1917phmt.proj.2

KG
11366
v.1628

CLXXVI

176

Plate No.	Date	Page
12301	Feb. 5. 1917	1
12300	" " "	11
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12501

Star Measures

1	18220	16930	18892	16598
128	10199 98	14942 48	15450	10046
25.3	97	54	50	46
	20	30	92	98
	12.80202	12.80188	25.34342	25.34348
2	17480	16973	16132	17460
166	12254 5-9	12183 84	99770	13813
5.7	64	65	70	13
	80	73	32	60
	16.52211	16.52111	56362	56353
3	17490	16320	16103	16312
3499	7578	16258	7601	14810
12.8	78	28	01	10
	90	20	03	12
	34991 23499 08		12850 2	12849 8

Moon

1			16662	18404
21			13467 91	11590
14.3			76	90
			62	04
			14.31916	14.31866
2	16000	16815		
204	12698	10113		
12-	98	13		
	00	15-		
	20.33022	20.32988		
3	17234	16740		
201	16260	76994 99		
15.8	60	09		
	34	41		
	20.09974	20.09559		

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12301

Star Measures

I	18220	16930	18892	16598
12.8	10199 98	14942 48	15450	10046
25.3	91	54	50	46
	20	30	92	98
	12.80222	12.80188	25.34422	25.34488
II	17480	16973	16132	17460
66	12254 59	12183 54	49770	13813
5.7	64	85	70	13
	80	73	32	60
	16.52221	16.52114	56362	5.63553
III	17490	16320	16103	16312
3499	7578	16258	7601	14870
12.8	78	24	01	10
	90	20	03	12
	34991 2	34990 4	128502	128498

Moon

II			16662	18404
1.1			13466 21	11590
14.3			76	40
			62	04
			14.31991	14.36586
III	16000	16815		
20.4	12648	10013		
15	96	13		
	00	15		
	20.33302	20.32938		
III	17234	16740		
20.1	16260	76 99		
15.8	60	09		
	34	40		
	20.09194	20.09559		

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12381

4. Moon

20.	17250		16726
16	16280	82	7692
	84		92
	50		26
	20.09668		20.09636

5.	17860		16434
305	13168		11130
17.	68		30
	60		34
	20.46892		20.46896

6	18280		16788
21	13584		11480
17.4	84		80
	80		88
	17.46896		17.46892

7	16350		16880
22	9208	04	14040 36
177	00		32
	50		80
	17.71146		17.71156

8	16590		16995
23	13175		10473 16
17.3	75		19
	90		95
	17.34165		17.34211

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4. Moon

20	1 17250		16726	
16	16280	++	7692	
	84		92	
	50		26	
	2009168		2009966	

5	17860		16434	
05	13168		11130	
7	64		30	
	60		34	
	2046892		2.1.46.96	

6				
21				
17.4				
	16280		16788	
	13564		11480	
	84		80	
	80		88	
	17.4696		1746.92	

7				
22				
177				
	16350		16480	
	9208	04	14040	3
	00		32	
	50		80	
	1771496		1.771.56	

8				
23				
17.3				
	16540		16495	
	13175		10433	16
	75		19	
	90		95	
	1734.15		17.3421	

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Date Feb 5. 1917

Exp 8 Stars	12	47			12	59		
" " Moon	12	53	07.3		12	53	07.6	
Clock fast		13	38.0					
M. Sid. Time	12	39	29.45					
M. Long	04	44	31.05		θ = +3		58	
G. Sid. Time	17	24	00.50					
G " " M.T	21	0	15.14					
Interval	20	23	45.36					
Red		-03	20.48					
G. M.T	20	20	24.88		20	34	02	

From Naut. Alman.

		R.A			Dec.		
Moon	20h	08 40	47.10		+16	36	56.5
Motion	1/2		1.9362				-10.064
motion	20.4147		39.53		-03	25	4
Tabular Place		08 41	26.63		+16	33	31.1

Moon age 14d

934" = 8.6

a = -507.5
+24
-483.5

Parallax 53 57.23
Semi-dian 14 43.6
R 883.6
Aug 7.8
Dif 3 -05
R 890.9
R 1.9097
a R 923
(1+a)R 1.8174
R² 3.3029

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1917phae.proj.2

Date Feb 5. 1917

Expt Stars	12	47			12	59	
" " Moon	12	53	07.3		12	53	07.6
Clock fast		13	38.0				
Sid Time	12		29.45				
Long	04		31.05		$\Theta = +3^{h}\ 58^{m}$		
Sid Time	17		0.50				
" " M.N	21	0	15.14				
Interval	20	23	45.36				
Red		03	20.48				
G M.T	20	20	24.88		20h	34	02.55

From Naut. Almanac.

				RA			Dec.		
Moon	20h	08	40	47.10		+16	36	56.5	
Motion 1h				1.9362				10.064	
Motion 20.4147				39.53			−03	25.4	
Tabular Place	08	41	26	63		+16	33	31.1	

Moons age 14d

934 : 86

$a = -5^{m}07.5^{s}$
$+24$
-483.5^{s}

Parallax	58	57.23
Semi-diam	14	43.6
R		883.6
Comp		7.8
2nd 3		.05
R		890.9
R		1.40471
a R		923
(1+a) R		1.81744
R2		330294

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12301

Plate Constants

y	12.8020	16.5216	34.9910
S	12.7570	16.7404	36.1198
y-S	+ 0450	- .2188	- 1.1288

y	25.3445	5.6358	12.8500
η	26.1636	5.4748	13.1401
y-η	- .8191	+ 1610	- 2901

Y-S	+ 5.00 X		- 38 y	+ 7.5 X	- 5.983
+ 0450	+ 6401	= 6851	- 963	= 5888	+ 96 = 5984
- 2188	+ 8261	= 6073	- 214	= 5859	+ 124 = 5983
- 1.1288	+ 17496	= 6208	- 488	= 5720	+ 263 = 5983 ✓
21.9122	+ 10956		- 604		+ 164 = 22.3655

y-η	+ 5.00 y		+ 46.6 X	+ 6.1 y	- 5233
- 8191	+ 12672	= 4481	+ 597	= 5078	+ 155 = 5233
+ 1610	+ 2818	= 4428	+ 770	= 5198	+ 35 = 5233
- 2901	+ 6425	= 3524	+ 1630	= 5154	+ 79 = 5233 ✓
15.8936	+ 7947		+ 1021		+ 97 = 16.2768

Table	a = - 3.4	e = - 2.7	a - e = - 0.7	f + d = - 60
	- 507.5	- 506.1	= - 1.4	= - 58.6
	- 504.1	- 5034	- = 0.7	- 2.6

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12301

Plate Constants

x	128020	165216	349910
ξ	12 7 5 7 0	16 7404	36 1198
x-ξ	+ 0450	- 2188	- 11288

y	25.3445	5.6358	12.8500
η	26 1636	5 4748	13 1401
y-η	- 8191	+ 1610	- 2901

1 - ξ	+ 5.00 x	- 34 y	+ 7.5 x	- 5.983
.0450	+ 6401	- 6851	- 963	= 5.8858 + 96 = 5.9854
2188	+ 8261	= 6073	- 214	= 5.8559 + 424 - 5983
1.1288	+ 17496	= 6208	- 488	= 5.7720 + 263 = 5983
1.19122	+ 10956		- 604	+ 164 = 22.3655

- η	+ 5.00 y.	+ 46.6 x	+ 6.1 y	- 5233
8191	+ 12672	= 4481 + 597	= 5078	+ 155 = 5233
1610	+ 2818	= 4428 + 770	= 5198	+ 35 = 5233
2901	+ 6425	= 3524 + 1630	= 5154	+ 79 = 5233
5.8946	+ 7947	+ 1021		T 97 = 16.2768

Cathe	a = - 3.4	e = - 2.7	a - e = - 0.7	b + d = - 6.1
	- 5.07.5	- 5.06.1	= - 14	= - 5.6

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12301

Moon Center

1	21.00000	− 09130	− 10	0·83554	33078	+	49
2	20.33080	− 1.5806	− 6	2.5002	32992	−	37
3	20.09660	− 1.8180	− 0	3.3051	33051	+	22
4	20.09667	− 1.8163	+ 1	3.2986	33098	+	69
5	20.46944	− 1.4436	+ 8	2081.6	33046	+	17
6	21.00000	− 0.9130	+ 10	0.8317	33056	+	27
7	21.91300	− 0.00000	+ 13	0.00000	33044	+	15
8	23.00000	+ 1.0870	+ 10	1.1837	32906	−	123
					33029		

					arc
1	14.31894	− 1.5725	+ 1	2.4724	210
2	15.00000	− 0.8940	+ 1	0.7990	241
3	15.89400	− 0.00000	+ 0	0.00000	270
4	16.00000	+ 0.10060	− 0	0.01120	273
5	17.00000	+ 1.10060	− 1	1.22300	308
6	17.46944	+ 1.5730	− 1	2.4739	330
7	17.71529	+ 1.8180	− 2	3.3044	360
8	17.34488	+ 1.4506	− 1	2.10699	36

Range 186

X = 21 y = 14.31894
17.46944
31.78838
y_0 15.89402
y_{min} 17.71529
R 1.82099
Corr R 1.81974
x_{min} = 20.09666
X_0 21.91400

