

KG

11366

v.1006

CLIV

154



Plate	Date	Page
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10998	Aug 12 '16	21
10999	"	21

10605

Star Measures

1	18139	17827	(2177)	18360	17170
10.7	12555	13419		1204044	1349899
18.6	55	19		48	00
	39	27		60	80
	<u>10.5584</u>	<u>10.5592</u>		<u>18.6316</u>	<u>18.6320</u>

3	18785	18032	(2203)	177495	18862
29.4	14889	11942		9842	16624
29.8	88	42		42	24
	90	40		7505	70
	<u>29.3897</u>	<u>29.3905</u>		<u>29.7661</u>	<u>29.7671</u>

3	17200	19456	2209	18688	17261
32.4	12345	14329	25	1692327	9042
512	47	20		31	42
	05	9464		90	69
	<u>324855</u>	<u>324864</u>		<u>5.1761</u>	<u>5.1773</u>

4	18866	18590	(2206)	18832	17310
31.4	15060	12403		19980	1617072
10.9	5859	03		80	74
	70	8594		38	20
	<u>31.3809</u>	<u>31.3809</u>		<u>10.8858</u>	<u>10.8860</u>

18.9355	2188	28.8082
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17.9787	2186	20.4657
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16810	16862	11257	1.6170	19440
14408	925654		8190	17410
	52			20
14.2402	14.2402		11.7980	11.7990

16522	17595	11367	16701	18082
1593736	8177		1494035	9845
35	77		30	45
22	95		01	82
<u>32.0586</u>	<u>0582</u>		<u>20.1766</u>	<u>20.1763</u>

1916phae:proj:2

10615

Star Measures

1

L	18139	17827
10.7	12555	13419
186	55	19
	39	27
	<u>10.5584</u>	<u>10.5592</u>

18360	17180
1204044	1359849
48	00
60	80
<u>18.6316</u>	<u>18.6320</u>

2	18785	18132
294	14889	11942
2.98	89	42
	90	40
	<u>29.8897</u>	<u>29.9905</u>

17495	18862
9842	16624
42	24
7505	70
<u>29.7661</u>	<u>29.7671</u>

2	17200	19456
324	1234546	1432925
5.2	47	28
	05	9464
	<u>324855</u>	<u>324864</u>

18688	17261
1692327	9442
31	42
90	69
<u>5.1761</u>	<u>5.1773</u>

189355

2188

288082

17.9787

2186

205657

16810	16862
14408	925654
	52

11257

16170	19440
8190	17420
	10

14.2402 14.2402

11.7980 11.7980

16522	17595
1593736	8177
35	77
22	95

11367

16701	18082
1494035	9845
30	45
01	82

32.0580 0582

20.1766 20.1767

25
14
3
2
1
3
24
14
4
24
16
5
24
16
6
24
17
7
24
17
8
24
17

10605

Moon

2

1 17622
 255 14677
 143 83
 222942

2
 23
 14.4

3
 24
 14.9

4 16205 16505
 24.4 11662 11049
 16.0 62 5150
 05 05
24.4543 24.4545

5 16226 16476
 24.4 11505 11190
 16.3 05 90
 26 76
24.4721 24.4714

6 16283 16446
 24.3 12962 976265
 17.0 62 68
 83 46
24.3321 24.3319

7
 24.0
 17.5

8 16028 17586
 23.4 1141004 1227092
 18 00 90
 28 86
23.4618 23.4624

18602 17506
 1568889 10420
 90 20
 06
142913 142914

18342 17332
 1478182 10880
 83 8884
 42 32
14.3560 14.3552

17498 16158
 7615 15980
 15 80
 98 20
14.9883 14.9860

18680 18940
 1315853 1446162
 48 6362
 80 40
17.5527 17.5522

Monday

$\frac{1}{10} \cdot 10^5 =$

4	1	7	6	2	2
5	1	7	6	7	7
10				2	2
				2	9
				4	2

34.4

3
24
14.8

$$\begin{array}{r} 4 \\ 144 \\ 16.0 \end{array} \quad \begin{array}{r} 16205 \\ 11662 \\ 62 \\ 05 \end{array} \quad \begin{array}{r} 1650.5 \\ 11049 \\ 5750 \\ 05 \end{array}$$

5°

16	22	6	16	47	6
24.4	11	50	5	11	19
		0	5		9
16.3		26			76
	24.4	721		24.4	714

$$\begin{array}{r} 16283 \\ 24.3 \quad 12962 \\ 17.0 \quad 62 \\ \quad \quad 83 \\ \hline 243321 \end{array}$$

240
 17.5

$$\begin{array}{r} 8 \\ 234 \\ 18 \end{array} \begin{array}{r} 16028 \\ 11410 \\ 48 \\ 28 \end{array} \begin{array}{r} 17586 \\ 12290 \\ 20 \\ 26 \end{array}$$

18602	17506
15688	11420
90	20
	06
14291	14291

$$\begin{array}{r} 18342 \\ 1478182 \\ \hline 142560 \end{array} \quad \begin{array}{r} 17332 \\ 10880 \\ 28804 \\ 32 \\ \hline 143552 \end{array}$$

17498	16128
7615	15480
15	88
98	20
149883	149860

$$\begin{array}{r} 18680 \\ 1315853 \\ 48 \\ 80 \\ \hline 7.5527 \end{array} \quad \begin{array}{r} 18940 \\ 14461 \\ 6362 \\ 40 \\ \hline 17.5522 \end{array}$$

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3.

Date Mar 23 '16^v

Times etc

Expt. Stars	17	00		17	12	
" Moon	17	06	12.3 ^L	17	06	12.5
Clock fast		05	27.1 ⁻			
2. Sid. Time	17	00	45.3 ^v	$\theta = +0^{\circ} 59'$		
H. Long.	04	44	31.05 ^{-L}			
S. Sid. Time	21	45	16.35 ^L			
Sid. Time M.N.	0	02	33.75 ^{-L}			
Interval	21	42	42.60 ^{-L}			
Reduction		03	33.42 ^{-L}			
G.M.T.	21	39	09.18 ^{-L}	21.65255 ^{-v}		

From Naut. Almanac			R.A.		Decl.	
moon 21 ^h	16	00	10.08	-25	14	37.6 ^L
motion 1 ^m			2.5647 ⁻			5.584 ⁻
motion 39.1538		+ 01	40.41 ^{-L}		- 03	38.6 ^L
Tabular Place	16	01	50.49	-25	18	16.2 ⁻

Moon's age ²⁰
+9^d

$$934'' = 5.7$$

$$5.6$$

$$a = -504.9$$

$$+24$$

$$-480.9$$

Parallax 59 03.9^{check}

Semi diam	16	07.2 ^{-L}
R		967.2 ^{-L}
ang		6.1 ^{6.0}
Dist 45		- 0.7 ⁻
R		972.6 ⁻
R		2.0849
(1+a) R	-	1003
R		1.9846
R ²		3.9386

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3

Times etc

Date Nov 23 '16

Exp to Stars	17	00		17	12
" Moon	17	06	12.35	17	06 12.5
clock fast		03	27.1		
Z ¹ Sid Time	17	00	45.35	$\theta = +0^h 59^m$	
H ¹ Long.	04	44	31.05		
S ¹ Sid Time	21	45	16.35		
Sid Time M.M.	0	02	33.75		
Interval	21	42	42.60		
Reduction		03	33.42		
G.M.T	21	39	09.18	21	6525.5

From Naut. Almanac

R.A.

Decl.

moon 21 ^h	16	00	10.08	-25	14	37.6
motion 1 ^h			2.5647			5.584
motion 39 15 38		-01	40.41		-03	38.6
Tabular Place	16	01	50.49	-25	18	16.2

moon age 19^h

934" = 154.7

Parallax 59 03.9

Semi diam 16 07.2

R 967.2

ang 16.1

Dist - 0.7

R 972.6

R 20849

(1+a) R - 1003

R 19846

R² 39386

a = -504.9

+24

-480.9

S	η	ΔS	$+0.1\eta$	$-4.4S$	-9
- 12.37	+ 0.69	- 47	+ 0 =	- 47 + 54 =	+ 7
- 457	+ 2.56	- 3	+ 0 =	- 3 + 20 =	+ 17
- 3.56	+ 11.33	- 13	+ 1 =	- 12 + 16 =	+ 4
+ 7.41	+ 12.36	+ 39	+ 1 =	+ 40 - 32 =	+ 8
+ 9.49	- 7.48	+ 35	- 1 =	+ 34 - 42 =	- 8
+ 10.64	- 13.48	+ 76	- 1 =	+ 75 - 47 =	+ 28
M + 0.16	- 1.87		- 0	- 1 =	<u>- 10</u>

$\Delta\eta$	$-0.1S$	-4.8η	$+8$
+ 3	+ 1 = + 4	- 3 =	+ 1
+ 2	+ 0 = + 2	- 12 =	- 10
+ 40	+ 0 = + 40	- 54 =	- 14
+ 62	- 1 = - 61	- 59 =	+ 2
- 27	- 1 = - 28	+ 36 =	+ 8
- 95	- 1 = - 96	+ 64 =	- 32
- 7	- 0	+ 9	<u>+ 17</u>

Corr. $\alpha = -0.03$
 $S = +0.8$

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Plate Center - Constants

4

10.5588	18.6318	15	53	46.01	-25	52	23.5
29.3901	29.7666	16	05	06.73	-24	21	40.9
32.4860	5.1767	16	07	07.54	-27	42	34.0
72.4349	53.5751	47	65	60.28	76	115	98.4
24.1450	17.8584	16	02	00.09	-250	58	52.8
22.	18.			-66.49			+66.1
-2.1450	+0.1416						
31.	466.5						

Plate Center { 16 00 53.60

$X-5$	$+500X$	$+7.28$	$+4.8X$	-14776			
$+9320$	$+5278$	$= 14599$	$+134$	$= 14733$	$+52$	$= 14785$	$+9$
$+5537$	$+8989$	$= 14526$	$+147$	$= 14673$	$+88$	$= 14761$	-15
$+5023$	$+9468$	$= 14491$	$+207$	$= 14698$	$+93$	$= 14791$	$(+15)$
-0280	$+14695$	$= 14415$	$+214$	$= 14629$	$+144$	$= 14773$	-3
-1161	$+15690$	$= 14529$	$+78$	$= 14607$	$+153$	$= 14760$	-17
-1654	$+16243$	$= 14589$	$+37$	$= 14626$	$+159$	$= 14785$	$+9$
224878	$+11244$	$=$	$+117$	$=$	$+110$	$=$	$22,1573$

y-n +500y

+2.1X

+24.8y

-10009

+0230	+9316	= 9546	+22	= 9568	+462	= 10030	+21
-0792	+10233	= 9441	+38	= 9479	+508	= 9987	-22
-5135	+14404	= 9269	+40	= 9309	+714	= 10023	(+14)
-5682	+14883	= 9201	+62	= 9263	+738	= 10001	-8
+4192	+5443	= 9635	+66	= 9701	+270	= 9971	-28
+7256	+2588	= 9844	+68	= 9912	+128	= 10040	+31
162721	+8136	=	+47	=	+402	=	16,1297

Tables.

a = -1.6

b = -18.8

a-b = +17.2

f+d = -8

-504.9

-524.8

+19.9

=-9.3

0-c

-503.3

-506.0

-1.3

10605

4

Plate Center + Constants

10.5588	18.6318	15	53	46.01	-25	52	23.5
29.3801	29.7666	16	05	06.73	-24	21	40.9
32.4860	5.1767	16	07	07.54	-27	42	34.0
24.349	15.35751	57	65	60.28	76	115	98.4
41.450	17.8584	16	02	00.09	-25	58	52.1
22	18.			-66.48			+66.1
-2.1450	+0.1416						
131	4665						

Plate Center { 16 00 53.60

X-5	+500X	+7.28	-25	59	46.7	+4.9X	-14776
+9320	+5278	= 14599	+134	= 14733	+52	= 14785	+9
+5537	+8989	= 14526	+147	= 14673	+88	= 14761	-15
+5023	+9468	= 14491	+207	= 14698	+93	= 14791	+15
-0280	+14695	= 14415	+214	= 14629	+144	= 14773	-3
-1161	+15690	= 14529	+78	= 14607	+153	= 14760	-17
-1654	+16243	= 14589	+37	= 14626	+159	= 14785	+9
14878	+11244	=	+117	=	+110	= 22.1573	-

y-2 +500Y

		+ 2.1A	+ 24.84	- 10009
+ 0230 + 9316 =	9546 + 22 =	9568 + 462 =	10030 + 21	
- 0792 + 90233 =	9441 + 38 =	9479 + 508 =	9987 - 22	
- 5135 + 14404 =	9269 + 40 =	9309 + 714 =	10023 + 14	
- 5682 + 14883 =	9201 + 62 =	9263 + 738 =	10001 - 3	
- 4192 + 5443 =	9635 + 66 =	9701 + 270 =	9971 + 28	
- 7256 + 2588 =	9844 + 68 =	9912 + 128 =	10040 + 31	
2721 + 8136 =	+ 47	+ 402	16.1297	

