 "	
19	1875-1876	Apr. 20	"	Apr.	8 7 38 =	354 "	354 "	354 "	

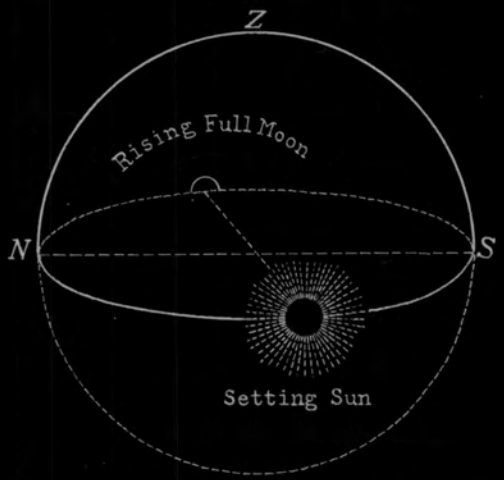
* Greenwich Mean Noon
** Jerusalem Civil Time
*** Boston Civil Time

To get J.C.T., add $14^h\ 21^m$ to paschal moon dates.

To get B.C.T., subtract $7^h\ 5^m$ from the J.C.T. dates.

	G.M.T.	J.C.T.	B.C.T.
	6939 days	6939 days	6939 days
	6940 days	6939 days	6939 days

Note: For seven years, from 1851 to 1857, the length of the lunar year is the same in both Jerusalem and Boston.



Beginning of 14 Nisan on the
Jerusalem Meridian

2h 4 m


Scorpio Libra Virgo Leo
Sagittary Scorpio Libra Virgo Leo
Capricorn Sagittary Scorpio Libra Virgo Leo Cancer
Aquarius Capricorn Sagittary Scorpio Libra Virgo Leo Cancer
Pisces Aquarius Capricorn Sagittary Scorpio Libra Virgo Leo Cancer
Aries Pisces Aquarius Capricorn Sagittary Scorpio Libra Virgo Leo Cancer
Taurus Aries Pisces Aquarius Capricorn Sagittary Scorpio Libra Virgo Leo Cancer
Gemini Taurus Aries Pisces Aquarius Capricorn Sagittary Scorpio Libra Virgo Leo Cancer
Constellations
Signs
Vernal Equinox

In Table II, five epochs in the reign of Artaxerxes are indicated. Three are taken from ancient contracts, as recorded in the Aramaic papyri, and two from the records of Ezra and Nehemiah. All five are synchronisms — the three papyri, according to Parker, being double-dated in Babylonian and Egyptian time, and the two Biblical dates fixed by solar and lunar calendars. All these epochs, therefore, tie the regnal years of the Persian king to the Julian calendar.

In the year 465 B.C., Papyrus 13 calls for an embolismic 1 Nisan on April 25. If the Jewish barley-harvest cycle had been followed on this date, 1 Nisan would have coincided with March 27, bringing the passover on April 9, one of the earliest passover dates in the 5th century B.C. The broken line in Table II leads to the embolismic 1 Nisan of Papyrus 13.

Thus we have the ancient record that the Babylonian year did not always conform to Jewish barley-harvest intercalation. (The three papyri dates in this Table are taken from A. E. Cowley. The astronomical data are based upon Ginzel.)

27
1
40
81
In Table II, 5 episodes in the reign of Artaxerxes are designated. Three are taken from ancient contracts ~~that were~~ recorded in the Aramaic Papyri, and two, ~~are taken~~ from the records of Ezra and Nehemiah. All five are ~~of the~~ synchronisms, and they therefore tie the regnal years of this Persian king to the Julian calendar.

The regnal years of the Papyri are noted in Persian reckoning, while ~~those of~~ the Feast of Trumpets and the event at Ahava are given in terms of the Jewish in the regnal year.

In the year 465 B.C. ~~the~~ Papyrus B ~~the barley harvest had~~ called for an embolismic 1 Nisan on April 25. If the Jewish Barley Harvest 4-year cycle in this year, had been followed, ~~March 27~~ 1 Nisan would have coincided with March 27, ~~as indicated by the redaction~~ bringing the passover on April 9, one of the earliest paschal dates in the 5th century B.C. The ~~redaction~~ in Table II ~~marks~~ broken line in Table II marks the embolismic position for ~~Papyrus B~~ 1 Nisan in Papyrus B ~~and~~