Remeasured plate

Moon Center $\begin{cases} X_0 & 21.91300 \\ Y_0 & 15.89400 \end{cases}$

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12300

Moon Earth

5

					O − C
1	21.00000	− 09130 − 10	08354	33078	+ 149
2	20.33000	− 1.57000 − 6	2.50052	32982	− 37
3	20.04666	− 1.81884 − 0	3.30551	33051	+ 32
4	20.04667	− 1.81863 + 1	3.29886	33098	+ 69
5	20.46944	− 1.44336 + 8	2.08414	33046	+ 17
6	21.00000	− 0.91330 + 10	0.83366	33056	+ 127
7	21.91940	− 0.00000 + 13	0.00000	33044	+ 115
8	23.00000	+ 1.08910 + 10	1.18336	32906	− 123
				33029	

				arc
1	14.31889	− 1.57255 + 1	2.47824	210
2	15.00000	− 0.89940 + 1	0.79910	241
3	15.89400	− 0.00000 + 0	0.00000	270
4	16.00000	+ 0.10660 − 0	0.01120	313
5	17.00000	+ 1.10660 − 1	1.22230	308
6	17.46944	+ 1.57330 − 1	2.47839	330
7	17.71551	+ 1.81880 − 2	3.30454	360
8	17.34488	+ 1.44816 − 1	2.10668	36
				Range 186

X = 21 y = 14.31889
17.46944
31.78833
y_0 15.89402
y_{max} 17.71551
R 1.82049
Corr R 1.81874
x_{max} = 20.04666
X_0 21.91400

Remeasured plate

Moon Center $\begin{cases} X_0 & 21.91300 = \\ Y_0 & 15.89440 \end{cases}$

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1	+ 1.42	− 119.0	− 206.0
2	+ 1.41	− 126.2	− 71.0
3	+ 0.00	− 0.0	− 0.0
4	− 0.20	− 190.7	+ 11.5
5	− 1.60	− 57.6	+ 44.4
6	− 1.42	− 110.0	+ 193.5
7	− 0.00	− 6.0	+ 132.0
8	+ 1.57	− 183.0	− 242.8
	+ 1.40	− 786.5	+ 481.4
	− 3.22		− 519.8
	+ 1.18		− 38.4

Same.

	− 44.7	− 780
	+ 58.5	+ 32.9
	− 40.0	− 00
	− 125.3	+ 7.6
	− 24.5	+ 18.9
	− 24.6	+ 42.4
	− 00	+ 27.2
	− 134.0 ½ mm	− 178.2
	+ 58.5	+ 129.0
	− 2926	− 2562
	− 234.1	− 127.2

a = −36	a	b	c
b = +20	+ 33	− 31	− 64
c = −66	+ 57	− 18	− 27
	+ 66	− 0	0
	+ 66	+ 2	+ 2
	+ 52	+ 22	+ 8
	+ 33	+ 32	− 1
	+ 0	+ 36	− 30
	− 39	+ 29	− 76

did not use

			O − C	Corr
+ 14	+ 14	= + 28	+ 21	− 43
+ 25	+ 8	= + 33	− 70	− 97
+ 29	+ 0	= + 29	− 7	− 7
+ 39	− 1	= + 28	+ 41	+ 43
+ 23	− 10	= + 13	+ 4	+ 12
+ 14	− 14	= 0	+ 27	+ 26
+ 0	− 16	= − 16	+ 31	+ 1
− 17	− 13	= − 30	− 93	− 169

+ 124 − 170

or 37

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2301

Conditional Equations. O-C

1	−0.91	−1.57	= +	49	+ 51	− 34	= +47	+ 84
2	−1.58	−0.89	= −	37	+ 89	2	= +87	− 7
3	−1.82	−0.00	= +	22	+ 102	− 0	= +102	−107
4	−1.82	+0.11	= +	69	+ 102	+ 0	= +103	+ 3
5	−1.44	+1.11	= +	17	+ 81	+ 2	= +83	− 43
6	−0.91	+1.57	= +	27	+ 51	+ 4	= +55	+ 68
7	−0.00	+1.82	= +	15	+ 0	+ 4	= +4	+123
8	+1.09	+1.45	= −	123½	− 61	+ 3	= −58	−110

+278 −267

ave 67

Plate Plane Coord.

opposite page.

+14.05 +1.18 = −786.5

+ 1.18 +12.41 = − 88.4

−( ) − 0.10 = + 66.0

+12.31 = + 27.6

+14.05 = −786.5 − 2.6 = −789.1

14.04 +1.18 = −2341 −7.39

+1.18 +12.41 = −127.2 +3.60

−( ) − .09 = + 19.7 +0.30Δ

+12.32 = − 107.5 b = − 8.7

+14.04 = −2341 + 10.3 = −2238 a = − 15.9

− 0.55Δ

ave 186 $\frac{-5.7}{38} = -15''$ R = 1.82

$\frac{R}{2}$ = .38 ΔR = − 0.2 −2Rc = −3.28

Corr + 0.9 Δk = − 0.98 | ΔS = − 0.5

$\frac{2K}{2}$ = − 5.7 True ΔR = −1.1 Δa = + 1.80 | Δθ = + 0.06

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Conditional Equations. O-C

1	−0.41	−1.57	= +1.49		+51	−54	= +47	+84
2	−1.58	−0.89	= −.87		+89	2	= +87	−1
3	−1.82	−0.00	= +.22		+102	−0	= +102	−107
4	−1.82	+0.11	= +1.69		+102	+0	= +106	+3
5	−1.44	+1.58	= +.17		+81	+2	= +83	−43
6	−0.41	+1.57	= +1.27		+51	+4	= +55	+68
7	−0.00	+1.82	= +1.45		+0	+4	= +4	+123
8	+1.09	+1.45	= −1.23½		−61	+3	= −58	−110

+278 −278

~~av 67~~

opposite page.

+14.05 +1.18 = −786.5

+1.18 +12.41 = −58.4

−( ) −0.10 = +66.0

+12.31 = +276 b = +

+14.05 = −786.5 −26 = −789.1 a = −

14.04 +1.18 = −234.1 −739

+1.18 +124.1 = −127.2 +3.60

−( ) −.09 = +197 +0.30Δ

+1232 = −1075 b = −8.7

+14.04 = −234.1 +103 = −2238 a = −159

−0.55Δ

ave 186 $\frac{-5.7}{38} = -.15$ R = 1.82

$\frac{R}{n} = .38$ ΔR = −0.2 −2Rc = −3.28

con +0.9 Δk = −0.98 ΔS = −0.3

$\frac{2k}{3} = -5.7$ True ΔR = −1.1 Δa = +180 ΔA = +686

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12381 Moore's Mean Position 7

x_0 21.9130
− 8
21.9122

15.8940
− 4
15.8936

From Plate Constants.

22.3655
22.
S_0 + 0.36555

16.2768
18.
−1.7232

log S_0 9.556289
Cor. S_0 9.982688
850724
Sin α-A 1.07297

log ½ δ 9.45889
S_0^2 9.12558
7.05334
log n_1 5.63811

α-A + 11.83
1.80
A 08 38 48.31

n_1 0
n_0 − 1.7232
log n_0 0.23634
7.33115
log tan δ-E 2.90519n

α 08 39 0.14
Red. + 2.91
α' 08 39 03.05

δ-D − 803.9
− 13 23.9
D +16 17 49.4

δ 16 04 25.5
Red. − 8.7
δ' 16 04 16.8

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12301

Moons Mean Position

x_0 21.91308
− 8
21.91222

15.89405
− 4
15.89361

From Plate Constants

22365.5
22.
S_0 + 0.36455

16.27888
1.
−1.72227

$\log S_0$ 9.562899
ch. S_0 998268
8.5729
Sun-A 1.172998

log a S 9.45849
S_4 9.12588
7.15334
log n_1 5.63881

n_4 0
n_1 −1.72227
log n_1 0.236224 n
7.331155
log T_m S_2 2.405069 n

X-A (1)+11.883
(1)
A 08 38 48.831

X_0 08 39 10.14
Red + 2.91
X' 08 39 03.023

S_2 −803.9
− 113.239
E +16 17 49.4

S_4 16 04 25.5
Red − 8.7
S' 16 04 16.8

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12301

Lunar Parallax

α	08	39	03.05
Θ	12	39	29.45
$\Theta - \alpha$	+4	0	26.40
=	+60°	06	36.00
$\frac{1}{2}(\alpha + \alpha')$		18	03.10
$\Theta - \frac{1}{2}(\alpha + \alpha')$	59°	48	32.90

	9.957271
$\cos \frac{1}{2}(\alpha - \alpha')$	9.999999
$\sec \Phi - \frac{1}{2}(\alpha + \alpha')$	0.298453
$\log \tan Y$	0.255779

Y	60	58	28.0
δ'	16	04	16.8
$Y - \delta'$	44	54	11.2

	9.826400
$\log \sin \Pi$	8.195733
$\sin (Y - \delta')$	9.848715
$\operatorname{Cosec} Y$	0.058291
$\sin (\delta - \delta')$	7.929171

$\delta - \delta'$	+ 29	12.3	
δ	16	33	29.1
eph δ	16	33	31.1
O - C		- 2.0	
Corr.		+ 0.5	
Final Red.		0.0	
δ =	16	33	29.6
O - C =		- 1.5	

Π	53	57.23	
	9.869130		
$\log \sin \Pi$	8.195730		
$\log \sin \Theta - x'$	9.938010		
$\log \sec \delta'$	0.018400		
$\log \sin \frac{1}{2}(\alpha - \alpha')$	8.021270		
$\frac{1}{2}(\alpha - \alpha')$	+ 3.6	06.2	
=	+ 2	24.41	

α	08	41	27.46
eph α	08	41	26.63
O - C		+ 0.83	
Corr.		- 0.01	
α =	08	41	27.45
O - C =		+ 0.82	

