1917phac.proj.20

KG
11366
v.1038

CLXXXVII

187

Plate	Date	Page
13284	Aug. 31 1917	1
13285	" " "	11
13307	Sept. 4. 1917	21

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1	16095	16792	16612	16740
20.5	11088 89	11812 10	11320	72036
9.5	90	08	20	36
	95	92	12	40
	20.5006	20.5018	9.5292	9.5296
2	16812	17463	17970	17112
21.2	14804	9476 77	16755 54	83222
27.1	04	78	53	22
	12	63	70	12
	21.2008	21.2014	27.1216	27.1210
3	17745	17460	18142	16903
32.8	99009	15300	11094	13960 59
13.8	09	00	94	58
	45	60	42	03
	32.7836	32.7840	13.7048	13.7056
4	16410	19963	19290	18648
13.0	15632	10741	16828	11098
19.2	32	41	28	98
	10	63	90	48
	13.0778	13.0778	19.2462	19.2450

More

1		18180	16782
14.4		13762	11208
14.5		62	08
		80	82
		14.4418	14.4416
2		16450	16550
13.3		14968	80228
15.1		68	28
		50	50
		15.1500	15.1478
		15.1482	

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13284 Star Measures 1

11	16095	16792	16612	16740
.0.5	11088 89	11812 10	11320	12036
1.5-	90	08	20	36
	95-	92	12	40
	20.5006	20.5018	9.5292	9.5296
2	16812	17463	17970	17112
21.2	14804	9476 77	16755-54	8322
-7.1	04	78	5-3	22
	12	63	70	12
	21.2008	21.2014	27.1216	27.1210
3	17745-	17460	18142	16903
32.8	9909	15300	11094	13960 5-9
13.8	04	00	94	58
	45-	60	42	03
	32.7836	32.7840	13.7048	13.7056
4	16410	19963	19240	18648
10.	15632	10741	16828	11098
9.2	32	41	28	94
	10	63	90	48
	13.0778	13.0778	19.2462	19.2450

More

1	18180	16782
24.	13762	11208
14.5-	62	08
	80	82
	14.4918	14.4916
	1645-0	165-5-0
23.0	1496 8	8028
15.1	68	28
	50	5-0
	15.1500	15.1478
	15.1482	

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Mars 2

3
22.7
16.0

18120		16265	
11946		12438	39
46		40	
20		65	
22.6174		22.6174	

4
22.7
16.5
X

18046		16920	
12280		12680	
80		80	
46		20	
22.5766		22.5760	

5
23.0
17.7

18470		16486	
11914		13032	36
14		40	
70		86	
17.6556		17.6550	

6
24.1
18.3

16840		16398	
13080		10148	50
80		52	
40		98	
18.3760		18.3752	

7
24.6
18.4

16496		16552	
11654		11380	82
54		84	
96		52	
18.4842		18.4830	

8
25.1
18.4

16050		16068	
11505.0		10598	94
15		94	
50		58	
18.4540		18.4528	

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Moon

3	18120	16265
22.7	11946	12438 39
16.0	46	40
	20	65
	22.6174	226174

4	18046	16920
2.7	12280	12680
6.5	80	80
	46	20
	22.5756	22.5960

5	18470	16486
3.0	11914	13032 36
7.7	14	40
	70	86
	17.65.56	17.65.50

6	16840	16398
4.1	13080	10148 50
8.3	80	52
	40	98
	18.3760	18.3752

7	16496	16552
4.6	11654	11380 84
8.4	54	84
	96	52
	18.4842	18.4830

8	16050	16068
5.1	11505.0	10598 96
8.4	15	94
	50	68
	18.45.40	18.45.28

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13284. Times Etc. 3

Date Aug 31st 1917

Exp. & Stars	22	05	4		22	17 4
" " Moon	22	10	39.6		22	10 39.8 4
Clock Slow		+	30.3			
M. Sid. Time	22	11	10.0 V			
A Young	04	44	31.05			
G Sid. Time	02	55	41.05 V			
" " M.N.	10	36	22.12 V			
Interval	16	19	18.93 V			
Red		02	40.44 V			
G. M.T.	16	16	38.49 V		16h	2774.

From Naut. Alman.

			R. A.	Dec.
Moon 16h	22	14	04.35 4	− 6 32 46.2 4
motion 1m			2.345 V	+ 15.495 V
motion 16m.6415			39.02 V	+04 17.9 4
Tabular Place	22	14	43.37 4	− 6 28 28.3 4

Moons age 14d.

934" = 10.5s

a = −500.5
+240
−476.5

Parallax	61 25.5 4
Semi-diam.	16 45.7 4
R	1005.7 4
Aug	12.0 4
Sun. S	−0.3 −
R	1017.4 4
R	2.1809 4
a·R	−1039 4
(1+a)R	2.0770 4
R²	43139 4

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Date Aug 31-1917

Sup & Stars	22	05			22	17
" Moon	22	10	39.6		22	10	39.8
Clock Slow			+ 30.3			
H Sid Time	22	11	10.0			
H Young	04	44	31.05			
G Sid Time	02	55	41.05			
" " M.N.	10	36	22.12			
Interval	16	19	18.93			
Red		02	40.44			
G. M.T	16	16	38.49			

G. = - 0h 3m

16h 27m 4s

From Naut Alman.		R.A.		Dec.
Moon 16h	22	14	04 35s	- 6 32 46.2
Motion 1m			2.34s	+ 15.49s
Motion 16m 6h 15s			39.02	+ 04 17.9
Tabular Place	22	14	43.37	- 6 28 28.3

Moons age 14d

Parallax	61	25.5s
Semi-diam	16	45.7
R		100.7
Aug		12.0
Int. s		-03
R		10174
R		2.1809
G·R		- 1039
(1+G)R		20770
R²		43139

934" 10.5s

a = - 500.5s

G = + 240

- 476.5s

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S_0	η_0	ΔS	$-3.5S \quad -2$
−1.40	−8.90	−3	+ 5 = +2
−0.79	+9.58	−2	+ 3 = +1
+11.46	−4.41	+42	− 40 = +2
M + 2.91	−1.65		− 10 = −12 = −0.04

$\Delta\eta$	-2.2η	$+.8S \quad -1$
−18	+20 = +2	− 1 = +1
+23	−21 = +2	− 1 = +1
−18	+ 10 = −8	+ 9 = +1
	+ 4	+ 1 = +4 = +0.2

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13284 Standard Coordinates 4

	Cape No. 3092 mg. 43	Cape No. 3094 mg. 5.7	Cape No. 3110 mg 6.9
C	22 11 33.49	22 11 53.29	22 18 17.45
G	33.49	53.31	17.47
E	33.47	53.31	17.47
m	22 11 33.48	22 11 53.30	22 18 17.46
Pier	53.53	53.26	53.54
α	22 12 27.31	22 12 46.56	22 19 11.00
A	22 13 11.32	22 13 11.32	22 13 11.32
α-A	− 44.01	− 24.76	+ 59.68
Sun "	− 44.01	− 24.76	+ 39.64
log	1.64355n	1.39375n	2.55587
cos δ₀	9.99555	9.99777	9.99615
log S₀	0.14634n	9.89876n	1.05926
S₀	− 1.4007	− 0.7921	+ 11.4621
S₁	− 3	− 2	+ 42
S	20.5990	21.2077	33.4663
X	20.5012	21.2011	32.7838
X-S	− .0978	− .0066	− .6825
C	− 8 16 52.5	− 5 53 11.6	− 7 42 01.0
G	52.8	11.6	0.6
E	52.6	11.7	1.2
m	− 8 16 52.6	− 5 53 11.6	− 7 42 0.9
Pier	+05 03.6	+05 04.4	+05 08.1
δ	− 8 11 49.0	− 5 48 07.2	− 7 36 52.8
Θ	− 7 02 36.6	− 7 02 36.6	− 7 02 36.6
δ-Θ	− 1 09 12.4	+ 1 14 29.4	− 34 16.2
Sun "	− 4152.9	+ 4470.1	− 2056.3
log	3.61837n	3.65032	3.31308n
log n₀	0.94952n	0.98147	0.64423n
tan δ	9.15855n	9.00694n	9.12615n
S₀²	0.2927	9.7975	2.1185
log n₁	6.50462	5.85778n	8.2980n
n₀	− 89026	+ 9.5822	− 4.4079
n₁	− 3	0	− 0198
η	9.0971	27.5822	13.5723
ζ	9.5294	27.1213	13.7052
ζ-η	+ .4323	− .4609	+ .1329

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13284 Standard Coordinates 4

	Cape No 3092 mg 43			Cape No 3094 mg 57			Cape No 3110 mg 60		
C	22	11	33 49	22	11	53.28	22	18	17.45
Q			33.49			53.31			17.47
E			33.47			53.31			17.47
m	22	11	33.48	22	11	53.30	22	18	17.46
Prec			53.63			53.26			53.54
α	22	12	27.31	22	12	46.56	22	19	11.00
A	22	13	11.32	22	13	11.32	22	13	11.32
X-A	-		44.01	-		24.76	+	5'	54.68
Sm "		-	44.01		-	24.76		+	35.64
log	1.6433			1.3937			2.5'5'5'57		
Cos δ	9.9945'			9.9997			9.9961		
log S_0	0.14634			9.8498			1.05'926		
S_0	-1.40.07			- 0.7921			+ 11.4621		
S_1	-		3	-		2	+		42
S	20.5'990			21.2077			33.4643		
X	20.5'012			21.2011			32.7838		
X-S	+	0978		-	0066		-	6825'	
C	- 8	16	5'25'	- 5'	5'3	11.6	-7	42	01.0
Z			5'2.8			11.6			0.6
E			5'2.6			11.7			1.2
m	- 8	16	5'26	- 5'	5'3	11.6	- 7	42	0.9
Prec		+ 05'	03.6		+ 05	04.4		+ 05	04.1
δ	- 8	11	49.0	- 5	48	07.2	- 7	36	5'28
E	- 7	02	36.6	- 7	02	36.6	- 7	02	36.6
δ-E	- 1	09	12.4	+ 1	14	29.4	-	34	16.2
tan		- 41	5'2.9		+ 44	70.1		- 20	5'6.3
log	3.6183			3.6503			3.3130		
log n_0	0.9495'			0.9814			0.6442		
tan δ	9.15'85'			9.0064			9.1261		
S_0^2	0.2927			9.7975'			2.1185'		
log n_1	6.5046			5.85'78			8.2980		
n_0	- 84026			+ 95822			- 4.4079		
n_1	-		3			0	-	0198	
n	9.0971			27.5522			13.5723		
y	9.5'294			27.1213			13.705'2		
y-1	+ 4323			- 4609			+ 1329		

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5

Plate Center + Constants.