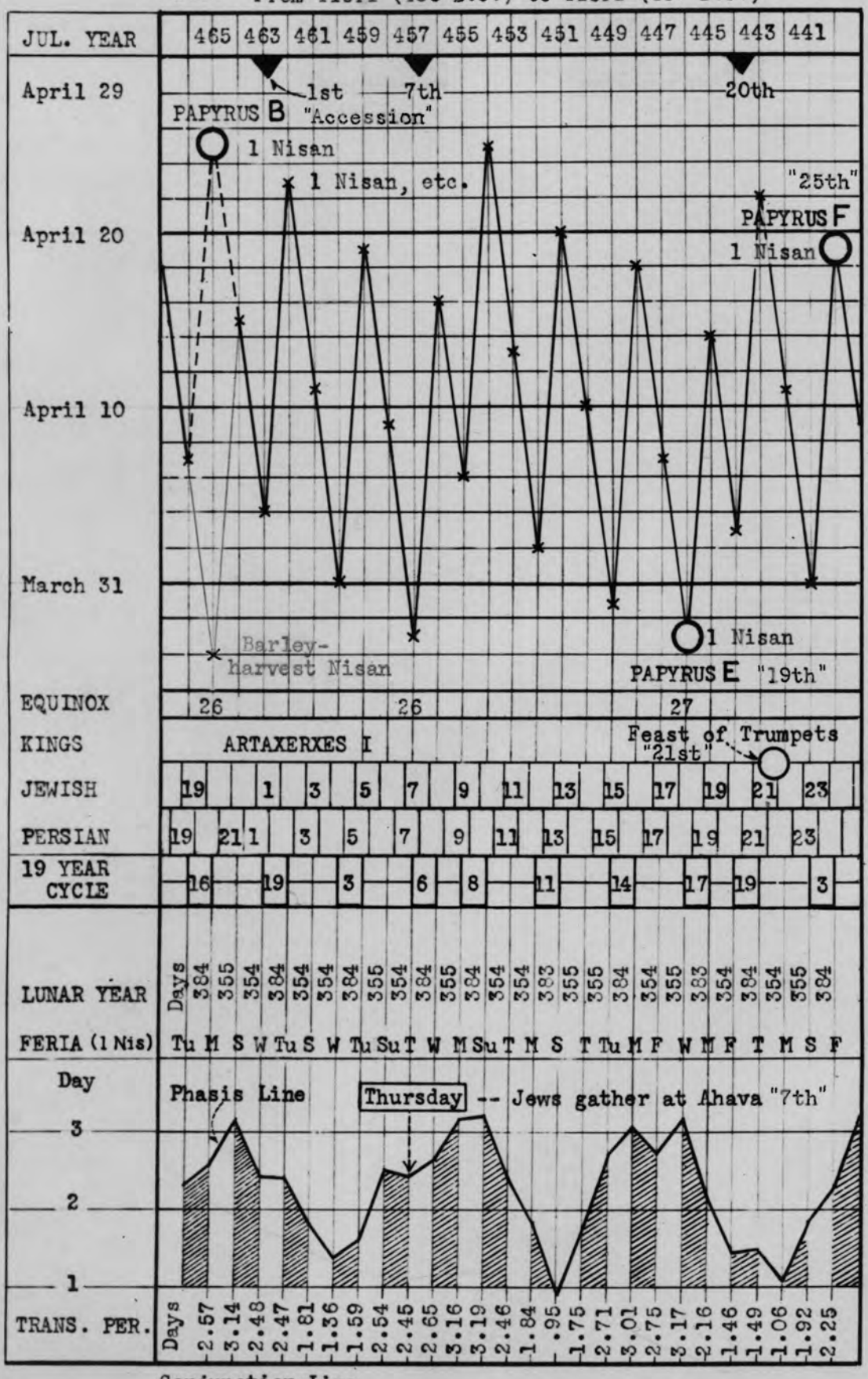
25 54 29 17 Thus the ancient ~~text~~ record that the Babylonian year did not always conform to Jewish embolisms. (The three Papyri references in this table are from A.E. Cowley. The astronomical data is based on Ginzel and Doberan.)

25 31 56 29 17

TABLE II

SEVENTH OF ARTAXERXES

B.C. From Tisri (458 B.C.) to Tisri (457 B.C.)



Conjunction Line

Table VI

Crucifixion Date

Rabbinical — Mosaic[1]

Moon Table For Years 28–33 A.D.

A.D.	Jewish Paschal F. Moons Civil Date		Nisan 13	Nisan 14	New Moons (Equinoctial)	Barley Harvest Full Moons Civil Date		Nisan Date 13	Nisan Date 14
28	Mar. 29.23	M	M	Tu	Apr. 13.68 T	Apr. 27.62	Tues.	Tues	Wed.
29	Apr. 17.21	Su	Su	M	Apr. 2.82 S	Apr. 17.21	Sun.	Sun.	Mon.
30	Apr. 6.93	Th	F	S	Mar. 22.84 W	[2] Apr. 6.93	Thur.	Fri	Sab.
31	Mar. 27.56	Tu.	Tu	W	Apr. 10.58 T	Apr. 25.94	Wed	Thur.	FRI
32	Apr. 14.47	M.	M	Tu	Mar. 29.95 S	Apr. 14.47	Mon.	Mon.	Tues.
33	Apr. 3.71	F.	F	S	Apr. 17.90 F	May 3.29	Sun.	Sun.	Mon.
34	Mar. 23.72	Tu	Tu	W	Apr. 7.58 W	Apr. 22.40	Thur.	Thur.	Fri.