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12301

Lunar Parallax

α	08	39	03.05
Θ	13	39	29.45
$\Theta - \alpha'$	+4	0	26.40
=	+60°	06	36.90
$\frac{1}{2}\lambda - \chi$		18	03.10
$\Theta - \frac{1}{2}\lambda - \frac{1}{2}\chi'$	59°	48	33.80

	9.957127
Cos ½ λ χ'	9.999999
Sec Θ - ½ λ - ½ χ'	0.298853
log tan γ	0.255778

γ	60	58	38.0
δ'	16	04	16.8
$\gamma - \delta'$	44	54	21.2

	9.826400
log sin π	8.195778
Sin γ - δ'	9.848873
Cosec γ	0.058829
Sin δ - δ'	7.929178

$\delta - \delta'$	+	29	12.3
δ	16	33	29.1
Sph δ	16	33	31.1
O - C			- 2.0
Corr.			+ 0.5
Final Red			0.0
δ -	16	33	29.6
O - C			- 1.5

π 53 57.27

	9.986913
log sin π	8.195778
Sin Θ - χ'	9.938801
Sec δ'	0.015740
Sin χ α'	8.021298

$\chi - \alpha'$	+	36	06.25
=	+	2	24.41

α	08	41	27.46
Sph α	08	41	26.63
O - C			+ 0.83
Corr			- 0.01
α	08	41	27.45
O - C			+ 0.42

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12300 Star Measures Dec. 11

2.	16843		16678		16328		16033
166.	11358	5-5-	12158	60	11628	25-	10727
55.	52		62		22		27
	43		78		28		33
	16.5488		12.5482		5.4703		5.4694
1.	16772		16597		16570		18152
129.	14887	89	8470		7700	02	17020
25.7	91		70		04		22
	72		97		70		52
	25.1883		25.1873		12.8866		12.8869
3.	16800		19448		16115		16250
350	16382	78	9866		9800	96	12572
12.7	74		66		92		70
	00		48		15-		50
	35.0422		35.0418		12.6319		12.6321

Moon Measures

1.					19140		16540
20.					10545	55-	15110
14.9					65		20
					40		40
					14.8585		14.8565
2.	16011		16895				
19.9	72704		15788				
15.	78		82				
	18		95				
	19.8877		19.8887				
3.	17917		16783				
196	12480		12230				
16	80		30				
	17		82				
	19.5437		19.5447				

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12300 Star Measures Dr. 11

2	16843		16678		16228		16033
10.6	11358	55	12158	60	11628	25	10727
5.5	52		62		22		27
	43		78		28		33
	165488		125482		54603		54694

4	16772		16597		16570		18152
12.9	14887	59	18470		7700	02	17020	21
25.2	91		70		04		2
	72		97		70		52
	251883		251873		128868		128969

3	16800		19448		16115		16250
35.0	16382	78	9866		9800	96	12572
12.7	74		66		92		70
	00		48		15		50
	350422		350418		126319		126321

Moon Measures

1	1				19940		16540
20.6					10545	55	15110	15
14.9					65		20
					40		40
					148582		148565

2	16018		16845				
19.9	72700	74	15788				
15.	76		82				
	18		95				
	98877		98881				

2	17917		16783				
19.6	12480		12230				
16	80		30				
	11		83				
	195437		195447				

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4. 16492 16680
19.6 83946 14772
16 98 72
92 80
19.80962 19.80922

5.
20
17.2

18190 16454
15577 75 9050
73 50
90 54
17.26157 17.25956

6
21
17.9

18970 16120
10540 42 14550
44 50
70 20
17.84228 17.84320

7
21.4
17.9

16408 16760
7630 15530
30 30
08 60
17.87718 17.87710

8
22
17.8

16350 16530
8732 14144 42
32 40
50 30
17.76182 17.76172

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4
19.6
16

16492 16680
8394,6 14772
98 72
92 80
19.8096 19.8092

5.
20
17.2

18190 16454
15°57'75" 90 57
73 57
90 54
17.26 15° 17.2594

6
21
17.4

18970 16121
105°40 42 145°57
44 57
70 20
17.8428 17.8430

7
21.4
17.4

16408 16760
7630 15°53°30
30 30
08 60
17.8718 17.8770

8
22
17.8

1635°0 16530
8732 14144 42
32 40
50 30
17.7618 17.7612

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12300

Feb 3. 1917

Juno

Exp. of Stars.	12	34			12	46		
" " Moon	12	39	46.0		12	39	46.3	
clock fast		13	38.0					
	12							
74. Sid. June	12	26	08.15					
Z. Long	04	44	31.05					
G. Sid. June	17	10	39.20					
" " M.N	21	0	15.14					
Interval	20	10	24.06					
Red		03	18.29					
G. M.T	20	07	05.77		20h	11	27.4	

$\theta = +3^h\ 45^m$

Moon 20h	8	40	47.10		+16	36	56.5	
motion 1m			1.9366				-10.057	
" 7.09617			13.74		-	01	11.4	
Tabular Place.	8	41	0.84		+16	35	45.1	

Moon's age 14d.

934 = 9.1

$a = 5057$
$+240$
-4817

Parallax	53	57.23
Semidiam	14	43.7
R		883.7
Aug		8.2
Dec 3		-0.3
R		891.6
R		1.9112
qR		-.9211
(1+q)R		1.8191
R^2		3.30922

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2300

Feb 7 1917

Times

Exp ♄ Stars	12	34			12	46	
" " Moon	12	39	46.0		12	34	46.3
Clock fast		13	38.0				
☿ Sid Time	12	26	08.15				
☿ Long	04	44	31.05				
G Sid Time	17	10	39.20				
" " " M.N	21	0	15.14				
Interval	20	10	24.06				
Red		03	18.29				
G M.T	20	07	05.77				

∴ ε = +3 h 45 m

21 h 11 m 27 s

Moon 20 h	-8	40	47.10		+16	36	56.5
Motion 1 m			1.9366				-10.05
7.09617			13.74			-01	11.4
Tabular Place	8	41	0.83		+16	35	45.1

Moons age 14 d.

934 : 9.1

Parallax	53	57.23
Semidiam	14	43.7
R		883.7
Aug		8.2
Δ		-03
R		8916
R		1.9112
qR		-921
(1+q)R		1.8191
R²		3.3092

a = 505.7
+240
-481.7

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S_0	η_0	ΔS	-5^S	$-5'\eta$	-7^V
-9.24	$+8.13$	-35^-	$+46 = +11$	$-4 = +7$	
-5.26	-12.53	-25^-	$+26 = +1$	$+6 = +7$	
$+14.11$	-4.92	$+75^-$	$-70 = +5^-$	$+2 = +7$	
m -0.27	-1.36		$+1^V$	$+1 = -5^{-V} = -0.02^V$	

$\Delta\eta$	-4.1η	$+.2S$	$+5^{-V}$
$+30$	$-33 = -3.$	$-2 = -5.$	
-55^-	$+51 = -4$	$-1 = -5^-$	
-28	$+20 = -8$	$+3 = -5^-$	
	$+6$	$0 = +11^V = +0.5^{-V}$	

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12300. Standard Coordinates. 14

	Cafe No. 1202 mg. 8.4	Cafe No. 1207 mg. 8.2	Cafe No. 1223 mg. 6.3
C	08 32 49.40	08 35 02.42	8 45 27.35
y	49.34	02.46	27.36
t	A.C. 49.50	A.C. 02.36	27.31
m	08 32 49.43	08 35 02.44	8 45 27.34
Prec	− 57.81	+ 56.87	56.87
α	08 33 47.24	08 35 59.31	8 46 24.21
A	08 38 48.31	08 38 48.31	8 38 48.31
α − A	− 05 01.07	− 02 49.00	+ 07 35.90
Sin α − A	− 301.04	− 169.00	+ 455.82
log "	2.478634	2.222789	2.658579
" cos δ	9.997978	9.985607	9.998357
" S₀	0.965565	0.720073	1.149600
S₀	− 9.2396	− 5.2569	+ 14.1123
S₁	− 34	− 26	+ 75
S	12.75770	16.74704	36.1198
X	12.88668	16.54885	35.04200
x − S	+ 1298	− 1919	− 1.0778
C	17 24 34.1	14 43 57.5	15 43 17.7
y	34.4	58.2	17.6
t	34.9	57.9	17.1
m	17 24 34.5	14 43 58.0	15 43 17.5
Prec	− 03 31.3	− 03 33.9	03 44.6
δ + 17°	21 03.2	+ 14 40 24.1	+ 15 39 32.9
D	16 17 49.4	16 17 49.4	16 17 49.4
δ − D	+ 1 03 13.8	− 1 37 25.3	− 38 16.5
tan δ − D	+ 3794.2	− 5846.9	− 2296.6
log "	3.579125	3.766923	3.361085
" n₀	0.910277	1.098073	0.692233
tan δ	94947	94180	94476
log S₀²	1.9313	1.4415	2.2992
" n₁	8.47944	7.91229	8.80022
n₀	+ 8.1334	− 12.5334	− 4.9230
n₁	+ 302	+ 82	+ 0.0631
n	26.1636	− 5.4748	13.1401
y	25.1878	5.4698	12.6320
y n	− .9758	− 0050	− .5081

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12300 Standard Coordinates. 14

