

JAN 2022,
MAY 2022,
APRIL 2023,
JAN 2025

A morning sight of the sun taken at 0832 (zone -4) on 11th October 1992 gave a position, through which the PL passed, of $39^{\circ}25'S$, $062^{\circ}17'E$. Using an estimated speed of 19 knots on a course of $261^{\circ}(LT)$, find the GMT and zone time of the sun's meridian passage and the DR at this time.

Solⁿ:

Ship's time: 11D 08H 32M

ZONE TIME: (-) 04H 00M

GMT: 11D 04H 32M

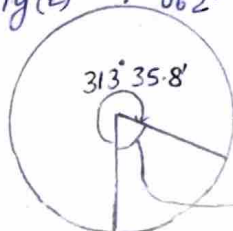
GHA SUN (11d 04h): $243^{\circ}18.8'$

Increment (32m 00s): $8^{\circ}00.0'$

GHA SUN: $251^{\circ}18.8'$

Long (E): $062^{\circ}17.0'$

SO, LHA = $313^{\circ}35.8'$



$$360^{\circ} - 313^{\circ}35.8' = 046^{\circ}24.2'$$

$$D'lat/hr = spd \times \cos co$$

$$= 19 \times \cos 261^{\circ} (S 81^{\circ} W)$$

$$= 2.97'S$$

$$Dep/hr = spd \times \sin co$$

$$= 19 \times \sin 261^{\circ} (S 81^{\circ} W)$$

$$= 18.77'W$$

Initial lat: $39^{\circ}25'S$

d'lat after 1 hr: $2.97'S$

Lat after 1 hr: $39^{\circ}27.97'S$

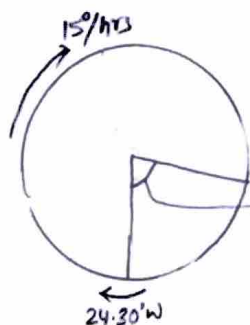
m'lat: $39^{\circ}26.5'$

$$\cos m'lat = dep/d'long$$

$$D'long/hr = dep/\cos m'lat$$

$$= 18.77 / \cos 39^{\circ}26.5'$$

$$= 24.30'W$$



$$spd: 15^{\circ} - 0^{\circ}24.30'$$

$$= 14^{\circ}35.7'$$

$$TIME TAKEN: 046^{\circ}24.2' \div 14^{\circ}35.7' = 03H 10M 46S$$

GMT: 11D 04H 32M 00S

TIME TAKEN: 03H 10M 46S

GMT at mer. pass: 12D 07H 42M 46S

Zone time at mer. pass: 12D 11H 42M 46S

To find DR at time of meridian passage

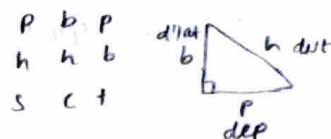
$$CO : 261^\circ(T)$$

$$= S 81^\circ W$$

$$Dist = Spd \times time$$

$$= 19 \times 03H 10M 46S$$

$$= 60.4 NM$$



$$\cos CO = \frac{d'lat}{dist}$$

$$\sin CO = \frac{dep}{dist}$$

$$\cos 81^\circ = \frac{d'lat}{60.4}$$

$$\sin 81^\circ = \frac{dep}{60.4}$$

$$d'lat = 9.45'S$$

$$dep = 59.7'W$$

$$Initial DR lat : 39^\circ 25'S$$

$$d'lat : 0^\circ 9.45'S$$

$$Final DR lat : 39^\circ 34.5'S$$

$$m'lat : 39^\circ 29.7'S$$

$$\cos m'lat = \frac{dep}{d'long}$$

$$\cos 39^\circ 29.7' = \frac{59.7'}{d'long}$$

$$d'long = 1^\circ 17.3'W$$

$$Initial DR long : 062^\circ 17'E$$

$$d'long : 1^\circ 17.3'W$$

$$Final DR long : 060^\circ 59.7'E$$

DR at the time of the Sun's meridian passage:

$$\boxed{39^\circ 34.5'S \quad 060^\circ 59.7'E}$$

JULY 2022, OCT 2024 PM

Similar question:- JAN 2014, JULY 2018, JULY 2021

Q) On 4th May 1992 at ship in DR $35^{\circ} 43.5'N$, $144^{\circ} 12.3'E$, the sextant altitude of SUN was $46^{\circ} 56.7'$ when GMT showed 03d 23h 27m 18s. If IE was 1.2' off the arc and HE was 12.5m, find the direction of the PL and a position through which it passes using intercept method. Draw a diagram in plane of rational horizon.