[1] Ginzel, F.K., "Handbuch der mathematischen und technischen Chronologie," Leipzig, 1911, pp. 548, 578.
(Hours and minutes are written as decimal fractions of the day.)

[2] May 6.23 Sab Sun Sun if a month later.

Feria for January 1, B.C. 500-1

	B.C.																							B.C.	
F	600	F	550	T	500	T	450	W	400	W	350	T	300	T	250	M	200	M	150	S	100	S	50	S
S	599	S	549	F	499	F	449	T	399	T	349	W	299	W	249	T	199	T	149	M	99	M	49	S
M	598	S	548	S	498	S	448	S	398	F	348	F	298	T	248	T	198	W	148	W	98	T	48	T
T	597	M	547	M	497	S	447	S	397	S	347	S	297	F	247	F	197	T	147	T	97	W	47	W
W	596	W	546	T	496	T	446	M	396	M	346	S	296	S	246	S	196	S	146	F	96	F	46	T
T	595	T	545	W	495	W	445	T	395	T	345	M	295	M	245	S	195	S	145	S	95	S	45	F
S	594	F	544	F	494	T	444	T	394	W	344	W	294	T	244	T	194	M	144	M	94	S	44	S
S	593	S	543	S	493	F	443	F	393	T	343	T	293	W	243	W	193	T	143	T	93	M	43	M
M	592	M	542	S	492	S	442	S	392	S	342	F	292	F	242	T	192	T	142	W	92	W	42	T
T	591	T	541	M	491	M	441	S	391	S	341	S	291	S	241	F	191	F	141	T	91	T	41	W
T	590	W	540	W	490	T	440	T	390	M	340	M	290	S	240	S	190	S	140	S	90	F	40	F
F	589	T	539	T	489	W	439	W	389	T	339	T	289	M	239	M	189	S	139	S	89	S	39	S
S	588	S	538	F	488	F	438	T	388	T	338	W	288	W	238	T	188	T	138	M	88	M	38	S
S	587	S	537	S	487	S	437	F	387	F	337	T	287	T	237	W	187	W	137	T	87	T	37	M
T	586	M	536	M	486	S	436	S	386	S	336	S	286	F	236	F	186	T	136	T	86	W	36	W
W	585	T	535	T	485	M	435	M	385	S	335	S	285	S	235	S	185	F	135	F	85	T	35	T
T	584	T	534	W	484	W	434	T	384	T	334	M	284	M	234	S	184	S	134	S	84	S	34	F
F	583	F	533	T	483	T	433	W	383	W	333	T	283	T	233	M	183	M	133	S	83	S	33	S
S	582	S	532	S	482	F	432	F	382	T	332	T	282	W	232	W	182	T	132	T	82	M	32	M
M	581	S	531	S	481	S	431	S	381	F	331	F	281	T	231	T	181	W	131	W	81	T	31	T
T	580	T	530	M	480	M	430	S	380	S	330	S	280	S	230	F	180	F	130	T	80	T	30	W
W	579	W	529	T	479	T	429	M	379	M	329	S	279	S	229	S	179	S	129	F	79	F	29	T
F	578	T	528	T	478	W	428	W	378	T	328	T	278	M	228	M	178	S	128	S	78	S	28	S
S	577	F	527	F	477	T	427	T	377	W	327	W	277	T	227	T	177	M	127	M	77	S	27	S
S	576	S	526	S	476	S	426	F	376	F	326	T	276	T	226	W	176	W	126	T	76	T	26	M
M	575	M	525	S	475	S	425	S	375	S	325	F	275	F	225	T	175	T	125	W	75	W	25	T
W	574	T	524	T	474	M	424	M	374	S	324	S	274	S	224	S	174	F	124	F	74	T	24	T
T	573	W	523	W	473	T	423	T	373	M	323	M	273	S	223	S	173	S	123	S	73	F	23	F
F	572	F	522	T	472	T	422	W	372	W	322	T	272	T	222	M	172	M	122	S	72	S	22	S
S	571	S	521	F	471	F	421	T	371	T	321	W	271	W	221	T	171	T	121	M	71	M	21	S
M	570	S	520	S	470	S	420	S	370	F	320	F	270	T	220	T	170	W	120	W	70	T	20	T
T	569	M	519	M	469	S	419	S	369	S	319	S	269	F	219	F	169	T	119	T	69	W	19	W
W	568	W	518	T	468	T	418	M	368	M	318	S	268	S	218	S	168	S	118	F	68	F	18	T
T	567	T	517	W	467	W	417	T	367	T	317	M	267	M	217	S	167	S	117	S	67	S	17	F
S	566	F	516	F	466	T	416	T	366	W	316	W	266	T	216	T	166	M	116	M	66	S	16	S
S	565	S	515	S	465	F	415	F	365	T	315	T	265	W	215	W	165	T	115	T	65	M	15	M
M	564	M	514	S	464	S	414	S	364	S	314	F	264	F	214	T	164	T	114	W	64	W	14	T
T	563	T	513	M	463	M	413	S	363	S	313	S	263	S	213	F	163	F	113	T	63	T	13	W
T	562	W	512	W	462	T	412	T	362	M	312	M	262	S	212	S	162	S	112	S	62	F	12	F
F	561	T	511	T	461	W	411	W	361	T	311	T	261	M	211	M	161	S	111	S	61	S	11	S
S	560	S	510	F	460	F	410	T	360	T	310	W	260	W	210	T	160	T	110	M	60	M	10	S
S	559	S	509	S	459	S	409	F	359	F	309	T	259	T	209	W	159	W	109	T	59	T	9	M
T	558	M	508	M	458	S	408	S	358	S	308	S	258	F	208	F	158	T	108	T	58	W	8	W
W	557	T	507	T	457	M	407	M	357	S	307	S	257	S	207	S	157	F	107	F	57	T	7	T
T	556	T	506	W	456	W	406	T	356	T	306	M	256	M	206	S	156	S	106	S	56	S	6	F
F	555	F	505	T	455	T	405	W	355	W	305	T	255	T	205	M	155	M	105	S	55	S	5	S
S	554	S	504	S	454	F	404	F	354	T	304	T	254	W	204	W	154	T	104	T	54	M	4	M
M	553	S	503	S	453	S	403	S	353	F	303	F	253	T	203	T	153	W	103	W	53	T	3	T
T	552	T	502	M	452	M	402	S	352	S	302	S	252	S	202	F	152	F	102	T	52	T	2	W
W	551	W	501	T	451	T	401	M	351	M	301	S	251	S	201	S	151	S	101	F	51	F	1	T