-504.9

-524.8

+19.9

=-9.3

PM

Cafe no 2188 mg 64				Cafe no. 2186 mg 4.9				2206 mg 6.8			
C	15	57	54.24	15	57	17.90					
Y			54.28			17.92					
E			AG. 54.32			17.90					
Mean	15	57	54.28	15	57	17.91					
Prec			57.53			+57.89					
α	15	58	51.83	15	58	15.80	16	06	54.77		
A	16	00	53.60	16	00	53.60	16	00	53.60		
$\alpha-A$	-	02	01.77	-	02	37.80			+0531.17		
$\sin \alpha-A$			-121.77			-157.80			+331.17		
log	2.08	583	n correct from	2.198	11n		2.520	05			
log δ	9.95	905	here	9.95	5-01		9.95	014			
log δ	0.55	212	n	0.66	036	n	0.97	743			
S_0	-3.56	55		-4.57	47		+9.49	36			
S_1	-	13		-00003			+0034				
S	18.43	32		1742.50			34.49	70			
X	18.93	55		17.9787			31.38	09			
$X-S$	+ .50	23		+ .5537			-	1161			
C	24	27	00.1	-25	35	10.9					
E			0.4			17.1					
E			AG. 0.9			9.5					
-24	27	0.5		-25	35	10.5					
Prec	-02	42.3		-02	43.7						
δ	-24	29	42.8	-25	37	54.2	-26	55	56.5		
δ	-25	57	46.7	-25	57	46.7	-25	57	46.7		
$\delta-A$	+1	28	03.9	+19	52.5		-58	9.8			
$\sin \delta-A$			+5285.0			+1192.5			-3490.1		
log	3.72	304		3.07	646		354	284	n		
	1.05	419		0.40	761		0.87	399	n		
log δ	9.65	861	n	9.68	106	n	9.70	59	n		
log δ	1.12	618		1.32	072	n	1.95	48			
log δ	7.83	82	n	8.05	52	n	8.71	41	n		
η_0	+11.3	286		+2.55	63		-7.48	15			
η_1	-	0069		-0.01	14		-0.05	18			
η	29.32	17		20.54	49		10.46	67			
η	28.80	82		20.46	57		10.88	59			
$\eta-A$	-	5135		-0.79	2		+4122				

10605 PM				Standard Coordinates				PM 5			
Cafe No. 2177 mg 3				Cafe No. 2213 mg 6.6				Cafe No. 2209 mg 4.6			
C	15	52	48.04	16	04	04.08	16	06	08.51		
q			48.04			09.10			08.52		
E		Boss	48.07			09.13		Boss	08.51		
mean	15	52	48.05	16	04	09.10	16	06	08.51		
Prec			+ 57.96			+ 57.63			+ 59.03		
α	15	53	46.01	16	05	06.73	16	07	07.54		
A	16	00	53.60	16	00	53.60	16	00	53.60		
$\alpha - A$	-	07	07.59	+	04	13.13	+	06	13.94		
$\sin \alpha - A$			- 427.52			+ 253.12			+ 373.90		
log "			2.63196			2.40333			2.57276		
log cos δ			9.95413			9.95950			9.94710		
log S ₀			1.09233			0.87007			1.02710		
S ₀	-		12.3688	+		7.4143	+		10.6439		
S ₁	-		0444	+		38	+		0075		
S			9.6268			29.4181			22.6514		
X			10.5588			29.3901			32.4860		
X-S			+ 9320	-		.0280	-		.1654		
C	-25	49	34.5	-24	19	05.9	-27	40	01.3		
q			34.2			07.0			01.2		
E		Boss	34.6		A.G	05.6		Boss	01.2		
mean	-25	49	34.4	-24	19	06.2	-27	40	01.2		
Prec	-	02	48.7	-	02	34.7	-	02	32.6		
δ	-25	52	23.5	-24	21	40.9	-27	42	38.8		
$\delta - A$	-25	57	46.7	-25	57	46.7	-25	57	46.7		
$\delta - B$	+	05	23.2	+	1	3.6	-	1	44	47.1	
log "			+ 323.2			+ 5767.3			- 6289.0		
log "			2.50947			3.76097			3.79858		
log "			9.84062			1.09212			1.12973		
log tan δ			9.68573			9.65591			9.72035		
log S _{0.2}			2.18466			1.74014			2.05420		
log m ₁			8.9238			8.4494			8.8279		
m ₀	+0.6928			+12.3629			-13.4816				
m ₁	-0.0840			-0.0281			-0.0673				
m	18.6088			30.3348			4.4511				
y	18.6318			29.7666			5.1767				
y-m	+0.230			- .5682			+ .7256				

10605 PM			Standard Coordinates			PM 5		
Cape no. 2177 mg. 3			Cape no. 2213 mg. 66			Cape no. 2209 mg. 46		
15	52	48.04	16	04	09.08	16	06	08.51
		48.07			09.10			08.52
		48.09			09.13			08.51
15	52	48.05	16	04	09.10	16	06	08.51
		+ 57.96			+ 57.63			+ 59.03
15	53	46.01	16	05	06.73	16	07	07.
16	00	53.60	16	00	53.60	16	00	53.60
-1A	-07	07.59	+	04	13.13	+	06	13.94
(A-A)		-427.52			+253.12			+373.40
	2.63196				240.333			257.276
008	995413				995950			994710
150	1.09233				0.87001			1.02710
S ₀	-12.3688		+	7.4143		+	10.6439	
S ₁	-0444		+	38		+	.0075	
S	9.6268			29.4181			22.6514	
X	10.5588			29.3901			32.4860	
-S	+4320			- .0280			- .1654	
C	-25° 49	34.5	-24	19	05.9	-27	40	01.3
4		34.2			05.9			01.2
2		34.6			05.6			01.2
15	-25	49	34.5	-24	19	06.2	-27	40
15	-02	48.7		-02	34.7		02	32.6
S	-25	52	23.5	-24	21	40.9	-27	42
15	-25	57	46.7	-25	57	46.7	-25	57
-E	+	05	23.2	+	1	36	05.2	-1
		+323.2			+57.653			-6289.00
15	2.50947			3.76197			3.79858	
7	9.84062			1.09212			1.12973	
7	9.68573			9.65591			9.72035	
75	2.18446			6.74014			2.05420	
7	8.9238			8.4494			8.8279	
15	+0.6428		+	12.3629		-	13.4816	
15	-0.0840		+	0.0281		-	0.0673	
15	18.6088			30.3348			4.4518	
15	18.6318			29.7666			5.1767	
15	+0.230			- .5682			4.7250	

Standard Coordinates.

11257

11367

m. 15 54 58.84
 Puc 58.41
 x 15 55 57.25
 A 16 00 53.60
 a-b - 4 56.35
 sin r - 396.33
 Y_g 2.47178m
 cos 9.95061
 E₀ 0.92963m
 S₀ -8.5042
 S₁ -0.025
 S 13.4933
 X 14.2402
 Y-S +.7469

16 05 47.86
 58.19
 16 06 46.05
 16 00 53.60
 + 05 52.45
 +352.41
 2.54705
 9.95489
 1.00918
 +10.2136
 + 0028
 32.2164
 32.0584
 - 1580

m. -26 45 52.0
 - 2 45.9
 0 -26 48 37.9
 0 +25 57 46.7
 - 50 51.2
 - 3051.4
 3.48450m
 0.81565m
 9.7036m
 1.8392
 8.61622

-25 37 20.7
 - 2 32.7
 -25 39 53.4
 +25 57 46.7
 + 17 53.3
 +1073.3
 3.03072
 0.36187
 9.6817m
 2.0183
 8.7534m

z₀ -6.5411
 z₁ -.0413
 z 11.4176
 y 11.7975
 z-y +3799

+2.3008
 -.0567
 20.2441
 20.1764
 -.0677

10605

Moons Center

6.

	X	X-X ₀	(X-X ₀) ²	-(Y-Y ₀) ²	O-C
1	22.4870	+0.0000 - 14	0.0000	3.9394	+ 8
2	23.0000	+0.5130 - 14	0.2617	3.9500	+ 114
3	24.0000	+1.5130 - 10	0.2861	3.9447	+ 61
4	24.4544	+1.9674 - 2	3.8699	3.9446	+ 60
5 X	24.4717	+1.9847 - 0	3.9390	3.9390	+ 4
6	24.3320	+1.8450 + 5	3.4058	3.9361	- 25
7	24.0000	+1.5130 + 10	2.2922	3.9347	- 39
8	23.4621	+0.9751 + 13	0.9533	3.9455	+ 69
				R ² 39386	

	Y	Y-Y ₀		
1 y _{min}	14.2914	-1.9816 - 32	3.9394	180°
2	14.3556	-1.9174 - 31	3.6883	165°
3	14.9872	-1.2858 - 21	1.6586	130°
4	16.0000	-0.2730 - 4	0.0747	98°
5	16.2730	-0.0000 - 0	0.0000	90°
6	17.0000	+0.7270 + 12	0.5303	69°
7	17.5525	+1.2795 + 21	1.6425	50°
8	18.0000	+1.7270 + 28	2.9922	29°

151

X = 24 Y = 14.9872
 17.5525
 325397
 Y₀ 16.2699
 Y_{min} 14.2914
 1.9785
 Com R 1.9846

X max = 24.4717

Moons Center { X₀ 22.4870
 Y₀ 16.2730

10665

Mobius Center

6

	x	$x - x_0$	$(x - x_0)^2$	$-1 - y_0$	$0 - C$
1	22.4870	+0.0000 - 14	0.0000	3.9394	+ 8
2	23.0000	+0.5130 - 14	0.2617	3.9500	+ 114
3	24.0000	+1.5130 - 10	2.2861	3.9447	+ 61
4	24.4544	+1.9674 - 2	3.8699	3.9446	+ 61
5	24.4717	+1.9847 - 0	3.9390	3.9390	+ 4
6	24.3320	+1.8450 + 5	3.4058	3.9361	- 25
7	24.0000	+1.5130 + 10	2.2922	3.9347	- 39
8	23.4621	+0.9751 + 13	0.9533	3.9455	+ 69
			R^2	3.9386	

	y	$y - y_0$	$(y - y_0)^2$
1	14.2914	-1.9816 - 32	3.9394
2	14.3556	-1.9174 - 31	3.6883
3	14.9872	-1.2858 - 21	1.6586
4	16.0000	-0.2731 - 4	0.0747
5	16.2730	-0.0000 - 0	0.0000
6	17.0000	+0.7270 + 12	0.5303
7	17.5525	+1.2795 + 21	1.6425
8	18.0000	+1.7270 + 28	2.9922

1.51

 $x = 24$ $y =$

14.9872

17.5525

3.25397

16.2699

14.2914

1.9785

Com R 1.9846

 $x_{max} = 24.4717$

Mobius Center

$\left\{ \begin{array}{l} x_0 = 22.4870 \\ y_0 = 16.2730 \end{array} \right.$

Formation of Normals

1	- 0.0 0	+ 0.0	- 15.8
2	- 0.98	+ 58.0	- 218.8
3	- 1.93	+ 92.3	- 78.3
4	- 0.53	+ 118.1	- 16.2
5	+ 0.00	+ 8.0	+ 0.0
6	+ 1.94	- 46.0	- 18.2
7	+ 1.93	- 59.0	- 50.0
8	+ 1.68	+ 67.0	+ 119.5
	+ 4.95	+ 343.4	+ 119.5
	- 3.44	- 105.1	- 397.3
	+ 1.51	+ 238.4	- 277.8

- a	- b	+ ΔC
+ 0	+ 6	- 10
+ 5	+ 6	- 5
+ 15	+ 4	+ 3
+ 20	+ 1	+ 5
+ 20	- 0	+ 4
+ 18	- 2	+ 0
+ 15	- 4	- 5
+ 10	- 5	- 11

10605

Conditional Equations

7

						O - C	Corr
1	+0.00	-1.98 = + 8.	+ 00	+ 35 = +35	"	-27	-37
2	+0.51	-1.92 = +114	+ 8	+ 33 = +41		+73	+68
3	+1.51	-1.28 = +61	+23	+22 = +45		+16	+19
4	+1.97	-0.27 = +60	+30	+ 5 = +35		+25	+30
5	+1.98	+0.00 = + 4	+31	- 0 = +31		-27	-23
6	+1.84	+0.73 = -25	+29	-13 = +16		-41	-41
7	+1.51	+1.28 = -39	+23	-22 = + 1		-40	-45
8	+0.97	+1.73 = +69	+15	-30 = -15		+84	+73