	Cape No. 1202 mg. 8.4	Cape No. 1207 mg. 8.2	Cape No. 1223 mg. 6.3
C	08 32 49.40	08 35 02.42	8 45 27.35
4	49.34	02.46	27.36
E	AC 49.50	AC 83.50	27.31
m	08 32 49.43	08 35 02.44	8 45 27.34
Red	− 51.31	− 56.87	56.87
x	08 33 47.24	08 35 59.31	8 46 24.21
A	08 38 48.31	08 38 48.31	38 48.31
x − A	− 05 01.07	− 02 49.00	07 35.90
Δx − A	− 3 00.4	− 169.00	+ 455.82
log cos δ	2.478634n	2.222189n	2.658719
log sin S₀	9.971978	9.985760	9.983507
log S₀	0.965663n	0.720713n	1.142490
S₀	− 9.23986	− 5.25569	+ 14.11123
S	− 34	− 26	+ 75
S	21.27516	16.74404	36.11198
λ	12.88668	16.54835	35.04200
λ − S	+ 1298	− 1918	+ 1.07178

C	17 24 34.1	14 43 57.5	15 43 17.7
4	34.4	58.2	17.6
E	34.9	AC 58.5	17.1
m	17 24 34.5	14 43 58.0	15 43 17.5
Red	− 03 31.3	− 03 33.9	03 44.6
δ	+ 17.21 03.2	+ 14 40 24.1	+ 15 39 32.9
D	16 17 49.4	16 17 49.4	16 17 49.4
δ − D	+ 11 03 13.8	− 1 37 25.3	− 38 16.5
Δ δ − 2	+ 37942	− 55467	− 22966
log Δ	3.57912	3.766692n	3.361088n
log R₀²	0.910271	1.098807n	0.692223n
tan δ	9.49947	9.41179	9.44786
log S₀²	1.98113	1.44115	2.24992
m₁	8.47994	7.91126	8.80002
η₀	+ 81.3534	− 12.5354	+ 4.9230
η₁	+ 0.3072	+ 0.0782	+ 0.0631
η	26.86736	5.47748	13.14011
y	25.46778	5.46698	12.63220
y − η	− .97958	− .00050	− .50781

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12306 Plate Center + Constants. 15

16.5485 54698 08 35 59.31 14 40 24.1
22 18 +02 49.00 +01 37 26.3
+5.4515 12.5302 08 38 48.31
31 466.5
+169.00 +5845.3

Plate Center { A 08 38 48.31
D = +16 17 49.4

X-S +500X -69.3Y +5.7X -6070
+1298+6443 = 7741 -1745 = 5996 +73 = 6069
-1919+8274 = 6355 -379 = 5976 +94 = 6070
-1.0778+175.21 = 6743 875 = 5868 +202 = 6070
21.365 2 +10683 -1113 +122 = 21.7274

Y-n +500Y +75.9X +648 -3975
-9758+12594 = 2836 +978 = 3814 +161 = 3975
-0050+2735 = 2685 +1256 = 3941 +35 = 3976
-5081+6316 = 1235 +2660 = 3895 +80 = 3975
16.058 5 +8029 +1621 +103 = 16.6363

Tables a = -2.8 c = -2.5 a-c = -0.3 a+d = -5.8
-505.7 -506.4 = +0.7 = -6.6

-502.9 -503.9 +1.0 -0.8

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12300

Plate Center + Constants. 15

16.5485 + 54698 08 35 59.31 + 4 40 24.1
22 18 + 02 44.00 + 01 37 26.7
+5.4515 125302 08 38 48.31
31 466.5
+169.00 +58453

Plate Center { A 08 38 48.3 L
D = +16 17 49 4

-S + 5.00 X -693 Y +5.7 X - 6070
298 + 6443 = 7741 + 1745 = 5946 + 73 = 6069
919 + 8274 = 6355 = 3779 = 5976 + 94 = 6070
0778 + 17521 = 6743 875 = 5868 + 202 = 6070
21365.2 + 10683 - 1113 + 122 = 21.7274

-η + 5.00 Y + 75.9 X + 6.4 Y -3975
17584 + 12594 = 2836 + 9978 = 3814 + 161 = 3975
10510 + 27355 = 2685 + 12556 = 3941 + 35 = 3976
0851 + 63116 = 1235 + 26600 - 3945 + 80 = 3978
16058.5 + 2029 + 1621 + 1123 = 16.6563

also a = -2.8 b = -25 a - c = -0.3 f + d = -5.8
-505.1 -506.4 = +0.7 = -6.6

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12300 Moon Center. 16

					O-C.
1	20.00000	-1.36307	185.97	3.30311	- 61
2	19.88822	-1.47488	21768	3.29881	-111
3	19.54422	-1.81888	33081	3.33081	- 11
4	19.80944	-1.55536	24121	3.29774	-118
5	20.00000	-1.36307	185588	3.29894	- 98
6	21.00000	-0.36307	0.13140	3.33126	+ 34
7	21.36330	-0.00000	0.00000	33058	- 34
8	22.00000	+0.63370	0.40770	33048	- 44
				33092	

					arc
1	14.85775	-1.20153	1.44434		229
2	15.00000	-1.05978	1.12113		234
3	16.05900	-0.00000	0.00000		270
4	17.00000	+0.94107	0.88553		301
5	17.26061	+1.20161	1.44436		311
6	17.84299	+1.78399	3.18166		349
7	17.87741	+1.81841	3.33158		360
8	17.76155	+1.70255	2.89778		20

Range 151

y = 20 y = 14.85775
17.26061
32.11836
y 16.05900
y max° = 17.87741
R 1.81841
Corr R 1.81911
X min 19.54422
21.36333

Moon Center { X₀ 21.36330
Y₀ 16.05900

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12300 Moon Center. 16

					O-C.
1	20 0 0 0 0 0	-1.3630-7	18597	33031	-61
2	19 8 8 8 2	-1.4748-6	21768	32981	-111
3	19 5 4 4 2	-1.8188-0	33081	33181	-11
4	19 8 0 9 4	-1.5536+5	24121	32974	-118
5	20 0 0 0 d	-1.3630+7	18558	32994	-98
6	21. 0 0 0 0	-0 3 6 3 0 +10	0 1 3 1 0 0	33126	+34
7	21 36 30	-0 0 0 0 0 +11	0 0 0 0 0 0	33058	-34
8	22 0 0 0 0	+0.6370+10	0.4 0 7 0	33048	-44
				33092	

				arc
1	14.8575	-12015+1	1.4434	229
2	15 0 0 0 0	-10598+1	1 1 2 1 3	234
3	16 0 5 9 0	-0 0 0 0 0 +0	0 0 0 0 0	270
4	18 0 0 0 0	+09410-1	0.8853	301
5	17.2606	+12016-1	1.4436	311
6	17.8429	+17839-2	3.1816	349
7	17.6774	+18184-2	3.3158	360
8	17.7615	+17025-2	2.8978	20

Range 151

y = 20 y = 14.8575
17.2606
32.1181
y 16 0590
y mod 0 = 17.8774
R 1.8184
Corr R 1.8191
X min 19.5442
21.3633

Moon Center { X0 21.3630
Y0 16 05 90

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1	+ 1.63	+ 83.0	+ 73.2
2	+ 1.56	+ 163.0	+ 117.5
3	+ 0.00	+ 19.0	+ 0.0
4	- 1.45	+ 182.9	- 111.0
5	- 1.63	+ 133.2	- 117.5
6	- 0.64	- 12.2	+ 6.06
7	- 0.00	+ 0.0	- 61.8
8	+ 1.09	- 2.82	- 74.8
	+ 4.28	+ 581.1	+ 251.3
	- 3.72	- 40.4	- 365.1
	+ .56	+ 540.7	- 113.8

	a	b	c	Cov. O-C.
a - 4	+ 5	- 4	- 6	- 18
	+ 6	- 3	- 4	- 5.9
4 + 3	+ 7	- 0	0	+ 71
	+ 6	+ 3	+ 2	- 37
c - 7	+ 4	+ 4	+ 1	- 24
	+ 1	+ 5	- 1	+ 66
	+ 0	+ 6	- 1	- 17
	- 2	+ 5	- 4	- 61

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1917phae.proj.2

12300 Conditional Equations 17

	$x - x_0$	$y - y_0$					O - C
1	−1.36	−1.20	= −61	−61	+12	= −49	+12
2	−1.47	−1.06	= −111	−66	+10	= −56	−55
3	−1.82	−0.08	= −11	−82	+0	= −82	+71
4	−1.55	+0.94	= −118	−70	−9	= −79	−39
5	−1.36	+1.20	= −98	−61	−12	= −73	−25
6	−0.36	+1.78	= +34	−16	−17	= −33	+67
7	−0.00	+1.82	= −34	−00	−18	= −18	−16
8	+0.64	+1.70	= −44	+29	−16	= +13	−57
						+138	−204
						av	43

+12.15 +0.56 = +5407 −7.28

+ 0.56 +14.58 = +113.8 +5.18

−( ) − 0.02 = − 25.0 +0.36

+0.39

+14.26 = −1388 b = −9.7

+12.15 = +540.7 + 5.4 = +546.1 a = +45.0

−0.61

are 15-1

$\frac{P}{n} = .17''$

$\frac{\Sigma r}{n} = -8.2''$

$\frac{-8.2}{.17} = -48.3''$

$\Delta R = -0.6''$

corr(5) = +0.1

True $\Delta R = -0.7$

R = 1.82

−2RC = −0.36

$\Delta L = -0.14$ $\Delta S = -0.1$

$\Delta q = +0.22$ $\Delta a = +0.01$

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2300 Conditional Equations 17

	x - x0	y - y0					O - C	
1	-1.36	-1.20	= -61	-61	+12	= -49	-	12
2	-1.47	-1.06	= -111	-66	+10	= -56	-	55
3	-1.82	-0.00	= -11	-82	+ 0	= -82	+	71
4	-1.55	+0.94	= -118	-70	- 9	= -79	-	39
5	-1.36	+1.20	= -98	-61	-12	= -73	-	25
6	-0.36	+1.78	= +34	-16	-17	= -33	+	67
7	-0.00	+1.82	= -34	-00	-18	= -18	-	16
8	+0.64	+1.70	= -44	+29	-16	= +13	-	57
							+138	-204

cw 43

+12.15 + 0.56 = +5407 - 9.28

+ 0.56 + 14.28 = + 113.8 + 3.18

- (1 - 0.02 = - 25.0 + 0.36

+ 0.39

+1426 = -1384 b = -9.7

+12.15 = +5407 + 54 = +5461 a = +45.0

- 0.61

are 15-1

$\frac{P}{n} = .17'$

$\frac{\Sigma r}{n} = -8.2'$

$\frac{-8.2}{.17} = -48.3'$

$\Delta R = -0.6'$

corr. 5 = +0.1

True $\Delta R = -0.7$

R = 1.82

-2RC = -0.36

$\Delta i = -0.14$ $\Delta S = -0.1$

$\Delta \Omega = +0.22$ $\Delta \alpha = +0.01$

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15300 Moon's Mean Position 16