S = Sunday T = Tuesday T = Thursday

G. Amadon. Mar. 16, 1941.

B.C.

1800 W	1750 𝒯	1700 𝒯	1650 M	1600 M	1550 𝒮	1500 𝒮	1450 S	1400 S	1350 F	1300 F	1250 T	1200 T	1150 W	1100 W	1050 𝒯	1000 𝒯	950 M	900 M	850 𝒮	800 𝒮	750 S	700 S	650
1799 T	1749- W	1699 W	1649- 𝒯	1599 𝒯	1549- M	1499 M	1449- 𝒮	1399 𝒮	1349- S	1299 S	1249- F	1199 F	1149- T	1099 T	1049- W	999 W	949- 𝒯	899 𝒯	849- M	799 M	749- 𝒮	699 𝒮	649-
1798 F	1748 F	1698 T	1648 T	1598 W	1548 W	1498 𝒯	1448 𝒯	1398 M	1348 M	1298 𝒮	1248 𝒮	1198 S	1148 S	1098 F	1048 F	998 T	948 T	898 W	848 W	798 𝒯	748 𝒯	698 M	648
1797- S	1747 S	1697- F	1647 F	1597- T	1547 T	1497- W	1447 W	1397- 𝒯	1347 𝒯	1297- M	1247 M	1197- 𝒮	1147 𝒮	1097- S	1047 S	997- F	947 F	897- T	847 T	797- W	747 W	697- 𝒯	647
1796 M	1746 𝒮	1696 𝒮	1646 S	1596 S	1546 F	1496 F	1446 T	1396 T	1346 W	1296 W	1246 𝒯	1196 𝒯	1146 M	1096 M	1046 𝒮	996 𝒮	946 S	896 S	846 F	796 F	746 T	696 T	646
1795 𝒯	1745- M	1695 M	1645- 𝒮	1595 𝒮	1545- S	1495 S	1445- F	1395 F	1345- T	1295 T	1245- W	1195 W	1145- 𝒯	1095 𝒯	1045- M	995 M	945- 𝒮	895 𝒮	845- S	795 S	745- F	695 F	645-
1794 W	1744 W	1694 𝒯	1644 𝒯	1594 M	1544 M	1494 𝒮	1444 𝒮	1394 S	1344 S	1294 F	1244 F	1194 T	1144 T	1094 W	1044 W	994 𝒯	944 𝒯	894 M	844 M	794 𝒮	744 𝒮	694 S	644
1793- T	1743 T	1693- W	1643 W	1593- 𝒯	1543 𝒯	1493- M	1443 M	1393- 𝒮	1343 𝒮	1293- S	1243 S	1193- F	1143 F	1093- T	1043 T	993- W	943 W	893- 𝒯	843 𝒯	793- M	743 M	693- 𝒮	643
1792 S	1742 F	1692 F	1642 T	1592 T	1542 W	1492 W	1442 𝒯	1392 𝒯	1342 M	1292 M	1242 𝒮	1192 𝒮	1142 S	1092 S	1042 F	992 F	942 T	892 T	842 W	792 W	742 𝒯	692 𝒯	642
1791 𝒮	1741- S	1691 S	1641- F	1591 F	1541- T	1491 T	1441- W	1391 W	1341- 𝒯	1291 𝒯	1241- M	1191 M	1141- 𝒮	1091 𝒮	1041- S	991 S	941- F	891 F	841- T	791 T	741- W	691 W	641-
1790 M	1740 M	1690 𝒮	1640 𝒮	1590 S	1540 S	1490 F	1440 F	1390 T	1340 T	1290 W	1240 W	1190 𝒯	1140 𝒯	1090 M	1040 M	990 𝒮	940 𝒮	890 S	840 S	790 F	740 F	690 T	640
1789- 𝒯	1739 𝒯	1689- M	1639 M	1589- 𝒮	1539 𝒮	1489- S	1439 S	1389- F	1339 F	1289- T	1239 T	1189- W	1139 W	1089- 𝒯	1039 𝒯	989- M	939 M	889- 𝒮	839 𝒮	789- S	739 S	689- F	639