21.2011 27.1213 22 12 46.56 −5 48 07.2
22. 18 24.76 −1 14 29.4
+0.7989 −9.1213
31 490
+24.76

Plate Center { A = 22h 13. 11.32
D = −7 02 36.6

X−5 +500X −71.84Y +.5X −8599
−0978 +10251 = 9273 − 684 = 8589 + 10 = 8599
−0066 +10601 = 10535 − 1947 = 8588 + 11 = 8599
−6825 +16392 = 9567 − 984 = 8583 + 16 = 8599
24.6553.0 +12328 −1178 + 12 = 24.9113

Y−n +500Y +72.1X +4.84 −10611
+4323 +47553 = 9088 + 1479 = 10567 + 45 = 10612
−4609 +13561 = 8952 + 1529 = 10481 + 130 = 10611
+1329 +68553 = 8182 + 2363 = 10545 + 66 = 10616
16.4066 +8203 + 1774 + 79 = 16.351

Table a = +0.2 b = −3.5 a−b = +3.7 b+d. 0.0
−5005 −5048 +43 −0.3
−5007 −5013 +0.6 −0.3

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Plate Center + Constants

21.2011 27.1213 22.12.46.56 -5° 48 07.2
32 18 24.76 -11 14 29.4
+07989 -9.12.13
31 490
+24.76

Plate Center { A = 22h 13 11.32
D = -7 02 366

X-5 +5°00X -71.8Y +.5X -85'99
.0978 +1025'1 = 9273 -684 = 8589 +10 = 85'99
-0066 +10601 = 10535 -1947 = 8588 +11 = 85'99
-6825' +16322 = 19567 -984 = 8583 +16 = 85'99
24.65'5'0 +12328 -1178 +12 = 249113

Y-n +5°00Y +72.1X +4.8Y -10611
.323 +4765' = 9088 +1479 = 10567 +45' = 11612
.609 +13561 = 8932 +1529 = 10481 +130 = 10611
1329 +6453 = 8182 +2363 = 10545' +66 = 10611
16.4066 +8203 +1774 +79 = 16.3511

Table a = +0.2 b = -3.5 a-b = +3.7 h+d. 0.0
-5005' -5048 +43 -0.3

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13284 Moon Center 6

			$(x-x_0)^2$	$+(y-y_0)^2$	O − C
1	24.0000	− 0.6530	0.4264	4.2955	− 184
2	23.0000	− 1.6530	2.7324	4.3212	+ 73
3	22.6174	− 2.0356	4.1440	4.3106	− 33
4 x	22.5763	− 2.0767	4.3126	4.3126	− 13
5	23.0000	− 1.6530	2.7324	4.2891	− 248
6	24.0000	− 0.6530	0.4264	4.3006	− 133
7	24.6530	0.0000	0.0000	4.3114	− 25
8	25.0000	+ 0.3470	0.1204	4.3069	− 70

Corr R^2 4.3139

					arc
1	14.4417	− 1.9663	− 7	3.8691	198′
2	15.1480	− 1.2600	− 5	1.5888	230′
3	16.0000	− 0.4080	− 1	0.1666	281
4	16.4080	0.0000	0	0.0000	270
5	17.6553	+ 1.2473	+ 4	1.5567	307
6	18.3756	+ 1.9676	+ 7	3.8742	342′
7	18.4836	+ 2.0756	+ 7	4.3114	360°
8	18.4534	+ 2.0454	+ 7	4.1865	10′

Range 172′

Y = 24 y_0 = 14.4417
18.3756
32.8173
y_0 16.4086

y_{max} 18.4836

R 2.0750
Corr R 2.0770
X_{min} 22.5763

x_0 24.6513

moon center: x_0 24.6530
y_0 16.4080

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13284 Moon Center 6

			$(x-x_0)^2$	$+(y-y_0)^2$		$\sigma \cdot \varepsilon$
1	24.0000	− 0 6S 30	0.4264	4.2955	−	184
2	23.0000	− 1. 6S 30	2.7324	4.3212	+	73
3	22.6179	− 2.0356	4.1440	4.3106	−	33
4 x	22.5763	− 2.0767	4.3126	4.3126	−	13
5	23.0000	− 1. 6S 30	2.7324	4.2891	−	248
6	24.0000	− 0 6S 30	0.4264	4.3006	−	133
7	24. 6S 30	0.0000	0.0000	4.3114	−	2S
8	2S.0000	+ 0.3470	0.1204	4.3069	−	70
			Corr R^2	43139		

					arc
1	14.4417	− 1.9663	− 7	3.8691	198
2	1S.1480	− 1.2600	− S	1.S888	233
3	16.0000	− 0.4080	− 1	0.1666	281
4	16.4080	0.0000	0	0.0000	290
S	17.6S S3	+ 1.2473	+ 4	1.S S67	307
6	18.37S6	+ 1.9676	+ 7	3.8742	342
7	18.4836	+ 2.0756	+ 7	4.3114	360
8	18.4S34	+ 2.04S4	+ 7	4.1865	10
					Range 172

y: 24 y_0 = 14.4417
18.37S6
32.8173
y_0 16.4086
y_{max} 18.4836

R 2.0750
Corr R 2.0770
x_{min} 22.S763

x_0 24 6S 13

Moon Center: x_0 24 6S 30
y_0 16.4080

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Formation of Normals:

1	+ 1.28	+ 1200.0	+ 363.0
2	+ 2.08	− 120.0	− 92.0
3	+ 0.84	+ 68.4	+ 13.5
4	0.00	+ 27.0	0.0
5	− 2.06	+ 410.0	− 310.0
6	− 1.28	+ 86.5	− 262.0
7	0.00.	0.0	− 52.0
8	+ 0.72	− 24.5	− 143.7
	+ 4.92	+ 7119	+ 376.5
	− 3.34	− 1445	− 859.7
	+ 1.58	+ 5674	− 483.2

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13284 7

	Conditional			Equations			O-C	
1	−0.65	− 1.97	= −184	−27	+ 54	= +27	− 211	
2	−1.65	− 1.26	= + 73	− 68	+ 35	= − 33	+ 106	
3	−2.04	− 0.47	= − 33	− 84	+ 11	= − 73	+ 40	
4	−3.08	0.00	= − 13	− 85	0	= − 85	+ 72	
5	−1.65	+ 1.25	= −248	− 67	− 34	= −101	− 147	
6	−0.65	+ 1.97	= −133	− 27	− 54	= − 81	− 52	
7	0.00	+ 2.18	= − 25	0	− 57	= − 57	+ 32	
8	+0.35	+ 2.05	= − 70	+ 14	− 56	= − 42	− 28	
						+250	−438	
							or 86	

+14.89 + 1.58 = +567.4

+ 1.58 + 19.55 = −483.2

−( ) − 0.17 = − 60.2

+19.72 = −543.4 b = −27.5

+14.89 = +567.4 + 43.5 = +610.9 a = +41.0

arc 172

$\frac{P}{n}$ = .30 ✓

$\frac{\Sigma v}{n}$ = −23.5 ✓

$\frac{-23.5}{30}$ = −.783 ✓

ΔR = − 1.0 ✓

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Conditional Equations

					O-C
1	-0.65"	- 1.97	= - 184	- 27 + 54 = + 27	- 211
2	- 1.65"	- 1.26	= + 73	- 68 + 35" = - 33	+ 106
3	- 2.04	- 0.41	= - 33	- 84 + 11 = - 73	+ 40
4	- 2.08	0.00	= - 13	- 85" 0 = - 85"	+ 72
5	- 1.65"	+ 1.25"	= - 248	- 67 - 34 = - 101	- 147
6	- 0.65"	+ 1.97	= - 133	- 27 - 54 = - 81	- 52
7	0.00	+ 2.18	= - 25"	0 - 57 = - 57	+ 32
8	+ 0.35"	+ 2.05"	= - 70	+ 14 - 56 = - 42	- 28
				+ 250 - 438	
				or 86	

+ 14.89 + 1.58 = + 567.4

+ 1.58 + 19.55" = - 483.2

- 1 - 0.17 = - 60.2

+ 19.72 = - 543.4 b = - 27.5"

+ 1489 = + 567.4 + 43.5" = + 6109 a = + 41.0

arc 172

$\frac{P}{n}$ = .30

$\frac{\delta V}{n}$ = - 23.5"

$-\frac{23.5"}{.30}$ = + 783

ΔR = - 40

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1. 22 12 31.812 − 8 11 24.38
27.295 49.13
+4.517 + 24.75