21.36 30 ✓
+ 22
21.36 52 ✓

16.05 90 ✓
− 5
16.05 85 ✓

From Plate Constants

21.72 74 ✓
22.
S_1 − 0.27 26

16.63 63 ✓
18.
− 1.36 37

log S_0 9.43 5-5-3 n ✓
log Cos δ_0 9.98 25-8 ✓
8.5 07 24 ✓
log Sin α-A 0.94 5-71 n ✓

α - A − 8.83

A 08 38 48.31

α_0 08 38 39.48 ✓

Red + 2.91 ✓

α_1 08 38 42.39 ✓

tan δ 9.46 08 ✓
S_0^2 8.87 11 ✓
7.05 34
log n_1 5-38 53 ✓

n_1 −1.36 37
n_0

log n_0 0.13 47 2 ✓ n
7.33 11 5-
log Tan δ-D 2.80 35 7 n

δ-D − 636.2 ✓
− 10 36.2 ✓
δ +16 17 49.4

δ_0 +16 07 13.2 ✓

Red − 8.7

δ_1 +16 07 4.5- ✓

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12300 Moons Mean Position 18

21 36 30
+ 22
21 36 52

16 05 90
− 5
16 05 85

From Plate Constants

21.7274
2 2.
S₀ − 02726

16.6363
1 8.
− 1.3637

log S₀ 9.4355 3 n
log Cos δ₀ 9.9825 8
8 5 0724
log Sin X-A 0.9457 1 n

Tan δ 9.9608
S₀² 8.8711
7.0534
log η₁ 5.3853

η₁ − 1.3637
η₀

X − H − 8.83

A 08 38 48.31

log η₀ 0.1347 2 n
7.3311 5
log Cos δ² 2.8035 7 n

α₀ 08 38 39.48

Red + 2.91

S.α − 6362
− 10 36 2
δ + 16 17 49.4

X₁ 08 38 42.39

δ₀ + 16 07 13.2

Red − 8.7

δ + 16 07 45

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1. 08 27 57.691
54.706
+ 2.985'

2. 08 38 32.164
29.155
+3.009

3. 8 42 25.693
22.941
+ 2.752

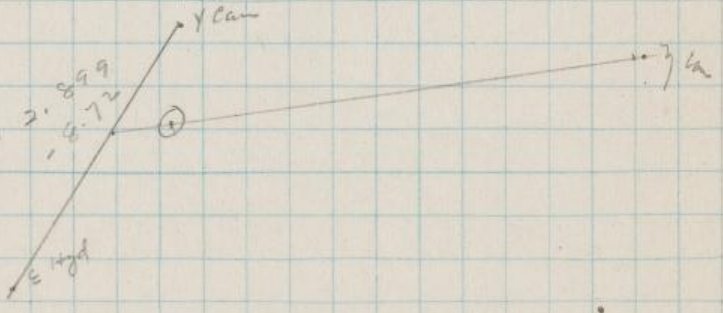
3.009
2.752
.257

+20 43 18.61
26.25'
− 7.64

21 45 55.86
46 04.17
− 8.31

6 43 17.68
26.95'
− 9.27

9.27
8.31
.96



+26
+21
+16
+11
+6
+1
−4
−9

52 50 48 46 44 42 40 38 36 34 32 30 28 26 8h

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12300 Reduction to apparent Place 19

H+α	05	40.5	85° 7.5	δ_0	16 07.2
H	21	01.8			
α	08	38.7	log cos δ_0		9.9826
G	22	46.6	log (i)		0.7752n
G+α	7	25.3	111° 19.5	δ (i)	0.7578n

Cos G+χ_0		9.5607n	sin δ_0	9.9435
log $\frac{1}{2}$		0.9807	Cos H+χ_0	8.9293
Sin G+χ_0		9.9692	log k	1.2919
tan δ_0		9.4609	Sin H+χ_1	9.9984
		8.8239	Sec δ_0	0.0174
				8.8239

log (g)'		0.5414n	k'	9.6647
log g		9.2347	k	0.1316

Q	+1.382	g'	-3.479
g	+0.172	k'	+0.462
k	+1.354	c	-5.725
Red.	+2.908	Red.	-8.742

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123 0 0 Reduction to apparent Place 19

H + χ	05	40.5	85°	7.5	δ_0 - 16 07.2
ν H	21	01.8			
χ	08	38.7		log Gas δ_0	9 9 8 2 6
G	22	46.6		log (i)	0.7 7 5 2 n
G + χ	27	25.3	111°	19.5 (ii)	0.7 5 7 8 n

Cos G + χ_0	9 5 6 0 7 n	Sin δ_0	9 9 4 3 5
log f	0 9 8 0 7	Cos H + χ_0	8 9 2 9 3
Sin G + χ_0	9 9 6 9 2	log h	1.2 9 1 9
Cos δ_0	9 9 6 0 9	Sin H + χ_0	9 9 9 8 4
	9 8 2 3 9	Sec δ_0	0 0 1 7 9
			8 8 2 3 9

log g'	0.5 4 1 4 n	f'	9.6 6 4 7
log g	9.2 3 4 7	h	0.1 3 1 6

f	+ 1 3 8 2	g'	- 3.4 7 9
g	+ 0 1 7 2	f'	+ 0.4 6 2
h	+ 1.3 5 4	δ	- 5 7 2 5"
Red	+ 2 9 0 8	Red.	- 8.7 4 2

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12300 Lunar Parallax 20

α'	08	38	42.39 ✓	
θ	12	26	08.15 ✓	
$\theta-\alpha'$	+ 3	47	25.76 ✓	
=	+ 56°	51	26.40 ✓	
$\frac{1}{2}\alpha-\alpha'$		+ 17	26.25 ✓	
$\theta-\alpha'-\frac{1}{2}\alpha-\alpha'$	56	34	0.15 ✓	

π = 53 57.23 ✓

	9.86912
sin π	8.19573 ✓
sin $\theta-\alpha'$	9.92289 ✓
Sec eq. δ	0.01848 ✓
sin $\alpha-\alpha$	8.00623

	9.95727 ✓
log Cos $\frac{1}{2}\alpha-\alpha'$	9.99999
Sec $\theta-\alpha-''$	025887
tan χ	0.21613

$\alpha-\alpha'$ + 34 52.5 ✓

= + 2 19.5 ✓

χ	38	42	08.6 ✓
δ'	16	07	04.5 ✓
$\chi-\delta'$	42	35	4.1

	9.82648 ✓
log sin π	8.19573
Sin $\chi-\delta'$	9.83038
Cosec χ	0.06830
Sin $\delta-\delta'$	7.92081

$\delta-\delta'$ + 28 38.9

δ	+16	35	43.4	α	8	41	01.89 ✓
eph δ	+16	35	45.1 ✓	eph α	8	41	00.84 ✓
O-C			- 1.7 ✓	O-C			+ 1.05 ✓
corr			+ 0.5 ✓	corr.			-0.01 ✓
α and Cord Ref			0.0	α	8	41	01.88
δ	+16	35	43.9	O-C			1.04
O-C			- 1.2				

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α'	08	38	42.39	
ϵ	12	26	08.1	S
$\epsilon \cdot x'$	+ 3	47	25.76	
z	+ 56°	51	26.40	
$\frac{1}{2} x \cdot x'$		+ 17	26.25	
$\epsilon' - x' - \frac{1}{2} x$	56	34	0.15	

π	53	57	23.	
	986913			
log sin π	8.193573			
sin $\epsilon \cdot x'$	9.922899			
sec eff. δ	0.001848			
sin $x \cdot x$	8.006623			
$x \cdot x'$	+ 34	57	25	
	= + 2°	19	9.5	

	9.957127			
log cos $\frac{1}{2} x \cdot x$	9.999999			
sec $\epsilon' - x' - \frac{1}{2} x$	0.257887			
tan γ	0.216139			
γ	57°	42	08.6	
δ'	16	07	04.5	
$\gamma \cdot \delta'$	42	36	4.1	
	9.826488			
log sin π	8.193573			
sin $\gamma \cdot \delta'$	9.830338			
cosec γ	0.006830			
sin $\delta \cdot \delta'$	7.920819			
$\delta \cdot \delta'$	+ 25	38.9		
δ	16	35	43.4	
eff δ	16	35°	45.1	
O-C		+ 1.7		
corr		+ 0.5		
Ecliptic Ref		00		
δ	+ 16	35°	43.9	
O-C		- 1.2		

α	8	41	1.89	
eff α	8	41	0.89	
O-C			+ 1.05	
corr.			-0.01	
α	= 8	41	01.88	
O-C			1.04	

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12297 Star Measures. 21

Moon Measures.