Solⁿ:

GMT = MAY 03d 23h 27m 18s

GHA SUN (03d 23h): $165^{\circ} 48.3'$

Increment (27m 18s): $6^{\circ} 49.5'$

GHA SUN : $172^{\circ} 37.8'$

LONG (E) : $144^{\circ} 12.3'$

LHA SUN : $316^{\circ} 50.1'$

P : $43^{\circ} 9.9'$

LHA 180° to 360°
body east of meridian
 $P = 360^{\circ} - LHA$

Declination sun (03d 23h): $15^{\circ} 57.9'N$

d(0.7): (+) $0.3'$

Declination SUN : $15^{\circ} 58.2'N$

Sextant Altitude : $46^{\circ} 56.7'$

IE (off) : (+) $1.2'$

Observed altitude : $46^{\circ} 57.9'$

Dip (HE - 12.5m): (-) $6.2'$

Apparent altitude : $46^{\circ} 51.7'$

Total corr LL : (+) $15.1'$

True altitude : $47^{\circ} 6.8'$

TZD : $42^{\circ} 53.2'$

By Intercept formula,

$$\cos CZD = \cos P \cdot \cos lat \cdot \cos dec \pm \sin lat \cdot \sin dec$$

lat & dec, same name add

$$\cos CZD = \cos 43^{\circ} 9.9' \cdot \cos 35^{\circ} 43.5' \cdot \cos 15^{\circ} 58.2' + \sin 35^{\circ} 43.5' \cdot \sin 15^{\circ} 58.2'$$

$$\cos CZD = 0.72993$$

$$CZD = 43^{\circ} 7.1'$$

$$TZD = 42^{\circ} 53.2'$$

$$\text{Intercept} = 13.9' (T)$$

Tom greater, away

$$A = \frac{\tan \text{lat}}{\tan p}$$

$$A = \frac{\tan 35^\circ 43.5'}{\tan 43^\circ 9.9'}$$

$$A = 0.767 \text{ (S)} \rightarrow \text{opp to lat except when LHA is NW } 090^\circ \text{ to } 270^\circ$$

$$B = \frac{\tan \text{dec}}{\sin p}$$

$$B = \frac{\tan 15^\circ 58.2'}{\sin 43^\circ 9.9'}$$

$$B = 0.418 \text{ (N)} \rightarrow \text{same as dec}$$

$$C = A \pm B$$

$$C = A - B$$

$$C = 0.767 - 0.418$$

$$C = 0.3495$$

$$\tan Az = \frac{1}{C} \times \cos \text{lat}$$

$$\tan Az = \frac{1}{0.349} \times \cos 35^\circ 43.5'$$

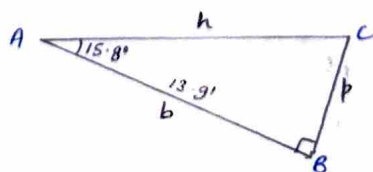
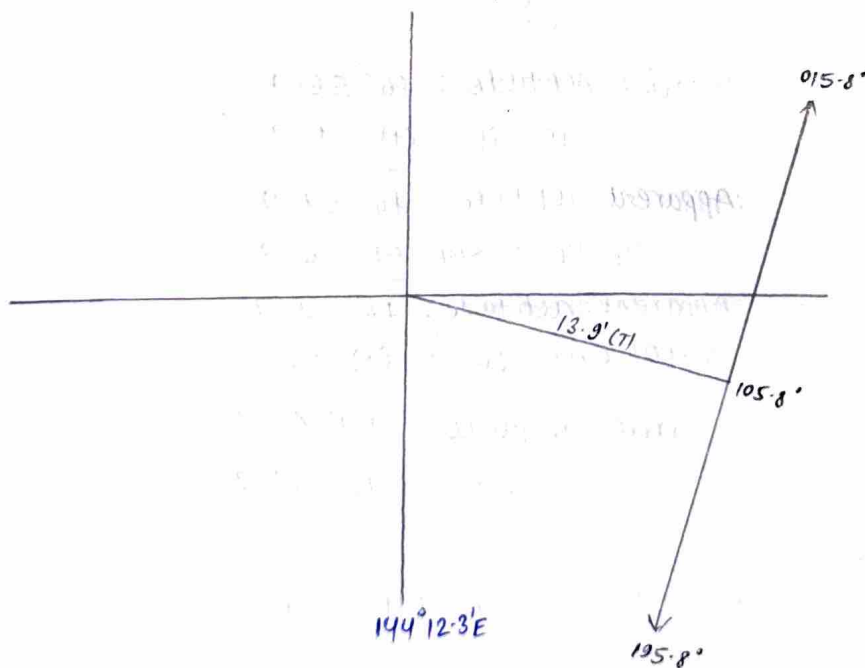
$$\tan Az = 3.52947$$

$$Az = 74.2^\circ \text{ (E)} \rightarrow \text{LHA } 180^\circ \text{ to } 360^\circ - E$$