1788 T	1738 W	1688 W	1638 𝒯	1588 𝒯	1538 M	1488 M	1438 𝒮	1388 𝒮	1338 S	1288 S	1238 F	1188 F	1138 T	1088 T	1038 W	988 W	938 𝒯	888 𝒯	838 M	788 M	738 𝒮	688 𝒮	638
1787 F	1737- T	1687 T	1637- W	1587 W	1537- 𝒯	1487 𝒯	1437- M	1387 M	1337- 𝒮	1287 𝒮	1237- S	1187 S	1137- F	1087 F	1037- T	987 T	937- W	887 W	837- 𝒯	787 𝒯	737- M	687 M	637-
1786 S	1736 S	1686 F	1636 F	1586 T	1536 T	1486 W	1436 W	1386 𝒯	1336 𝒯	1286 M	1236 M	1186 𝒮	1136 𝒮	1086 S	1036 S	986 F	936 F	886 T	836 T	786 W	736 W	686 𝒯	636
1785- 𝒮	1735 𝒮	1685- S	1635 S	1585- F	1535 F	1485- T	1435 T	1385- W	1335 W	1285- 𝒯	1235 𝒯	1185- M	1135 M	1085- 𝒮	1035 𝒮	985- S	935 S	885- F	835 F	785- T	735 T	685- W	635
1784 𝒯	1734 M	1684 M	1634 𝒮	1584 𝒮	1534 S	1484 S	1434 F	1384 F	1334 T	1284 T	1234 W	1184 W	1134 𝒯	1084 𝒯	1034 M	984 M	934 𝒮	884 𝒮	834 S	784 S	734 F	684 F	634
1783 W	1733- 𝒯	1683 𝒯	1633- M	1583 M	1533- 𝒮	1483 𝒮	1433- S	1383 S	1333- F	1283 F	1233- T	1183 T	1133- W	1083 W	1033- 𝒯	983 𝒯	933- M	883 M	833- 𝒮	783 𝒮	733- S	683 S	633-
1782 T	1732 T	1682 W	1632 W	1582 𝒯	1532 𝒯	1482 M	1432 M	1382 𝒮	1332 𝒮	1282 S	1232 S	1182 F	1132 F	1082 T	1032 T	982 W	932 W	882 𝒯	832 𝒯	782 M	732 M	682 𝒮	632
1781- F	1731 F	1681- T	1631 T	1581- W	1531 W	1481- 𝒯	1431 𝒯	1381- M	1331 M	1281- 𝒮	1231 𝒮	1181- S	1131 S	1081- F	1031 F	981- T	931 T	881- W	831 W	781- 𝒯	731 𝒯	681- M	631
1780 𝒮	1730 S	1680 S	1630 F	1580 F	1530 T	1480 T	1430 W	1380 W	1330 𝒯	1280 𝒯	1230 M	1180 M	1130 𝒮	1080 𝒮	1030 S	980 S	930 F	880 F	830 T	780 T	730 W	680 W	630
1779 M	1729- 𝒮	1679 𝒮	1629- S	1579 S	1529- F	1479 F	1429- T	1379 T	1329- W	1279 W	1229- 𝒯	1179 𝒯	1129- M	1079 M	1029- 𝒮	979 𝒮	929- S	879 S	829- F	779 F	729- T	679 T	629-
1778 𝒯	1728 𝒯	1678 M	1628 M	1578 𝒮	1528 𝒮	1478 S	1428 S	1378 F	1328 F	1278 T	1228 T	1178 W	1128 W	1078 𝒯	1028 𝒯	978 M	928 M	878 𝒮	828 𝒮	778 S	728 S	678 F	628
1777- W	1727 W	1677- 𝒯	1627 𝒯	1577- M	1527 M	1477- 𝒮	1427 𝒮	1377- S	1327 S	1277- F	1227 F	1177- T	1127 T	1077- W	1027 W	977- 𝒯	927 𝒯	877- M	827 M	777- 𝒮	727 𝒮	677- S	627
1776 F	1726 T	1676 T	1626 W	1576 W	1526 𝒯	1476 𝒯	1426 M	1376 M	1326 𝒮	1276 𝒮	1226 S	1176 S	1126 F	1076 F	1026 T	976 T	926 W	876 W	826 𝒯	776 𝒯	726 M	676 M	626