+198 -135

av 42

$$+17.02 + 1.51 = +238.4 + 10.29$$

$$+ 1.51 + 14.53 = -277.8 - 1.71$$

$$- 1.51 - 0.13 = -20.9 - 91$$

$$+14.4 = -298.5 -2.62$$

$$b = -17.5 - 0.18$$

$$+17.02 = +238.4 + 265 = +264.9$$

$$a = +15.5 + 0.62$$

arc meas .151 $\frac{\Sigma v}{n}$

$$\frac{p}{n} = .18$$

$$+8$$

$$\frac{+8}{.18} = +44$$

$$\Delta R = +0.54$$

$$\text{Corr} = +0.35$$

$$\Delta R = +0.19$$

$$-2RC = -0.79 -16$$

$$\Delta B = +0.14 +3 \quad \Delta S = +0.1$$

$$\Delta a = -0.49 -10 \quad \Delta \alpha = -0.02$$

10605

Conditional Equations

7

							0 - e
1	+ 0.50	- 1.98	= + 8	+ 0.0	+ 35	= + 35	- 27
2	+ 0.51	- 1.92	= + 114	+ 8	+ 33	= + 41	+ 73
3	+ 1.51	- 1.28	= + 61	+ 23	+ 22	= + 45	+ 16
4	+ 1.97	- 0.27	= + 60	+ 30	+ 5	= + 35	+ 25
5	+ 1.98	+ 0.00	= + 4	+ 31	- 0	= + 31	- 27
6	+ 1.84	+ 0.73	= - 25	+ 29	- 13	= + 16	- 41
7	+ 1.51	+ 1.28	= - 39	+ 23	- 22	= + 1	- 40
8	+ 1.97	+ 1.73	= + 69	+ 15	- 30	= - 15	+ 84

+198 - 135

av 42

$$+17.02 + 1.51 = +238.4$$

$$+ 1.51 + 14.53 = -277.8$$

$$- 1.51 - 0.13 = -20.9$$

$$+ 14.4 = -298.5$$

$$b = -17.5$$

$$+17.02 = +238.4 + 265 = +2649$$

$$a = +15.5$$

Arc meas 151

 $\frac{\Sigma k}{n}$

$$\frac{p}{n} = 18$$

+8

$$\frac{+8}{18} = +44$$

$$\Delta R = 0.54$$

10605

Moon's Mean Position

8

$$\begin{array}{r}
 Y_0 \quad 22.4870'' \\
 \quad + 8'' \\
 \hline
 22.4878''
 \end{array}$$

$$\begin{array}{r}
 16.2730'' \\
 \quad - 9'' \\
 \hline
 16.2721''
 \end{array}$$

From Plate Constants.

$$\begin{array}{r}
 22.1573'' \\
 \quad 22'' \\
 \hline
 J_0 + 0.1573''
 \end{array}$$

$$\begin{array}{r}
 16.1297'' \\
 \quad 18'' \\
 \hline
 -1.8703''
 \end{array}$$

$$\begin{array}{r}
 \log S_0 \quad 9.19673'' \\
 \log \cos \delta \quad 9.95290'' \\
 \quad 8.50724'' \\
 \log \sin(\alpha - A) \quad 0.73659''
 \end{array}$$

$$\begin{array}{r}
 \log \tan \delta \quad 9.6824m \\
 \log S_0^2 \quad 8.3935'' \\
 \quad 7.0534'' \\
 \log n_1 \quad 5.1293m
 \end{array}$$

$$\alpha - A \quad + 5.45''$$

$$\begin{array}{r}
 n_1 \quad 0.0000 \\
 n_0 \quad -1.8703
 \end{array}$$

$$A \quad 16 \quad 00 \quad 53.60''$$

$$\alpha_1 \quad 16 \quad 00 \quad 59.05''$$

$$\text{Red} \quad + 2.50''$$

$$\alpha' \quad 16 \quad 01 \quad 01.55''$$

$$\begin{array}{r}
 \log n_0 \quad 0.271.91m'' \\
 \quad 7.33115'' \\
 \log \tan \delta - \delta \quad 2.94076m''
 \end{array}$$

$$\begin{array}{r}
 \delta - \delta \quad -87.25'' \\
 \quad -14 \quad 32.5'' \\
 \delta \quad -25 \quad 57 \quad 46.7''
 \end{array}$$

$$\delta_0 \quad -26 \quad 12 \quad 19.2''$$

$$\text{Red} \quad -10 \quad -10.4''$$

$$\delta' \quad -26 \quad 12 \quad 29.6''$$

10605

Moon's Mean Position

8

$$\begin{array}{r}
 Y_0 \quad 22.4870 \\
 \quad + 8 \\
 \hline
 22.4878
 \end{array}$$

$$\begin{array}{r}
 16.2730 \\
 \quad - 9 \\
 \hline
 16.2721
 \end{array}$$

From Plate Constants.

$$\begin{array}{r}
 22.1573 \\
 \quad 22 \\
 \hline
 20 \quad + 0.1573
 \end{array}$$

$$\begin{array}{r}
 16.1297 \\
 \quad 18 \\
 \hline
 - 1.8703
 \end{array}$$

$$\begin{array}{r}
 \log S_0 \quad 9.19673 \\
 \log \cos i \quad 9.95290 \\
 \quad 8.51724 \\
 \log S_0 \cos i \quad 0.73659
 \end{array}$$

$$\begin{array}{r}
 \log \tan \delta \quad 4.6824 \\
 \log S_0^2 \quad 8.3935 \\
 \quad 7.0534 \\
 \log n \quad 5.1293
 \end{array}$$

$$X - A \quad + 5.45$$

$$\begin{array}{r}
 \eta_1 \quad 00000 \\
 \eta_0 \quad -1.8703
 \end{array}$$

$$A \quad 16 \quad 00 \quad 53.60$$

$$X_1 \quad 16 \quad 00 \quad 59.05$$

$$\text{Red} \quad + 2.50$$

$$X' \quad 16 \quad 01 \quad 01.55$$

$$\begin{array}{r}
 \log \eta_0 \quad 0.27191 \\
 \quad 7.33115 \\
 \log \tan \delta - \epsilon \quad 2.94076
 \end{array}$$

$$\begin{array}{r}
 \delta - \epsilon \quad - 87.25 \\
 \quad - 18 \quad 32.5 \\
 \epsilon \quad - 25 \quad 57 \quad 46.7
 \end{array}$$

$$S_0 \quad - 25 \quad 42 \quad 19.2$$

$$\text{Red} \quad - 18.4$$

$$\delta' \quad - 26 \quad 12 \quad 29.6$$

$$\begin{array}{r}
 1. \quad 15 \quad 55 \quad 24.256 \\
 \quad \quad \quad 21.789 \\
 \quad \quad \quad + 2.467 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 -22 \quad 23 \quad 12.64 \\
 \quad \quad \quad 0.78 \\
 \quad \quad \quad - 11.86 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 2. \quad 16 \quad 00 \quad 35.368 \\
 \quad \quad \quad 32.956 \\
 \quad \quad \quad + 2.412 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 -19 \quad 34 \quad 47.53 \\
 \quad \quad \quad 34.99 \\
 \quad \quad \quad - 12.54 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 3. \quad 16 \quad 13. \quad 35.747 \\
 \quad \quad \quad 32.721 \\
 \quad \quad \quad + 3.026 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 -49 \quad 57 \quad 04.86 \\
 \quad \quad \quad 2.23 \\
 \quad \quad \quad - 2.63 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 3026 \\
 2.467 \\
 \hline
 .559
 \end{array}$$

$$\begin{array}{r}
 -11.86 \\
 \quad \quad 2.63 \\
 \hline
 9.23
 \end{array}$$

- 1
- 6

- 11

- 16

- 21

- 26

- 31

- 36

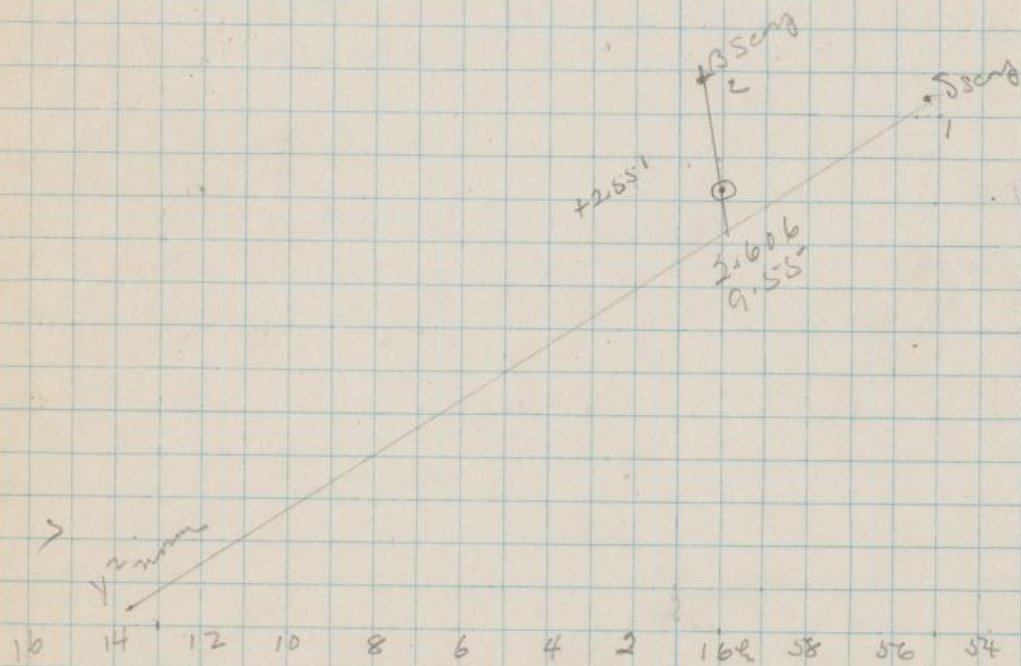
- 41

- 46

- 51

- 56

- 61



10605

Reduction to Apparent Place

9

$$H + \alpha_0 \quad 33 \quad 46.0'' \quad 146^\circ 30' \quad S_0 \quad -26 \quad 12.3''$$

$$H \quad 17 \quad 45.0''$$

$$\alpha_0 \quad 16 \quad 01.0''$$

$$G \quad 21 \quad 58.8''$$

$$G + \alpha_0 \quad 37 \quad 59.8''$$

$$209^\circ 57'$$

$$\log \cos S_0 \quad 9.9529''$$

$$\log i \quad 0.9101''$$

$$\log (1) \quad 0.8630''$$

$$\log \cos G + \alpha_0 \quad 9.9377''$$

$$\log g \quad 1.0629''$$

$$\log \sin G + \alpha_0 \quad 9.6983''$$

$$\log \tan S_0 \quad 9.6921''$$

$$8.8239$$

$$\log \sin S_0 \quad 9.6450''$$

$$\cos H + \alpha_0 \quad 9.9211''$$

$$\log h \quad 1.2738''$$

$$\sin H + \alpha_0 \quad 9.7479''$$

$$\sec S_0 \quad 0.0471''$$

$$8.8239$$

$$\log g' \quad 1.0006''$$

$$9.2772''$$

$$\log h' \quad 0.8399''$$

$$9.8867''$$

58

$$g \quad +1.544''$$

$$g \quad +0.189''$$

$$g \quad +0.770''$$

$$\text{Red} \quad +2.503''$$

$$g' \quad -10.000''$$

$$+6.917''$$

$$-7.295''$$

$$\text{Red} \quad -10.378''$$

10615

Reduction to Apparent Place

9

H + x ₀	33	46.0	146° 30'	S ₀	-25	12.3
--------------------	----	------	----------	----------------	-----	------

H	17	45.0
---	----	------

x ₀	16	01.0
----------------	----	------

G	21	58.8
---	----	------

G + x ₀	37	59.8
--------------------	----	------

209° 57'

log cos i 9.9529

log i 0.9101 m

log (1) 0.8630 m

log cos G + x₀ 9.9377 m

log g 1.0629

log sin G + x₀ 9.6983 mlog tan S₀ 9.6921 m

88239

log g'	-1.0006 m
g	9.2772

log sin S₀ 9.6450 mcos H + x₀ 9.9211 m

log h 1.2738

sin H + x₀ 9.7499sec S₀ 0.0471

8.8239

log h'	0.8399
h	9.8867

g + 1.544

g + 0.189

g + 0.770

Red + 2.503

g' - 10.000

h' + 6.917

i' - 7.295

Red - 10.373

10605

Lunar Parallax

10

$$\begin{array}{rcl}
 \alpha' & 16 & 01 & 01.55 \\
 \theta & 17 & 00 & 45.30 \\
 \theta - \alpha' & +59 & & 43.75 \\
 = & +140 & 55 & 56.25 \\
 \frac{1}{2} \alpha - \alpha' & + & 06 & 13.64 \\
 \theta - \alpha' - \frac{1}{2} \alpha - \alpha' & 14 & 49 & 42.61
 \end{array}$$

$$\begin{array}{rcl}
 & 9.95727 \\
 \log \cos \frac{1}{2} \alpha - \alpha' & 000000 \\
 \sec \theta - \alpha' - \frac{1}{2} \alpha - \alpha' & 001471 \\
 \log \tan \gamma & 9.97198
 \end{array}$$

$$\gamma \quad 43 \quad 09 \quad 11.5$$

$$\delta' \quad -26 \quad 12 \quad 29.6$$

$$\gamma - \delta' \quad 69 \quad 21 \quad 41.1$$

$$\begin{array}{rcl}
 & 9.82640 \\
 \log \sin \gamma & 8.23504 \\
 \sin \gamma - \delta' & 9.97119 \\
 \operatorname{cosec} \gamma & 016498 \\
 \sin \delta - \delta' & 8.19761
 \end{array}$$

$$\delta - \delta' \quad +54 \quad 10.3$$

$$\delta \quad -25 \quad 18 \quad 19.3$$

$$\gamma - \delta \quad -25 \quad 18 \quad 16.2$$

$$O-C \quad - \quad 3.1$$

$$\text{curr} = +0.8$$

$$\text{2nd Ord. Ref.} \quad +0.6$$

$$\text{Inv. Corr.} \quad +0.1$$

$$\delta - \quad -25 \quad 18 \quad 18.6$$

$$O-C \quad - \quad 2.4$$

$$\Pi \quad 59 \quad 03.9$$

$$9.86913$$

$$\log \sin \Pi \quad 8.23504$$

$$\sin \theta - \alpha' \quad 9.41108$$

$$\sec \delta' \quad 0.04381$$

$$\sin \alpha - \alpha' \quad 7.55906$$

$$\alpha - \alpha' \quad +12' \quad 27.29$$

$$= +49.82$$

$$\alpha \quad 16 \quad 01 \quad 51.37$$

$$\gamma - \alpha \quad 16 \quad 01 \quad 50.49$$

$$O-C \quad +0.88$$

$$\text{curr} = -0.03$$

$$\text{Inv.} \quad -0.02$$

$$\alpha - \quad 16 \quad 01 \quad 51.35$$

$$O-C \quad +0.86$$

10.615

Lunar Parallax

10

α 16 01 01.55
 θ 17 00 45.30
 $\theta - \alpha$ + 59 43.75
 $=$ +14° 55' 56.25
 $1/2 \alpha - \alpha$ + 06 13.64
 $2 \alpha - 1/2 \alpha$ 14 99 42.68