1
237
15

	16783	16212
	13920	9076
	20	76
	83	12
	23.28 63	23.28 64

2
23.
15.7

	16218	16172
	14270	81102
	70	14
	18	72
	151948	151940

3
27.6
16.0

	16580	16750
	12323 20	11010
	17	10
	80	50
	22.42 60	22.42 60

22.3
165

	16650	16750
	13562 60	9840
	58	40
	50	50
	223090	223090

5
223
17.0

	16644	16750
	13118 16	10285 88
	14	91
	44	50
	22.35 28	22.35 38

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12297 Star Measures 21

Moon Measures.

	16783	16212
2	13420	9076
	20	76
	83	12
	23.2863	23.2864

	16218	16172
	14270	8110
	70	14
	18	72
	15.1948	15.1940

	16580	16750
6	12323 20	11010
0	17	10
	80	50
	22.4260	22.4260

3	16650	16750
3	13562 60	9840
	58	40
	50	50
	22.3090	22.3090

	16644	16750
5	13118 16	10285 88
	14	91
1	44	50
	22.3528	22.3538

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12297

b/ 16200 16888
229 6818 17 16254 69
18 16 74.
00 88
22.9383 22.9381

7 16046 16677
23 15500 45 7220 19
18 90 18
46 77
18.0551 18.0542

8 16892 16232
24 12280 82 10842
18.4 84 42
92 32
18.4610 18.4610

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12297

b/ 16200 16888
229 6818 17 16264 69
18 16 74
00 88
22.9383 22.9381

7 10046 16677
23 15°50'00 45" 7220 19
18 90 18
46 77
18.05°51 18.0542

8 16892 16232
24 12280 42 10842
18.4 84 42
92 32
18.4610 18.4610

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Date Feb. 3. 1917

Eqp & Slow	6	04			6	16	
" " Moon	6	11	10.4		6	11	10.8
Clock fast		13	34.6				
H. Sid. Time	5	57	36 0				
H. Long	4	44	31.05				
G. Sid. Time	10	42	07.05				
" " " M.N	20	52	22.03				
Interval	13	49	45.02				
Red		02	15.93				
G. M.T	13	47	29.09		13.791 41		

$\odot$ — m 0 h 5 3 m

From Naut. Alman.	R.A.			Dec.			
Moon 13 h	06	48	48.42	+23	46	21.9	
Motion 1 m			2.13 45			5.223	
" 47.4848		01	41.36		-04	08.0	
Tabular Place.	06	50	29.78	+23	42	13.9	

Moons age 12d

934" = 14.5

a = -503.5"
+240
-479.5"

Parallax	54	11.8
Semi diam	14	47.8
R		887.8
aug		13.0
Dec 4.		-04
R		900.4
R		1930.1
(1+A)R		-425
(1+A)R		1.8376
R^2		3.3768

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12297 Times Etc 23

Date Feb. 3 1917

Eph t Star	6	04		6	16	
" " Moon	6	11	10·4	6	11	10.8
Clock fast		13	34.6			
☿ Sid Time	5ʰ	57	360			
☿ Long	4	44	31.05ˢ			
G Sid Time	10	42	07 05ˢ			
" " " M.N	20	52	22.03			
Interval	13	49	45.02			
Red		02	15.93			
G M T	13	47	29 09	13.791141		

G time 0ʰ 53ᵐ

From Naut Alman.		RA			Dec.		
Moon 13ʰ	06	48	48 42	+23	46	21.9	
Motion 1ᵐ			2.134ˢ			5.223	
" 47.4848		01	41.36		-04	08.0	
Tabular Place.	06	50	29.78	+23	42	13.9	

Moons age 12ᵈ

934" = 14.5ˢ

Parallax	54	11.8
Semidiam	14	47.7
R		887.7
aug		13.1
Dec 4ˢ		-04
R		9004
q R		1930.1
(q R)²		925
(1+q) R		1.8376
R²		33768

α = -513.5ˢ
+240
-479.5ˢ

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12297 Standard Coordinates. 24

I.	16220	19446	16622	17192
164	12743	12925.29	13597.52	10202
5.3	45.44	33	07	02
	20	46	22	92
	16.34.76	16.3483	5.3020	5.3010
II.	16622	17182	10130	16595
91.7	99555.38	13850	10308	12403
23.6	61	50	08	03
	22	82	30	95
	21.6664	21.6668	23.5822	23.5808
III.	16095	16334	16531	17213
34.5	10457.54	11990.85	11610.11	12137
23.5	51	80	12	34
	95	34	31	13
	24.5641	34.5651	234920	344926

21.6666 23.5815 6 49 39.13 24 21 06.8
23. 18. + 10.33 − 43 23.8
0.3334 5.5815 6 49 49.46 +23 37 43.0
3.5 4665
+ 10.33 − 2603.8

X − S + 500 X − 39.4 Y + 35 X − 4673
+ 1651 + 8174 = 9825 − 209 = 9616 + 57 = 9673
− 0308 + 10833 = 10525 − 929 = 9596 + 76 = 9672
− 6804 + 17282 = 10478 − 926 = 9552 + 121 = 9673
24.1505 + 12075 − 655 + 84 = 24.3336 ✓

Y − m + 500 Y + 40.7 X + 5 Y − 12673
+ 9362 + 2651 = 12013 + 657 = 12670 + 3 = 12673
− 0002 + 11791 = 11789 + 872 = 12661 + 12 = 12673
− 0475 + 11746 = 11271 + 1360 − 12661 + 12 = 12673 ✓
16.6223 + 8311 − + 1971 + 8 = 162840

0 − e − −504.1 −501.1 −3.0 − 0.8

Table a + 0.6 e + 0.6 a − e = 0 b + d = 0.0
− 503.5 − 500.5 1 − 3.0 − 0.8

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12297 Standard Coordinates 24

1	16220	19476	16622	17192
164	12743	12925.29	135.9702	10202
5.3	45.44	33	01	02
	20	46	22	92
	16.34706	16.34883	5.30220	5.30110

2	16622	17182	10130	16595
21.7	99555.38	13850	10308	12403
23.6	61	50	08	03
	22	82	30	95
	21.66664	21.66668	23582.2	23.58108

3	16095	16334	16531	17213
34.5	10457.54	11990.55	11610.11	12139
23.5	51	80	12	34
	95	34	31	13
	34.56411	34.56511	234920	344926

21.6666 23.58455 6 49 39 13 24 21 06.8
23. 18. + 10.33 - 43 23.5
0.3334 5.58155 6 49 49.46 +23 37 43.0
31.5 4065
-10.933 -26038

X - 5 + 500 X - 394 Y + 35 X - 9673
651 + 8174 = 9825 - 209 = 9616 + 57 = 9673
308 + 10833 = 10525 - 929 = 9596 + 76 = 9672
804 + 17282 = 10478 - 926 = 9552 + 121 = 9673
1505 + 12075 - 655 + 54 = 29333

Y - 71 + 500 Y + 402 X + 5 Y - 12673
+ 9362 - 2651 = 12013 + 65.7 = 12670 + 3 = 12673
- 0002 + 11741 = 11789 + 87.2 = 12661 + 12 = 12673
- 0475 + 11746 = 11271 + 1360 - 12661 + 12 = 12673
6223 + 8311 + 971 + 8 = 162840

Tables 1. + 0.6 2. + 0.6 4 - 2 = 0 b + d = 0
- 5.005

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S_0	η_0	ΔS	$-4.8\,S$	$-.2\,\eta$	$+1$
-5.81	-13.65	-32	$+28$	$=-4+3$	$=-1$
-0.30	$+5.58$	-0	$+1$	$=+1-1$	$=0$
$+13.24$	$+5.45$	$+64$	-64	$=0-1$	$=-1$
$m\ +2.33$	-1.72		-11	0	$=-10'' = -0.03''$

$\Delta\eta$	$-3.4\,\eta$	$-1.8\,S$	$+14$
-70	$+46$	$-2.4+10$	$=-14$
$+5$	-19	$=-14+0$	$=-14$
$+28$	-18	$=+10-24$	$=-14$
	$+6$	-4	$=+16'' = +0.8''$

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12297 Standard Coordinates 25

Cafe No. 986 mg 5.2			Cafe No. 992 mg 6.7			Cafe No. 1015 mg 5.7		
C	6 45	33.47	6 48	36.93		6 56	19.25	
9		33.54		36.96			19.26	
8		33.45		36.96			19.23	
m	6 45	33.49	6 48	36.95		6 56	19.25	
Prec	01	01.14	01	02.18		01	02.17	
α	6 46	34.63	6 49	39.13		6 57	21.42	
A	6 49	49.46	6 49	49.46		6 49	49.46	
α-A	- 03	14.83		- 10.33		+ 07	31.96	
Sin "		-194.82		- 10.33			451.88	
log "	2.289633n		1.014100n			2.655022		
log cos δ	9.964559		9.995953			9.995959		
" δ₀	0.764746n		9.480887n			1.121885		
δ₀	- 5.8137		- 0.3026			+ 13.2388		
δ	- 32		0			62		
S	16.1831		21.6974			35.2450		
X	16.3480		21.6666			34.5646		
X-S	+ .1649		- 0308			- .6804		
C	+21 52	44.8	+24 22	20.9		+24 21	28.5	
9		45.5		21.4			29.2	
8		44.9		20.6			29.3	
Mean	21 52	45.1	+24 22	21.0		+24 21	29.0	
Prec	- 01	07.8	- 01	14.2		- 01	23.6	
S	+21 51	37.3	+24 21	06.8		+24 20	05.4	
D	23 37	43.0	23 37	43.0		23 37	43.0	
δ-D	- 1 46	05.7	+ 43	23.8		+ 42	22.4	
log "	- 6367.7		+ 2603.9			+ 2542.5		
log "	3.803948n		3.415262			3.405227		
" n_0	1.135113n		8.746777			8.736642		
log cos δ	9.6033		9.6557			9.6554		
S_0^2	15289		89617			22437		
" n_1	81856		56708			89525		
n_0	-13.6500		+ 5.5817			+ 5.4502		
n_1	+0.0153		0			+0.0896		
n_2	4.3653		23.5817			23.5398		
y_0	5.3015		23.5815			23.4923		
$y_0 - n_2$	+.9362		- .0002			- .0475		