1775 S	1725- F	1675 F	1625- T	1575 T	1525- W	1475 W	1425- 𝒯	1375 𝒯	1325- M	1275 M	1225- 𝒮	1175 𝒮	1125- S	1075 S	1025- F	975 F	925- T	875 T	825- W	775 W	725- 𝒯	675 𝒯	625-
1774 𝒮	1724 𝒮	1674 S	1624 S	1574 F	1524 F	1474 T	1424 T	1374 W	1324 W	1274 𝒯	1224 𝒯	1174 M	1124 M	1074 𝒮	1024 𝒮	974 S	924 S	874 F	824 F	774 T	724 T	674 W	624
1773- M	1723 M	1673- 𝒮	1623 𝒮	1573- S	1523 S	1473- F	1423 F	1373- T	1323 T	1273- W	1223 W	1173- 𝒯	1123 𝒯	1073- M	1023 M	973- 𝒮	923 𝒮	873- S	823 S	773- F	723 F	673- T	623
1772 W	1722 𝒯	1672 𝒯	1622 M	1572 M	1522 𝒮	1472 𝒮	1422 S	1372 S	1322 F	1272 F	1222 T	1172 T	1122 W	1072 W	1022 𝒯	972 𝒯	922 M	872 M	822 𝒮	772 𝒮	722 S	672 S	622
1771 T	1721- W	1671 W	1621- 𝒯	1571 𝒯	1521- M	1471 M	1421- 𝒮	1371 𝒮	1321- S	1271 S	1221- F	1171 F	1121- T	1071 T	1021- W	971 W	921- 𝒯	871 𝒯	821- M	771 M	721- 𝒮	671 𝒮	621-
1770 F	1720 F	1670 T	1620 T	1570 W	1520 W	1470 𝒯	1420 𝒯	1370 M	1320 M	1270 𝒮	1220 𝒮	1170 S	1120 S	1070 F	1020 F	970 T	920 T	870 W	820 W	770 𝒯	720 𝒯	670 M	620
1769- S	1719 S	1669- F	1619 F	1569- T	1519 T	1469- W	1419 W	1369- 𝒯	1319 𝒯	1269- M	1219 M	1169- 𝒮	1119 𝒮	1069- S	1019 S	969- F	919 F	869- T	819 T	769- W	719 W	669- 𝒯	619
1768 M	1718 𝒮	1668 𝒮	1618 S	1568 S	1518 F	1468 F	1418 T	1368 T	1318 W	1268 W	1218 𝒯	1168 𝒯	1118 M	1068 M	1018 𝒮	968 𝒮	918 S	868 S	818 F	768 F	718 T	668 T	618
1767 𝒯	1717- M	1667 M	1617- 𝒮	1567 𝒮	1517- S	1467 S	1417- F	1367 F	1317- T	1267 T	1217- W	1167 W	1117- 𝒯	1067 𝒯	1017- M	967 M	917- 𝒮	867 𝒮	817- S	767 S	717- F	667 F	617-
1766 W	1716 W	1666 𝒯	1616 𝒯	1566 M	1516 M	1466 𝒮	1416 𝒮	1366 S	1316 S	1266 F	1216 F	1166 T	1116 T	1066 W	1016 W	966 𝒯	916 𝒯	866 M	816 M	766 𝒮	716 𝒮	666 S	616
1765- T	1715 T	1665- W	1615 W	1565- 𝒯	1515 𝒯	1465- M	1415 M	1365- 𝒮	1315 𝒮	1265- S	1215 S	1165- F	1115 F	1065- T	1015 T	965- W	915 W	865- 𝒯	815 𝒯	765- M	715 M	665- 𝒮	615
1764 S	1714 F	1664 F	1614 T	1564 T	1514 W	1464 W	1414 𝒯	1364 𝒯	1314 M	1264 M	1214 𝒮	1164 𝒮	1114 S	1064 S	1014 F	964 F	914 T	864 T	814 W	764 W	714 𝒯	664 𝒯	614