995727
 $\log \cos 1/2 \alpha$ 000000
 $\log \theta - \alpha - 1/2 \alpha$ 001474
 $\log \tan \gamma$ 997198

γ 43 09 19.5

δ -26 12 29.6

$\gamma - \delta$ 69 21 49.1

982641
 $\log \sin \gamma$ 823504
 $\sin \gamma - \delta$ 997119
 $\cos \gamma$ 016498
 $\sin \delta - \delta$ 819759

$\delta - \delta$ +54 10.3

δ -25 18 19.3

$\gamma - \delta$ -25 18 16.2

O-C - 3.11

Curv = + 0.8

2nd Ord Ref. + 0.6

Inv. Corr. + 0.1

δ -25 18 18.4

O-C - 2.4

Π 59 13.9

986913

$\log \sin \Pi$ 823504

$\sin \theta - \alpha$ 941108

$\sec \delta$ 1014381

$\sin \alpha - \alpha$ 755906

$\alpha - \alpha$ +12 327.29

= + 49.82

α 16 01 51.37

$\gamma - \alpha$ 16 01 50.49

O-C +0.88

Curv = -0.03

Inv. = +0.02

α 16 01 51.35

O-C +0.86

16
15
2
19
2
2
2
2
10
1
2
14
2
2
14
3
2
16

10998

July 2

Star Measures

L 19910 16537
 16.4 15709 10752
 13.9 09 52
 12 47
16.4207 16.4209

17518 169.68
 80707376401205
 76 091
 20 74
139447 13.9437

3 17952 19783
 19.2 16371 11373
 229 71 73
 60 91
19.1582 19.1582

16342 17802
 659492 17559
 90 59
 52 7812
229759 22.9756

325 16773 17960
 10.4 11762 12982
 62 82
 79 60
32.5014 32.5022

17160 17453
 13319 11313
 15 09
 68 57
10.3844 10.3854

Moon Measures

13
 143 18102
 1445456
 02
 3 143646

18102 18586
 1445456 12238
 58 38
 02 96
14.3646 14.3646

22
 149
 3 17717 17163
 21.5 12564 12302
 16.0 6263 02
 05 63
21.5148 21.5139

18780 18213
 8899 18105
 99 05
 90 19
149890 14.9890

1998

Juv 2

Star Measures

11

- 19910 16537
 164 15709 10752
 139 09 52
 12 47
164201 164209

17518 16468
 80707376401205
 76 091
 20 74
139447 139437

3 17952 19783
 192 16371 11373
 229 71 73
 60 91
191582 191582

16342 11802
 659492 17559
 90 59
 52 7812
229759 229756

2 16773 17960
 325 11762 12982
 104 62 82
 79 60
325014 325022

17160 17453
 13319 11313
 15 091
 68 57
103844 103864

Normal Measures

1
 3
 43 12102
 14454
 52
 0
 2
 22
 49

18102 18586
 1445456 12238
 58 38
 02 96
143646 143646

17717 17163
 18 12564 12302
 20 6263 02
 05 63
215148 215139

18780 18263
 8899 18105
 99 05
 90 89
149890 149890

5
31
16

5
20
17

2
17

2
18

8
2

10998

Moon Measures

12

4	17064	18518
21.6	1226160	13330
16.5	59	30
	68	24
	<u>214806</u>	<u>214808</u>

5	16760	18172
21.6	10897.98	14038.42
17	99	46
	70	8172
	<u>215878</u>	<u>215870</u>

6	16151	17866
22	9012	15010
17.7	22	10
	71	76
	<u>177148</u>	<u>177142</u>

7	18300	17592
23	14948	10940
18.2	50	40
	08	7602
	<u>183353</u>	<u>183341</u>

8	18614	17373
23.5	1456664	11429
18.3	62	29
	24	7375
	<u>184054</u>	<u>184054</u>

198

Mean Measures

12

17064 18518

1226160 13330

59 30

88 24

21.4806 21.4808

16760 18172

216 10897918 1403842

17 99 46

78 172

21.5878 21.5870

16151 17866

9012 } 17 15010

22 } 10

71 76

17.7148 17.7144

18300 17592

14948 10940

50 49 40

08 7602

18.3353 18.3341

18614

1456664

62

24

14054

18614 17373

1456664 11429

62 29

24 7375

18.4054 18.4054

10998

Yinbo Etc.

Date Aug 12 '16

Exp & Stars.	20	30		20	42	
" " Moon	20	35	41.7	20	42	42.0
Clock fast		08	17.2			
H. Sid. Time	20	27	24.65 ^v	$\Theta = -0^h 42^m$		
H. Long	04	44	31.05 ^v			
G. Sid. Time	25	11	55.70 ^v			
G. Sid. Time M.N.	9	22	24.76 ^v			
Interval	15	49	30.94 ^v			
Reduction		02	35.55 ^v			
G. M. T.	15	46	55.39 ^v			15 ^h 78205

From Naut. Almanac	RA		Decl.	
Moon 15 ^h	21	07	06.80 ^v	-15 02 44.0 ^v
Motion 1 ^m			2.4109 ^v	+14.103 ^v
" 46.92316	01		53.13 ^v	11 01.7 ^v
Tabular Place	21	08	59.93 ^v	-14 51 42.3

moon's age 14^d

$$9.34'' = 8.3$$

Parallax	60	57.77 ^v
Semi-diam	16	38.1 ^v
R		998.1 ^v
Aug		9.5 ^v
Sin 2		-0.1 ^v
R		1007.5 ^v
R		2.1597 ^v
(1+a)R		-1029 ^v
R		2.0568 ^v
R ²		42304 ^v

$$\begin{aligned} a &= -500.6 \\ &+ 24 \\ \hline &-476.6 \end{aligned}$$

10998

Linn's etc.

Date Aug 12 '16

Exp. & Stars.	20	30		20	42	
" " Moon	20	35	41.7	20	42	420
Clock fast		18	17.2			
Fl. Sid Time	20	27	24.65	$\theta = -0^h 42^m$		
H. Long	04	44	31.05			
h. Sid Time	25	11	55.70			
Sid Time H. H.	9	22	24.76			
Interval	15	49	30.94			
Reduction		12	35.55			
N.M.T.	15	46	55.39			15 ^h 78205

From Transit Almanac	RA			Decl.	
Mean 15 ^h	21	07	0680	-15	02 44.0
Motion 1 ^m			24119		+14.103
" 46.72316		01	53.13		11 11.7
Tabular Place	21	08	59.93	-14	51 42.3

means aug 14^d

934" = 8.3

Parallax	60	57.77
Semi-diam	16	38.1
R		998.1
Aug		9.5
Sun		-0.1
R		1007.5
R		2.1597
(1+a)R		-1029
R		2.0568
R ²		42304

$$\begin{array}{r}
 a = -500.6 \\
 + 24 \\
 \hline
 -476.6
 \end{array}$$

10998

Plate Center + Constants.

14

16.4205	139442	21	05	28.30	-16	02	36.2
19.1582	229758	21	07	02.95	-14	48	58.8
32.5018	10.3849	21	14	35.08	-16	31	58.6
368.0805	347.3049	3163	27	06.33	347	23	33.6
22.6935	15.7683	21	09	02.11	-15	47	51.2
22	18			-21.50		+17	21.1
-6935	+2.2317						
31	466.5						

Plate Center $\left\{ \begin{array}{l} A = 21 \quad 08 \quad 40.61^{\circ} \\ B = -15 \quad 30 \quad 30.1^{\circ} \end{array} \right.$

$$\begin{array}{rcl}
 Y-S & +500X & +36.44 \\
 +.3640 + 8210 = 11850 & + 507 = 12357 & +.6X - 12367 \\
 +.1941 + 9579 = 11520 & + 836 = 12356 & +.11 = 12367 \\
 -.4282 + 16251 = 11969 & + 878 = 12347 & +.20 = 12367 \\
 23.5390 + 11770 & + 595^{\circ} & +.14 = 23.5402^{\circ}
 \end{array}$$

$$\begin{array}{rcl}
 Y-\eta & +500Y & -41.9X \\
 +0846 + 6972 = 7818-688 & -7130 + 103 = 7233 & +7.44 \\
 -3621 + 11488 = 7867-803 & -7064 + 170 = 7234 & -7234 \\
 +3327 + 5192 = 8519-1362 = 7157 & + 77 = 7234 & \\
 16.3504 + 8175 & -986^{\circ} & +121 = 16.3580^{\circ}
 \end{array}$$

$$\begin{array}{rcl}
 \text{Japhu} & a = +0.2 & b = -7.0 \\
 & = -500.6 & = -507.4 \\
 & & a-b = +7.2 \\
 & & +6.8 \\
 & & b+d = +2.0 \\
 & & +5.5^{\circ}
 \end{array}$$

$$a-c = -500.8 \quad -500.7 \quad +3.5^{\circ}$$

29

+

+

16

11998

Plate Center + Constants.

14

16.4205	139442	21	05	2830	-16	02	36.2
19.1582	227758	21	17	02.95	-14	48	58.8
32.5018	103849	21	14	35.08	-16	31	58.6
368.0805	31473042	3163	27	0633	3147	23	33.6
226935	157683	21	09	02.11	-15	47	51.2
02	18			-21.50		+17	21.1
-6935	+2.2317						
31	466.5						

$$\text{Plate Center} \left\{ \begin{array}{l} A = 21 \quad 08 \quad 40.61 \\ B = -15 \quad 30 \quad 30.1 \end{array} \right.$$

$$\begin{array}{l} +500X \\ +3640 + 8210 = 11850 \\ +1941 + 9579 = 11520 \\ -4282 + 16251 = 11969 \\ 235396 + 11770 \end{array} \quad \begin{array}{l} +3644 \\ +507 = 12357 \\ +836 = 12352 \\ +378 = 12347 \\ +595 \end{array} \quad \begin{array}{l} +51 - 12367 \\ +10 = 12367 \\ +11 = 12367 \\ -20 = 12367 \\ +14 = 23.5408 \end{array}$$

$$\begin{array}{l} y-n \quad +500Y \\ +0846 + 6972 = 7818 - 688 \\ -3621 + 11488 = 7867 - 8.03 \\ 43327 + 5192 = 8519 - 1362 \\ 16.3804 + 8175 \end{array} \quad \begin{array}{l} -41.9X \\ -7130 + 103 = 7233 \\ +7064 + 170 = 7234 \\ 7157 + 77 = 7234 \\ -986 \end{array} \quad \begin{array}{l} +7.4Y - 7234 \\ +103 = 7233 \\ +170 = 7234 \\ 77 = 7234 \\ +121 = 1635.80 \end{array}$$