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12297 Standard Coordinates 25

Cafe No. 986 mg 5.2			Cafe No. 992 mg 6.7			Cafe No. 1015 mg 5.2		
C	6 45	33.47	6 48	36.93		6 56	19.25	
9		33.54		36.66			19.26	
8		33.45		36.96			19.23	
m	6 45	33.49	6 48	36.85		6 56	19.25	
Prec	01	01.14	01	02.18		01	02.17	
A	6 46	34.63	6 49	39.13		6 57	21.42	
A	6 49	49.46	6 49	49.46		6 49	49.46	
X-A	- 03	14.83	-	10.33		+ 07	31.96	
Sm.		-14.82		-10.33			45.188	
log "	2.389633		1.014103			2.655032		
log cos δ	9.946759		9.995-953			9.995.959		
" δ₀	0.764466		9.948087			1.321859		
δ₀	- 5.8137		- 0.3026			+ 13.2388		
δ.	- 32		0			62		
δ	16.1831		21.6974			35.2450		
X	16.3480		21.6666			34.5646		
X-δ	+ .1651		- 0308			- .6804		
C	+21 5-2	44.8	+24 22	20.9		+24 21	28.5-	
9		45.5-		21.4			29.2	
8		44.9		20.6			27.3	
Mean	21 5-2	45.1	+24 22	21.0		+24 21	29.0	
Prec	- 01	07.8	- 01	19.2		- 01	23.6	
δ	+21 51	37.3	+24 21	06.8		+24 20	05.4	
Θ	23 37	43.0	23 37	43.0		23 37	43.0	
δ-Θ	- 1 46	05.7	+ 1 43	23.8		+ 42	22.4	
"	- 6368.7		+2603.9			+3542.8-		
log "	3.803948		3.415-62			3.405-27		
log η₀	1.135113		0.774671			0.736442		
log cos δ	9.6033		9.6557			9.65-54		
δ²	15289		89617			2.2437		
log η₁	8.18856		5.6708			8.9525-		
η₀	-13.6500		+ 5.5817			+ 5.4502		
η	+0.0153		0			+0.0896		
η	4.3653		23.5817			23.5398		
η	5.3015-		23.5815-			23.4923		
η-η	+9.3662		- 0.0002			- 0475-		

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12297 Mean Center 26

	Δx				
1.	23.28647	-0.86160	0	0.74223	33767	- 1
2.	23.00000	-1.14800		1.31179	33711	- 57
3.	22.42238	-1.72562		2.97729	33610	-158
4	22.30401	-1.83390		3.38819	33819	+ 51
5	22.35522	-1.79258		3.22249	33670	- 98
6	22.93755	-1.21005		1.46488	33609	-159
7	23.00001	-1.14780		1.31179	33677	- 91
8	24.14780	-0.00000		0.00000	33786	+ 18
					33768	

	Δy			arc.
1	15.00000	-1.62300	-1	26344	208
2	15.14028	-1.43328	-1	20532	219
3	16.00000	-0.62300	-0	03881	250
4	16.62300	-0.00000	-0	00000	270
5	17.00001	+0.37700	+0	01421	282
6	18.00001	+1.37700	+0	18961	319
7	18.05546	+1.43116	+1	20998	321
8	18.46100	+1.83801	+1	33786	360

Range 152

Y = 23. y = 15.19444
18.05546
33.24990

y_0 16.62450
y max 18.46100
R 1.83650
Corr R 1.83776
X min. 22.30990
X_0 24.14600

Plate Center $\begin{cases} X_0 & 24.14800 \\ Y_0 & 16.62300 \end{cases}$

Very poor edge

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12297 Mean Centers 26

	Δx				
1.	23 28 64	-0.86 16	0	07423	33761	- 1
2.	23 0000	-1.1480		13179	33711	- 51
3	22 42 88	-1.7242		29629	33610	-158
4	22 31.90	-1.6390		33814	33814	+ 51
5	22 35.22	-1.7958		32249	33690	-175
6	22 93 7.5	-1 2005		14648	33609	-159
7	23.0000	-1.1480		13179	33687	-191
8	24.1480	-0.0000		00000	33786	+ 118
					33788	

	Δy			arc.
1	15 0000	-16 230	-1	26344	208
2	15.1402	-1 4328	-1	20332	219
3	16.0000	-0 6230	-0	03881	250
4	16.6230	-0.0000	-0	00000	270
5	17.0000	+0 3770	+0	01421	282
6	18.0000	+1 3770	+0	18961	319
7	18.0546	+1.4316	+1	21498	321
8	18.4610	+1.8380	+1	33786	360

Range 15 2

Y = 23 y- 15.1944
18.0546
33490

y₀ 16.6245
y max 18.4610
R 1.8365

Corr R

X min 22.3090
X₀ 24.1460

Plate Centre { x₀ 24.1480
y₀ 16.6230

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1	+ 1.39	+ 110	+ 1.6
2	+ 1.65	+ 65.5	+ 81.5
3	+ 1.07	+ 271.2	+ 98.1
4	+ 0.00	− 93.8	− 0.0
5	− 0.68	+ 176.2	− 37.0
6	− 1.67	+ 192.5	− 279.5
7	− 1.65	+ 104.9	− 130.6
8	− 0.00	+ 0.6	+ 33.2
	+ 4.11	+ 8113	+ 214.4
	− 4.00	− 93.8	− 386.5
	+ 0.11	+ 717.5	− 172.1

a = −25
b = + 4
c = −37

a	b	c	Cor O−C
+ 22	− 6	− 21	− 2
+ 29	− 6	− 14	− 34
+ 43	− 2	+ 4	− 77
+ 46	− 0	+ 9	+ 152
+ 45	+ 1	+ 9	+ 6
+ 30	+ 5	− 2	− 82
+ 29	+ 6	− 2	− 16
+ 0	+ 7	− 30	+ 14

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12297 Conditional Equations. 27

					O-C	
1	− 0.86	− 1.62	= − 1	− 43	+ 23	= − 20 + 19
2	− 1.15	− 1.43	= − 57.	− 57	+ 20	= − 37 − 20
3	− 1.72	− 0.62	= − 158	− 86	+ 9	= − 77 − 81
4	− 1.84	− 0.01	= + 51	− 92	+ 0	= − 92 + 143
5	− 1.80	+ 0.38	= − 98	− 90	− 5	= − 95 − 3
6	− 1.21	+ 1.38	= − 159	− 60	− 19	= − 79 − 80
7	− 1.15	+ 1.43	= − 91	− 57	− 20	= − 77 − 14
8	− 0.00	+ 1.84	= + 18	− 00	− 26	= − 26 + 47
						+ 206 − 198
						arc 50
	+ 14.42	+ 0.11	= + 717.5		− 9.73	
	+ 0.11	+ 12.54	= − 172.1		+ 1.36	
	− .	− 0	= − 5.5			+ 0.11
		+ 12.54	= − 177.6			h = − 141
	+ 14.42	= + 717.5	+ 1.5 = + 719.0			a = + 49.8
						− 0.67

arc 152

$\frac{D}{n} = .17$

$\frac{\Sigma x}{n} = + 1$

$\frac{+1}{.17} = + 5.9$

$\Delta R = \frac{+5.9}{81} = + 0.1$

Corr 4 + 0.5

True ΔR = − 0.4

R = 1.84

−2Rc = − 1.84

Δh = − 0.20 $\Delta \delta$ = − 0.1

Δq = + 1.23 $\Delta \alpha$ = + 004

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12297 Conditional Equations. 27

					O-C			
1	-0.86	-1.62	= - 1	-43	+23	= +28	+	1
2	-1.15	-1.43	= - 57.	-57	+20	= -37	+	2
3	-1.72	-0.62	= - 158	-86	+ 9	= -77	-	8
4	-1.84	-0.01	= + 51	-92	+ 0	= -92	+	14
5	-1.80	+0.38	= - 98	-90	- 5	= -95	-	
6	-1.21	+1.38	= - 159	-60	- 19	= -79	-	8
7	-1.15	+1.43	= - 91	-57	- 20	= -77	-	1
8	-0.00	+1.84	= + 18	-00	- 26	= -26	+	4
						+206 -198		
						cor 50		
	+14.42	+0.11	= +717.5	-9.73				
	+0.11	+12.54	= -172.1	+1.36				
	-	- 0	= - 55			+0.11		

+12.54 = -176 t = -14.1

+14.42 = +717.5 + 1.5 = +719.8 a = +49.8

- 0.67

arc 15°2

$\frac{D}{2}$ = 17°

$\frac{\Sigma r}{2}$ = + 1°

$\frac{+1}{17}$ = + 5°9

ΔR = $+\frac{5°9}{51}$ + 0.1

Corr 4 40.5°

True ΔR: - 0.4

R = 184

-2Rc = - 154

Δt: - 0.20 $\Delta \delta$: - 0.1

Δa: + 1.23 $\Delta \alpha$: + 009

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12297 Morris Mean Position 28

