EWCE-103

SURVEYING

We are going to discuss:

- Definition of Survey
- A few areas where survey used
- Methods of surveying
- Purpose of survey
- Primary division of survey
- Classification of survey
- Basic principles of survey

Definition of Surveying

Surveying is the **art and science** of determining the **relative positions** of points **on, above or beneath** the surface of the Earth/sea **by means of direct or indirect measurements** of **distance**, **direction** & **elevation** and **presenting them** on a piece of paper, known as plan or map.

History

A **few areas** where surveying are being used:

- To **map the Earth**.
- To **prepare navigational map.**
- To **established boundary** of public and private land.
- To **develop data bases** for natural resources etc for efficient management.
- To ***develop engineering data***.

Methods of Surveying.

Methods of Surveying:

a. **Geodetic Surveying:**

-Takes into account the **actual shape of the Earth**.

-Generally **high in accuracy** and **covers a large areas** (more than 390 sq miles).

b. **Plane Surveying**

-Assumed that the surveying areas is a **flat plane.**

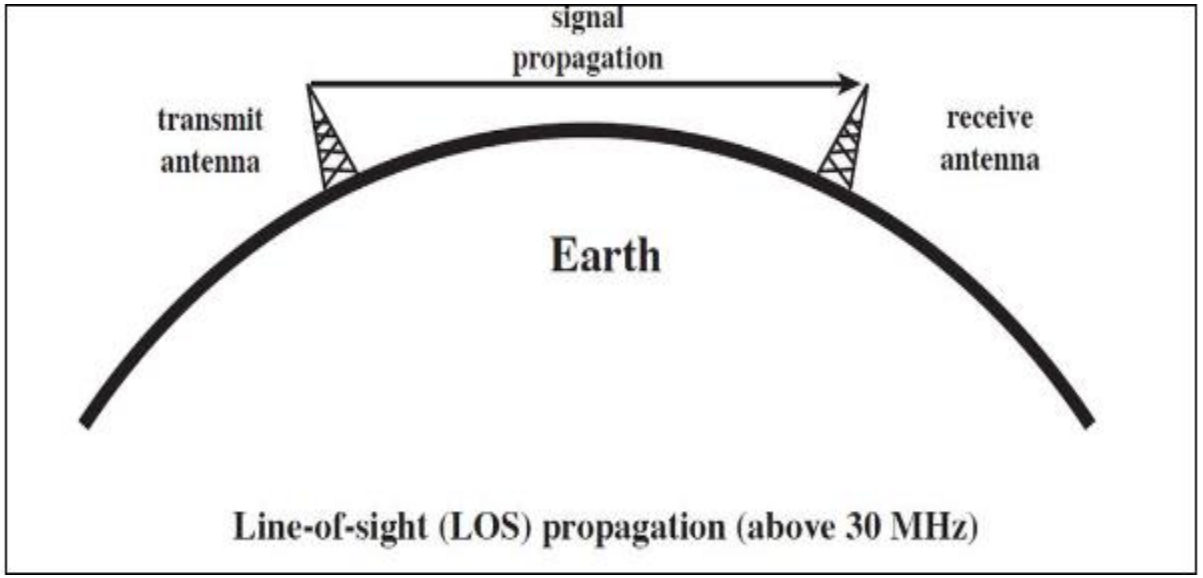
-Generally covers a **smaller areas**.

Purpose of Surveying:

- **Determine the relative positions** of the existing features of the ground.
- **Layout the marked positions** of proposed structures on the ground.
- **Determine the area, volumes and other related measurements**.
- **Prepare a map of a country** of detailed out locations of cities, towns, villages, major roads etc
- **Prepare engineering detailed plans and sections** of various aspects such as roads, railways, bridges, dams and other structures.
- **Prepare a topographical map** showing details of hills, valleys, rivers etc.

Requirements of consideration of the Earth's Surface as curved or plane depends on the followings aspects:

- **Characteristic** of the survey
- **Magnitude** of the survey
- **Precision** of the survey



Primary divisions of Survey

Primarily, surveying can be divided into twos:

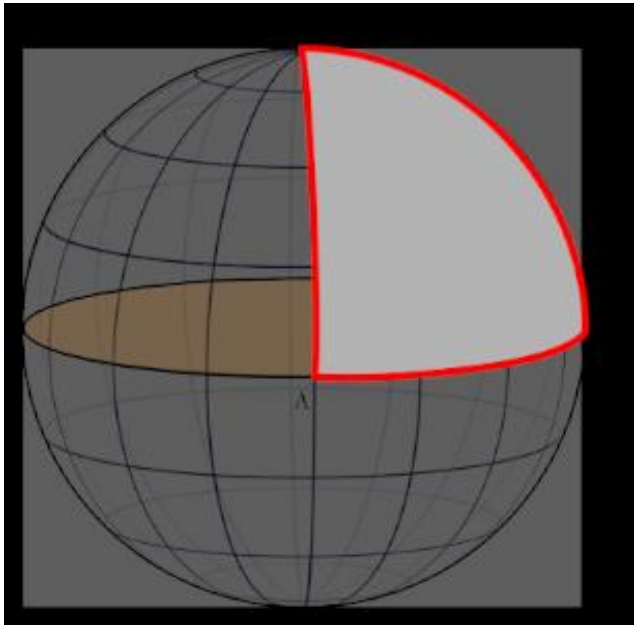
Plane Surveying:

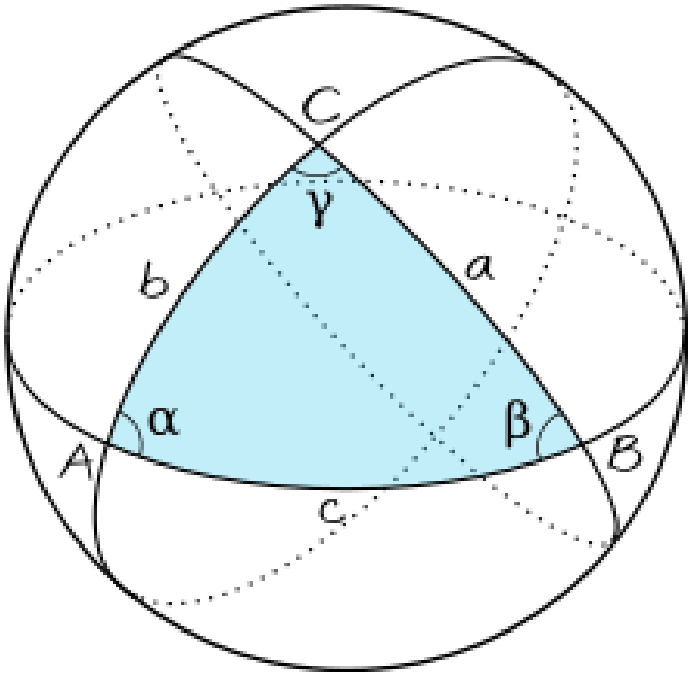
- **Mean surface** of the earth is plane.
- **Spheroidal shape** is neglected.
- **All triangles** formed by the survey lines are plane triangles.
- **Level lines** are straight and plumb lines are parallel.

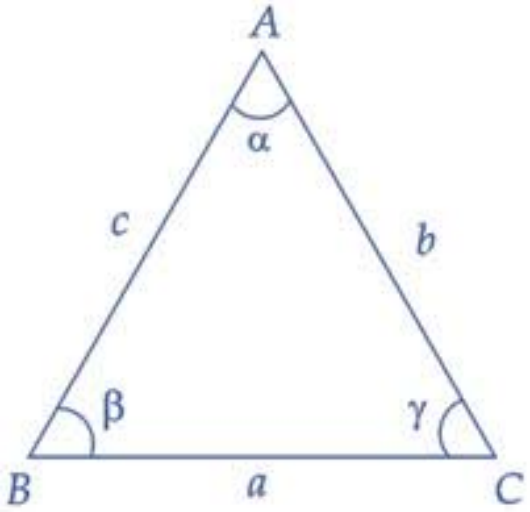
- Length of an arc of 12 kms long lying on the earth surface **is only 1 cm** greater than the subtended chord.

- Differences between the sum of the angles in plane triangle and sum of those spherical triangle is **only 1' for** a triangle at the earth's surface having an area of 195 Sqkm.

Spherical & Plane Triangle







Geodetic Surveying:

- Shape of the earth is taken into account.
- All triangles are the spherical triangles.
- Involves spherical trigonometry.
- Survey includes works of larger magnitude and precision.

Objective of Geodetic Survey:

To **determine the precise positions** on the surface of the earth, at widely distant points which **form the control stations**, to which surveys of lesser precision may be referred.

Classifications of Survey

Survey may be classified basing on the uses and purposes of the resulting map.

Based on the nature of Field Survey

- **Land Survey**
- **Marine Survey**
- **Astronomical Survey**

Land Survey.

Topographical Survey

- Consists of horizontal and vertical location of certain points by linear and angular measurements, and is made to determine the natural as well as artificial features.