2. 22 17 26610 − 1 47 57.01
22.185 48 21.22
4.425 + 25.21

3. 22 26 19.938 − 11 5 45.41
15.390 6 10.87
4.548 + 25.46

− 25.21
24.75
.46

+ 13

+ 8

+ 3

− 2

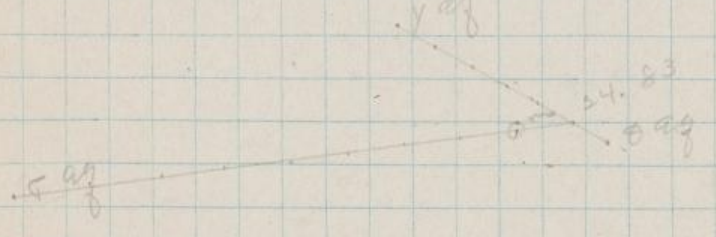
− 7

− 12

− 17

− 22

28 26 24 22 20 18 16 14 12 10 8 6 4 22



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13284 8

Mean Position

Y_0 24 65 30 ✓
+ 20 ✓
24 65 50 ✓

α_0 16 40 80 ✓
− 14
16 40 66 ✓

From Plate Constants

24.9113 ✓
22.
+ 2.9113 ✓

16.35 11 ✓
.18.
−1.6489 ✓

log S. 0.464094 ✓
Cos δ. 9.999651
8.507724
Sin x A 1.960034 ✓

tan δ 9.10455 ✓
S. ✓ 0.92822 ✓
7.05734
log n. 7.08611

x. A +91.27 ✓
+01 31.27 ✓
A 22 13 11.32 ✓

n. −0.00012
n. −1.6477

log n. 0.21688 ✓
7.33715
tan δ. R 2.88573 ✓

α_0 22 14 42.59 ✓

Red +4.50

α' 22 14 47.09

δ. R −768.7
+12 48.7
R −7 02 36.6 ✓

δ_0 −7 15 25.3

Red +25.0

δ' −7 15 0.3

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13284

Moons Mean Position

X_0 24.6535.30
+ 20
24.6535.50

Y_0 16.40.80
-14
16.40.66

From Plate Constants

24.9113
22.
+ 2.9113

16.35.11
18.
-1.6489

log S_1 0.46409
cos S_0 9.99965-1
8.50724
$S_1 \times R$ 1.96034

tan S 9.10453-n
S_1^2 0.9282
7.05334
log r_1 7.08619-n

α A + 91.27
+01 31.27
A_0 22 13 11.32

r_1 -0.00012
r_0 -1.6477

log r_0 0.21688-n
7.33115
Log $S \cdot R$ 2.88573-n

α_0 22 14 42.59

δ E - 7687
-12 48.7
D -7 02 36.6

Red + 450

α' 22 14 47.09

S_0 -7 15 25.3

Red +25.0

δ' -7 15 0.3

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Reduction to Apparent Place

$H+\alpha_0$	5	49.0	87° 15′	δ_0	−7″ 15.4
H	7	34.3			
α_0	22	14.7			
G	23	40.5		$\cos\delta_0$	9.9965
$G+\alpha_0$	21	55.2	328° 48′	k'	0.8787
				(k)	0.8752

$\log\cos G+\alpha_0$	9.9321			
$\log g$	1.3132	$\sin\delta_0$	9.1015	n
$\sin G+\alpha_0$	9.7143 n	$\cos H+\alpha_0$	8.6810	
$\tan\delta_0$	9.1049 n	k	1.2792	
	8.8239	$\sin H+\alpha_0$	9.9995	−
		$\sec\delta_0$	0.0035	
$\log q'$	1.2453		8.8239	
q_ξ	8.9563			

$\log k'$	9.0617	n	
k	0.1061		

q	+13.135
q	+0.090
k	+1.277
Red.	+4.502

q	+17.590
k'	−0.115
b	+7.503
Red	+24.978

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Reduction to Apparent Place.

$H+\chi_0$	5	49.0	87° 15′	δ_0	−7	15′.4
H	7	34.3				
χ_0	22	14.7				
G	23	40.5″		$\cos\delta_0$	9 9 9 6 5	
$G+\chi_0$	21	55.2	328° 48′	i	0 8 7 8 7	
				(i)	0.8 7 5 2	

$\log\cos\beta+\chi_0$	9.9 3 2 1			
$\log g$	1.3 1 3 2	$\sin\delta_0$	9.1 0 1 5 n	
$\sin G+\chi_0$	9.7 1 4 3 n	$\cos H+\chi_0$	8.6 8 1 0	
$\tan\delta_0$	9.1 0 4 9 n	h	1.2 7 9 2	
	8 8 2 3 9	$\sin H+\chi_0$	9 9 9 9 5	
		$\sec\delta_0$	0 0 0 3 5	
			8 8 2 3 9	

$\log q'$	1.2 4 5 3	$\log h'$	9.0 6 1 7 n
q	8 9 5 0 3	h	0.1 0 6 1

f	+3.1 3 5″
g	+0.0 9 0
h	+1 2 7 7
Red	+4.5″ 0 2

f'	+17.5″ 9 0
h'	−0.1 1 5″
i	+7.5″ 0 3
Red	+0.4 9 7 8

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13284

Lunar Parallax.

α	22	14	47.09	π	6′	25.5″
Θ	22	11	10.00			
$\Theta - \alpha$	−	03	37.09		9.869913	
=	−	54	15.35	log sin π	8.225205	
$\frac{1}{2}\alpha - \alpha$			− 21.65	" Sin $\Theta - \alpha'$	8.198815n	
$\Theta - \Theta_1 = \frac{1}{2}\alpha - \alpha'$	−	53	53.75	" Sec δ	0.002.78	
				Sec $\alpha\alpha'$	6.322.11n	

	9.995727
Cos $\frac{1}{2}\alpha\alpha'$	0.000000
Sec $\Theta - \alpha'$ - $\frac{1}{2}\alpha\alpha'$	0.000005
log tan γ	9.995732

$\alpha - \alpha'$ − − 43.″31

= − 2.89

γ	42	11	21.6
δ'	− 7	15	0.3
$\gamma - \delta'$	49	26	21.9

	9.826400
log Sin π	8.225205
Sin $\gamma - \delta'$	9.886065
Dsec γ	0.172900
Sin $\delta - \delta'$	8.132005

$\delta - \delta'$	+	46	35.4					
δ	− 6	28	24.9		α	22	14	44.20
Eph δ	− 6	28	28.3		Eph α	22	14	43.37
O − C	+		3.4		O − C			+ 0.83
Corr.	−	+	0.2		Corr.			− 0.03
2nd Cord Red	+		0.1		α	22	14	44.17
δ =	− 6	28	24.6					
O − C′			+ 3.7		O − C	=		+ 0.80

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Lunar Parallax.

α'	22	14	47.09	π	6"	1	25.5
Θ	22	11	10.00				
$\Theta - \alpha'$	−	03	37.09				9.869913
=	−	54	15.85	log sin π			8.255205
$\frac{1}{2}(\alpha - \alpha')$			− 21.65	" sin $\Theta - \alpha'$			8.198815
$\Theta - \Phi' - \frac{1}{2}(\alpha - \alpha')$	−	53	53.75	" sec δ'			0.000277
				sin $\alpha - \alpha'$			6.321211 n

	9.95727	
cos $\frac{1}{2}(\alpha - \alpha')$	0.000000	
sec $\Theta - \alpha' - \frac{1}{2}(\alpha - \alpha')$	0.000005	
log tan γ	9.957732	

$\alpha - \alpha'$ − 43.30

= − 2.89

γ	42	11	21.6
δ'	− 7	15	0.3
$\gamma - \delta'$	49	26	21.9

	9.826400
log sin π	8.255205
sin $\gamma - \delta'$	9.886065
Orsec γ	0.172900
sin $\delta - \delta'$	8.132000

$\delta - \delta'$	+	46	35.4
δ	− 6	28	24.9
Eph δ	− 6	28	28.3
O − C	+		3.4
Corr	+		0.2
2nd Corr Reg	+		0.1
δ	− 6	28	24.6
O − C	+		3.7

α	22	14	44.20
Eph α	22	14	43.37
O − C	+		0.83
Corr	−		0.03
α	22	14	44.17
O − C	+		0.80

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13285

Star Measures

1				
19.9	19576	17684	17090	17252
9.5	11258 56	16004	12258 54	12068 70
	54	04	50	72
	76	84	90	52
	19.8320	19.8320	94836	94818

3				
20.5	17810	17420	16164	16914
27.0	13304	11940	15376	7692
	04	48 44	76	92
	10	20	64	14
	20.4586	20.4524	27088	27078

3				
7.	17145	19277	16780	17888
13.7	16220 19	10205	9610	15036 43
	18	05	10	50
	45	77	80	88
	32.0926	32.0928	13.7170	13.7165

Moon

1				
24.0			16830	16450
14.9			8398	14886
			98	86
			30	50
			14.8432	14.8436

2				
13.7	17204	16728		
5.0	10898	13020		
	98	20		
	04	18		
	23.6306	23.6292		

3				
23.0			16636	16850
15.6			11415 16	12050
			17	50
			36	50
			15.5220	15.5200

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13285⁻

Star Measures

1	19⁻76	17684	17090	17262
4.9	1125⁻8 56	16004	1225⁻8 54	12068 70
4.5	5⁻4	04	5⁻0	72
	76	84	90	52
	19.8320	19.8320	99830	9948
2	17810	17420	16164	16914
20.5	13304	11940	15376	7692
27.0	04	48 44	76	92
	10	20	64	14
	20.4506	20.4524	27078	27078
3	17145⁻	19277	16780	17888
37.	16220 19	10205⁻	9610	15⁻0364
13.7	18	05⁻	10	50
	45⁻	77	80	88
	32.0926	32.0928	13710	13716⁻

Moon

1			16830	1645⁻0
4.0			8398	1488 86
4.9			98	86
			30	50
			148432	148436
2	17204	16728		
3.7	10898	13020		
5.0	98	20		
	09	28		
	23.6306	23.6292		
3			16636	1685⁻0
3.0			1141⁻5 16	1205⁻0
5.6			17	50
			36	50
			15⁻52⁻20	15⁻52⁻00

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13285⁻ Moon 12

4	16860	16400
22.8	9700	135⁻46 51
16.0	00	46
	60	00
	22,7160	22,7151

5⁻	16888	16370
22.6	11492 94	1176871
17.0	96	74
	88	70
	225394	225401

6	16935⁻	16330
22.9	7813	15⁻47 38
18.0	13	30
	35⁻	30
	229122	229100

7

23.	17694	16962
18	165⁻14	80 9900
	14	01
	94	62
	18.1180	18.1138

8

24	17182	16460
18.8	9125⁻26	145⁻22
	27	22
	82	60
	18,8056	18,8062

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3285⁻ Moon 12

:	16860	16400
28	9700	135⁻4651
:0	00	56
	60	00
	22,7160	22,7151

	16888	16370
6	11492 94	11768 71
0	96	74
	88	70
	225⁻394	225⁻401

	16935⁻	16330
1	7813	15⁻4⁻38
0	13	30
	35⁻	30
	22,9122	22,9100

	17694	16982
	165⁻14	809900
	14	01
	94	22
	18,1180	18,1178

:		
:	17182	16460
	9125⁻26	145⁻22
	27	22
28	82	60
	18,8056	18,8062

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1917phae.proj.26

13285 Time etc.

Date Aug. 31st 1917

Eq. t. Star	22	19		22 h 31	
" " Mean	22	24	33.8	22 24 : 34.0	
Clock slow			30.3.		
H. Sid Time	22	25	04.2		
H Long	04	44	31.05	Θ = + 0h 10m	
G Sid Time	3	0.9	35.25		
" " M.N.	10	36	22.12		
Interval	16	33	13.13		
Red		02	42.71		
G. M.T.	16	30	30.42	16h 50 8 45	

From Naut. Alm.			R.A.		Dec.	
Mean 16h	22	14	04.35	- 6	32	46.2
Motion in			2.3447			15.479
Motion 31m 307		01	11.53		7 07	52.8
Tabular Place	22	15	15.88	- 6	24	53.4

Mean age 14d

934 " 10.5

Q = -5030
+24.0
-47.90

Parallax	61 25.5
Semi-diam	16 45.7
R	1005.7
Aug	12.0
Sun's	- 0.3
R	1017.4
R	2.1809
aR	- 1044
(1+a)R	2.0765
R²	4.3158

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1328S

Times Etc.