1763 𝒮	1713- S	1663 S	1613- F	1563 F	1513- T	1463 T	1413- W	1363 W	1313- 𝒯	1263 𝒯	1213- M	1163 M	1113- 𝒮	1063 𝒮	1013- S	963 S	913- F	863 F	813- T	763 T	713- W	663 W	613-
1762 M	1712 M	1662 𝒮	1612 𝒮	1562 S	1512 S	1462 F	1412 F	1362 T	1312 T	1262 W	1212 W	1162 𝒯	1112 𝒯	1062 M	1012 M	962 𝒮	912 𝒮	862 S	812 S	762 F	712 F	662 T	612
1761- 𝒯	1711 𝒯	1661- M	1611 M	1561- 𝒮	1511 𝒮	1461- S	1411 S	1361- F	1311 F	1261- T	1211 T	1161- W	1111 W	1061- 𝒯	1011 𝒯	961- M	911 M	861- 𝒮	811 𝒮	761- S	711 S	661- F	611
1760 T	1710 W	1660 W	1610 𝒯	1560 𝒯	1510 M	1460 M	1410 𝒮	1360 𝒮	1310 S	1260 S	1210 F	1160 F	1110 T	1060 T	1010 W	960 W	910 𝒯	860 𝒯	810 M	760 M	710 𝒮	660 𝒮	610
1759 F	1709- T	1659 T	1609- W	1559 W	1509- 𝒯	1459 𝒯	1409- M	1359 M	1309- 𝒮	1259 𝒮	1209- S	1159 S	1109- F	1059 F	1009- T	959 T	909- W	859 W	809- 𝒯	759 𝒯	709- M	659 M	609-
1758 S	1708 S	1658 F	1608 F	1558 T	1506 T	1458 W	1408 W	1358 𝒯	1308 𝒯	1258 M	1208 M	1158 𝒮	1108 𝒮	1058 S	1008 S	958 F	908 F	858 T	808 T	758 W	708 W	658 𝒯	608
1757- 𝒮	1707 𝒮	1657- S	1607 S	1557- F	1507 F	1457- T	1407 T	1357- W	1307 W	1257- 𝒯	1207 𝒯	1157- M	1107 M	1057- 𝒮	1007 𝒮	957- S	907 S	857- F	807 F	757- T	707 T	657- W	607
1756 𝒯	1706 M	1656 M	1606 𝒮	1556 𝒮	1506 S	1456 S	1406 F	1356 F	1306 T	1256 T	1206 W	1156 W	1106 𝒯	1056 𝒯	1006 M	956 M	906 𝒮	856 𝒮	806 S	756 S	706 F	656 F	606
1755 W	1705- 𝒯	1655 𝒯	1605- M	1555 M	1505- 𝒮	1455 𝒮	1405- S	1355 S	1305- F	1255 F	1205- T	1155 T	1105- W	1055 W	1005- 𝒯	955 𝒯	905- M	855 M	805- 𝒮	755 𝒮	705- S	655 S	605-
1754 T	1704 T	1654 W	1604 W	1554 𝒯	1504 𝒯	1454 M	1404 M	1354 𝒮	1304 𝒮	1254 S	1204 S	1154 F	1104 F	1054 T	1004 T	954 W	904 W	854 𝒯	804 𝒯	754 M	704 M	654 𝒮	604
1753- F	1703 F	1653- T	1603 T	1553- W	1503 W	1453- 𝒯	1403 𝒯	1353- M	1303 M	1253- 𝒮	1203 𝒮	1153- S	1103 S	1053- F	1003 F	953- T	903 T	853- W	803 W	753- 𝒯	703 𝒯	653- M	603
1752 𝒮	1702 S	1652 S	1602 F	1552 F	1502 T	1452 T	1402 W	1352 W	1302 𝒯	1252 𝒯	1202 M	1152 M	1102 𝒮	1052 𝒮	1002 S	952 S	902 F	852 F	802 T	752 T	702 W	652 W	602
1751 M	1701- 𝒮	1651 𝒮	1601- S	1551 S	1501- F	1451 F	1401- T	1351 T	1301- W	1251 W	1201- 𝒯	1151 𝒯	1101- M	1051 M	1001- 𝒮	951 𝒮	901- S	851 S	801- F	751 F	701- T	651 T	601-