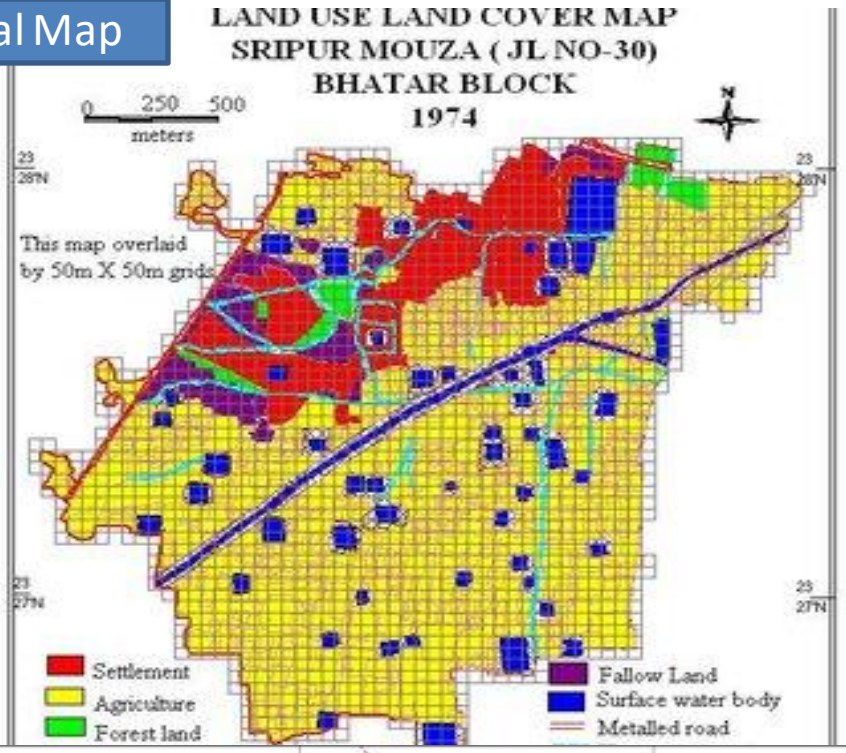
Cadastral Survey

- Fixing property lines
- Calculation land areas
- Transferring the land property from one owner to another.
- Fixing boundary of municipalities, state, provinces and federal jurisdictions etc.