-500.6

-517.4

+6.8

+5.5

S	η	ΔS	-3.18	$+1.6 \eta$	-9
-5.94	-4.13	-8	$+18$	$+10$	$-2 = +8$
-3.03	$+5.34$	-3	$+9$	$+6$	$+3 = +9$
$+10.92$	-7.91	$+48$	-34	$+14$	$-5 = +9$
$M+1.54$	-1.64		-5	-1	$= -15$
					<u><u> </u></u>
		-1.5η	$+19$	$+5$	
		-6	$+6 = 0$	$-6 = -6$	
		$+5$	$-8 = -3$	$-3 = -6$	
		-28	$+12 = -16$	$+11 = -5$	
		$+2$	$+1 =$	$+8$	<u><u> </u></u>

$$\text{corr. } \alpha = -0.05$$

$$\delta = +0.4$$

10998			Standard Coordinates			15		
Cape No 2927 mag 7.4			Cape No 2935 mag 6.5			Cape No 2953 mag 6.9		
C	21	04	34.87	21	06	09.89	21	13
g			34.90			09.95		
E			34.87			09.92		
Mean	21	04	34.88	21	06	09.92	21	13
Prec		+	53.42		+	53.03		+
α	21	0.5	28.30	21	0.7	02.95	21	1.4
A	21	0.8	40.61	21	0.8	40.67	21	0.8
$\alpha - A$	-	0.3	12.31	-	0.1	37.66	+	0.5
tan "			-192.31			-97.66		+
log "	2.28	400m		1.98	972m		2.54	953m
" cos δ	9.98	275		9.98	531		9.98	166
" S ₀	0.77	399m		0.48	227m		1.03	843
S ₀	-59	42.7		-3.03	57		+10.9	252
S ₁	-00	0.8		-00	0.3		+00	0.48
S	-16.0	56.5		18.9	64.0		32.9	30.0
X	16	42.05		19.1	58.2		32.5	01.8
X-S	+	36.40		+	19.42		-	.4282
C	-16	06	28.1	-14	52	52.3	-16	35
g			27.7			52.4		
E			27.8			52.2		
Mean	-16	06	27.9	-14	52	52.3	-16	35
Prec		+	03		+	03		+
δ	-16	0.2	36.2	-14	4.8	58.8	-16	3.1
D	+15	30	30.1	-15	30	30.1	-15	30
D-D	-	32	06.1		+4.1	31.3	-	1
tan "			-192.62			+249.14		-
log "	3.28	470m		3.39	644m		3.56	692m
" n ₀	0.61	585m		0.72	759m		0.89	807m
" tan δ	9.45	873m		9.42	245m		9.47	251m
" S ₀ ²	1.54	798		0.96	454		2.07	686
" n ₁	8.06	01m		7.44	04m		8.60	28m
n ₀	-4.1	291		+5.3	406		-7.9	080
n ₁	-0.0	115		-0.0	027		-0.0	401
n ₂	13.8	594		23.3	379		14.0	519
y	13.9	442		22.9	758		10.3	849
y-n	+	0.8	48	-	.36	21	+	.33

10998			Standard Coordinates			15'			
after No 2927 mag 7.4			Cape No 2935 mag 6.5			Cape No 2953 mag 6.9			
C	21	04	34.87	21	06	09.89	21	13	41.71
Y			34.90			09.95			41.77
E			34.87			09.92			41.71
Mean	21	04	34.88	21	06	09.92	21	13	41.73
P ₁₀₀		+	53.42		+	53.03		+	53.35
A	21	05	28.30	21	07	02.95	21	14	35.08
A	21	08	41.61	21	08	40.67	21	08	40.61
X-A		-03	12.31		-01	37.66		+15	54.47
tan			-192.31			-97.66			+35443
log	2.28	400	n	1.98	972	n	2.54	953	n
cos	9.98	275	-	9.98	531	-	9.98	166	-
S ₀	0.77	399	n	0.48	227	n	1.03	843	n
-S ₀	-5.94	27	-	-3.03	57	-	+10.92	52	-
-S ₁	-0.01	18	-	-0.00	02	-	+0.04	48	-
-S ₂	-1.60	565	-	1.89	640	-	32.93	10	-
X	164	205	-	19.15	82	-	32.50	18	-
X-S	+36	40	-	+19	42	-	-4.28	2	-
C	-16	06	28.1	-14	52	52.3	-16	35	59.0
Y			27.7			52.4			58.5
E			27.8			52.2			59.3
Mean	-16	06	27.9	-14	52	52.3	-16	35	58.9
P ₁₀₀		+03	51.7		+03	53.5		+04	0.8
S ₀	-16	02	36.2	-14	48	58.8	-16	31	58.8
S ₁	-15	30	30.1	-15	30	30.1	-15	30	30.1
S ₂	-	32	06.1		+41	312	-1	01	28.7
tan			-1926.2			+2491.4			-3689.1
log	3.28	400	n	3.39	644	n	3.56	692	n
h ₀	0.61	58.5	n	0.72	759	n	0.89	807	n
tan S	9.45	873	n	9.42	245	n	9.47	251	n
S ₂	1.54	798	-	0.96	454	-	2.07	686	-
h ₁	8.06	012	n	7.44	042	n	8.60	282	n
h ₀	-4.12	81	-	+5.34	06	-	-7.90	80	-
h ₁	-0.01	15	-	-0.00	02	-	-0.04	00	-
h ₂	1.38	594	-	23.33	79	-	1.00	572	-
Y	13.94	42	-	22.97	58	-	11.38	49	-
Y-h	+0.84	8	-	-3.62	21	-	+2.33	0	-

10998

Mean Center.

16

	X	$X - X_0$	ΔX	$(X - X_0)^2$	$O - C$
1	23.0000	-0.5370	+4	0.2880	+ 10
2	22.0000	-1.5370	+3	2.3614	- 170
3	21.5143	-2.0227	+1	4.0905	- 180
4	21.4807	-2.0563	+0	4.2296	- 8
5	21.5874	-1.9496	-1	3.8017	- 44
6	22.0000	-1.5370	-3	2.3633	- 6
7	23.0000	-0.5370	-4	0.2888	+ 78
8	23.5370	-0.0000	-4	0.0000	+ 42
Com H. 2304					

	Y	$Y - Y_0$	ΔY		
1	14.3646	-1.9844	-14	3.9434	195
2	14.9890	-1.3600	-9	1.8520	228
3	16.0000	-0.3490	-2	0.1219	260
4	16.3490	0.0000	-0	0.0000	270
5	17.0000	+0.6510	+4	0.4243	288
6	17.7143	+1.3653	+9	1.8665	311
7	18.3347	+1.9857	+14	3.9486	345
8	18.4054	+2.0564	+14	4.2346	360
					165

$X = 23$	$Y = 14.3646$	$X = 22$	$Y = 14.9890$
	18.3347		17.7143
	32.6993		327033
Y_0	16.3496	Y_0	16.3516

Y_{max} 18.4054
 2.0558
 Com R 2.0568
 X_{min} 21.4807
 23.5375

Plate Center $\left\{ \begin{array}{l} X_0 \quad 23.5370 \\ Y_0 \quad 16.3490 \end{array} \right.$

0998

Means Center.

16

	X	Y - Y ₀	ΔX	(X - X ₀) ²		O - C
	23.0000	-0.5370	+4	0.2880	42374	+ 10
2	22.0000	-1.5370	+3	2.3614	42134	- 170
3	21.5143	-2.0227	+1	4.1905	42124	- 180
4	21.4817	-2.0563	-0	4.2296	42296	- 8
5	21.5874	-1.9496	-1	3.8017	42260	- 44
6	22.0000	-1.5370	-3	2.3633	42298	- 6
7	23.0000	-0.5370	-4	0.2888	42374	+ 71
8	23.5370	-0.0000	-4	0.0000	42346	+ 42
Com. H. 2304						

	Y	Y - Y ₀	ΔY		
1	14.3646	-1.9844	-14	3.9434	195
2	14.9890	-1.3600	-9	1.8520	229
3	16.0000	-0.3490	-2	0.1219	260
4	16.3490	0.0000	-0	0.0000	270
5	17.0000	+0.6510	+4	0.4243	298
6	17.7143	+1.3653	+9	1.8665	311
7	18.3347	+1.9857	+14	3.9486	345
8	18.4054	+2.0564	+14	4.2346	360

X = 23	Y = 14.3646	X = 22	Y = 14.9890
	18.3347		17.7143
	32.6993		327033
Y ₀	16.3496	Y ₀	16.3516

Y_{max} 18.4054
 Y₀ 20.558
 Com. R 2.2568
 X_{max} 21.4807
 23.5375

Plate center { X₀ 23.5370
 Y₀ 16.3490

normals.

1	+ 1.07
2	+ 2.10
3	+ 0.71
4	+ 0.00
5	- 1.27
6	- 2.09
7	- 1.07
8	- 0.00
	+ 3.88
	- 4.43
	- 0.55

-	5.4
+ 26	1.9
+ 36	3.8
+ 12	4
+ 8	5.8
+ 9	1
- 37	8
- 0	0.0
+ 73	3.0
- 43	2
+ 68	9.8

-	19.8
+ 23	0.1
+ 63	0
+ 20	0
- 28	6
- 81	5
+ 138	2
+ 86	4
+ 51	7.7
- 129	9
+ 38	7.8

- a	- b	+ ^{+ 49} ΔC
- 16	+ 14	+ 47 [✓]
- 45	+ 9	+ 13 [✓]
- 59	+ 2	- 8 [✓]
- 60	+ 0	- 11 [✓]
- 57	- 4	- 12 [✓]
- 45	- 9	- 5 [✓]
- 16	- 13	+ 20 [✓]
- 0	- 14	+ 35 [✓]

10998

Conditional Equations

							0-c	18
1	-0.54	-1.98	= +10	-22	-55	= -77	+87	+134
2	-1.54	-1.36	= -170	-62	-38	= -100	-70	-57
3	-2.02	-0.35	= -180	-81	-10	= -91	-89	-97
4	-2.06	-0.00	= -8	-83	-0	= -83	+75	+64
5	-1.95	+0.65	= -44	-79	+18	= -61	+17	+5
6	-1.54	+1.36	= -6	-62	+38	= -24	+18	+13
7	-0.54	+1.98	= +70	-22	+55	= +33	+37	+57
8	-0.00	+2.06	= +42	-0	+57	= +57	-157	+20
							+234	-174

$$17.42 - 0.55 = +6.89.8 - 10.19$$

$$-0.55 + 16.39 = +387.8 + 2.36$$

$$+0.55 - 1.74 = +21.78 - 0.32$$

$$+14.65 = +409.58 + 2.04 f = +27.9 \quad \text{+ 0.140}$$

$$17.42 = +689.8 + 15.3 = +705.1 \quad a = +40.4 \quad \text{+ 0.58}$$

arc 165

 $\frac{\sum v}{n}$

$$\frac{P}{n} = .22$$

$$+7.5$$

$$+ \frac{7.5}{22} = +.34$$

$$\Delta R = +0.4$$

$$\text{corr.} = -0.6$$

$$\Delta R = +1.0$$

$$-2RC = +2.47 + 49$$

$$\Delta b = +0.35 + 7 \quad \Delta \delta = +0.2$$

$$\Delta a = -1.43 - 29 \quad \Delta \alpha = -0.05$$

10998

Conditional Equations

0-C 18

1	-0.54	-1.98	= +10	-22	-55	= -77	+87
2	-1.54	-1.36	= +170	-62	-38	= -170	-70
3	-2.02	-0.35	= -180	-81	-10	= -91	-89
4	-2.16	-0.00	= -8	-83	-0	= -83	+75
5	-1.95	+0.65	= -44	-79	+18	= -61	+17
6	-1.54	+1.36	= -6	-62	+38	= -24	+18
7	-0.54	+1.98	= +70	-22	+55	= +33	+37
8	-0.00	+2.16	= +42	-0	+57	= +57	-15
							+234 -17

$$17.42 - 0.55 = +689.8$$

$$-0.55 + 16.39 = +387.8$$

$$+0.55 - 1.74 = +21.78$$

$$+14.65 = +409.58$$

$$b = +27.9$$

$$17.42 = +689.8 + 15.3 = +705.1 \quad a = +40.4$$

arc 165

 $\frac{\sum v}{n}$

$$\frac{P}{n} = .22$$

$$+7.5$$

$$+ \frac{7.5}{22} = +.34$$

$$\Delta R = +0.4$$

10998

Mean Mean Position

18

$$\begin{array}{r} X_0 \quad 235370 \\ \quad + 20 \\ \hline 235390 \end{array}$$

$$\begin{array}{r} Y_0 \quad 16.3490 \\ \quad + 1.4 \\ \hline 16.3504 \end{array}$$

From Plate Constants

$$\begin{array}{r} 23.5402 \\ \underline{22} \\ + 1.5402 \end{array}$$

$$\begin{array}{r} 16.3580 \\ \underline{18} \\ - 1.6420 \end{array}$$

$$\log S \quad 0.18758$$

$$8.50724$$

$$\log \cos \delta \quad 9.98344$$

$$\log \sin (X-A) \quad 1.69690$$

$$\log \tan \delta \quad 9.4493$$

$$S_1 \quad 0.3751$$

$$7.0534$$

$$\log \pi \quad 6.8778$$

$$X-A \quad + 49.76$$

$$\eta_1 \quad -0.0007$$

$$\eta_0 \quad -1.6413$$

$$A \quad 21 \quad 08 \quad 40.61$$

$$\log \pi_0 \quad 0.21519$$

$$X_0 \quad 21 \quad 09 \quad 30.37$$

$$7.33115$$

$$\log \tan \delta - \pi \quad 2.88404$$

$$\text{Red} \quad + 4.53$$

$$\delta - \pi \quad -76.567$$

$$X' \quad 21 \quad 09 \quad 34.90$$

$$-12 \quad 45.7$$

$$\theta \quad -15 \quad 30 \quad 30.1$$

$$\delta_0 \quad -15 \quad 43 \quad 15.8$$

$$\text{Red} \quad + 16.8$$

$$\delta' \quad -15 \quad 42 \quad 59.0$$

10998

Moon's Mean Position

18

$$\begin{array}{r} X_0 \quad 23.5370 \\ \quad + 20 \\ \hline 23.5390 - \end{array}$$

$$\begin{array}{r} Y_0 \quad 16.3490 \\ \quad + 14 \\ \hline 16.3504 - \end{array}$$

