9th nov,
SUNDAY

OMITTED MEASUREMENTS

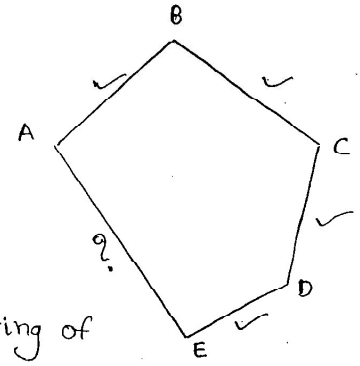
- Maximum number of omitted measurements = 2
as $\Sigma L = 0$ & $\Sigma D = 0$.

Case 1 : Length & Bearing of one side is omitted.

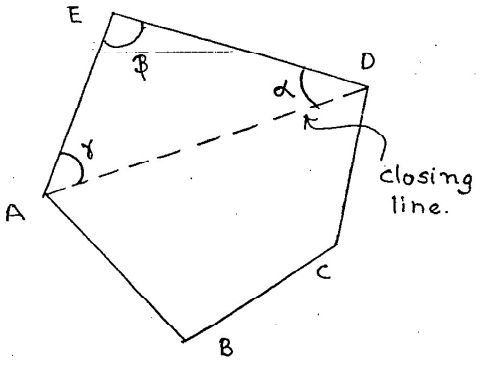
Latitude of EA $= -\Sigma L$

Departure of EA $= -\Sigma D$.

Length of EA $= \sqrt{(-\Sigma L)^2 + (-\Sigma D)^2}$



Case 2 : Length of one side & bearing of Adjacent side are omitted.



Line	Length	Bearing
AB	✓	✓
BC	✓	✓
CD	✓	✓
DE	?	✓
EA	✓	?

Applying sine rule in ΔADE,

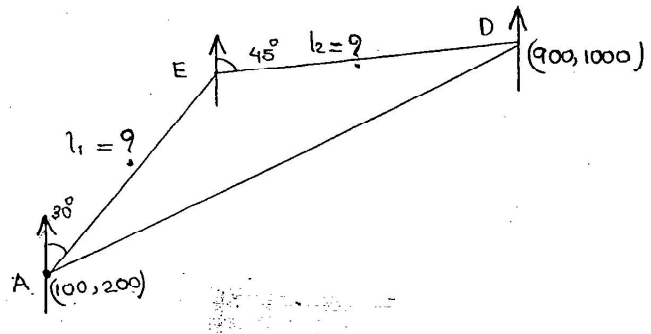
$$\frac{\sin\alpha}{EA} = \frac{\sin\beta}{AD} = \frac{\sin\gamma}{DE}$$

$$\sin\beta = \frac{\sin\alpha * DA}{EA} \Rightarrow \beta \text{ is obtained.}$$

$$\therefore \gamma = 180 - (\alpha + \beta).$$

$$DE = \frac{\sin\gamma . EA}{\sin\alpha}$$

Q.



Find lengths AE & ED.

Method I :

Latitude E wrt A. = Latitude of E wrt D.

ie $100 + l_1 \cos 30 = 900 + l_2 \cos 45$

$0.866\, l_1 - 0.707\, l_2 = 800$

Departure of E wrt A = Departure of E wrt D.

$200 + l_1 \sin 30 = 1000 + l_2 \sin 45$.

$0.5\, l_1 - 0.707\, l_2 = 800$.

P-28

51

Line	Length (m).	Bearing
PR	200	0°
QR	1000	45°
RS	907	180°
SP	?	?

$\Sigma L = 0$

$\Rightarrow 200 \cos 0 + 1000 \cos 45 + 907 \cos 180 + SP \cos\theta = 0$

$\Sigma D = 0$

$\Rightarrow 200 \sin 0 + 1000 \sin 45 + 907 \sin 180 + SP \sin\theta = 0$.

$SP \cos\theta = -0.107$

$SP \sin\theta = -707.107$

$\Rightarrow \theta = \tan^{-1}\left(\frac{707.107}{0.107}\right) = \underline{90^\circ}$

For SP,

latitude $= -\Sigma L = -106$ (S)

departure $= -\Sigma D = -707.10$. (W).