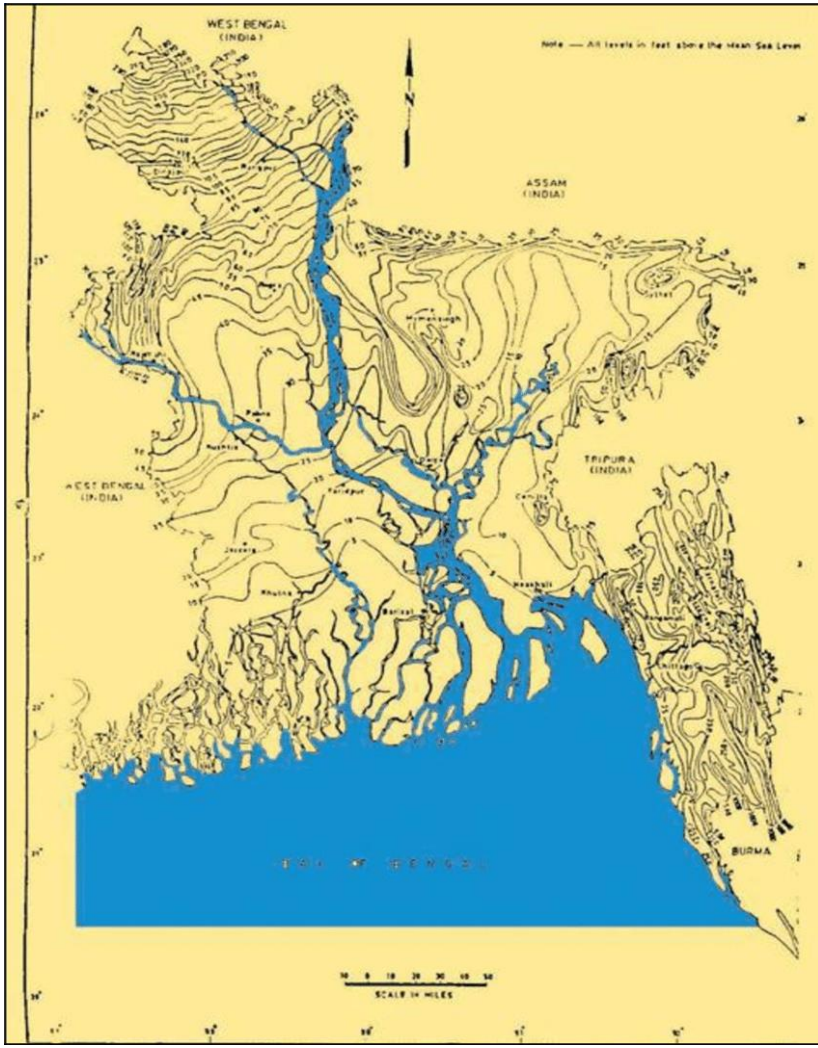
City Survey

- Constructing streets, water supply system, sewerage lines etc.

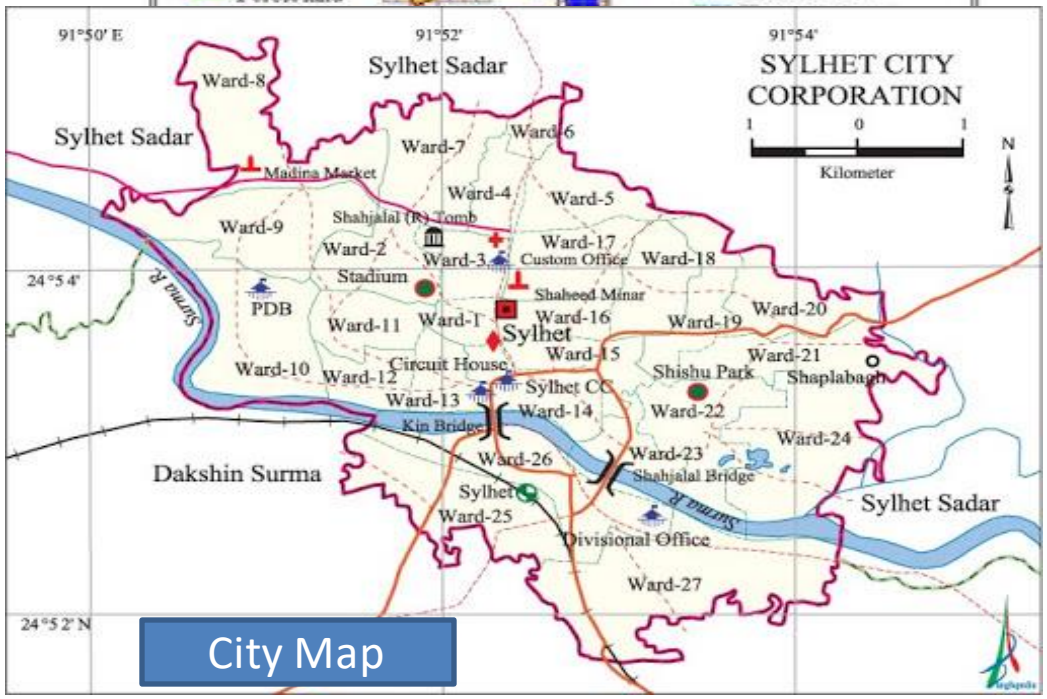
Cadastral Map



Topo Map of Bangladesh



City Map



Marine Survey:

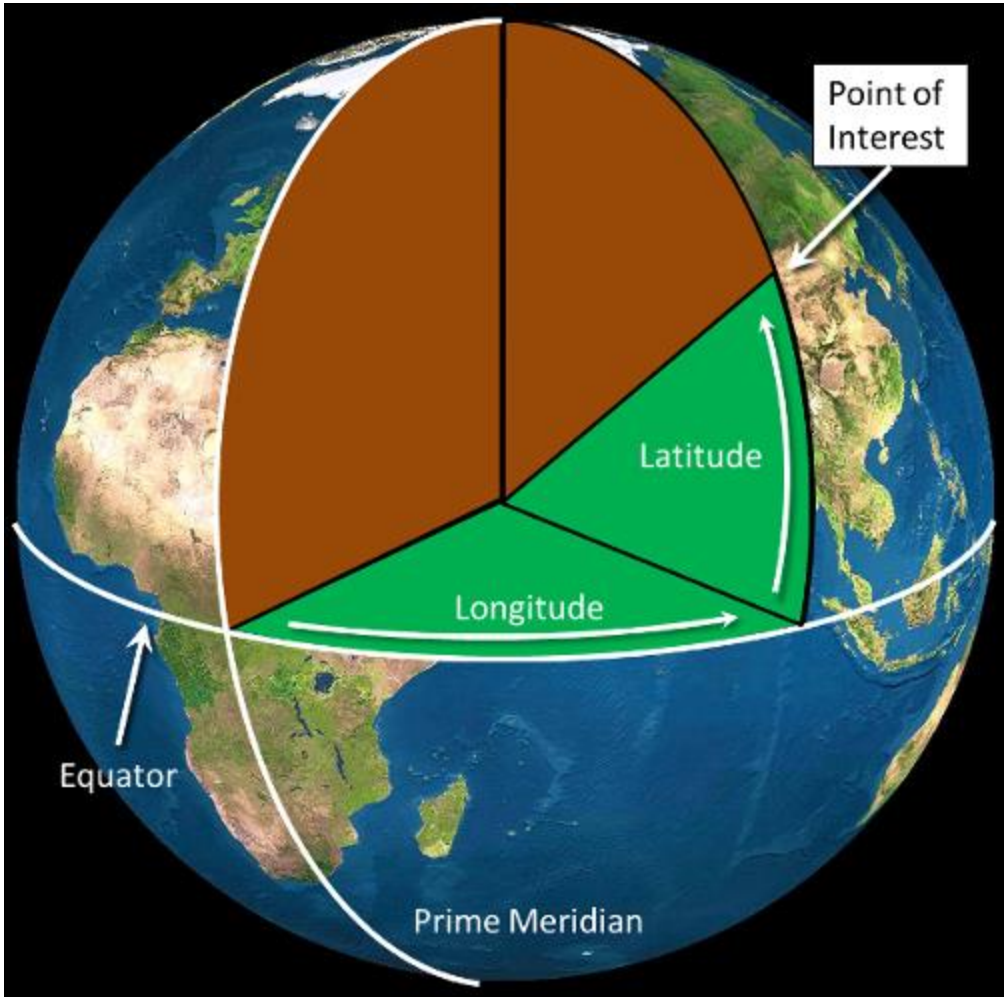
- Deals with the **boundary of water body** for the purpose of **navigations**, **harbor works**, determination of **mean sea level** etc.
- Works consists of measurement of the **discharge of the streams**, **topography of shores** and **banks, fluctuations of tide** etc.

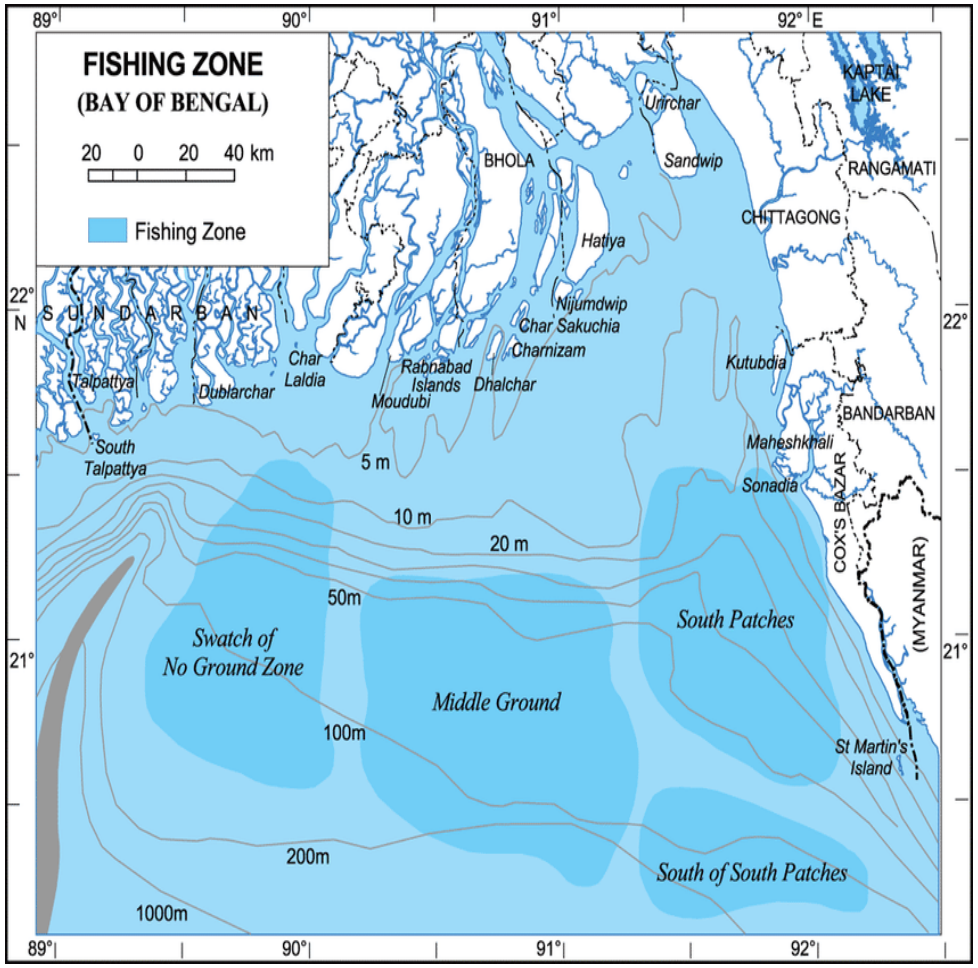
Astronomical Survey:

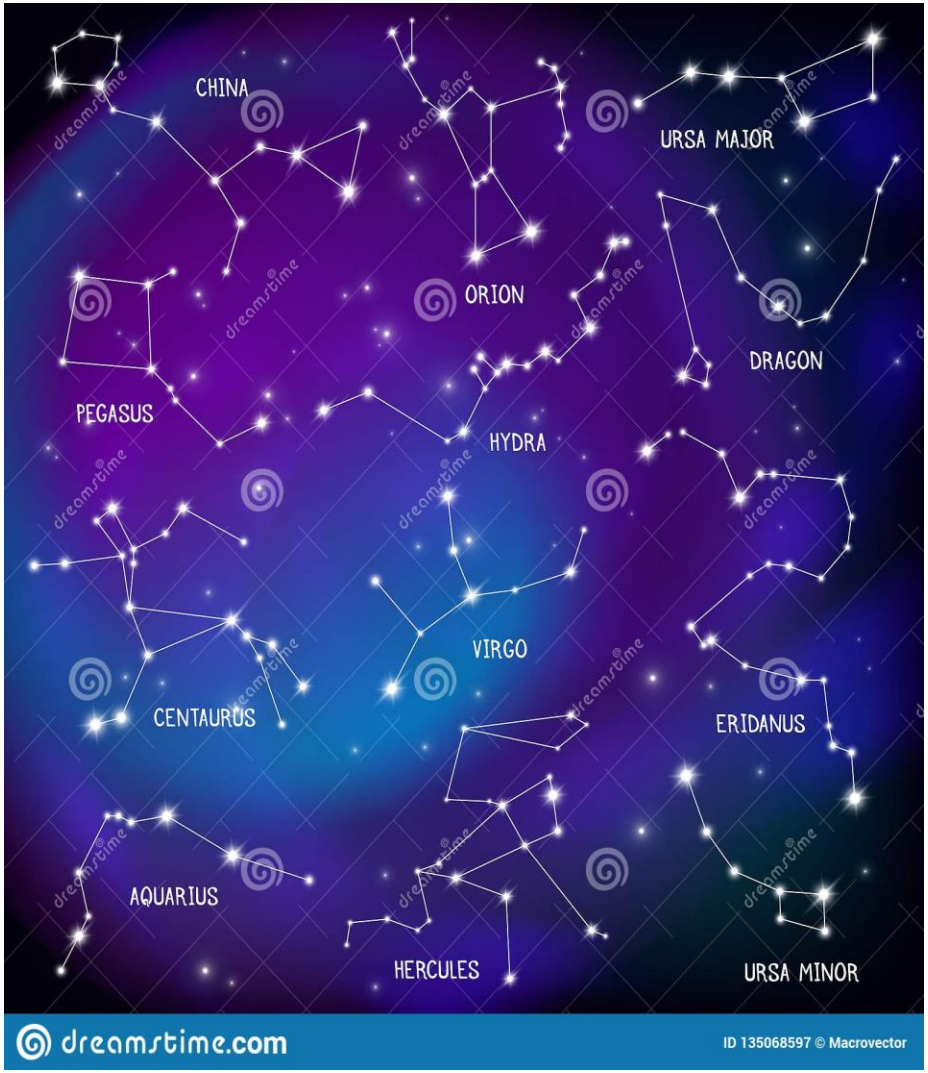
- Means to determine **the absolute locations of points and directions** of any line on the surface of the earth.