From Plate Constants

$$\begin{array}{r} 23.5402 \\ 22 \\ \hline + 1.5402 - \end{array}$$

$$\begin{array}{r} 16.3580 \\ 18 \\ \hline - 1.6420 - \end{array}$$

$$\begin{array}{l} \lg S \quad 0.18758 \\ \lg CH E_0 \quad 8.50724 \\ \lg CH E_1 \quad 9.98344 \\ \lg Sm X-A \quad 1.69690 \end{array}$$

$$\begin{array}{l} \lg \tan \delta \quad 9.4493m \\ " S \quad 0.3751 \\ \quad 7.0534 \\ \lg \alpha \quad 6.8778m \end{array}$$

$$X-A \quad + 49.76$$

$$\eta \quad -0.0007 -$$

$$\eta_0 \quad -1.6413 -$$

$$A \quad 21 \quad 08 \quad 40.61$$

$$\lg \alpha_0 \quad 0.21519m$$

$$X_0 \quad 21 \quad 09 \quad 30.37$$

$$7.33115$$

$$\lg \tan \delta - \alpha \quad 2.88404m$$

$$Red \quad + 4.53$$

$$S_0 \quad -76.547 -$$

$$X' \quad 21 \quad 09 \quad 34.90$$

$$-12 \quad 45.7$$

$$E \quad -15 \quad 30 \quad 30.1$$

$$S_0 \quad -15 \quad 43 \quad 15.8$$

$$Red \quad + 16.8$$

$$S' \quad -15 \quad 42 \quad 59.0$$

$$\begin{array}{r}
 1. \quad 21 \quad 01 \quad 18.210 \\
 \quad \quad \quad 13.626 \\
 \quad \quad + 4.584 \\
 \hline
 \end{array}$$

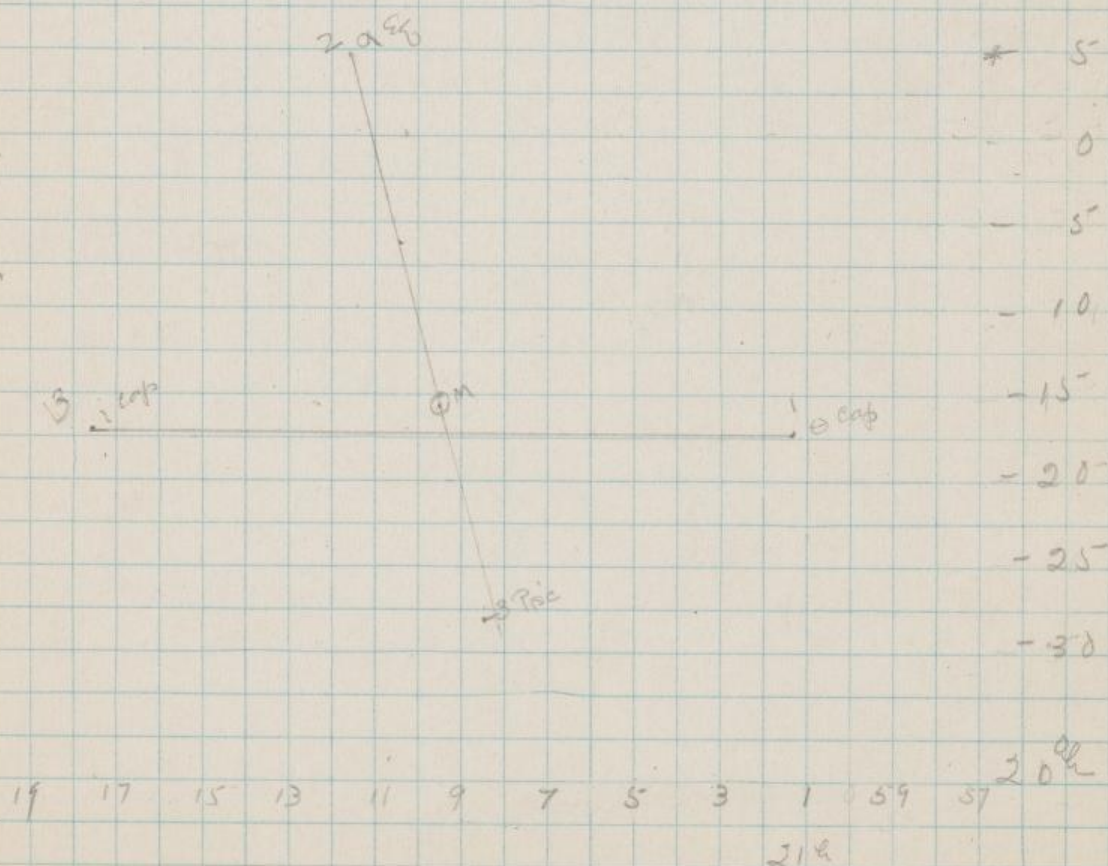
$$\begin{array}{r}
 -17 \quad 33 \quad 46.86 \\
 \quad \quad 34 \quad 2.73 \\
 \quad \quad + 15.87 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 2. \quad 21 \quad 11. \quad 41.597 \\
 \quad \quad \quad 37.506 \\
 \quad \quad + 4.091 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 +4 \quad 54 \quad 16.90 \\
 \quad \quad 53 \quad 59.81 \\
 \quad \quad + 17.09 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 3. \quad 21 \quad 17 \quad 38.862 \\
 \quad \quad \quad 34.307 \\
 \quad \quad + 4.555 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 -17 \quad 11 \quad 17.05 \\
 \quad \quad \quad 34.54 \\
 \quad \quad + 17.49 \\
 \hline
 \end{array}$$



10998

Reduction to apparent place.

19

$H + \alpha$	29	58.9	89	43.5	S_0	-15	43.3
H	08	49.4					
α	21	09.5			$\log \cos \delta_1$		9.9834
δ	23	06.8			$\log i$		0.7959
$Q + \alpha$	44	16.3	304	4.5	$\log (i)$		0.7793

$\log \cos Q + \alpha$	9.7484
$\log g$	1.2877
" $\sin Q + \alpha$	9.9182 ^m
" $\tan \delta_0$	9.4495 ^m
	8.8239

$\log g'$	1.0361
" g	9.4793

J	+2.881
q	0.301
h	1.350

Red. +4.532

$\log \sin \delta_0$	9.4329 ^m
$\cos (H + \alpha)$	7.6873
$\log h$	1.2899
$\log \sin (H + \alpha)$	9.9999
$\sec S_0$	0.0166
	8.8239

$\log h'$	8.4101 ^m
h	0.1303

g'	+10.8667
h'	-0.0257
l	+6.016

Red. +16.856

10998

Reduction to apparent place.

19

$H + \lambda$	29	589	89	43.5	S_0	-15	43.3
H	08	49.4					
λ	21	09.5			$\log \cos \delta_1$	9.9834	
G	23	06.8			$\log i$	0.7959	
$Q + \lambda$	44	16.3	304	4.5	$\log (1)$	0.7793	

$\log \cos Q + \lambda$	9.7484			
$\log g$	1.2877			
$\log \sin Q + \lambda$	9.9182 ^m			
$\log \tan \delta_1$	9.4495 ^m			
	8.8239			

$\log \sin \delta_1$	9.4329 ^m			
$\cos (H + \lambda)$	7.6873			
$\log h$	1.2899			
$\log \sin (H + \lambda)$	9.9999			
$\sec \delta_1$	0.0166			
	8.8239			

$\log g'$	1.0361			
$\log g$	9.4793			

$\log h'$	8.4101 ^m			
$\log h$	0.1303			

f	+2.881			
g	0.301			
h	1.350			

Red. +4.532

g'	+10.8667			
h'	-0.0257			
	+6.016			

Red. +16.856

18998

Lunar Parallax.

20

α'	21	09	34.90 ^v
θ	20	27	24.65 ^v
$\theta - \alpha'$	-	42	10.25 ^v
$=$	-10°	32	33.75 ^v
$\frac{1}{2}(\alpha - \alpha')$	-	04	16.12 ^v
$\theta - \alpha' - \frac{1}{2}(\alpha - \alpha') - 10$	28		17.63 ^v

$\log \cos \frac{1}{2}(\alpha - \alpha')$	9.95729
$\log \sin \frac{1}{2}(\alpha - \alpha')$	0.00000
$\log \tan \frac{1}{2}(\alpha - \alpha')$	0.00729
$\log \tan \frac{1}{2} \gamma$	9.96456 ^v

$$\gamma \quad 42 \quad 39 \quad 53.1^{\circ}$$

$$\delta' \quad -15 \quad 42 \quad 59.0^{\circ}$$

$$\gamma - \delta' \quad 58 \quad 22 \quad 52.1$$

$\log \sin \Pi$	9.82640 ^v
$\sin(\gamma - \delta')$	8.24877 ^v
$\csc \gamma$	9.93021 ^v
$\sin(\delta - \delta')$	0.16896 ^v
$\sin(\delta - \delta')$	8.17434 ^v

$$\delta - \delta' \quad +51 \quad 21.6^{\circ}$$

$$\delta \quad -14 \quad 51 \quad 37.4^{\circ}$$

$$\text{Exp } \delta \quad -14 \quad 51 \quad 42.3^{\circ}$$

$$\theta - \alpha \quad +4.9^{\circ}$$

$$\begin{aligned} \text{Curr.} & + 0.4 \\ \text{2nd ord. ref.} & + 0.1 \\ \text{Dir. Corr.} & + 0.2 \end{aligned}$$

$$\delta - \quad -14 \quad 51 \quad 37.1$$

$$\theta - \alpha = \quad + 5.2$$

$$\Pi \quad 6.0 \quad 57.77^{\circ}$$

$$9.86913$$

$$\log \sin \Pi \quad 8.24877^{\circ}$$

$$\log \sin(\theta - \alpha') \quad 9.26237^{\circ}$$

$$\log \sec \frac{1}{2} \delta \quad 0.01478^{\circ}$$

$$\sin(\alpha - \alpha') \quad 7.39505^{\circ}$$

$$\alpha - \alpha' \quad -8' \quad 32.23$$

$$= \quad -34.515$$

$$\begin{aligned} \alpha. \quad 21 \quad 09 \quad 0.75^{\circ} \\ \text{Exp } \alpha \quad 21 \quad 08 \quad 59.93^{\circ} \end{aligned}$$

$$\theta - \alpha \quad +0.82^{\circ}$$

$$\begin{aligned} \text{Curr.} & -0.05^{\circ} \\ \text{Dir. Corr.} & -0.05^{\circ} \end{aligned}$$

$$\alpha \quad 21 \quad 09 \quad 00.70$$

$$= \quad +0.77$$

10998

Lunar Parallax.