same as C

$$T Az = 105.8^\circ \text{ (T)}$$

$$PL = 015.8^\circ - 195.8^\circ$$



p b p
h h b
s c t

$$\cos \theta = \frac{b}{h}$$

$$\cos \theta = \frac{AB}{AC}$$

$$\cos 15.8^\circ = \frac{13.9'}{AC}$$

$$AC \text{ i.e. dep} = 14.4'E$$

$$\cos \text{lat} = \frac{\text{dep}}{d' \text{ long}}$$

$$\cos 35^\circ 43.5' = \frac{14.4'}{d' \text{ long}}$$

$$d' \text{ long} = 17.7'E$$

$$\text{DR long} : 144^\circ 12.3'E$$

$$d' \text{ long} : \underline{17.7'E}$$

$$\text{Obs long} : 144^\circ 30.0'E$$

A morning sight of SUN was taken at 0900 HRS ship's time on 16th June 1992 using a DR of $26^{\circ} 16' N$ gave an observed longitude of $74^{\circ} 46' W$. Using an estimated speed of 15 kts on a course of $258^{\circ}(T)$. Find
a) Ship's time of meridian passage.

SMT: 16D 09H 00M

Zone time: (+) 05H 00M

GMT: 16D 14H 00M

2F ME HE =

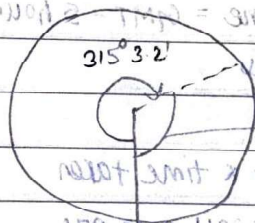
GHA (16d 14h): $29^{\circ} 49' 2''$

Increment (00m 00s): 00' 00"

GHA SUN: $29^{\circ} 49' 2''$

Long(W): $74^{\circ} 46' 00''$

LHA SUN: $315^{\circ} 3' 2''$



$$D' Lat/hr = SPD \times \cos CO$$

$$= 15 \times \cos 258^{\circ} (S 78^{\circ} W)$$

$$= 3.12'S$$

$$Dep/hr = SPD \times \sin CO$$

$$= 15 \times \sin 258^{\circ}$$

$$= 14.67' W$$

$$D' Lat: 26^{\circ} 16' N$$

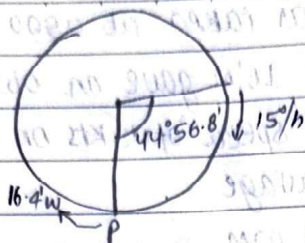
$$Lat \text{ after } 1 \text{ hr}: 26^{\circ} 12' 88'' N$$

$$m' Lat: 26^{\circ} 14' 4'' N$$

$$D' Long/hr = Dep / \cos m' Lat$$

$$= 14.67 / \cos 26^{\circ} 14'$$

$$= 16.4' W$$



$$44^{\circ} 56.8'$$

$$14^{\circ} 43.6' (15^{\circ} - 0^{\circ} 16.4')$$

$$= 3H 3M 7S$$

SHIP'S TIME: 09H 00S

TIME TAKEN: + 03H 03M 07S

SHIP'S TIME AT MER. PASS: 12H 03M 07S Ans

(b) The computed sextant altitude of SUN's LL for this time (H.E: 12m, I.E: 3' on the arc, ship's time = GMT - 5 hours)

① Find Latitude at mer. pass

$$\text{Total } d'lat = d'lat/hr \times \text{time taken}$$

$$= 3.12' \times 03H 03M 07S$$

$$= 9.49'S$$

$$DR \text{ lat: } 26^{\circ} 16'N$$

$$d'lat: 9.49'S$$

$$\text{Obs lat: } 26^{\circ} 06.59'N \quad \text{Lat at mer. pass}$$

② Find declination

$$\text{SMT mer. pass: } 16D 12H 03M 07S$$

$$\text{zone time: } (+) 05H 00M 00S$$

$$\text{GMT mer. pass: } 16D 17H 03M 07S$$

$$\text{Declination (16d 17h): } 23^{\circ} 22.4'N$$

$$d(0.1) = 0.0'$$

$$\text{Declination SUN: } 23^{\circ} 22.4'N$$

No. 145

Date 29-04-25

Sextant altitude: $87^{\circ} 09.0'$ Ans

Observed altitude: $87^{\circ} 06.0'$

Dip (HE-12m): $(-)$ $06.1'$

Apparent altitude: $86^{\circ} 59.9'$

Total corr LC: $(+)$ $15.9'$

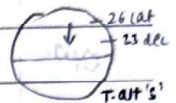
True altitude: $87^{\circ} 15.8' NS$

MZD: $02^{\circ} 44.2' N$ } same name add

Dec: $23^{\circ} 22.4' N$

Obs Lat: $26^{\circ} 06.59' N$

workout in
opposite
to get sextant
altitude



$$MZD + dec = obs lat$$

$$MZD = obs lat - dec$$

$$26^{\circ} 06.59' - 23^{\circ} 22.4' = 2^{\circ} 44.19'$$

$$26^{\circ} 06.59'$$

$$23^{\circ} 22.4'$$

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