Date Aug 31st 1917

Exp to Stars	22	19			22	31
" " Moon	22	24	33.8		22	24 34.0
Clock slow			30.3			
☉ Sid Time	22	25	042			
+λ Long	04	44	31.05s	⊖ =	+0h	10m
☉ Sid Time	3	09	35.25s			
" " M.N	10	36	22.12			
Interval	16	33	13.13			
Red		02	42.71			
☉ M.T	16	30	3042	16h 50m 84s		

From Naut Alm.

			R.A		Dec.	
Moon 16h	22	14	04.35s	-6	32	46.2
Motion 1m			2.3947			15.499
Motion 31m 5.07		01	11.53		+07	52.8
Tabular Place	22	15m	15.88	-6	24	534

Moons age 14d

934" 10.5

a = -5030
+24.0
-4790

Parallax 61 25.5s
Semi-diam 16 45.7
R 10057
Aug 120
Δr s -03
R 10174
R 2.18 09
aR -1044
(1+a)R 2.07 65
R² 4.31 18

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Plate Constants

X	19.8320	20.45-20	32.0927
S	20.5990	21.2077	33.4663
x-S			

y	9.4827	27.0783	13.7168
η	9.0971	27.5822	13.5723
y-η			

X-S +5000X −24.2y +3X −2075

−7670	+9916	=	2246	−230	−2016	+59	= 2075
−7557	+10226	=	2669	−655	−2014	+61	= 2075
−13736	+16046	=	2310	−332	−1978	+96	= 2074
24.6194	+12310			−407		+74	= 25.6096 ✓

y-η +5004 +22.3X +4.7y −9084

+3856	+4741	=	8597	+442	= 9039	+44	= 9083
−5039	+13539	=	8500	+456	= 8956	+128	= 9084
+1445	+6858	=	8303	+716	= 9019	+65	= 9084
16.8236	+8412			+550		+79	= 16.8193 ✓

Table a = +0.2 c = −3.5 a−c = +3.7 b+d = 0.0

−5030	−5047	+1.7	+1.9
−5032	−5012	−2.0	+1.9

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13285

Plate Constants.

x	196320	2045.20	32.0927
S	205990	21.2077	33.4663
x-S			

y	94827	27.0783	13.7168
η	9.0971	27.5822	13.7723
y-η			

-S + 5.00 x − 24.2 y + 3 x − 2075

7670 + 9916 = 2246 − 230 = 2016 + 54 = 2070
7557 + 10226 = 2669 − 655 = 2014 + 61 = 2075
13736 + 16046 = 2310 − 332 = 1978 + 96 = 2074
24.6194 + 12310 − 407 + 74 = 25.6096

η-y + 5.007 + 22.8 x + 4.7 y − 9084

3856 + 4741 = 8597 + 442 = 9039 + 44 = 9083
5039 + 13539 = 8500 + 456 = 8956 + 128 = 9084
1445 + 6858 = 8303 + 716 = 9019 + 65 = 9084
16.8236 + 8412 + 5.50 + 79 = 16.8123

Table a = +0.2 c = −3.3 a − c = +3.7 b + d = 0.0
−5.030 −5.047 +1.7 +1.9

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13285 Moon Center 15

		$x - x_1$	Δy		$O - C$
1	24.0000	−0.6160	0.3795	4.3051	− 67
2	23.6297	−0.9863	0.9728	4.3023	− 95
3	23.0000	−1.6160	2.6115	4.3106	− 12
4	22.7155	−1.9003	3.6119	4.2914	− 204
5	22.5397	−2.0769	4.3110	4.3110	− 8
6	22.9111	−1.7049	2.9067	4.2906	− 212
7	23.0000	−1.6160	2.6115	4.2859	− 259
8	24.0000	−0.6160	0.3795	4.3062	− 56
			R²	4.3118	

				arc
1	14.8434	−1.9806 − 7	3.9256	197
2	15.0000	−1.8240 − 7	3.3295	208
3	15.5210	−1.3030 − 5	1.6991	231
4	16.0000	−0.8240 − 3	0.6795	247
5	16.8240	0.0000 0	0.0000	270°
6	18.0000	+1.1760 +4	1.3839	304
7	18.1180	+1.2940 +5	1.6744	308
8	18.8059	+1.9819 +7	3.9267	343

Range 146

X = 24 y = 14.8434
18.8059
33.6493
y_0 16.8246

Com R 2.0765
X min 22.5397
X_0 24.6162

Moon Center { X_0 24.6160
Y_0 16.8240

Screen cut off limit near y max.

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1917phae_proj.20

13245

Moon Center

		$x - x_0$	p_1			Δ
1	24.0000	-0.6160	0	0.3795	43051	- 67
2	23.6297	-0.9863		09728	43023	- 95
3	23.0000	-1.6160		26115	43106	- 12
4	22.7155	-1.7005		36119	42914	- 204
5	22.5397	-2.0763		43110	43110	- 8
6	22.9111	-1.7049		29067	42906	- 212
7	23.0000	-1.6160		26115	42859	- 259
8	24.0000	-0.6160		03795	43062	- 56
			R^2		43118	

				arc
1	14.8434	-1.9806 -7	39256	197
2	15.0000	-1.8240 -7	33295	208
3	15.5210	-1.3030 -5	16991	231
4	16.0000	-0.8240 -3	06795	247
5	16.8240	0.0000 0	00000	270°
6	18.0000	+1.1760 +4	13839	304
7	18.7180	+1.2940 +5	16944	308
8	18.8059	+1.9819 +7	39267	343

Range 146

$x = 24$ $y = 14.8434$

18.8059

$33649\ 3$

$y_0 = 16.8246$

Cam R 2.0765

x_{min} 22.5397

x_0 24.6162

Moon Center $\begin{cases} x_0 \; 246160 \\ -y_0 \; 16.8240 \end{cases}$

screen cut off limit near y_{max}.

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Formation of Normals.

1	+ 1.22	+ 41.5	+ 132.5
2	+ 1.79	+ 94.0	+ 173.2
3	+ 2.90	+ 19.4	+ 15.6
4	+ 1.56	+ 387.5	+ 167.2
5	+ 0.00	+ 16.6	+ 0.0
6	- 2.00	+ 360.0	- 250.0
7	- 2.10	+ 420.0 1/4	- 334.2 1/4
8	- 1.22	+ 34.7	- 111.0
	+ 6.67	+ 1783.7	+ 488.5
	- 5.32		- 528.
	+ 1.35		- 39.5

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13285

16

Conditional Equations.

								O - C
1	− 0.62	− 1.98	= − 67	− 42	+ 15	= − 27	−	40
2	− 0.99	− 1.82	= − 95	− 67	+ 14	= − 53	−	42
3	− +.62	− 1.30	= − 12	− 109	+ 10	= − 99	+	87
4	− 1.90	− 0.82	= − 204	− 128	+ 6	= − 122	−	82
5	− 2.08	− 0.00	= − 8	− 140	+ 0	= − 140	+	136
6	− 1.70	+ 1.18	= − 212	− 114	− 9	= − 123	−	89
7	− 1.62	+ 1.29	= − 259	− 109	− 10	= − 119	−	140
8	− 0.62	+ 1.98	= − 56	− 42	− 15	= − 57	+	1

+224 -393

av 77

+17.78 +1.35 = +1183.7

+1.35 +1662 = −39.5

−( ) − 0.10 = − 90.0

+16.52 = − 129.5 h = − 7.8

+17.78 = +1183.7 + 10.5 = +1194.2 a = +67.3

arc 146

$\frac{P}{n}$ = .14 ✓

$\frac{\Sigma V}{n}$ = − 21.1 ✓

$\frac{-21.1}{.14}$ = − 151 ✓

ΔR = − 1.9 ✓

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1 3 2 8 5

Conditional Equations.

					O - C
1	- 0 6 2	- 1 9 8	= - 6 7	- 42 + 15" = - 27	- 40
2	- 0 9 9	- 1.8 2	= - 95"	- 67 + 14 = - 53	- 42
3	- +.6 2	- 1.3 0	= - 12	= 109 + 10 = - 99	+ 67
4	- 1 9 0	- 0 8 2	= - 2 0 4	- 128 + 6 = - 122	- 82
5	- 2 0 8	- 0 0 0	= - 8	- 140 + 0 = - 140	+ 136
6	- 1.7 0	+ 1.1 8	= - 2 1 2	- 114 - 9 = - 123	- 89
7	- 1.6 2	+ 1.2 9	= - 25" 9 4	- 109 - 10 = - 119	- 140
8	- 0 6 2	+ 1.9 8	= - 5" 6	- 42 - 15" = - 57	+ 1

+ 224-343

av 77

+ 1 7.7 8 + 1.3 5" = + 1 1 8 3.7

+ 1 3 5" + 1 6 6 2 = - 39. 5"

- 1 . 1 - 0.1 0 = - 90.0

+ 1 6. 5" 2 = - 1 2 9. 5" h = - 7.8

+ 1 7.7 8 = + 1 1 8 3.7 + 1 0.5" = + 1 1 9 4.2 a = + 6 7.3

are 146

$\frac{P}{n} = .14$

$\frac{\Sigma v}{n} = - 21.1$

$\frac{-21.1}{.14} = - 15"1$

$\Delta \lambda = - 1.9$

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13285

Moons Mean Position.

