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# \* SURVEYING \*

- BY ASHISH KUMAR SIR

ESE  $\left\{ \begin{array}{l} \rightarrow \text{Prelims :- 28 Marks.} \\ \rightarrow \text{Mains :- 65 Marks.} \end{array} \right.$

GATE  $\approx$  6 Marks.

\* Syllabus :-

chap 1-4  $\rightarrow$  Horizontal  
5-8  $\rightarrow$  Vertical.

1) Introduction.

2) linear measurement & chain survey.

\* 3) compass survey

\* 4) Traverse survey

\* 5) levelling work

chap.  
1-11  $\rightarrow$  98% syllabus

6) contours & Area-Volume

Extra  $\rightarrow$  2%.

7) Trigonometrical levelling

8) Tacheometry

\* Extra :-

9) Curves. (data est.) other are data collection

i) plane table survey.

10) Accuracy & Errors.

ii) Triangulation

\* \* 11) photogrammetry (advance survey)

iii) GPS / GIS / Remote sensing / Time concept.

\*  $\rightarrow$  GATE

All  $\rightarrow$  ESE

\* Instruments

## chapter 1 :- Introduction

- Survey is the art of determining the relative positions of point on, above or beneath the earth surface. through direct or indirect measurement of distance, direction & elevation.
- It also includes establishment of points to the ground which are predetermined to paper.

### \*\* Classification of Survey :-

- 1) LAND Survey :- Survey on surface of earth.
  - a) topographical survey :- to know about general topography of area such as river, pond, valley, building, rails, roads etc.
  - b) cadastral survey :- to know about property lines. such as state boundary, district boundary, Municipal boundary etc.
  - c) city survey :- to provide any services to a city such as water supply, roads, rails etc.

2] Hydrographic Survey :- to know about underwater features.

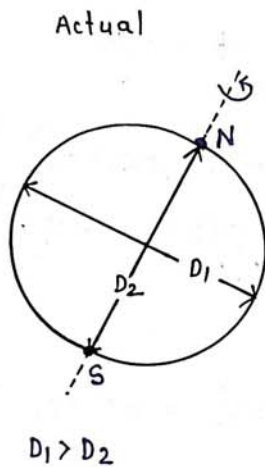
3] Astronomical Survey :- to know about position of stars, planet, moon, sun etc.

\* Note :- to know about antique substance.

[ Archeological Survey ]

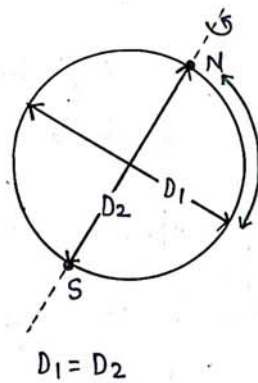
ASI → India  
↓ survey of  
Archea

\* Earth



$\therefore D_1 - D_2 = 42.95 \text{ km}$

Assumed (sphere)



curvature



Geoid



Geodetic Survey

Plane Survey

- When effect of earth curvature is considered
- Suitable for large area

- When effect of earth curvature is not considered
- Suitable for small area.

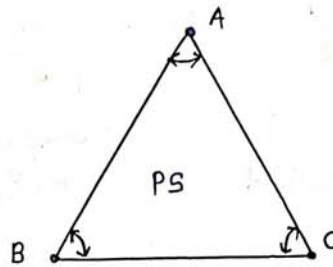
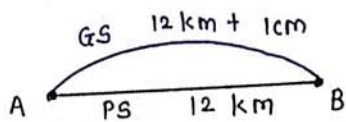
\* observations :-

\* Note :- i) Generally Geodetic Survey is considered for an area more than 250 km<sup>2</sup>.

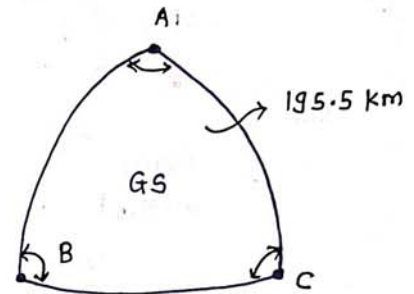
2) observations :-

i) For a distance measurement of 12 km in plane Survey geodetic distance will be just 1 cm extra

ii) For a triangle of size 195.5 km<sup>2</sup> in geodetic Survey sum of internal angle will be just 1 sec. extra



$$\angle A + \angle B + \angle C = 180^\circ$$



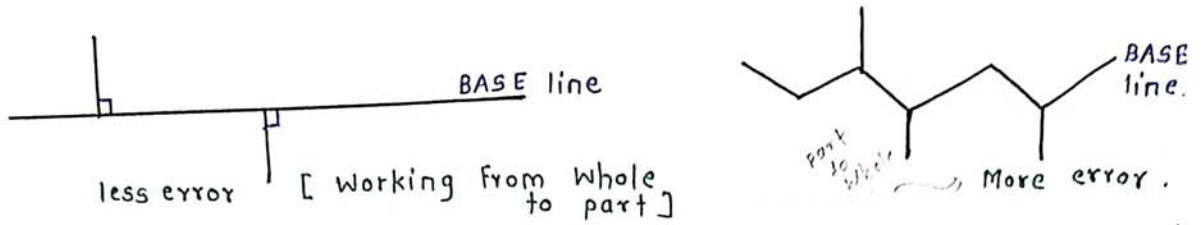
$$\angle A + \angle B + \angle C = 180^\circ 0' 1''$$

