Geodetic Astronomy

FC 22239

Continuous Assessment 04

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$\varphi = 7^\circ\ 10'\ 25''\ N$
$\lambda = 81^\circ\ 25'\ 15''\ E$ } Geodetic coordinate of place.

Longitude of the CM $= \lambda_0 = 80^\circ\ 46'\ 18''\ E$

Set	Time	object	face	Horizontal Angle	Vertical Angle
	-	RO	FL	165° 30' 40"	-
	$8^h\ 24^m\ 50^s$	Sun	FL	14° 12' 13"	23° 05' 50"
1	$8^h\ 25^m\ 10^s$	Sun	FR	194° 12' 15"	23° 06' 16"
	-	RO	FR	345° 30' 44"	-

Mean Horizontal Angle to RO $= \left(\frac{345^\circ\ 30'\ 44'' - 180^\circ) + 165^\circ\ 30'\ 40''}{2}\right)$

$= 165^\circ\ 30'\ 42''$

Mean Horizontal angle to Sun $= \frac{(194^\circ\ 12'\ 15'' - 180^\circ) + 14^\circ\ 12'\ 13''}{2}$

$= 14^\circ\ 12'\ 14''$

Mean Vertical angle to Sun $= \frac{23^\circ\ 5'\ 50'' + 23^\circ\ 6'\ 16''}{2}$

$= 23^\circ\ 6'\ 3''$

Mean Standard time to Sun $= \frac{8^h\ 24^m\ 50^s + 8^h\ 25^m\ 10^s}{2}$

$= 8^h\ 25^m$

Refraction correction = $-58'' \cot H$

$= -58 \cot (23^\circ 6' 3'')$

$= -0^\circ 2' 16''$

Parallex correction = $9'' \cos H$

$= 9 \cos (23^\circ 6' 3'')$

$= 0^\circ 0' 8''$

Corrected Altitude = Mean Vertical Angle to Sun + Parallex correction + refraction Correction

$23^\circ 6' 3'' + 0^\circ 0' 8'' - 0^\circ 2' 16''$

ST $\xrightarrow{5^h\ 30^m}$ GST

GMT of Sun = $8^h\ 25^m$

$5^h\ 30$

$2^h\ 55$

Declination (δ) for $2^h\ 55^m$

δ for $0^h = 9^\circ\ 11.3'$

δ for $6^h = 9^\circ\ 6.0'$

$5.3'$

δ for $2^h\ 55^m = \frac{0^\circ\ 5.3'}{6} \left(2 + \frac{55}{60}\right)$

$= 0^\circ\ 2'\ 35''$

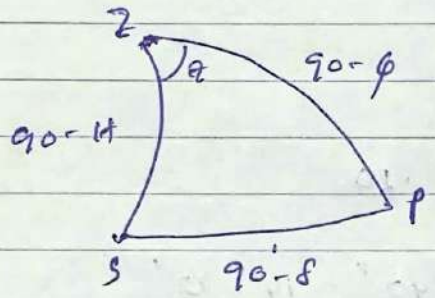
$= 9^\circ\ 2.6'$

Total declination = $9^\circ\ 11.3'\ 0'' - 0^\circ\ 2.6'$

$= 9^\circ\ 8.7'$

Azimuth of Sun

$$\cos Z = \frac{\sin\delta - \sin H \sin\phi}{\cos H \cos\phi}$$



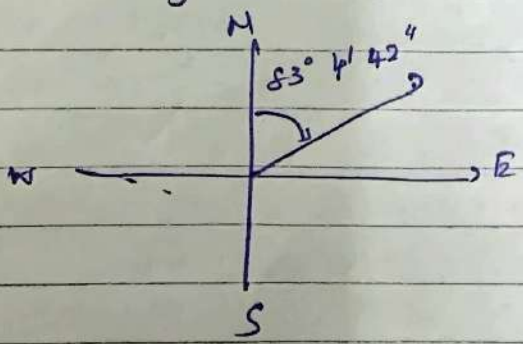
$\delta = 9^\circ\ 8.7'$ $\quad H = 23^\circ\ 3'\ 55''$ $\quad \phi = 7^\circ 10'\ 25''\ N$

$$\cos Z = \sin(9^\circ\ 8.7') - \sin(23^\circ\ 3'\ 55'')\sin(7^\circ 10'\ 25'')$$
$$\cos(23^\circ\ 3'\ 55'')\ \cos(7^\circ\ 10'\ 25'')$$

