

June 1999

Question 1

$$\begin{aligned} \text{a) } \cos AB &= \cos \text{Lat A} \cos \text{Lat B} \cos P \pm \sin \text{Lat A} \sin \text{Lat B} \\ &= \cos 7^\circ \cos 13^\circ 27' \cos 135^\circ 25' + \sin 7^\circ \sin 13^\circ 27' \\ &= -0.687532864 + 0.028346409 \\ &= -0.659186454 \\ AB &= 131^\circ 14.'3 \\ &= 7,874.3 \\ \text{Pilotage etc.} &= 125' \\ \text{Total dist} &= \underline{7,999.3 \text{ miles}} \end{aligned}$$

$$\begin{aligned} \text{b) } \cos A &= \frac{\cos PB - \cos PA \cos AB}{\sin PA \sin AB} \\ &= \text{N } 65^\circ 12.'7 \text{ W} \end{aligned}$$

Lat Vertex

$$\begin{aligned} \sin PV &= \sin A \sin PA \\ \cos \text{Lat V} &= \sin A \cos \text{Lat A} \\ &= \sin 65^\circ 12.'7 \cos 7^\circ \\ \text{Lat V} &= 25^\circ 41.'9 \text{ N} \end{aligned}$$

Long Vertex

$$\begin{aligned} \tan P &= \frac{1}{\sin \text{Lat A} \tan A} \\ P &= 75^\circ 13.'0 \text{ W} \\ \text{Long A} &= 80^\circ 00.'0 \text{ W} \\ \text{Long Vertex} &= 155^\circ 13.'0 \text{ W} \end{aligned}$$

$$\text{Position of Vertex} = 25^\circ 41.'9 \text{ N } 155^\circ 13.'0 \text{ W}$$

$$\begin{aligned} \text{c) } \sin \text{Co P} &= \tan PV \tan \text{Co PX} \\ \tan \text{Lat X} &= \tan \text{Lat V} \cos P \\ &= \cos 12^\circ 47' \tan 25^\circ 41.9 \\ \text{lat X} &= 25^\circ 08.'5 \text{ N} \\ \text{Lat Pinnacles} &= 25^\circ 20.'0 \text{ N} \\ \text{Dlat} &= 0^\circ 11.'5 \\ &\text{You pass 11.5 miles South of the pinnacles.} \end{aligned}$$

2. See attached plot.

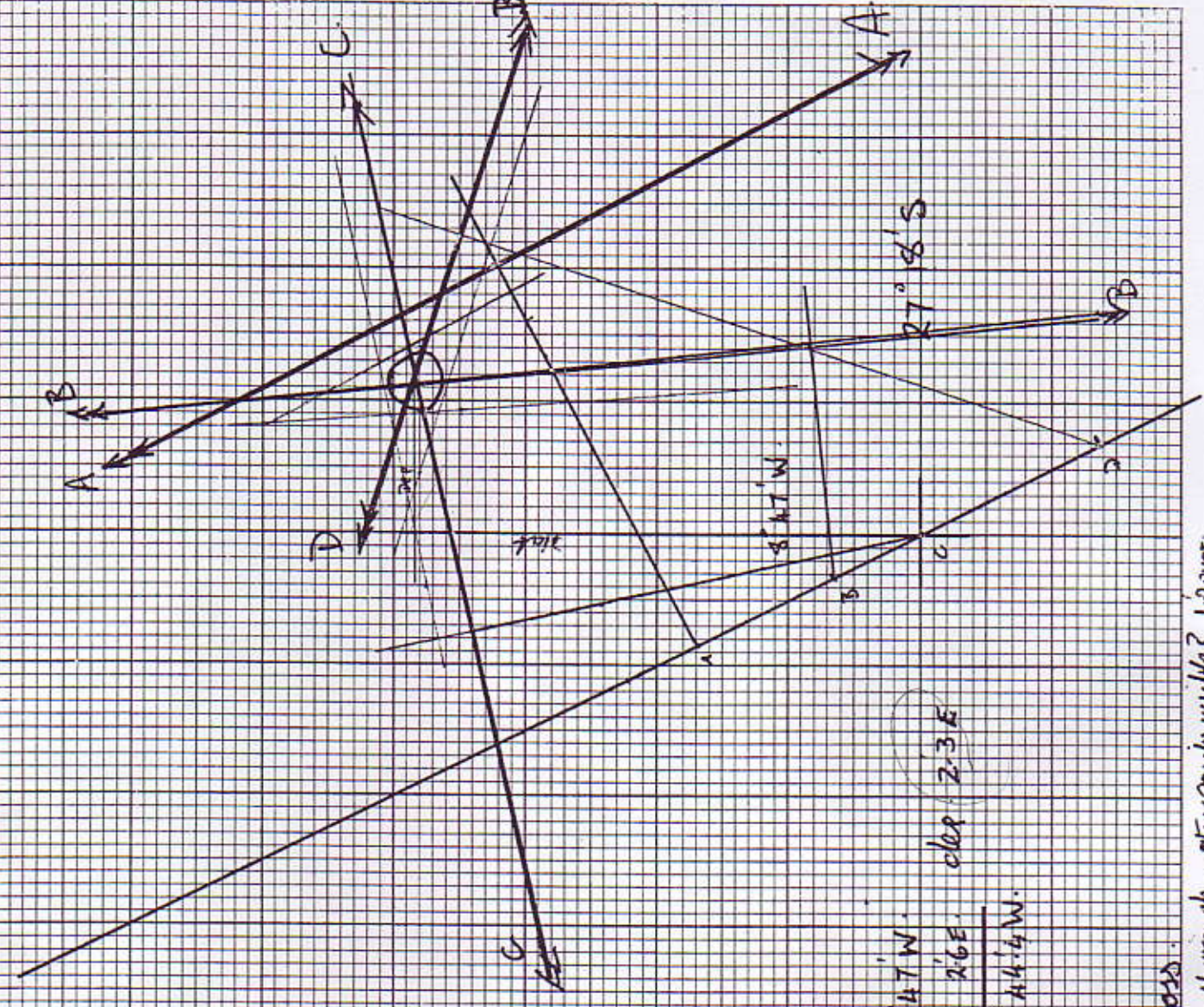
On completing the plot, we find three pl's crossing, with a fourth nearby. Back to position Line theory. "crossing gives us a position, three confirms it, a fourth is a bonus. If the fourth does not cross with the other three, then we don't get the bonus, and we run with the three p/L's

SUN 2 1999

Observed position / AT $27^{\circ} 10' 35''$
 Long $8^{\circ} 44' 4''$ W.

Star A - 15' alt $54.9 = 3.75$
 Star B - 6' alt $15.0 = 1.5$
 Star C - 0' alt $= 0$
 Star D - 12' alt $15.0 = 3.0$

D.R. $27^{\circ} 18' S$. $8^{\circ} 47' W$.
 alt $7.7 N$ $2.6 E$. $2.3 E$
 Obs Alt $27^{\circ} 10' 35''$. $8^{\circ} 44' 4'' W$.
 Made $27^{\circ} 14' S$



Scale 1 cm = 1'

Use position where 3 p/l's cross.

A^c Pt. earliest one taken - How good - star easily visible? 10 star.