8th nov,
SATURDAY

THEODOLITE TRAVERSING

1. Loose Needle Method.

Bearings of lines will be measured with theodolite wrt the compass fitted (in-built).

2. Fast Needle Method.

N-direction will be established separately by prismatic compass and bearings are measured. It is more accurate than loose needle method.

3. Method of Included Angles (Backbearing Method).

Used for GALE's traverse tables.

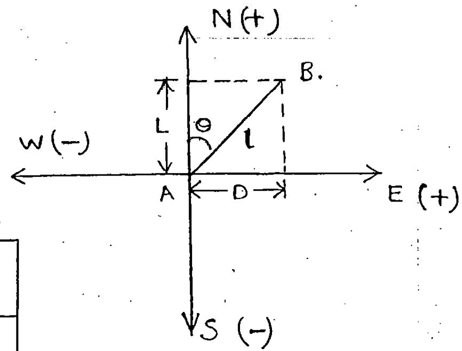
4. Method of Deflection Angles.

It is suitable for open traverse.

→ Traverse Computations.

Latitude, $L = l\cos\theta$

Departure, $D = l\sin\theta$



If L & D of a line are given,

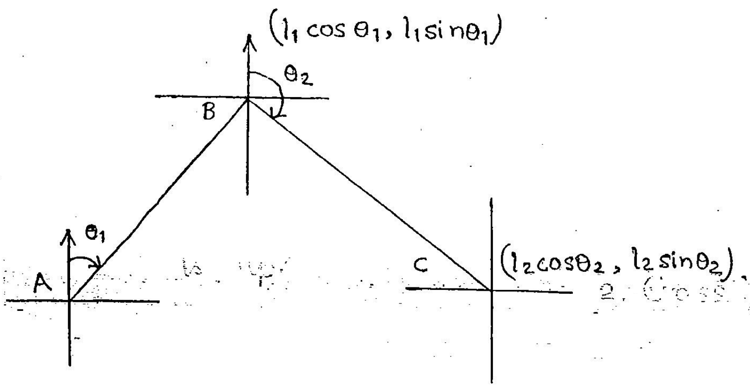
length of a line, $l = \sqrt{L^2+D^2}$
bearing of line, $\theta = \tan^{-1}\left(\frac{D}{L}\right)$

If Latitude and Departure of a line are equal,

Bearing $= 45°$

→ Consecutive co-ordinates or Dependent co-ordinates.

These are the L & D of a succeeding station wrt preceding line



→ Total Co-ordinates (or) Independent co-ordinates.

Co-ordinates of stations will be calculated from assumed origin.

Q.

Line	Length	Bearing	Consec. Coordinates.				Total coordinates	
			L		D		L	D
			+	−	+	−		
		Station A	196.65			36.45	300	300
AB	50	N 80°30' E						
		Station B	8.25		49.31		308.25	349.31
BC	100	S 40°30' E						
		Station C		76.04	64.94		232.21	414.25
CD	150	S 20°30' W						
		Station D.		140.5		52.53	91.71	361.72
DA.	200	N 10°30' W.						

Total co-ordinates of A is given as (300, 300).

S θ E ⇒ L (−)
D (+)

N θ E ⇒ L (+)
D (−)

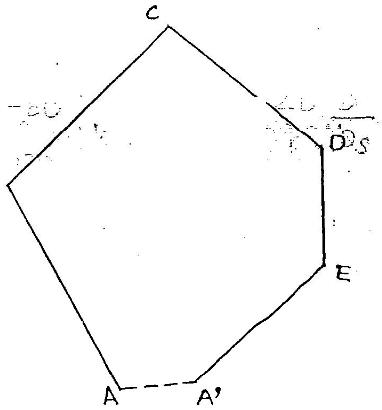
S θ W ⇒ L (−)
D (−)

N θ W ⇒ L (+)
D (−)

→ Closing Error & Angle of Misclosure

In a closed traverse ABCDEA,

AA' is the closing error.



- In a closed traverse algebraic sum of latitudes of all lines is equal to zero.