Absolute Location:

- Exact place on the Earth.
- Given by Longitude and Latitude




FISHING ZONE
(BAY OF BENGAL)
20 0 20 40 km
Fishing Zone
89°
90°
91°
92° E
22° N
21°
KAPTAI LAKE
Urirchar
Sandwip
BHOLA
RANGAMATI
CHITTAGONG
Hatiya
Nijumdwip
Char Sakuchia
Charnizam
Kutubdia
SUNDARBAN
Talpattya
Dublarchar
Char Laldia
Rabnabad Islands
Moudubi
Dhalchar
BANDARBAN
Maheshkhali
South Talpattya
5 m
Sonadia
COX'S BAZAR
10 m
20 m
50m
(MYANMAR)
South Patches
Swatch of No Ground Zone
Middle Ground
100m
St Martin's Island
200m
South of South Patches
1000m


CHINA
URSA MAJOR
ORION
DRAGON
PEGASUS
HYDRA
VIRGO
CENTAURUS
ERIDANUS
AQUARIUS
HERCULES
URSA MINOR
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Classification Based on the objective of the Survey

- **Engineering Survey** -To obtain sufficient data for designing works etc.
- **Military Survey** - Determine points of strategic importance.
- **Mine Survey-** Used for exploring mineral wealth etc.
- **Geological Survey** - Used for determining different strata in the earth's crust.
- **Archaeological Survey** – Used for unearthing relics of antiquity.

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Classification Based on Instrument Used:

- Chain survey
- Theodolite survey
- Tachometric survey
- Plane Table survey
- Photogrammetric survey
- Aerial survey

Basic Principles of survey

Basic principles of surveying can be stated under the two aspects:

- To **locate the position of a point** by **measuring from two reference points.**

- To **work from whole to part**.

To locate the position of a point from two reference points.

- Let, P and Q are the two reference points on the ground.
- **Distance can be measured** accurately.
- Relative positions of **P and Q can be plotted** on a paper to some scale.
- Thus **P & Q will serve as reference points** for fixing relative positions of other points.
- **Any other point such R**, can be located by following two points.

To locate the position of a point from two reference points.

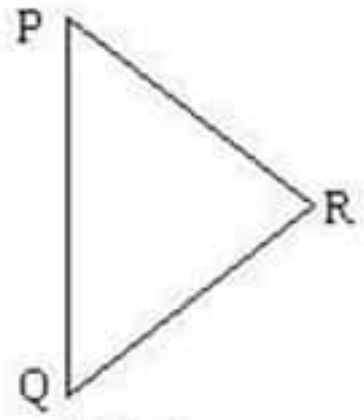


Fig. a

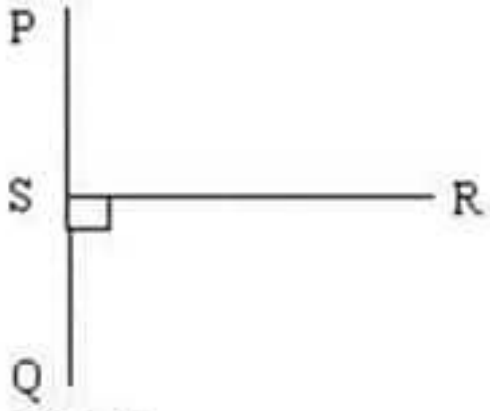


Fig. b

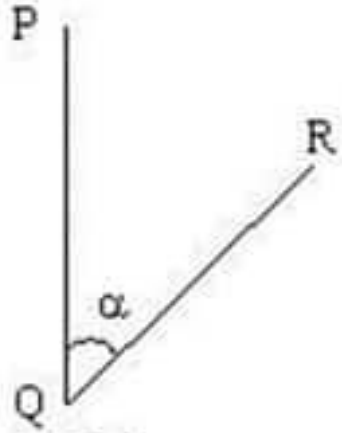


Fig. c

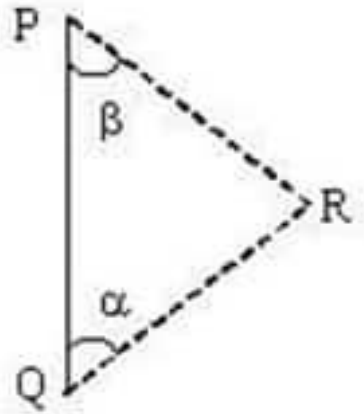


Fig. d

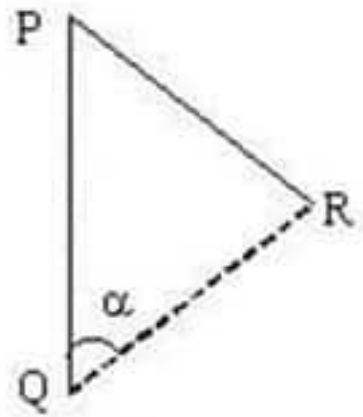


Fig. e

Working from Whole to Part

- Establish a system of **control points** and **fix them at higher precision.**
- **Minor control points are then fixed**.
- **Details can be located** using minor control points by running minor traverse.