2.

x'	21	09	34.90"
G	21	27	34.65"
$G-x'$	-	42	10.25"
$=$	-10°	32	33.75"
$\frac{1}{2}(x-x')$	-	04	16.12"
$G-x' - \frac{1}{2}(x-x') - 10$	38		17.63"

	9.995727
$\log \cos \frac{1}{2}(x-x')$	0.000000
$\sec G - x' - \frac{1}{2}(x-x')$	0.00729
$\log \tan y$	9.96456

y	42	39	53.0"
-----	----	----	-------

δ'	-15	42	59.0"
-----------	-----	----	-------

$y-\delta'$	58	22	52.1"
-------------	----	----	-------

	9.82640
$\log \sin \Pi$	8.24877
$\sin(y-\delta')$	9.93021
$\cos y$	0.16896
$\sin(\delta'-y)$	8.17434

$\delta-\delta'$	51	21.6"
------------------	----	-------

δ	-14	51	37.4"
----------	-----	----	-------

$\phi \delta$	-14	51	42.3"
---------------	-----	----	-------

$O-C$	+ 4.9"
-------	--------

C_{corr}	+ 0.4
$\Delta \text{ord up}$	+ 0.1
$\Delta \text{ord down}$	+ 0.2

δ	-14	51	37.1"
----------	-----	----	-------

$O-C$	+ 5.2
-------	-------

Π	6.1	57.77"
-------	-----	--------

986913

 $\log \sin \Pi$ 8.24877 $\sin(G-x')$ 9.26237 $\sec \phi \delta$ 0.1478 $\sin(x-x')$ 7.39505

$x-x'$	-8	32.23"
--------	----	--------

$=$	-34.15"
-----	---------

x	21	09	0.7
ϕx	21	08	59.9

$O-C$	+0.82
-------	-------

C_{corr}	-0.05
$\Delta \text{ord up}$	-0.15

1
16
13
2
19
22
3
32
10
1
2
14
2
23
14
3
22
16

10999

Star Measures Tycho 249 153 21

1	18349	17473	18020	18249
165	139807	118407	10688	15582
138	7477	4643	88	82
	47	75	16	49
			13.7329	13.7333
	164371	164368		

2	17558	17180	18398	17121
191	164222	83207	10552	14980
227	20	1216	5453	7678
	60	80	98	21
	19.1137	19.1136	22.7845	22.7857

3	16746	18721	17080	18229
326	11300	14156	14266	11049
103	00	6058	6264	49
	46	17	76	31
	325446	325440	10.2815	10.2818

Moon Measures

1	19087	18840
24	13861	14050
145	6563	50
	83	40
	145222	145210

2	18865	18445
23	19965	17318
149	65	22
	63	43
	14.8898	14.8883

3	18412	17882
222	16402	9892
160	02	92
	10	82
	222010	22.2010

16
138

19
22

32
10

24
14

2
14

3
22
16

11999

Star Measures Tycho 249 153 21

18349 17473
 165 139807 1188043
 138 74 17 46 43
 47 75
164371 164368

18020 18249
 10688 15582
 88 82
 16 49
137329 137333

17558 17180
 191 16422 21 83 20 16
 227 20 12
 60 80
191137 191136

18398 17121
 10552 14980
 54 53 76 78
 98 21
227845 227857

16746 18721
 326 11300 14156 58
 103 00 60
 46 17
325446 325440

17080 18229
 14266 14049
 62 64 49
 76 31
102815 102818

Main Measures

19087
 24 13861
 145 65
 83

18840
 14050
 50
 40
145222 145210

18412 17882
 222 16402 9892
 161 02 92
 10 82
222010 222010

18865 18445
 19960 17318
 65 22
 63 43
148898 148883

1
4
22
18
5
22
17
4
22
18
23
18
8
24
1

10999

Moon Measures

4	18767	17608
---	-------	-------

22.1	1761819	8760
------	---------	------

16.5	20	60
------	----	----

67	08
----	----

<u>221148</u>	<u>22.1152</u>
---------------	----------------

5	18205	16577
---	-------	-------

22.2	1657175	822824
------	---------	--------

17	79	20
----	----	----

05	79
----	----

<u>22.1630</u>	<u>22.1645</u>
----------------	----------------

6	18520	17072
---	-------	-------

22.8	1148892	1.4100
------	---------	--------

18.8	96	00
------	----	----

18	70
----	----

<u>227027</u>	<u>22.7029</u>
---------------	----------------

1		
---	--	--

23.0		
------	--	--

18.2		
------	--	--

17149

16160

14540

8750

40

5452

47

58

18.260918.2608

18385

16773

12082785

13078

88

78

81

73

18.629818.6305

8		
---	--	--

24.1		
------	--	--

18.6		
------	--	--

1
4
22
18
5
22
17
4
22
18
2
22
18
8
22
1

10999

Moon Measures

4	18767	17608
---	-------	-------

221	1761819	8760
-----	---------	------

165	20	60
-----	----	----

	67	08
--	----	----

<u>221148</u>	<u>221152</u>
---------------	---------------

5	18205	16577
---	-------	-------

222	1657175	822824
-----	---------	--------

17	791	28
----	-----	----

	05	79
--	----	----

<u>221630</u>	<u>221645</u>
---------------	---------------

4	18520	17072
---	-------	-------

228	1148892	14100
-----	---------	-------

188	961	00
-----	-----	----

	18	70
--	----	----

<u>227027</u>	<u>227029</u>
---------------	---------------

1

230

18.2

17149

14540

40

47

182609

16160

8750

545

58

182608

8

241

18.6

18385

12082785

881

81

186298

16773

13078

78

73

186305

10999

Times etc

23

Date Aug. 12 '16

Exp to Stars	20	43		20	55
" " Moon	20	49	11.6	20	55 11.9
Clock Fast		08	17.2		

H. Sid. Time	20	40	54.55	$\delta = -0^h 28^m$
21 Yang	04	44	31.05	
S. Sid. Time	25	25	25.60	
" " M.N.	09	22	24.76	
Interval	16	03	0.84	
Reduction		02	37.77	
S. M.T.	16	00	23.07	16.00 641

From Almanac	R.A.	Decl.
Moon 16 ^h 21 09	31.41 ^h -14	48 37.2 ^h
" " 1 ^m	2.4073 ^h	14.158
" " 0 ^m 38.45 ^h	0.92	+05.4
Tabular Place 21 09	32.33 ^h -14	48 31.8 ^h

Moon's Age 14^d

934 = 8.4

$$\begin{array}{r} a = -498.7 \\ + 24 \\ \hline -474.7 \end{array}$$

Parallax	60	57.64
Semi-diam	16	38.1 ^h
R		998.1 ^h
Aug.		9.6 ^h
Dyn. 3		-0.3 ^h
R		1007.4 ^h
R		2.1595 ^h
1+a/R		-1025 ^h
R		2.0570 ^h
R ²		4.2312 ^h

10999

Times etc

23

Date Aug 12 '16

Exp h Stars	20	43		20	55	
" " Moon	20	49	11.6	20	55	11.9
Clock fast		08	17.2			
	20	40	54.55			
H Sid Time	20	40	54.55	B = -0	28	
ZI Time	04	44	31.05			
S Sid Time	25	25	25.60			
B " " M.N.	09	22	24.76			
Interval	16	03	08.4			
Reduction		12	37.77			
B M.T.	16	00	23.07	16.00	641	

From Almanac	R.A.	Decl.
Moon 16 ^h	21 09 31.41	-14 48 37.2
Moon 1 ^m	24.073	14.158
" 0 ^m 38.45	0.92	+15.4
Tabular Place	21 09 32.33	-14 48 31.8

Moon's Age 14d

$$934 = 8.4$$

$$\begin{array}{r} A = -498.7 \\ + 24 \\ \hline -474.7 \end{array}$$

Parallax	60	57.64
Semi-diam	16	38.1
R		998.1
Aug.		9.6
Dy. 3		-0.3
R		1007.4
R		2159.5
H+a/R		-1025
R		20370
R ²		42312

10999

Plate Constants.

24

$$\begin{array}{rcl}
 X & 16.4370 & 19.1136 & 32.5443 \\
 S & -16.0565 & 18.9641 & 32.9300 \\
 X-S & +.3805 & +.1495 & -.3857
 \end{array}$$

$$\begin{array}{rcl}
 Y & 13.7331 & 22.7851 & 10.2816 \\
 \eta & 13.8596 & 23.3379 & 10.0522 \\
 Y-\eta & -.1265 & -.5528 & +.2294
 \end{array}$$

$$\begin{array}{rcl}
 X-S & +500X & +107.74 & -1.3X -13481 \\
 +.3805 + 8218 & = 12023 & +1479 = 13502 & -21 -13481 \\
 +.1495 + 9557 & = 11052 & +2254 = 13506 & -25 -13481 \\
 -.3857 + 16272 & = 12415 & +1007 = 13522 & -42 = 13480 \\
 241760 + 12088 & & +1785 & -31 = 242121
 \end{array}$$

$$\begin{array}{rcl}
 Y-\eta & -113X & +4.38 & -3802 \\
 -.1265 + 6866 & = 560.1 & -1858 = 3743 & +59 = 3802 \\
 -.5528 + 11392 & = 5864 & -2160 = 3704 & +98 = 3802 \\
 +.2294 + .5141 & = 7435 & -3678 = 3757 & +44 = 3801 \\
 16.5717 + 8286 & & -2732 & +71 = 16.7540
 \end{array}$$

$$\begin{array}{rcl}
 \text{Table } a = +0.1 & c = -7 & a-c = +7.1 & b+d = +1.5 \\
 = -498.7 & = -504.3 & = +5.6 & = +5.3
 \end{array}$$

$$\begin{array}{rcl}
 W-c & -498.8 & -497.3 & +3.8
 \end{array}$$

11999

Plate Constants.

24

$$\begin{array}{rcl}
 X & 164370 & 19.1136 & 32.5443 \\
 S & 161565 & 18.9641 & 32.9300 \\
 X-S & +.3805 & +.1495 & -.3857
 \end{array}$$

$$\begin{array}{rcl}
 Y & 13.7331 & 22.7851 & 10.2816 \\
 \eta & 13.8596 & 23.3379 & 10.0522 \\
 Y-\eta & +.1265 & -.5528 & +.2294
 \end{array}$$

$$\begin{array}{rcl}
 X-S & +.500X & +107.74 & -1.3X - 13481 \\
 +3805 + 8218 & = 12023 & +1479 = 13502 & -121 - 13481 \\
 +1495 + 81557 & = 11052 & +2254 = 13506 & -25 - 13481 \\
 -3857 + 16272 & = 12415 & +1007 = 13522 & -42 - 13480 \\
 24.1760 + 12088 & & +1785 & -31 = 24.2121
 \end{array}$$

$$\begin{array}{rcl}
 Y-\eta & -113X & +4.38 & -3802 \\
 -1265 + 6866 & = 5601 & -1858 = 3743 & +59 = 3802 \\
 -.5528 + 11.392 & = 5864 & -2160 = 3704 & +98 = 3802 \\
 +2294 + .5141 & = 7435 & -3678 = 3757 & +44 = 3801 \\
 16.5717 + 8286 & & -2732 & +71 = 16.7540
 \end{array}$$

$$\begin{array}{rcl}
 \text{Tables } a = +0.1 & b = +7 & a-b = +7.1 & b+d = +1.5 \\
 & = -498.7 & = -504.3 & = +5.3
 \end{array}$$

10999

Moore's Center.

25

	X	X-X ₀	ΔX	(X-X ₀) ²		O-C
1	24.0000	-0.1720	+3	0.0295	4.2517	+205
2	23.0000	-1.1720	+2	1.3731	4.2194	-118
3	22.2110	-1.9710	+1	3.8844	4.2155	-157
4	22.1150	-2.0570	+0	4.2271	4.2312	-00
5	22.1638	-2.0082	-1	4.0333	4.2142	-170
6	22.7028	-1.4692	-2	2.1592	4.1929	-383
7	23.0000	-1.1720	-2	1.3741	4.2198	-114
8	24.1720	-0.0000	-3	0.0000	4.2296	-16
Com R ²					4.2312	

		Δy		
1	14.5216	-2.0534	-14	4.2222
2	14.8890	-1.6860	-11	2.8463
3	16.0000	-0.5750	-4	0.3311
4	16.5750	-0.0000	-0	0.0000
5	17.0000	+0.4250	+3	0.1809
6	18.0000	+1.4250	+9	2.0337
7	18.2608	+1.6858	+11	2.8457
8	18.6302	+2.0552	+14	4.2296

Range 176

Approx. Center

X = 23 y = 14.8890
 18.2608
 33.1498
 y₀ 16.5749

y max 18.6302
 R 2.0553
 Com R 2.1570
 X min 22.1150
 X₀ 24.1720

Moore's Center { X₀ 24.1720
 y₀ 16.5750

10999

Means Center

25

	X	X-X ₀	ΔY	X-X ₀ ²	Y	Y-Y ₀	Y-Y ₀ ²
1	24.0000	-0.1720	+3	0.0295	4.2517	+2.05	
2	23.0000	-1.1720	+2	1.3731	4.2194	-1.18	
3	22.2010	-1.9710	+1	3.8844	4.2155	-1.57	
4	22.1150	-2.0570	+0	4.2271	4.2312	-0.0	
5	22.1638	-2.0082	-1	4.0333	4.2142	-1.70	
6	22.7028	-1.4692	-2	2.1592	4.1894	-3.83	
7	23.0000	-1.1720	-2	1.3741	4.2498	-1.14	
8	24.1720	0.0000	-3	0.0000	4.2296	-1.6	
Com R ²					4.2312		

	X	X-X ₀	ΔY	X-X ₀ ²	Y	Y-Y ₀	Y-Y ₀ ²
1	14.5216	-2.0534	-14	4.2222	1.84		
2	14.8890	-1.6860	-11	2.8463	2.15		
3	16.0000	-0.5750	-4	0.3311	2.54		
4	16.5750	-0.0000	-0	0.0000	2.70		
5	17.0000	+0.4251	+3	0.1809	2.82		
6	18.0000	+1.4251	+9	2.1332	3.14		
7	18.2608	+1.6858	+11	2.8457	3.25		
8	18.6302	+2.0552	+14	4.2296	3.60		
Range .176							

Approx Center

X = 23 Y = 14.8890
 18.2608
 3.31498
 Y₀ 16.5749

Y_{max} 18.6302
 R 2.0553
 Com R 2.1570
 Y_{min} 22.1150
 X₀ 24.1720

Means Center
 Y₀ 24.1720
 Y₀ 16.5750

Normals

1	+0.35
2	+197
3	+1.12
4	+000
5	-0.86
6	-2.09
7	-1.96
8	-000
	+3.44
	-4.91
	-1.47

-	20.5
+	138.0
+	309.5
+	0
+	342.0
+	562.0
+	133.2
+	000
+	1484.7
-	20.5
+	1464.2