\*\* Principles of Surveying :-

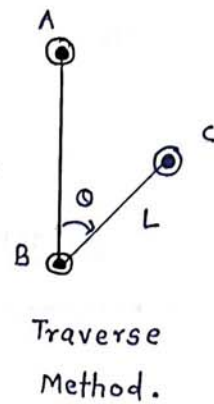
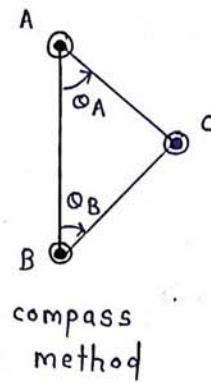
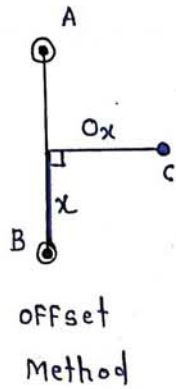
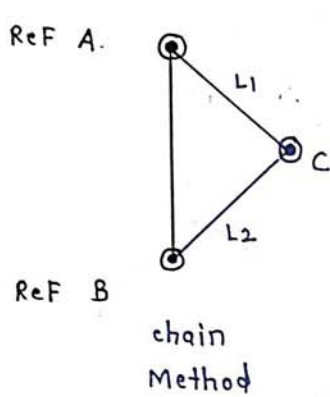
i) Working From Whole to a part :-  
larger measurement      smaller

- According to this principle larger measurements are taken first with high degree of precision. & then smaller measurements are taken even with lower degree of precision.

- In this way errors of small g measurements will not be appear to a larger measurements.



- 2) location of a point w.r.t. minimum two reference points:





\*\* Scale :-

$$\text{Scale} = \frac{\text{Map distance}}{\text{Ground distance}}$$

\* Representation :-

$$\text{Scale} :- \frac{1 \text{ cm}}{10 \text{ m}}$$

$$\text{Scale} :- 1 \text{ cm} = 10 \text{ m}$$

every 10 m measured you to the ground is represented by just 1 cm on sheet of paper.

\* Representative Factor :-

$$\text{RF} = \frac{1 \text{ cm}}{(10 \times 100) \text{ cm}} = \frac{1}{1000}$$

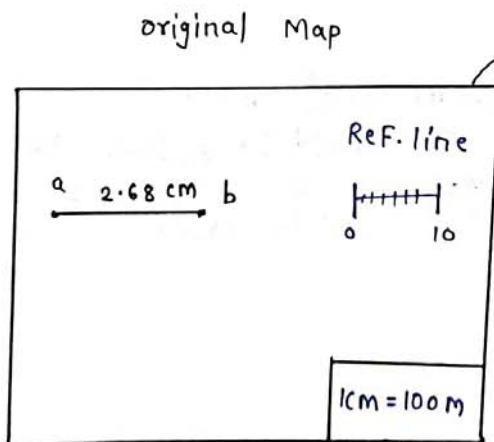
Scale for Area  $\rightarrow [1 \text{ cm}]^2 = [10 \text{ m}]^2$   
 $1 \text{ cm}^2 = 100 \text{ m}^2$

$$\therefore \text{Scale} = \frac{1}{1000}$$

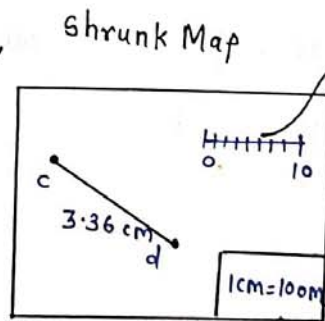
$$\text{Scale } [1 : 1000]$$

\*\* Shrunken / extended Scale :-

Map issue  $\rightarrow$  by Survey of India.



$$AB = 2.68 \times 100 = 268 \text{ m (ground)}$$



$$cd (\text{Map}) = 3.36 \text{ cm}$$

$$CD (\text{ground}) = \cancel{3.36 \times 100} = \cancel{336 \text{ m}}$$

10 cm REF. line is now read as 9.5 cm only

$$* \text{ Shrinkage Factor} = \frac{\text{shrunken length}}{\text{original length}}$$

[ SF ]

shrinkage & extended map can be identified by Reference line.

$$\text{Shrunken Scale} = \text{SF} \times \text{original scale.}$$

(SS)

$$\therefore \text{SF} < 1$$

$$\text{EF} > 1$$

$$\rightarrow \text{Soln : } \text{SF} = \frac{9.5}{10} = 0.95$$

$$\text{SS} = \text{SF} \times \text{OS}$$

$$\text{ES} = \text{EF} \times \text{OS}$$

↓  
original  
scale

$$\therefore \text{SS} = 0.95 \times \frac{1 \text{ cm}}{100 \text{ m}}$$

Shrunken  
Scale

$$= \frac{1 \text{ cm}}{\left(\frac{100}{0.95}\right) \text{ m}}$$

$$\therefore \text{cd (Map)} = 3.36 \text{ cm}$$

$$\text{CD (ground)} = 3.36 \times \frac{100}{0.95}$$

$$= 353.68 \text{ m.}$$

Q.24 / WB / Survey

$$\text{SF} = \frac{9.4}{10} = 0.94$$

$$\therefore \text{SS} = 0.94 \times \frac{1}{25} = \frac{1}{(25/0.94)}$$

$$a) \text{ length (ground)} = 8.2 \text{ cm} \times \frac{25}{0.94} = 218.08 \text{ m} //$$

$$b) \text{ Area (ground)} = 234.5 \text{ cm}^2 \times \left(\frac{25}{0.94}\right)^2 = 165869.73 \text{ m}^2$$