X_0 24.6160 ✓
+ 34 ✓
24.6194 ✓

Y_0 16.8240 ✓
- 4 ✓
16.8236 ✓

From Plate Constants

25.6096 ✓
22.
+3.6096

16.8193 ✓
18.
-1.1807

$\log S_0$ 0.3577 46 ✓
$\log \delta_0$ 9.9965-6 ✓
8.5072 4 ✓
$\sin \alpha - A$ 2.0536 6 ✓

$\alpha - A$. + 01 53.15 ✓
A 22 13 11.32

α_0 22 15 04.47 ✓

Red + 4.50

α' 22 15 8.97 ✓

$\log \tan S$ 9.1005-n ✓
S_1 1.1149 ✓
7.0534
$\log n_1$ 7.2688 n ✓

n_1 -0.0019
n_0 -1.1788

$\log n_0$ 0.0714 9 n
7.3315-
$\log \tan S - \Theta$ 2.7403 4 n

$\delta - \Theta$ -09 10.0 ✓
Θ: - 7 02 36.6 ✓

S_0 - 7 11 46.6 ✓

Red +25.0 ✓

S' - 7 11 21.6 ✓

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13285

Moons Mean Position

X_0 24.6160
+ 34
24.6194

Y_0 16.8240
- 4
16.8236

From Plate Constants

25.6096
22.
+3.6096

16.8193
18.
-1807

log S. 0.5575746
cos δ_0 9.9996576
8.5017224
Sin $\alpha \cdot A$ 2.0575366

$\alpha \cdot A$. + 01 53.15
A 22 13 11.32

α_0 22 15 04.47

Red + 4.50

α' 22 15 8.97

tan S 9.1005 n
S_2 1.11149
7.15334
log z_2 7.26288 n

n_1 -.00019
z_0 -1.1788

log n_0 0.07149 n
7.33115
log Tan $\delta - \Theta$ 2.74034 n

$\delta \Theta$ -04 10.0
Θ - 7 02 36.6

S_0 - 7 11 46.6

Red + 25.0

S' - 7 11 21.8

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Lunar Parallax.

α'	22	15	08.97	π	61′ 25.5
θ	22	25	04.20		
$\theta-\alpha'$	+	09	55.23		
=	+	2°	28	48.45	9.866913
$\frac{1}{2}\alpha-\alpha$			+	59.26	log sin π 8.255205
$\theta-\alpha'-\frac{1}{2}\alpha-\alpha$	+	2°	27	49.09	sin $\theta-\alpha'$ 8.636213
					sec γ δ 0.000273
					sin $\alpha-\alpha'$ 6.760125

9.995727

cos $\frac{1}{2}\alpha-\alpha$ 0.000000

sec $\theta-\alpha'-\frac{1}{2}\alpha-\alpha$ 0.000040

log tan χ 9.995767

$\alpha-\alpha'$ + 1′ 58.72

= + 7.91

χ 42 12 43.8

δ' −7 11 21.6

$\chi-\delta'$ 49 24 05.4

9.822640

log sin π 8.255205

sin $\chi-\delta'$ 0.172711

cosec χ 9.880241

sin $\delta-\delta'$ 8.131557

$\delta-\delta'$ + 46 32.6

δ	−6	24	49.0	α	22 15 16.88
γ/δ	−6	24	53.4	γ/α	22 15 15.84
O−C		+	4.4	O−C	+ 1.00
Corr		+	0.2	Corr	− 0.03
2nd Corr Ref		+	0.1		
δ	−6	24	48.7	α	22 15 16.85
O−C		+	4.7	O−C	+ 0.97

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13285

Lunar Parallax

α'	22	15	08.97
θ	22	23	04.20
$\theta - \alpha'$	+	09	55.23
=	+	2° 28	48.45
$\frac{1}{2}\lambda - \alpha$		+	59.36
$\phi - x' : \frac{1}{2}\alpha - \alpha'$	+	2° 27	50.57

	995727
$10\frac{1}{2}\ x \cdot \alpha$	000000
$c\theta\ x' : \frac{1}{2}\alpha\ \alpha'$	000040
log tan γ	995767

γ 42 12 43.8

δ' −7 11 21.6

$\gamma - \delta'$ 49 24 05.4

	982640
log Sin π	8.25°20s
Sin $\gamma - \delta'$	017271
Cosec γ	984041
Sin $\delta \cdot \delta'$	8.131257

$\delta \cdot \delta'$ + 46 32.6

δ −6 24 49.0

$\frac{1}{2}h\ \delta$ −6 24 16.34

O − C + 4.4

Curv + 0.2

2nd Cd Eq + 0.1

δ −6 24 48.7

O − C + 4.7

π 61″ 25.5

	9.869913
log Sin π	8.25°21s
Sin $\theta - \alpha'$	8.636215
Sec $\frac{1}{2}\delta$	0.000273
Sin $\alpha - \alpha'$	6.759919

$\alpha - \alpha'$ + 1′ 58.″92

= + 7.^{s}91

α 22 15 16.88

$\frac{1}{2}h\ \lambda$ 22 15 15.86

O − C + 1.00

Curv − 003

α 22 15 16.85

O − C = + 097

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13307 Star Measures 21

1	16228	17238	16504	17790
17.	15962	7510	13674	10620
19.2	62	10	74	20
	28	38	04	90
	17.0266	17.0272	19.2830	19.2830
2	17797	16938	16900	17380
19.9	9208	15520	12815	11460 61
13.4	06 07	20	15	62
	97	38	00	80
	19.8590	19.8582	13.4085	13.4081
3	16358	16040	16820	17760
34.5	12163	10230 64	11104	13480
22.6	65	30	04	80
	58	40	20	60
	24.4194	34.4190	22.5716	22.5720
4	19138	19358	18440	17783
334	15670	12833 31	16555 54	9661
14.2	70	29	53	61
	38	58	40	83
	33.3168	33.3473	14.1886	14.1878

Moon

1	16202	16450	18882	16930
	7400	14792	14868 66	10936
	00	52	64	36
	02	50	82	30
	24.8302	24.8302	15.4016	15.4006
2			18215	16490
25.			11470 75	13.2202 22
13.7			80	24
			15	90
			15.6740	15.6732

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13307 Star Measures 21

L	16228	17238	16504	17790
7.	15°962	75°10	13674	10628
9.2	62	10	74	20
	28	38	04	90
	17.0266	17.0272	19.2830	19.2830
2	17797	16938	16900	17380
9.4	9218	15°520	12815°	11460 61
3.4	06 07	20	15°	62
	97	38	00	80
	19.85°90	19.85°82	12.408 5°	13.4081
3	16354	16040	16820	17760
9.5°	12163	10230	11104	13480
22.6	64 65°	30	04	80
	5°8	40	20	60
	3.44194	3.44190	22.5°716	22.5°720
4	19138	19358	18440	17783
334	15670	12833 31	165°5°5°5°4	9661
14.2	70	29	53	61
	38	5°8	40	83
	33.8468	33.3473	14.1886	14.1878

Moon

L	16202	16450	18882	16930
	7900	14752	14868 66	10936
	00	5°2	64	36
	02	5°0	82	30
	24.8302	24.8302	15°4016	15°4006
2			18215°	16490
5.			11470 75°	13220 26
5.7			50	24
			15°	90
			15.6740	15.6732

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3
25.7
16.5

17558	16766
15310,12	9020
14	20
58	66
25,22 46	25,22 54

4
25.1
17.0

17126	16756
15292,94	8586
96	86
26	56
25,18 32	25,18 30

5
25.0
17.5

17621	16235
12487,89	11375
91	75
21	35
17,51 32	17,51 40

6
24.
18.9

17210	16263
12852	10628,27
52	20
10	63
18,43 58	18,43 64

7
23.2
18.7

17410	16630
11408	12638
08	38
10	30
18,60 02	18,60 08

8
23
18.6

16885	16900
98747,35	13985,90
76	95
85	90
22,70 10	22,70 00

16722	16040
11412	11348
12	48
22	40
18,53 10	18,53 28

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3	17.5.5.8	16766
.2	15310	9020
.5	14 12	20
	58	66
	25.2246	25.2254
	17126	16756
.1	15292	8556
.0	96 94	86
	26	56
	25.1832	25.1830

	17621	16235
0	12487 89	11375
.5	91	75
	21	35
	17.5132	17.5140
	17210	16263
.1	12852	10628 27
.4	52	20
	10	63
	18435.8	18436.4
	17410	16630
2	11408	12638
.1	08	58
	10	30
	18.602	18608
	16885	16990
.3	98749.5	139850.0
.86	76	95
	85	90
	22.7010	22.1000
	16722	16040
	11412	11348
	12	42
	22	40
	18.5310	18.5308

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13307 Times Etc 23

Date. Sept. 4, 1917

Exp. & Stars	02	53			03	05	
" " Moon	02	59	00.0		02	59	00.3
clock Slow			31.9				
H. Sid. Time	02	59	32.05	G =	+0h	52m	
" Long.	04	44	31.05				
G. Sid. Time	07	44	03.10				
" " " M.N	10	52	8.33				
Interval	20	51	54.77				
Red		3	25.10				
G. M. T.	20	48	29.67		20.8082		

From Naut. Almanac R A Dec.

Moon 20h	02	05	35.46	+17	33	0.2	
Motion 1h			2.3515			+10.643	
" 48.2945		01	54.03		08	36.1	
Tabular Place	02	07	29.49	+17	41	36.3	

934" = 13.9

Moon's Age 18d

a = -5.044
+240
-480.4

Parallax	59	00.6
Semi-diam	16	07.9
R		967.9
Aug.		-14.9
Dist. 4		-0.4
R		982.4
R		2.1067
a R		-101.2
(1+a) R		2.0055
R²		4.0220

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13307 Times Etc. 23

Date Sept 4, 1917

Exp ♄ stars	02	53		03	05
" " moon	02	59	00.0	02	59 003
clock slow			31.9		
♄ Sid Time	02	59	32.05	$\epsilon = +0^h 5.2^m$	
" Long	04	44	31.05		
☉ Sid Time	07	44	03.10		
" " " M.N	10	52	8.33		
Interval	20	51	54.77		
Red		3	25.10		
☉ M.T.	20	48	29.67	20.80812	

From Naut. Almanac R A Dec.