- Algebraic sum of departures of all lines is equal to zero.

ie $\Sigma L = 0$

$\Sigma D = 0$

∴ Algebraic sum of latitudes of all line excepts AA' + latitude of AA' = 0.

ie $\Sigma L + L' = 0$.

$$\boxed{L' = -\Sigma L}$$

Similarly, $\boxed{D' = -\Sigma D}$

- Closing error, $e = \sqrt{(L')^2 + (D')^2}$

$$e = \sqrt{(-\Sigma L)^2 + (-\Sigma D)^2}$$

Bearing of AA', $\theta = \tan^{-1}\left(\frac{D'}{L'}\right) = \tan^{-1}\left(\frac{\Sigma D}{\Sigma L}\right)$

Angle of misclosure $\Big\}$ $\theta = \tan^{-1}\left(\frac{\Sigma D}{\Sigma L}\right)$

Q.

Line	L	D
AB	100	−200
BC	250	−100
CA	−600	500

$\Sigma L = -250$

$\Sigma D = 200.$

$\therefore \quad L' = 250 \quad \& \quad D' = -200$

Closing error, $e = \sqrt{250^2 + 200^2} = 320.16$

Angle of misclosure, $\theta = \tan^{-1}\left(\frac{200}{250}\right) = 38.65^\circ$

$\theta = \underline{\underline{N\ 38.65^\circ\ W}}$

9th nov,
SUNDAY

⊙ If $A(L_1, D_1)$ & $B(L_2, D_2)$ are given,

Length AB $= \sqrt{(L_2 - L_1)^2 + (D_2 - D_1)^2}$

$\tan\theta = \dfrac{D_2 - D_1}{L_2 - L_1}$

⊙ If e be the closing error in the bearing of last line of a closed traverse, correction to first bearing of a line is given by:

Correction to I $= \dfrac{1.e}{N}$

Correction to II $= \dfrac{2.e}{N}$

Correction to III $= \dfrac{3.e}{N}$

Correction to last line $= \dfrac{Ne}{N} = e.$

→ Balancing the Traverse.

1. Bowditch's Method.

In this method, linear measurements are directly proportional to $\sqrt{l}$ and angular measurements are inversely ~~directly~~ proportional to $\sqrt{l}$, where l is length of a line in traverse. It is also called as a Compass Rule in which linear measurements are accurate than angular measuremen

ie $LM \propto \sqrt{l}$

$AM \propto \frac{1}{\sqrt{l}}$

∴ Correction to latitude, $C_L = \Sigma L \frac{l}{\Sigma l}$.

Correction to departure, $C_D = \Sigma D \frac{l}{\Sigma l}$.

where Σl → perimeter of traverse.

2. Transit Rule.

This is most suitable for theodolite traversing in which angular measurements are accurate than the linea measurements.

$$C_L = \Sigma L . \frac{L}{L_S}$$

$$C_D = \Sigma D . \frac{D}{D_S}$$

L_S → arithmetic sum of latitudes

D_S → arithmetic sum of departures.

L	D
10	40
−20	−70
40	−20

$\Sigma L = 30$ $\quad \Sigma D = -50$

$L_S = 70$ $\quad D_S = 130$

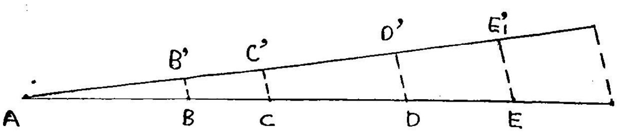
$$C_L = \Sigma L \frac{L}{L_S}$$

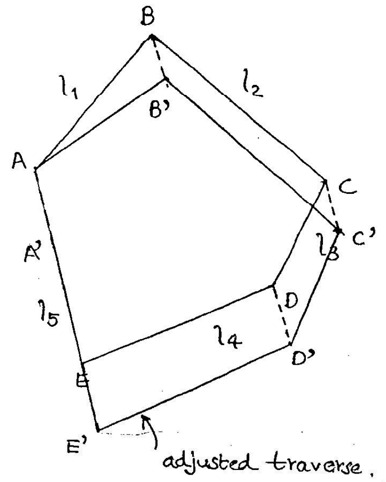
$$= 30 * \frac{10}{70} = \underline{\underline{4.286}}.$$

$$C_D = \Sigma D \frac{D}{D_S} = -50 \times \frac{40}{130}$$

$$= \underline{\underline{15.385}}$$

3. Graphical Method.





4. Axis Method

It is adopted when angles are measured very accurate and corrections to be applied only to the lines.

$$\text{Relative error of closure} = \frac{\text{Closing error}}{\text{Perimeter}}$$

$$= \frac{e}{P} = \frac{1}{P/e}$$

$$\text{Degree of accuracy for linear measurements} = \frac{e}{P}$$

$$\text{Degree of accuracy for angular measurements} = \tan^{-1}\left(\frac{e}{P}\right).$$