-	420.
+	200.
+	89.
+	000
-	71.5
-	544.0
-	192.0
-	32.7
+	289.0
-	1260.2
-	971.2

-a	-b	+16	+DC
-	1	+	2
-	10	+	2
-	18	+	1
-	18	+	0
-	18	-	0
-	13	-	1
-	10	-	2
-	0	-	2

10999

Conditional Equations

26. 0 - e

1	-0.17	-2.05	= +2.05	-14	+133	= +1.19	+86	+103
2	-1.17	-1.69	= -1.18	-93	+110	= +17	+135	+143
3	-1.97	-0.57	= -1.57	-154	+37	= -117	-40	-41
4	-2.06	-0.01	= -0	-165	+0	= -165	+165	+163
5	-2.01	+0.42	= -1.70	-160	-27	= -187	+17	+15
6	-1.47	+1.42	= -383	-118	-93	= -211	-172	-170
7	-1.17	+1.68	= -114	-94	-110	= -204	+90	+94
8	-0.00	+2.05	= -16	-0	-133	= -133	+117	+131

$$+610 - 212$$

$$\text{av. } 103$$

$$17.08 - 1.47 = +1464.2 - 10.02$$

$$1.47 + 16.69 = -971.2 + 1.27$$

$$1.47 - 0.13 = +125.92 - .09$$

$$+16.82 = -1097.1 + 1.186 = -65.2 + 0.07$$

$$17.08 = +1464.2 - 95.8 = +1368.4 \quad a = +80.0'' - 0.58$$

arc 176

 $\frac{\Sigma v}{n}$

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

$$+49$$

$$\frac{+49}{30} = +1.6$$

$$\Delta R = +2.0$$

$$\text{corr. } -0.2$$

$$\Delta R = +2.2$$

$$-2RC = +0.82 \quad +16$$

$$\Delta \theta = +0.06 (+1) \quad \Delta \delta = +0.0$$

$$\Delta \alpha = -0.47 (-9) \quad \Delta \alpha = -0.02$$

10999

Conditional Equations

26

O - C

1	-0.17	-2.15	= +2.15	-14	+133	= +1.69	+86
2	-1.17	-1.69	= -1.18	-93	+110	= +17	+1135
3	-1.47	-1.57	= -1.57	-154	+37	= -1.17	-40
4	-2.06	-0.00	= -0	-165	+0	= -1.65	+1.65
5	-2.01	+0.42	= -1.70	-160	-27	= -1.87	+17
6	-1.47	+1.42	= -383	-118	-93	= -2.11	-172
7	-1.17	+1.68	= -1.14	-94	-110	= -2.04	+90
8	-0.00	+2.15	= -16	-0	-133	= -1.33	+1.17
							+610 -212

or 103

$$17.08 - 1.47 = +1464.2$$

$$1.47 + 16.69 = -97.12$$

$$1.47 - 0.13 = +125.92$$

$$+16.82 = -1297.1$$

$$b = -65.2$$

$$17.08 = +1464.2 - 95.8 = +1368.4 \quad a = +80.0$$

arc 176

 $\frac{\Sigma v}{n}$

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

$$+49$$

$$\frac{+49}{30} = +1.6$$

$$\Delta R = +2.0$$

10999

Moon's Mean Position.

27

$$\begin{array}{r} x_0 \ 24 \ 17 \ 20 \\ + \ 40 \\ \hline 24 \ 17 \ 60 \end{array}$$

$$\begin{array}{r} y_0 \ 16 \ 57 \ 50 \\ - \ 33 \\ \hline 16 \ 57 \ 17 \end{array}$$

From Plate Constants

$$\begin{array}{r} 24 \ 21 \ 21'' \\ - \ 22 \\ \hline S. + 2 \ 21 \ 21'' \end{array}$$

$$\begin{array}{r} 16 \ 75 \ 40'' \\ 18 \\ \hline - \ 1 \ 24 \ 60'' \end{array}$$

$$\begin{array}{ll} \log S & 0.34481'' \\ \log \cos \delta & 9.98355'' \\ & 8.50724'' \\ \log \sin(\alpha - A) & 1.85402'' \end{array}$$

$$\begin{array}{ll} \log \tan \delta & 9.4479'' \\ \log S_0^2 & 0.6896'' \\ & 7.0534 \\ \log n_1 & 7.1909'' \end{array}$$

$$\begin{array}{ll} \alpha - A & + 71.45'' \\ & + 01 \ 11.45'' \end{array}$$

$$A \ 21 \ 18 \ 40.61''$$

$$\alpha_0 \ 21 \ 09 \ 52.06''$$

$$\text{Red} \quad + 4.53''$$

$$\alpha' \ 21 \ 09 \ 56.59''$$

$$n_1 \ -0.0015''$$

$$n_0 \ -1.2445''$$

$$0.09499''$$

$$7.33115''$$

$$2.76384''$$

$$\tan(\delta - \delta_0) \ -58.05''$$

$$- \ 09 \ 40.54''$$

$$\delta \ -15 \ 30 \ 30.1''$$

$$S_0 \ -15 \ 40 \ 10.6''$$

$$\text{Red} \quad + 16.8''$$

$$\delta' \ -15 \ 39 \ 53.8''$$

10999

Mean Mean Position.

$$\begin{array}{r} X_0 \quad 24 \ 17 \ 20 \\ \quad \quad + 40 \\ \hline 24 \ 17 \ 60 \end{array}$$

$$\begin{array}{r} Y_0 \quad 16 \ 57 \ 50 \\ \quad \quad - 33 \\ \hline 16 \ 57 \ 17 \end{array}$$

From Plate Constants

$$\begin{array}{r} X \quad 24 \ 21 \ 21^{\circ} \\ \quad \quad 22 \\ \hline S \quad + \quad 2 \ 21 \ 21 \end{array}$$

$$\begin{array}{r} Y \quad 16 \ 75 \ 40^{\circ} \\ \quad \quad 18 \\ \hline - \quad 1 \ 24 \ 61^{\circ} \end{array}$$

$$\begin{array}{ll} \log S & 0.34483^{\circ} \\ \log \cos \delta & 99^{\circ} 35.5^{\circ} \\ & 85^{\circ} 07' 24 \\ \log \sin i \cdot H & 1.85412 \end{array}$$

$$\begin{array}{ll} \log \tan \delta & 94479^{\circ} \\ \log S_0 & 0.6897^{\circ} \\ & 7.0534 \\ \log n_1 & 7.1909^{\circ} \end{array}$$

$$\begin{array}{r} X-A \quad + \quad 71.45 \\ \quad \quad + 01 \quad 11 \ 45 \end{array}$$

$$A \quad 21 \quad 18 \quad 40.61$$

$$\lambda_1 \quad 21 \quad 19 \quad 52.06$$

$$\text{Red} \quad + \quad 4.53$$

$$\alpha' \quad 21 \quad 09 \quad 56.59$$

$$n_1 \quad -0.0015^{\circ}$$

$$n_2 \quad -1.2445^{\circ}$$

$$0.09499^{\circ}$$

$$7.33115^{\circ}$$

$$2.76384^{\circ}$$

$$\text{Table} \quad -58.05^{\circ}$$

$$- \quad 19 \ 40.5^{\circ}$$

$$E \quad -15 \quad 30 \quad 30.1$$

$$S_0 \quad -15 \quad 40 \quad 10.6$$

$$\text{Red} \quad + \quad 16.8$$

$$S' \quad -15 \quad 39 \quad 53.8$$

10999

29

Lunar Parallax

α'	21	09	56.60
θ	20	40	54.55 ^v
$\theta - \alpha'$	-29		2.05 ^v
$\frac{1}{2}(\alpha - \alpha')$	-7°	15'	30.75 ^v
$\frac{1}{2}(\alpha - \alpha') - \frac{1}{2}(\theta - \theta')$	-02		56.81
$\theta - \alpha' - \frac{1}{2}(\alpha - \alpha')$	-7°	12'	33.94

$$\pi \quad 60'' \quad 57.64''$$

$$\begin{aligned} \log \sin \pi & 9.86913^{\circ} \\ \log \sin \theta - \alpha' & 8.24875^{\circ} \\ \log \sec \theta - \alpha' & 9.10157^{\circ} \\ \log \sin(\theta - \alpha') & 0.01467^{\circ} \\ \sin(\theta - \alpha') & 7.23412^{\circ} \end{aligned}$$

$$\begin{aligned} \log \cos \frac{1}{2}(\alpha - \alpha') & 9.95727^{\circ} \\ \log \sec(\theta - \alpha') - \frac{1}{2}(\alpha - \alpha') & 0.00000^{\circ} \\ \log \tan \gamma & 0.00345^{\circ} \\ & 9.96072 \end{aligned}$$

$$\alpha - \alpha' - 5' \quad 53.62$$

$$= -23.57$$

$$\gamma \quad 42 \quad 24 \quad 45.6^{\circ}$$

$$\delta' \quad -15 \quad 39 \quad 53.8^{\circ}$$

$$\gamma - \delta' \quad 58 \quad 04 \quad 39.4$$

$$\begin{aligned} \log \sin \pi & 9.82640 \\ \log \sin \gamma - \delta' & 8.24875^{\circ} \\ \log \sec \gamma & 9.92878^{\circ} \\ \log \sin(\delta - \delta') & 0.17104^{\circ} \\ \sin(\delta - \delta') & 8.17497^{\circ} \end{aligned}$$

$$\delta - \delta' \quad + \quad 51 \quad 26.0^{\circ}$$

$$\delta \quad -14 \quad 48 \quad 27.8^{\circ}$$

$$\delta - \delta' \quad -14 \quad 48 \quad 31.8^{\circ}$$

$$\delta - \delta' \quad + \quad 4.0^{\circ}$$

$$\begin{aligned} \text{Curv} & + 0.4 \\ \text{2nd ord. ref.} & + 0.1 \\ \text{Curv} & + 0.0 \end{aligned}$$

$$\begin{aligned} \delta - & -14 \quad 48 \quad 27.7 \\ \delta - \delta' & + \quad 41 \end{aligned}$$

$$\alpha \quad 21 \quad 09 \quad 33.03^{\circ}$$

$$\alpha - \alpha' \quad 21 \quad 09 \quad 32.33^{\circ}$$

$$\begin{aligned} \delta - \delta' & + 0.70^{\circ} \\ \text{Curv.} & - 0.05^{\circ} \end{aligned}$$

$$\text{Curv.} \quad - 0.02$$

$$\begin{aligned} \alpha \quad 21 \quad 09 \quad 33.01 \\ \delta - \delta' & + 0.68 \end{aligned}$$

130999

24

Lunar Parallel.

α'	21	09	56.60
θ	20	40	54.55"
$\theta - \alpha'$	-29		2.05"
"	-7°	15'	30.75"
$\frac{1}{2} \alpha - \alpha''$	-02		56.81
$\theta - \alpha' - \frac{1}{2} \alpha - \alpha''$	-7°	12'	33.94

$$\pi \quad 60'' \quad 57.64''$$

$$9.86913''$$

$$\log \sin \pi \quad 8.24875''$$

$$'' \sin \theta - \alpha' \quad 9.10157''$$

$$'' \sec \theta \quad 0.11467''$$

$$\sin \alpha - \alpha'' \quad 7.23412''$$

$$\alpha - \alpha' - 5' \quad 53.62$$

$$= -23.57$$

	9.95727''
$\log \cos \frac{1}{2} \alpha - \alpha'$	0.00000''
$\sec (\theta - \alpha' - \frac{1}{2} \alpha - \alpha'')$	0.00345''
$\log \tan \gamma$	9.96072

$$\gamma \quad 42 \quad 24 \quad 45.6''$$

$$\delta' \quad -15 \quad 39 \quad 53.8''$$

$$\gamma - \delta' \quad 58 \quad 04 \quad 39.4$$

	9.82640
$\log \sin \pi$	8.24875''
$\sin \gamma - \delta'$	9.92878''
$\cos \alpha$	0.17104''
$\sin (\delta - \delta')$	8.19497''

$$\delta - \delta' \quad 51 \quad 26.0$$

$$\delta \quad -14 \quad 48 \quad 27.8$$

$$\epsilon \text{ h } \delta \quad -14 \quad 48 \quad 31.8''$$

$$\delta - \epsilon \quad +4.0$$

$$\begin{aligned} \text{Curv} & +0.4 \\ 2^{\text{nd}} \text{ ord. ref.} & +0.1 \\ \text{Inv.} & +0.0 \end{aligned}$$

$$\delta \quad -14 \quad 48 \quad 27.7$$

$$\delta - \epsilon \quad +4.1$$

$$\alpha \quad 21 \quad 09 \quad 33.03''$$

$$\epsilon \text{ h } \alpha \quad 21 \quad 09 \quad 32.33''$$

$$\delta - \epsilon \quad +0.70$$

$$\text{Curv.} \quad -0.05$$

$$\text{Inv.} \quad -0.02$$

$$\alpha \quad 21 \quad 09 \quad 33.01$$

$$\delta - \epsilon \quad +0.68$$