Moon 20h	02	05m	35.46	+17	33	0.2	
Motion 1h			2.35.15			+10.643	
" 48.4945m		01	54.09		08	36.1	
Tabular Place	02	07	29.49	+17	41	36.3	

934" = 13.9

Moon's Age 18d

a = -5.044
+240
-480.4

Parallax
Semi-diam 16 07 9
R 967.9
Aug 14.9
Dr. 4 - 0.4
R 982.4
R 2.1067
a R - 1012
(1+a) R 2.00555
R2 4.02220

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Cafe no 330 mg 7.5

02 11 33.884
33.889
33 880

02 11 33.884
55.999

α 02 12 29.883
A 02 05 59.995
+ 06 29.888
+ 389.83

2.59087
9.98075
1.07886

22
+ 11.99911
+ 46
33.99957
X 33.33470
− .64887 10186

+16 51 08.9
8.3
8.9
+16 51 08.7
+04 45.8
δ +16 55 54.5
+17 28 26.6
− 32 32.1
−1952.2
3,2905.2 n
0,62167 n

9.4835
2.1577
8.6946

η_0 −4.1847
+ 0.0495
13.8648
y 14.1882
+ 22234 10328

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13307

Standard Coordinates

	Cafe no. 305 mg 7.0			Cafe no 311 mg 6.4			Cafe no. 331 mg 7.4		
C	02 02	16.44		02 03	53.38		2 12	13.34	
q		16.52			53.33			13.33	
ε		16.43			53.42			13.33	
m	02 02	16.46		02 03	53.38		2 12	13.33	
Prec		55.85			55.90			57.28	
α	02 03	12.31		02 04	49.28		2 13	09.61	
Δ	02 05	59.95		02 05	59.95		2 05	59.95	
α-A	− 02	47.64		− 01	10.67		+ 7	09.66	
Δ-D		−167.64			−70.67		+	429.60	
log	2.224377n			1.849244n			2.633306		
log cos δ	9.997910			9.998098			9.997803		
log S_0	0.710711n			0.337466n			1.118331		
S_0	− 5.1370			− 2.1750			+ 13.1321		
S_1	−	4		−	2		+	60	
S	−16.8626			−19.8248			35.1381		
X	17.0269			19.8586			34.4192		
X-S	+ .1643			+ .0338			− .7189		
C	+17 33	11.0		+16 45	18.8		17 59	29.0	
q		11.6			18.4			28.9	
ε		12.0			18.9			29.4	
m	+17 33	11.5		+16 45	18.7		17 59	29.1	
Prec	+ 4	52.0		+ 04	49.0		04	45.2	
J	+17 38	03.5		+16 50	07.7		18 04	14.3	
D	+17 28	26.6		+17 28	26.6		17 28	26.6	
δ-D	+ 09	36.9		− 38	18.9		+ 35	47.7	
Tan	+ 576.9			− 2299.0			2147.8		
log	2.761104			3.361547n			3.331966		
log k_0	0.092255			0.692697n			0.663111		
tan δ	9.50222			9.48091			9.51336		
S_0^2	.14214			06749			22367		
log n_1	7.97770			7.20922			8.80337		
n_0	+ 1.2367			− 4.9282			+ 46037		
n_1	+ 0095			+ 0016			+ .0636		
η	19.2462			13.0734			22.6673		
ψ	19.2830			13.4083			22.5718		
ψ-η	+ 0368			+ 3349			− 0955		

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1 2 3 0 1

Standard Coordinates

Cape no. 305			mg 7.0			Cape no 311			mg 6.4			Cape no 331			mg 7.4			
C	02	02	16	44		02	03	53	38			2h	12		13	34		
4			16	52				53	33						13	33		
ε			16	43				53	42						13	33		
m	02	02	16	46		02	03	53	38			2	12		13	33		
Prec			55	85				55	90						56	28		
α	02	03	12	31		02	04	49	28			2	13		09	61		
A	02	05°	59	95		02	05°	59	95			2	05°		59	95		
α - A		- 02	47	64			- 01	10	67				+ 7		09	66		
ξ			- 167	64				- 70	67				+	429	60			
log ξ	2.222437					1.849248						2.633066						
log cos δ	999910					999098						999803						
log S_0	071071					033746						111833						
S_0	- 51370					- 21750						+ 13,1321						
S_1	-			4		-			2			+			60			
S	16.86426					19.82488						35,13881						
X	17.02669					19.85586						34,41912						
X - S	+ .1643					+ .0338						- 7189						
C	+ 17	33	11	0		+ 16	45°	18	8			17	59		29	0		
4			11	6				18	4						28	9		
ε			12	0				18	9						29	4		
m	+ 17	33	11	5°		+ 16	45°	18	7°			17	59		29	1		
Prec		+ 4	52	0			+ 64	49	0				04		45	2		
S	+ 17	38	03	5°		+ 16	50	07	7°			18	04		14	3		
D	+ 17	28	26	6		+ 17	28	26	6			17	28		26			
δ - D		+ 09	36	9		-	38	18	9			+	35°		47	7		
ξ			+ 576	9			- 2299	0						2147	8			
log ξ	2.761105					3.361574						3.331966						
log h_0	0.092255					0.692669						0.663111						
tan δ	9.5022					9.4809						9.5136						
S_0^2	14214					06749						22367						
log n_1	7.9770					7.2092						8.8037						
n_0	+ 1.23677					- 4.9282						+ 4.6037						
n_1	+ 0095°					+ 0016						+ 0636						
η	19.24662					13.07334						22.66738						
4	19.28300					13.40833						22.57185						
4 - η	+ 0.3638					+ 3349						- 0953°						

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S_0	η_1	Δs	-3.35	-2η	-7
-5.14	$+1.24$	-9	$+17$	$=+8+0$	$=+8$
-2.17	-4.93	-2	$+7$	$=+5+1$	$=+6$
$+11.99$	-4.18	$+47$	-40	$=+7+1$	$=+8$
$+13.13$	$+4.60$	$+68$	-43	$=+7-1$	$=+6$
$+1.36$	-1.59		-4	$0=-\frac{11}{}$	$=-0.04$

-3η $+28$ -4

$\Delta\eta$					
$+1$	-4	$=-3$	-1	$=-4$	
-4	$+15$	$=+11$	-0	$=+11$	
-18	$+12$	$=-6$	$+2$	$=-4$	
$+23$	-14	$=+9$	$+3$	$=+12$	
	$+5$			$0=+1=0.0$	

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17.0269	19.2830	10156	10010
19.8586	13.4083	10.267	10053
33.3470	14.1882	10186	10328
34.4192	22.5718	10020	10331

3688	3269	20423	20063
67.76	3676	20206	20659
5144	4185	20176	20341
5320	2759	20453	20381

−30.88	− 4.07	= +	217	− 596
− 1.76	+ 14.26	= −	277	− 40
+	+ 0.23	= −	12.3	= + 39.9
	+ 14.49	= −	289.3	= − 6.1

−30.88	= + 217.	− 81.5	= +135.5
	− 596	− 17.1	= −613.1

$y = -20.0 \mid -0.4$

$x = -4.4 \mid +19.8$

1917phae.proj.20

13307 Plate Center + Constants. 25

19.8586 13.4083 02 07 49.28 +16 50 07.7
22 18 +01 10.67 +38 18.9
+2.1414 +4.6917
33 490
+70.67 +2298.9

Plate Center { A 02 05 59.95
B +17 28 26.6

X-S +500X +20Y +4.4X -10620
+1643 +8513 = 10156 +386 = 10542 +75 = 10617
+0338 +9929 = 10267 +268 = 10535 +87 = 10622
-6487 +16673 = 10186 +264 = 10470 +147 = 10617
-7189 +17209 = 10020 +451 = 10471 +151 = 10622
23.2147 11609 +332 +102 = 23.3604

Y-M +500Y -19.3X +.4Y -9682
+0368 +9642 = 10010 -328 = 9682 +8 = 9690
+3349 +6704 = 10053 -383 = 9670 +5 = 9675
+3234 +7094 = 10328 -644 = 9684 +6 = 9690
-0955 +11286 = 10331 -665 = 9666 +9 = 9675
16.5933 +8297 -448 +7 = 16.4107

Table a = -0.8 b = -1.4 a-b = +0.6 b-d = -0.2
Obs. -504.4 -500.4 -4.0 -0.2

-503.6 -499.0 -4.6 0

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13307 Plate Center + Constants 20

19,8586	13.40833	02 04	49.28	+16 50	07.7
22	18.	+ 01	10.67	+ 38	18.9
+2.1414	+4.69118				
33	490				
+70.59	+2298.9				

Plate Center { A 02 05 59.93 ; D +17 28 26.6

X-5	+5000X	+20Y	+4,4X	-10620
+1643	+8513	= 10156	+386 = 10542	+75 = 10617
+0338	+9929	= 11267	+268 = 10535	+87 = 10622
-6487	+16673	= 10186	+264 = 10470	+147 = 10617
+7189	+17209	= 10020	+451 = 10471	+151 = 10622
23.2181	+11609		+332	+102 = 23.3664

y-7	+5000y	-19.3x	+,4y	-9682
:368	+9642	= 10010	-328 = 9682	+8 = 9690
:349	+6704	= 10053	-383 = 9670	+5 = 9675
:234	+7044	= 10328	-644 = 9684	+6 = 9690
:955	+11286	= 10331	-668 = 9663	+9 = 9672
16.5933	+8297		-448	+7 = 16.4107

Tables a = -0.8 e = -1.4 a-e = +0.6 1+d = -0.2
Obs. -504.4 -500.4 -4.0 -0.2

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13307 Mapu Center 26

	X	X−X₀	ΔX=0	(X−X₀)² + (Y−Y₀)²		
1	24.8302	+1.6112		2.5959	4.0152	− 68
2	25.0000	+1.7810		3.1720	4.0193	− 27
3	25.2250	+2.0060		4.0240	4.0240	+ 20
4	25.1831	+1.9641		3.8577	4.0225	+ 05
5	25.0000	+1.7810		3.1720	4.0179	− 41
6	24.0000	+0.7810		0.6100	4.0037	− 183
7	23.2190	0.0000		0.0000	4.1268	+ 248
8	22.7005	−0.5185		0.2688	4.0208	+ 12
					4.0220	