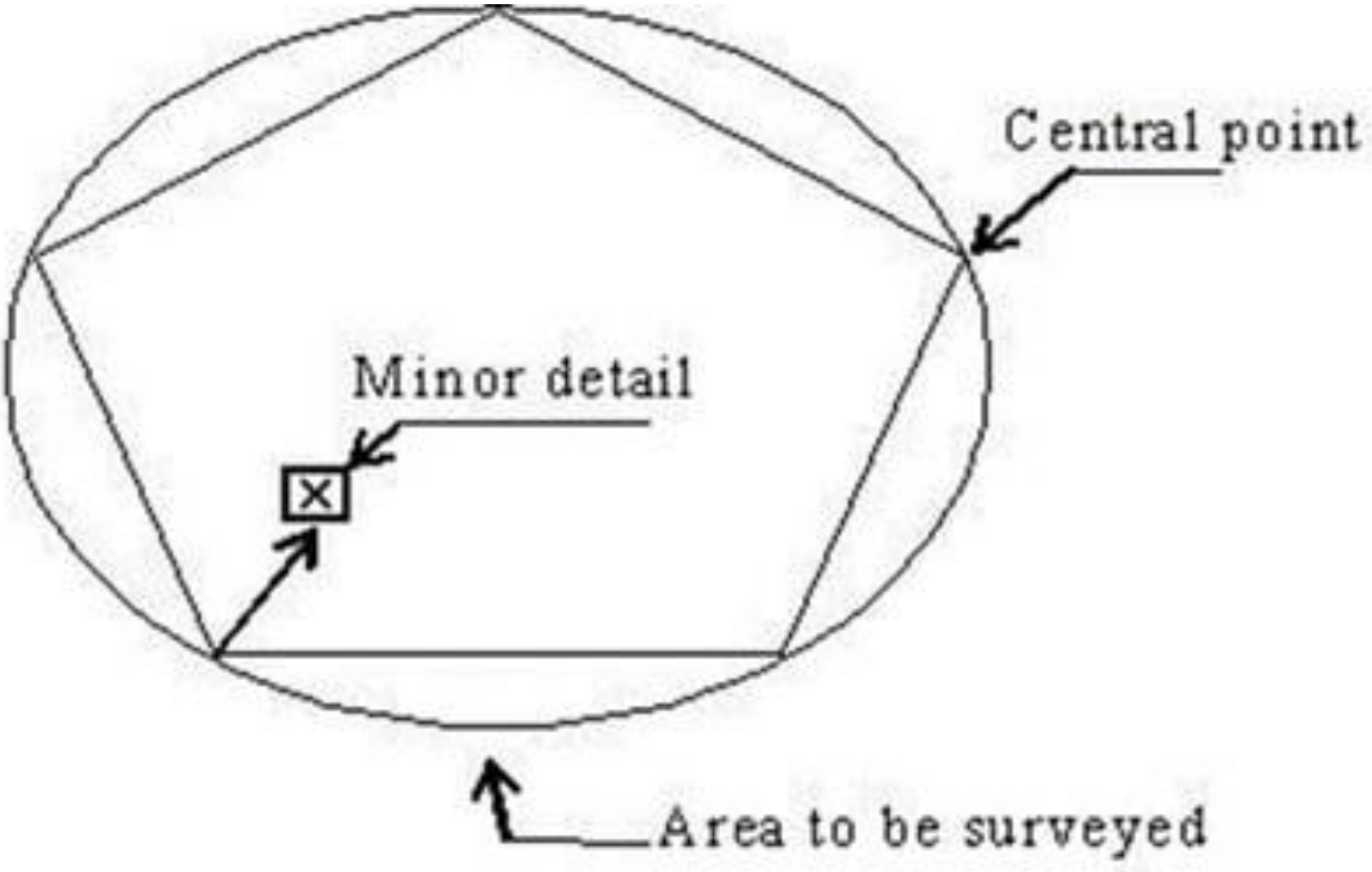
Question: Briefly describe the principles of survey with examples.

What is a control point?

- A **control point** is a **point** on the ground or **any permanent structure** whose horizontal and vertical location/position is known.

- **Control points** are **used as a starting point** of all types of surveys

Working from whole to part



Reasons for working from whole to parts

- To prevent the **accumulation of errors**, otherwise errors will be expanded with greater magnitude.

- To **control and localize the minor errors,** otherwise work will be uncontrollable at the end.

Thank You