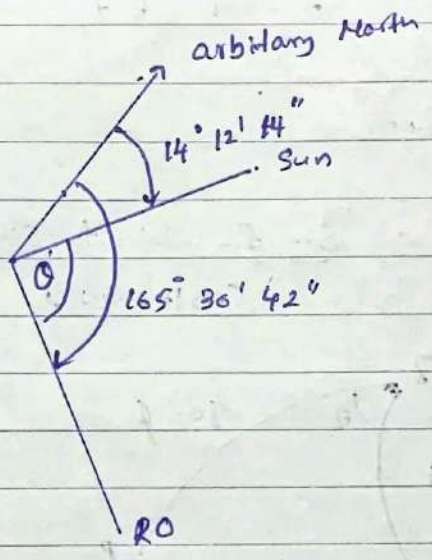
$Z = 83^\circ\ 4'\ 42.21''$

Azimuth of the sun (A) = $83^\circ\ 4'\ 42''$ (morning set)

If ST is $8^h\ 25^m$ then this is the morning set

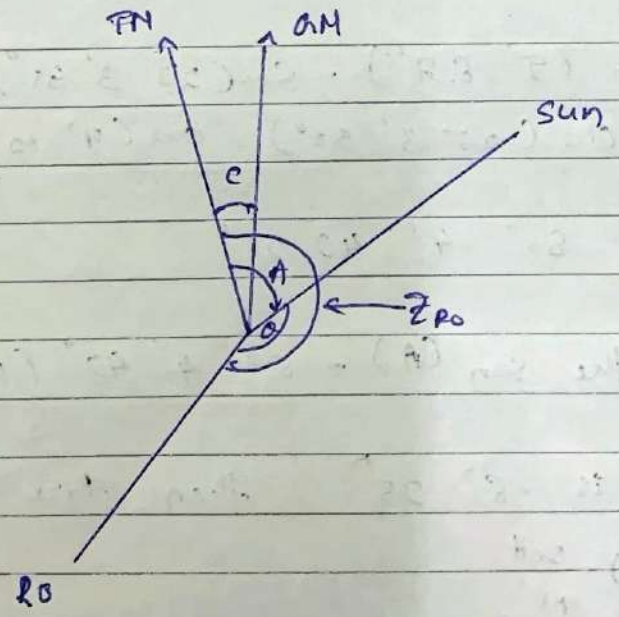


Included angle from Sun to RO



$Q = 165^\circ\ 30'\ 42'' - 14^\circ\ 12'$

$Q = 151^\circ\ 18'\ 28''$ (Included Angle of Sun and RO)



Azimuth of RO = A to O

$Z_{RO} = 83^\circ 4' 42'' + 151^\circ 18' 28''$

$Z_{RO} = 234^\circ 23' 10''$

Bearing of RO

Convergence (c) = $\Delta\lambda \sin\phi$

$\Delta\lambda = 81^\circ 25' 15'' - 80^\circ 46' 18''$

$= 0^\circ 38' 57''$

$C = 0^\circ 38' 57'' \sin(7^\circ 10' 25'')$

$= 0^\circ 4' 51.84''$

$= 0\ 4' 52''$

Bearing of RO = $Z_{RO} - C$

$= 234^\circ 23' 10'' - 0^\circ 4' 52''$

$= 234^\circ 18' 18''$