	Y	Y−Y₀	ΔY	(Y−Y₀)²	arc
1	15.4011	−1.1929	−1	1.4232	126
2	15.6736	−0.9204	−1	0.8473	117
3	16.5940	0.0000	0	0.0000	90
4	17.0000	+0.4060	0	0.1648	78
5	17.5136	+0.9196	+1	0.8459	63
6	18.4361	+1.8421	+1	3.3937	23
7	18.6005	+2.0065	+1	4.0264	0
8	18.5309	+1.9369	+1	3.7520	−15

Range 141

Y = 25 y = 15.6736
17.5136
33.1872
y_0 16.5936
Y max 18.6005
R 2.0069
Com R 2.0055
X max 25.2250
X_0 23.2181

Mapu Center { X_0 23.2190
Y_0 16.5940

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13307 Moon Center 26

	x	x − x₀	Δx = 0	(x − x₀)²	+ (y − y₀)²	
1	24.8302	+ 1.6112		25°9°9	4015°2	+ 168
2	25.0000	+ 1.7810		3.17.20	4.0193	+ 27
3	25.22°0	+ 2.0060		4.0240	4.0240	+ 20
4	25.1831	+ 1.9641		3.8°77	4.0225°	+ 05°
5	25.0000	+ 1.7810		3.17.20	4.0179	+ 91
6	24.0000	+ 0.7810		0.61.00	4.0037	− 183
7	23.2190	0.0000		0.0000	4.1268	+ 248
8	22.7005°	− 0.5185°		0.2688	4.0208	+ 152
					4.0220	

	y	y − y₀	Δy	(y − y₀)²	arc.
1	15°4011	− 1.1929	− 1	1.4232	126
2	15.6736	− 0.9204	− 1	0.8473	117
3	16.5940	0.0000	0	0.0000	90
4	17.0000	+ 0.4060	0	0.1648	68
5	17.5136	+ 0.9196	+ 1	0.8459	63
6	18.4361	+ 1.8421	+ 1	3.3937	23
7	18.6005°	+ 2.0065°	+ 1	4.0264	0
8	18°309	+ 1.9369	+ 1	3.75°20	− 15°

Range 141

y = 25° y = 15°.6736
17.°136
33.1872
y₀ 16°.936
y max 18.6005°
R 2.0069
Corr R 2.005°°
x max 25.22°0
x₀ 23.2181

Moon Center { x₀ 23.2190
y₀ 16.°940

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1	− 1.92	− 109.5	+ 81.0
2	− 1.64	− 48.2	+ 25.0
3	0.00	+ 40.0	0.0
4	+ 0.80	+ 9.8	+ 2.0
5	+ 1.64	− 73.0	− 37.7
6	+ 1.44	− 143.0	− 337.0
7	+ 0.00	+ 0.0	+ 96.7
8	− 1.01	+ 6.2	− 23.3
	+ 3.88	+ 56.0	+ 204.7
	− 4.57	− 373.7	− 398.0
	− 0.69	− 317.7	− 193.3

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1917phae.proj.26

13307

27

Conditional Equations

6-C

1	+1.61	−1.19	=	−68	−30	+17	=	−13	−	55
2	+1.78	−0.92	=	−27	−33	+13	=	−20	−	7
3	+2.01	0.00	=	+20	−37	0	=	−37	+	57
4	+1.96	+0.41	=	+ 5	−36	− 6	=	−42	+	47
5	+1.78	+0.42	=	− 41	−33	−13	=	−46	+	5
6	+0.78	+1.84	=	−183	−14	−26	=	−40	−	143
7	0.00	+2.01	=	+48	0	−29	=	−29	+	77
8	−0.52	+1.94	=	−12	+10	−27	=	−17	+	5

+191 −205

av 49

+17.70 − 0.69 = −317.7

− 0.69 + 1445 = −193.3

+( ) − 0.03 = − 12.4

+ 1442 = − 2057 b = − 142

+17.70 = −317.7 − 9.8 = −327.5 a = − 18.5

ave 141

$\frac{R}{n} = .11$

$\frac{\Sigma v}{n} = -1.7$

$\frac{-19}{11} = +1.55$

$\therefore R = -0.2$

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Conditional Equations

								O - C
1	+ 1.61	− 1.19	= − 68	− 30	+ 17	= − 13	− 55
2	+ 1.78	− 0.92	= − 27	− 33	+ 13	= − 20	− 7
3	+ 2.01	0.00	= + 20	− 37	0	= − 37	+ 57
4	+ 1.96	+ 0.41	= + 5	− 36	− 6	= − 42	+ 47
5	+ 1.78	+ 0.42	= − 41	− 33	− 13	= − 46	+ 5
6	+ 0.78	+ 1.84	= − 183	− 14	− 26	= − 40	− 143
7	0.00	+ 2.01	= + 48	0	− 29	= − 29	+ 77
8	− 0.52	+ 1.94	= − 12	+ 10	− 27	= − 17	+ 5

+ 191 + 205
ar 49

+ 17.70 − 00.69 = − 317.7

− 0.69 + 1445 = − 193.3

+ ( ) − 0.03 = − 12.4

+ 1442 = − 2057 b = − 142

+ 17.70 = − 317.7 − 9.8 = − 327.5 a = − 18.5

Arc 141

$\frac{P}{n} = -11$

$\frac{\Sigma r}{n} = -17$

$\frac{-17}{11} = -15.5$

$\Delta R = -0.2$

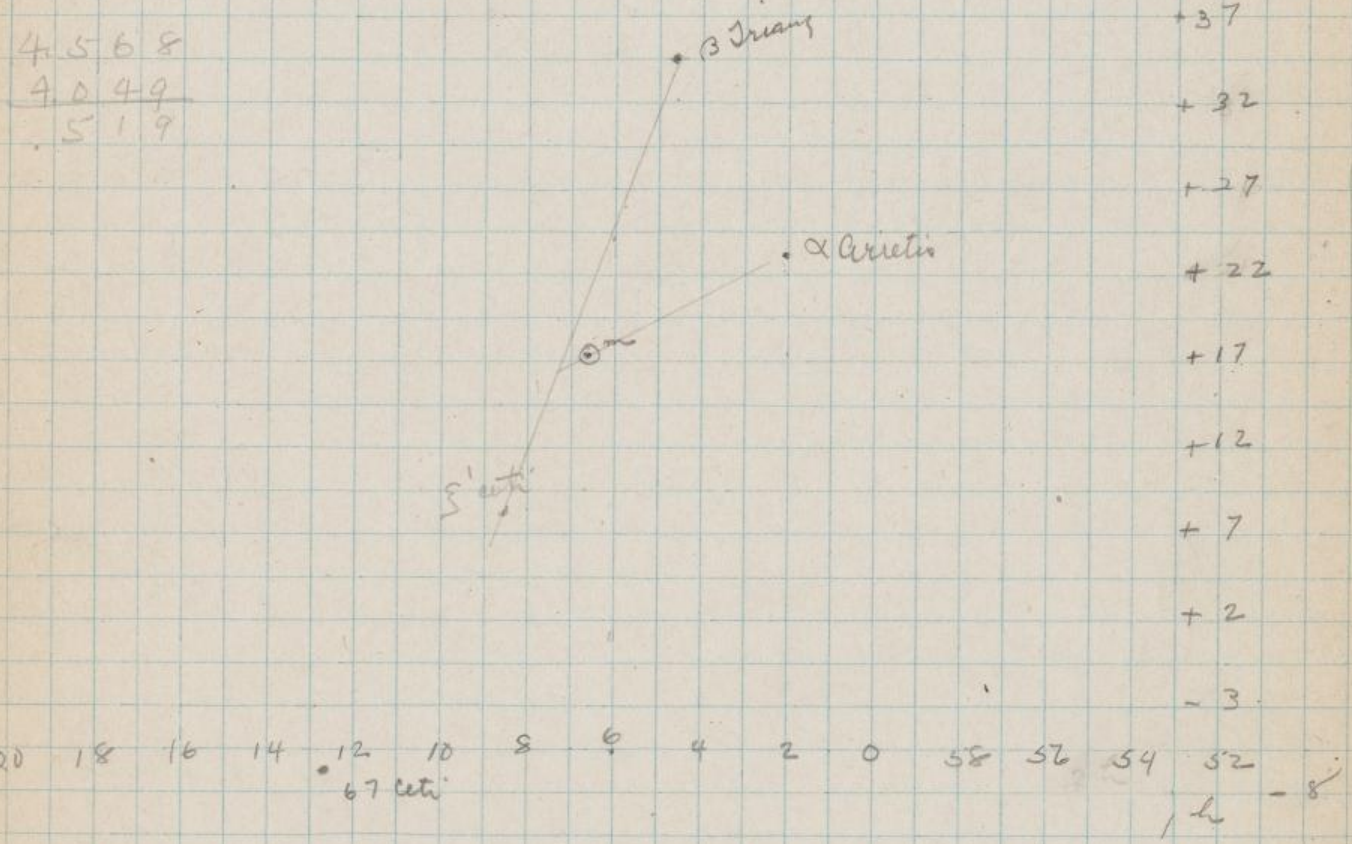
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α

		33.737					33.98	
02	02	29.429		+	23	04	13.49	
		+4.308					+19.89	
		40.533					59.55	
02	04	35.965		+	34	35	42.98	
		+4.568					+16.57	
		39.959					51.90	
02	08	35.910			8	27	28.09	
		4.049					+23.81	

4.568
4.049
.519



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13307

Moon's Mean Position.