1612
40
1572

Julian and Jewish Leap Years
Day of Week for January 1

Julian Time

A.D

100 Ƨ	50 S	1 S	51 F	101 F	151 Th	201 Th	251 W	301 W	351 T
99 M	49- Ƨ	2 Ƨ	52- S	102 S	152- F	202 F	252- Th	302 Th	352- W
98 T	48 T	3 M	53 M	103 Ƨ	153 Ƨ	203 S	253 S	303 F	353 F
97- W	47 W	4- T	54 T	104- M	154 M	204- Ƨ	254 Ƨ	304- S	354 S
96 F	46 T	5 Th	55 W	105 W	155 T	205 T	255 M	305 M	355 Ƨ
95 S	45- F	6 F	56- Th	106 Th	156- W	206 W	256- T	306 T	356- M
94 Ƨ	44 Ƨ	7 S	57 S	107 F	157 F	207 Th	257 Th	307 W	357 W
93- M	43 M	8- Ƨ	58 Ƨ	108- S	158 S	208- F	258 F	308- Th	358 Th
92 W	42 T	9 T	59 M	109 M	159 Ƨ	209 Ƨ	259 S	309 S	359 F
91 T	41- W	10 W	60- T	110 T	160- M	210 M	260- Ƨ	310 Ƨ	360- S
90 F	40 F	11 Th	61 Th	111 W	161 W	211 T	261 T	311 M	361 M
89- S	39 S	12- F	62 F	112- Th	162 Th	212- W	262 W	312- T	362 T
88 M	38 Ƨ	13 Ƨ	63 S	113 S	163 F	213 F	263 Th	313 Th	363 W
87 T	37- M	14 M	64- Ƨ	114 Ƨ	164- S	214 S	264- F	314 F	364- Th
86 W	36 W	15 T	65 T	115 M	165 M	215 Ƨ	265 Ƨ	315 S	365 S
85- T	35 T	16- W	66 W	116- T	166 T	216- M	266 M	316- Ƨ	366 Ƨ
84 S	34 F	17 F	67 Th	117 Th	167 W	217 W	267 T	317 T	367 M
83 Ƨ	33- S	18 S	68- F	118 F	168- Th	218 Th	268- W	318 W	368- T
82 M	32 M	19 Ƨ	69 Ƨ	119 S	169 S	219 F	269 F	319 Th	369 Th
81- T	31 T	20- M	70 M	120- Ƨ	170 Ƨ	220- S	270 S	320- F	370 F
80 T	30 W	21 W	71 T	121 T	171 M	221 M	271 Ƨ	321 Ƨ	371 S
79 F	29- T	22 Th	72- W	122 W	172- T	222 T	272- M	322 M	372- Ƨ
78 S	28 S	23 F	73 F	123 Th	173 Th	223 W	273 W	323 T	373 T
77- Ƨ	27 Ƨ	24- S	74 S	124- F	174 F	224- Th	274 Th	324- W	374 W
76 T	26 M	25 M	75 Ƨ	125 Ƨ	175 S	225 S	275 F	325 F	375 Th
75 W	25- T	26 T	76- M	126 M	176- Ƨ	226 Ƨ	276- S	326 S	376- F
74 T	24 T	27 W	77 W	127 T	177 T	227 M	277 M	327 Ƨ	377 Ƨ
73- F	23 F	28- Th	78 Th	128- W	178 W	228- T	278 T	328- M	378 M
72 Ƨ	22 S	29 S	79 F	129 F	179 Th	229 Th	279 W	329 W	379 T
71 M	21- Ƨ	30 Ƨ	80- S	130 S	180- F	230 F	280- Th	330 Th	380- W
70 T	20 T	31 M	81 M	131 Ƨ	181 Ƨ	231 S	281 S	331 F	381 F
69- W	19 W	32- T	82 T	132- M	182 M	232- Ƨ	282 Ƨ	332- S	382 S
68 F	18 T	33 Th	83 W	133 W	183 T	233 T	283 M	333 M	383 Ƨ
67 S	17- F	34 F	84- Th	134 Th	184- W	234 W	284- T	334 T	384- M
66 Ƨ	16 Ƨ	35 S	85 S	135 F	185 F	235 Th	285 Th	335 W	385 W
65- M	15 M	36- Ƨ	86 Ƨ	136- S	186 S	236- F	286 F	336- Th	386 Th
64 W	14 T	37 T	87 M	137 M	187 Ƨ	237 Ƨ	287 S	337 S	387 F
63 T	13- W	38 W	88- T	138 T	188- M	238 M	288- Ƨ	338 Ƨ	388- S
62 F	12 F	39 T	89 Th	139 W	189 W	239 T	289 T	339 M	389 M
61- S	11 S	40- F	90 F	140- Th	190 Th	240- W	290 W	340- T	390 T
60 M	10 Ƨ	41 Ƨ	91 S	141 S	191 F	241 F	291 Th	341 Th	391 W
59 T	9- M	42 M	92- Ƨ	142 Ƨ	192- S	242 S	292- F	342 F	392- Th
58 W	8 W	43 T	93 T	143 M	193 M	243 Ƨ	293 Ƨ	343 S	393 S
57- T	7 T	44- W	94 W	144- T	194 T	244- M	294 M	344- Ƨ	394 Ƨ
56 S	6 F	45 F	95 Th	145 Th	195 W	245 W	295 T	345 T	395 M
55 Ƨ	5- S	46 S	96- F	146 F	196- Th	246 Th	296- W	346 W	396- T
54 M	4 M	47 Ƨ	97 Ƨ	147 S	197 S	247 F	297 F	347 Th	397 Th
53- T	3 T	48- M	98 M	148- Ƨ	198 Ƨ	248- S	298 S	348- F	398 F
52 T	2 W	49 W	99 T	149 T	199 M	249 M	299 Ƨ	349 Ƨ	399 S
51 F	1- T	50 Th	100- W	150 W	200- T	250 T	300- M	350 M	400- Ƨ