X_0 24.14804
+ 25
24.15054

y_0 16.62300
− 7
16.62293

From Plate Constants

24336
22.
+ 23336

162840
18
−1.71160

03 68 02
9.99627 1
8507 24
sin α − A 1.89807

9.69962
0.73600
7.05534
7.42256

α − A +01 19.08

m, +.0003
n0 −1.71163

A 6.49 49.46

0.23459 m
7.33115
2.90344 n

α_0 6 51 08.54

δ − B −13 20.6
B 23 37 43.0

Red + 2.86

α' 6 51 11.40

δ_0 +23 24 22.4

Red − 0.5

δ' +23 24 21.9

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12298 Morris Mean Position #8

X_0 24 14 60
+ 25
24.15 05

Y_0 16.62 30
− 7
16.62 23

From Plate Constants

24 33 36
22
+ 23 36

03 48 02
99 62 71
85 07 24
sin α = 1.89 80 7

16 23 40
18
−1.71 60

96 36 2
0.73 60
7 05 34
7 42 56
2

$x - A$ +01 14 08

m_x +.00 03
y_0 −1.71 63

A 6 49 49 46

0.23 45 9 n
7 33 1 s
2.90 34 4 n

α_0 6 51 08.54

$\delta - \Theta$ −13 20 6
Θ 23 37 43.0

δ_0 +23 24 22.4

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1. 6 43 34.467
31.963
+2.504

2 6 47 22.384
19.245
+3.139

3 6 59 14082
11.248
+2.834

3.139
2.834
.305

3.002
2.504
.498

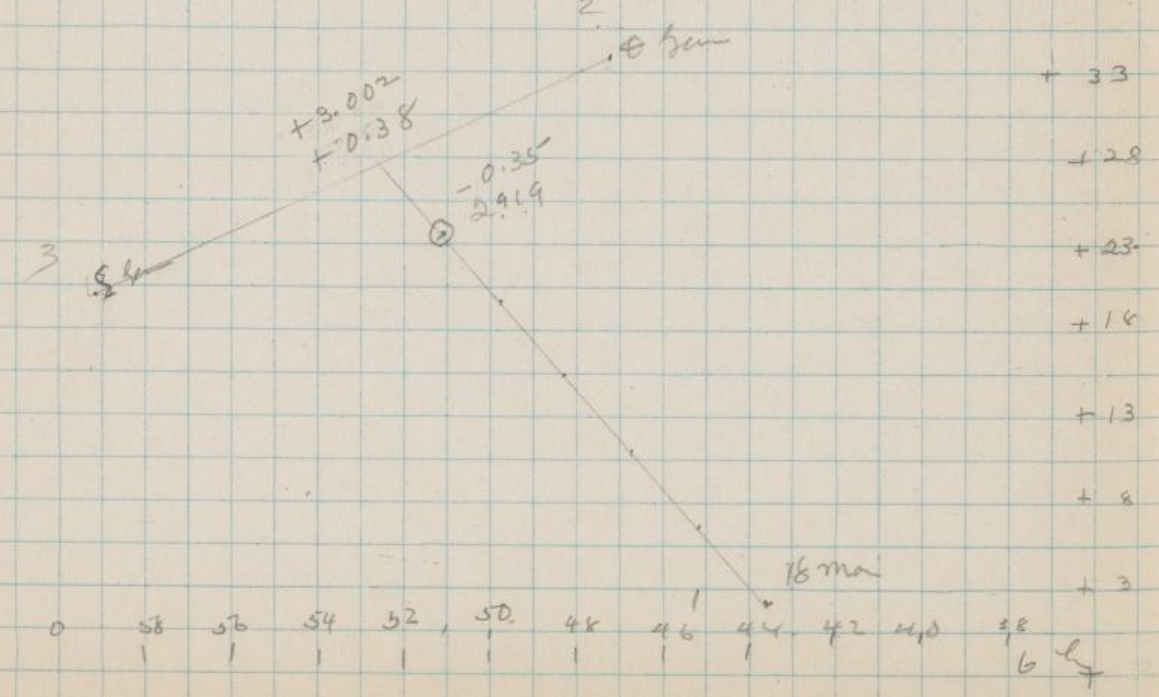
+2 30 10.19
14.20
−4.01

34 3 46.95
45.02
+1.93

20 41 33.53
35.05
−1.52

+1.93
−1.52
3.45

+0.38
−4.01
4.39



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1917phae.proj.2

12297 Reduction to Apparent Place 29

$H+\alpha_0$	4	01.9	60	28.5	
H	21	10.8			
α_0	06	51.1			
C	22	47.8			
$C+\alpha_0$	5	38.9	84	43.5	

δ_0 +23 24.4

log cos δ_0	9.96271
log i	0.75858n
log (1)	0.72129n

$\cos C+\alpha_0$	8.96355
q	0.97288
$\sin C+\alpha_0$	9.99981
$\tan \delta_0$	9.63664
	88239

log q'	9.99363
log q	9.43112

$\sin \delta_0$	9.59991
$\cos H+\alpha_0$	9.69927
h	1.29934
$\sin H+\alpha_0$	9.99396
$\sec \delta_0$	0.00373
	88239

log h'	0.58552
h	0.09422

q	+1.362
q'	+0.270
h	+1.242
Red.	+2.874

q'	+0.864
h'	+3.848
i	−5.266
Red.	−0.554

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12297 Reduction to Apparent Place 24

$H + \chi_0$	4	0 1 9	60	28.5"	
H	21	10.8			
α_0	06	51.1			
C	22	49.8			
$C + \chi_0$	5	38 9	89	43.5"	

δ_0 +23 24 4

log cos δ_0	9 9 6 2 1
log i	0.7 5 4 3 n
log i'	0.7 2 1 5 n

Cos $C + \chi_0$	8 9 6 3 5
q	0 9 7 2 8
Sin $\xi + \chi_0$	9 9 9 8 1
tan δ_0	9 6 3 6 4
	8 8 2 3 9

Sin δ_0	9 5 9 8 9
Cos $H + \chi_0$	9 6 9 2 7
h	1 2 9 3 4
Sin $H + \chi_0$	9 9 3 9 6
Sec δ_0	0 0 3 7 3
	8 8 2 3 9

log g'	9 9 3 6 3
log f	9.4 3 1 2

log k'	0.5 8 5 2
k	0 0 9 4 2

f	+1.3 6 2
g	+0.2 7 0
h	+1.2 4 2
Red.	+2.8 7 4

g'	+0.5 6 4
k'	+3 8 4 8
k	-5 2 6 6
Red.	-0.5 5 4

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12297 Lunar Parallax. 30

α	06	51	11.40	π	54	11.8
θ	05	57	36.00			
$\theta-\alpha$	−	53	35.40		9.869913	
=	−13°	23	51.00	log sin π	8.19768	
$\frac{1}{2}(\alpha+\alpha')$	−	05	04.36	" Sin $\theta-\alpha'$	9.364944	m
	−13	18	46.64	Sec $\frac{1}{2}(\alpha+\alpha')$	0.038271	
			9.95727	Sin $\alpha-\alpha'$	7.470021	m
log Cm $\frac{1}{2}(\alpha+\alpha')$			0.000000			
" Sec $\theta-\alpha'$			0.01182	$\alpha-\alpha'$	−10	8.73
log tan γ			9.969091	=	−	40.58
γ	42	57	45.6			
δ'	23	24	21.9			
$\gamma-\delta$	19	33	23.7			
			9.82640			
log sin π			8.19768			
Sin $\gamma-\delta'$			9.52470			
Cosec γ			0.16652			
Sin $\delta-\delta'$			7.71530			
$\delta\delta$		+	17	50.9		
δ	23	42	12.8	α	6	50 30.82
δ by Obs	23	42	13.9	α by Obs	6	50 29.78
O−C		−	1.1	O−C		+ 1.04
Corr.			+ 0.7	Corr.		− 0.03
2nd Coord Ref			0.0			
				α	6	50 30.79
δ	+23	42	13.5			
O−C			− 0.4	O−C		+ 1.01

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12297 Lunar Parallax 3c

α'	06	51	11.40
Θ	05	57	36.00
$\Theta - \alpha'$	−	53	35.40
=	−13°	23	51.00
$\frac{1}{2} x \cdot x$		− 05	17.38
	−13	18	46.62
	9 9 5 7 2 7		
log $\ln \frac{1}{2} x \cdot x$	0 0 0 0 0 0		
sec $\phi - x' -$	0 0 1 1 6 3		
log tan γ	9.4 6 9 1 0		
γ	42	57	45.6
ζ'	23	24	21.9
$\gamma - \zeta'$	19	33	24.1
	9.8 2 6 4 6 0		
log sin π	8 1 9 7 6 8		
sin $\gamma - \zeta'$	9 5 2 4 7 2		
Const.	0 1 6 6 5 2		
sin $\zeta \cdot c'$	7.7 1 5 3 2		
$\delta\delta$		+ 17	
δ	23	42	138
$\gamma h \delta$	23	42	139
O − C		− 1.1	
Corr.		+ 07	
Ind'l Ref		00	
δ	+23	42	13.5"
O − C		− 0.4	

π	54	11.8	
	9 8 6 9 1 3		
log sin π	8 1 9 7 6 8		
sin E − x'	9 3 6 4 9 4		
sec $\phi \cdot \zeta'$	0 0 3 8 2 7		
sin $\zeta \cdot x'$	7.4 7 0 0 2		
$\alpha \cdot x'$	−10	8.73	
=	−	40.58	
α	6	50	30.82
$\gamma h \alpha$	6	50	29.78
O − C		+ 1.04	
Corr.		− 0 03	
α	6	50	30.79
O − C		+ 1.01	

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