X_0 23.2190 ✓
− 9
23.2181

Y_0 16.5940 ✓
− 7
16.5933

From Plate Constants

23.3604 ✓
12.
+1.3604 ✓

16.4107 ✓
18.
−1.5893 ✓

log S 0.13367
log δ_0 9.997997 ✓
8.507724
log δ_0 α-A 1.646446 ✓

log $\tan \delta_0$ S_0^2 9.49921 ✓
0.26673 ✓
7.05534
log n_1 68128 ✓

α-A + 4431
n_1 + 0.0006
n_0 − 1.5899 ✓

A 02 05 59.95 ✓

log n_0 0.201377 n
7.33175
log $\tan \delta$-B 2.870222 n

α_0 02 06 44.26 ✓

Red + 4.16

δ-B −741.7
−12 21.7 ✓
B +17 28 26.6 ✓

α' 02 06 48.42

δ_0 +17 16 04.9 ✓

Red + 21.4

δ' +17 16 26.3 ✓

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Moons Mean Position

X_0 23 21 90 "
− 9
23.21 81

Y_0 16.59 40 "
− 7
16.59 33

From Plate Constants

23.36 04 "
22.
1.36 04 "

16 41 07 "
18.
− 1.58 93 "

log S 0.13367
" cos δ_0 9.997997 "
8.507724
log Sin X-A 1.646466 "

log tan S 9.49921 "
S.2 − 0.26 73
7.05 34
log n_1 6.81 28

X-A + 44.31 "

n_1 + 0.0006
n_0 − 1.58 93

A 02 05 59.95 "

log n_0 0.20137 n
7.331 15-5"
log tan D-E 2.870222 n

α_0 02 06 44.26 "

D-E − 74.1.7
− 12 21.7 "

Red + 4.16

D +17 28 26.6

α' 02 06 48.42

δ_0 +17 16 04.9 "

Red + 21.4

δ' +17 16 26.3

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Reduction to Apparent Place

$H+\alpha_0$	09	27.8	$14^{\circ}\,57'$	δ_0	$+17^{\circ}\ 16.1$
H	07	21.1			
α_0	02	06.7		$\log \cos \delta_0$	9.9800
α	23	40.4		$\log i$	0.8874
$G+\alpha_0$	1	47.1	$26^{\circ}\ 46.5$	" (i)	0.8674

$\cos G+\alpha_0$	9.9508	$\sin \delta_0$	9.4725	
$\log g$	1.3139	$\cos H+\alpha_0$	9.8962	n
$\log \sin G+\alpha_0$	9.6537	$\log k$	1.2779	
$\tan \delta_0$	9.4926	$\sin H+\alpha_0$	9.7898	
	8.8239	$\cos \delta_0$	0.0200	
			8.8239	

$\log g'$	1.2647	$\log k'$	0.6766	n
g	9.2841	k	9.9116	

α	+3.156	g'	+18.395
g	+0.192	k'	−4.432
k	+0.816	i	+7.369
Red	+4.164	Red	−21.332

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13307

Reduction to Apparent Place

$H+\alpha_0$	09	27 8	141° 57'	δ_0	+17° 16.1
H	07	21.1			
α_0	02	06.7		$\log \cos \delta_0$	9.9800
G	23	40.4		$\log i$	0.8874
$G+\chi_0$	1	47.1	26° 46.5'	" (i')	0.8674

$\cos G+\chi_0$	9.9508		$\sin \delta_0$	9.4725
$\log g$	1.3139		$\cos H+\chi_0$	9.8962
$\log G+\chi_0$	9.6537		$\log k$	1.2779
$\tan \delta_0$	9.4926		$\sin H+\chi_0$	9.1898
	8.8239		$\sec \delta_0$	0.0200
				8.8239

$\log g'$	1.2647	$\log k'$	0.6466
g	9.2841	k	9.9116

f	+3.15"6
g	+0192
k	+0816
Red	+4164

g'	+18.39"5
k'	−4432
i	+7389
Red	−21.332

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13307 Linear Parallax. 30

α'	02	06	48.42	π	5	9.0657
θ	02	59	32.05			
$\theta - \alpha'$	+	52	43.63			
=	+13°	10'	54.45			9.869137
$\frac{1}{2}(\alpha - \alpha')$		5	14.00	log sin π		8.235536
$\theta - \frac{1}{2}(\alpha + \alpha')$	+13	05	40.45	" sin $\theta - \alpha'$		9.358800
				" sec θ/δ		0.021047
				sin $\alpha - \alpha'$		7.483539
			9.955727			
log cos $\frac{1}{2}(\alpha - \alpha')$			0.000000	$\alpha - \alpha'$	+10'	28.00"
sec $\theta - \frac{1}{2}(\alpha + \alpha')$			0.011447		=	+ 41.86"
log tan χ			9.968711			
χ	42	56	16.2"			
δ'	+17	16	26.3"			
$\chi - \delta'$	25	39	49.9"			
			9.826400			
log sin π			8.235536			
sin $\chi - \delta'$			9.636558			
cosec χ			0.166721			
sin $\delta - \delta'$			7.865061			
$\delta - \delta'$		+25	11.8"			
δ	+17	41	38.1"	α	02	07 30.28"
g/k δ	+17	41	36.3"	g/k α	02	07 29.49"
O-C		+	1.8"	O-C		+.79"
2nd Cld Ref			0.0	corr.		-0.04"
corr		-	0.0			
				α	02	07 30.24
				O-C =		0.75

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13307 — Lunar Parallax. — 30

α'	02	06	48.42
α	02	59	32.05
$\alpha - \alpha'$	+	52	43.63
δ'	+13°	10'	59.95
$\frac{1}{2}(\alpha - \alpha')$		5	14.08
$\frac{1}{2}(\alpha - \alpha') - \frac{1}{2}(\alpha - \alpha')^3$		13.05	40.95

π 59' 06.57

	9.869913
log Sin π	8.235536
" Sin θ x'	9.350800
" Sec $\frac{1}{2}(\delta + \delta')$	0.002104
Sin $\frac{1}{2}(\alpha - \alpha')$	7.483538

	9.955727		
log Cos $\frac{1}{2}(\alpha - \alpha')$	0.000000	$\alpha - \alpha'$	+ 10 28.09
θ x - $\frac{1}{2}(\alpha - \alpha')$	0.01144	=	+ 41.86
log Tan γ	9.968711		

γ	42	56	16.2
δ'	+17	16	26.3
$\gamma - \delta'$	25	39	49.9

	9.826400
log Sin π	8.235530
Sin $\gamma - \delta'$	9.636558
Cosec γ	0.166712
Sin $\delta - \delta'$	7.865060

$\delta - \delta'$		25	11.8
δ	+17	41	38.1
$\gamma - \delta$	+17	41	36.3
O-C		+	1.8

α	02	07	30.28
$\gamma - \alpha$	02	07	29.47
O-C			+.99

2 Ccl. Ref 0.0

Corr - .004

α 02 07 30.24

O-C 1.75

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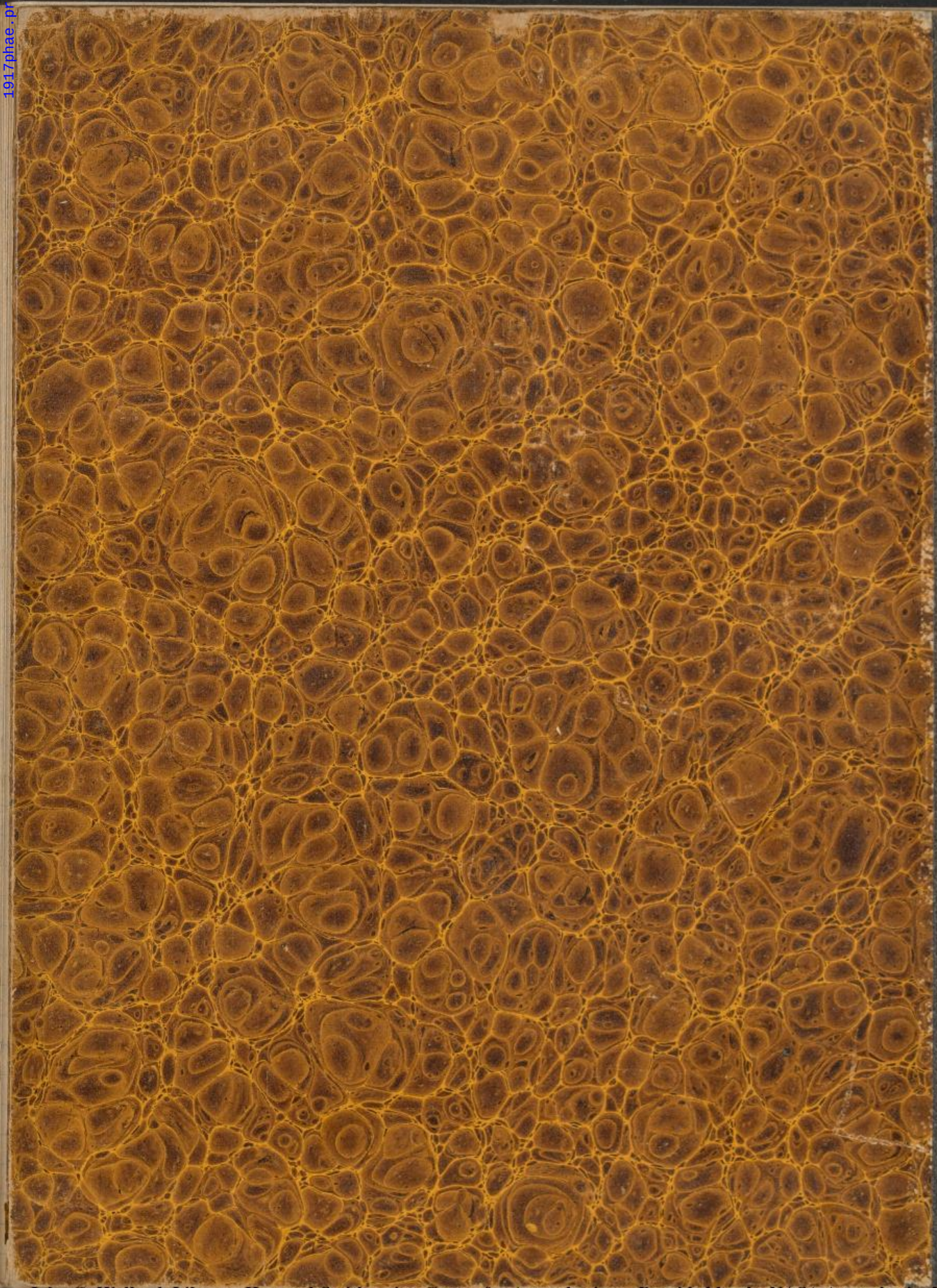
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