$\Rightarrow$ S90° W $= 270°$

SP $= \underline{\underline{707.107 \text{ m}}}$

~~It is an indirect leveling in which~~

52. Latitude of Q wrt P = Latitude of Q wrt R.

$$100 + l_1 \cos 30 = 1000 + l_2 \cos 45.$$

$$0.866 l_1 - 0.707 l_2 = 900.$$

Departure of Q wrt P = Departure of Q wrt R.

$$200 + l_1 \sin 30 = 1000 + l_2 \sin 45.$$

$$0.5 l_1 - 0.707 l_2 = 800.$$

$$\Rightarrow l_1 = 273.224 \text{ m}$$

$$l_2 = \underline{\underline{938.314 \text{ m}}}$$

P-42

1. $\Sigma L = 400.75 + 100.25 - 199 - 300$

$= 2$

$\Sigma D = 99.25 + 399.75 - 300.5 - 200.5$

$= -2.$

$\therefore L' = -\Sigma L = -2$ (S)

$D' = -\Sigma D = 2.$ (E)

$$e = \sqrt{-2^2 + 2^2} = \underline{\underline{2.82 \text{ m}}}$$

$$\theta = \tan^{-1}\left(\frac{D'}{L'}\right) = 45° \Rightarrow S\,45\,E = \underline{\underline{135°}}$$

2 $\Sigma L = 0$

$$200\cos\theta + 98\cos 178 + l\cos 270 + 86.4\cos 1^\circ = 0.$$

$$200\cos\theta - 97.94 + 0 + 86.386 = 0$$

$$\cos\theta = 0.0577 \Rightarrow \theta = 86.68^\circ$$

$\Sigma D = 0$

$$200\sin 86.68^\circ + 98\sin 178 + l\sin 270 + 86.4\sin 1^\circ = 0,$$

$$l = 204.59 \text{ m}$$

3. $$150 + l_1\cos 29^\circ 30' = 1500 + l_2\cos 45^\circ 45'$$

$$200 + l_1\sin 29^\circ 30' = 1300 + l_2\sin 45^\circ 45'$$

$$l_1 = 712.71 \text{ m}.$$

$$l_2 = 1045.7 \text{ m}$$

4. $\Sigma L = 0.$

$$250\cos 60 + 300\cos 290 + 350\cos 190 + l_1\cos\theta = 0.$$

$$\Rightarrow AD\cos\theta = L' = 117.08 \text{ m} \quad (N)$$

$\Sigma D = 0$

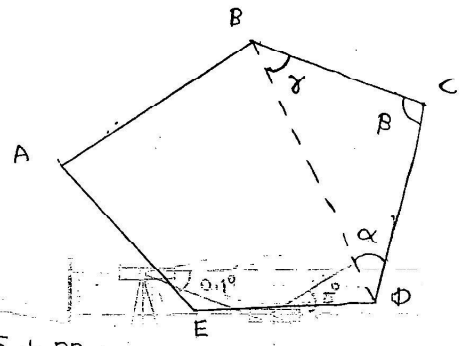
$$250\sin 60 + 300\sin 290 + 350\sin 190 + AD\sin\theta = 0$$

$$\Rightarrow AD\sin\theta = D' = 126.18 \text{ m} \quad (E)$$

$$\theta = \tan^{-1}\left(\frac{126.18}{117.08}\right) = 47.14^\circ$$

$$AD = 172.13 \text{ m}.$$

5. In closed traverse ABDEA,



$200 \sin 121 + 350 \cos\theta + 280 \sin 235 + 5 \sin 205 + BD \sin\theta = 0$

$BD \sin\theta = D' = 60.04.$

$\Sigma L = 0$

$\Rightarrow 200 \cos 121 + 280 \cos 235 + 5 \cos 205 + BD \cos\theta = 0$

$BD \cos\theta = L' = 268.14 \text{ m.}$

$\theta = 12.62^0 \quad \& \quad BD = 274.78 \text{m}$

$\angle CDB = \alpha = (BB)_{CD} - (FB)_{DB}.$

$= 143 - 12.62 = 130.38$

$$\frac{\sin\alpha}{BC} = \frac{\sin\beta}{BD} = \frac{\sin\gamma}{CD.}$$

$$\frac{\sin 130.38}{350} = \frac{\sin\beta}{274.78} = \frac{\sin(180-(130.38+\beta))}{CD.}$$

$\beta = 36.73^0$

$CD = 102.5 \text{ m.}$

$\beta =$