Plane Table Survey



What will learn in today's class:

- Definition
- Equipment and Accessories
- Advantages and disadvantages
- Methods/process of setting up plane table
- Methods of orientation
- Methods of Plane table Surveying

Plane Table Survey:

- **Graphical method** of survey in which the **field observation** and **plotting are done simultaneously**.

- **Most suitable** for small scale map/plan.

- Plan is **drawn by the surveyor in the field**, while the area is before his eye.

- **No possibility of omitting** necessary measurement.

Equipment and Accessories for Plane Tabling

Equipment:

- Plane Table
- Tripod
- Alidade



Accessories:

- **Trough compass**
- Spirit level
- **U-fork with plumb bob**
- Water proof cover
- **Drawing paper**
- Pins
- **Drawing materials**.



Plane Table and Tripod

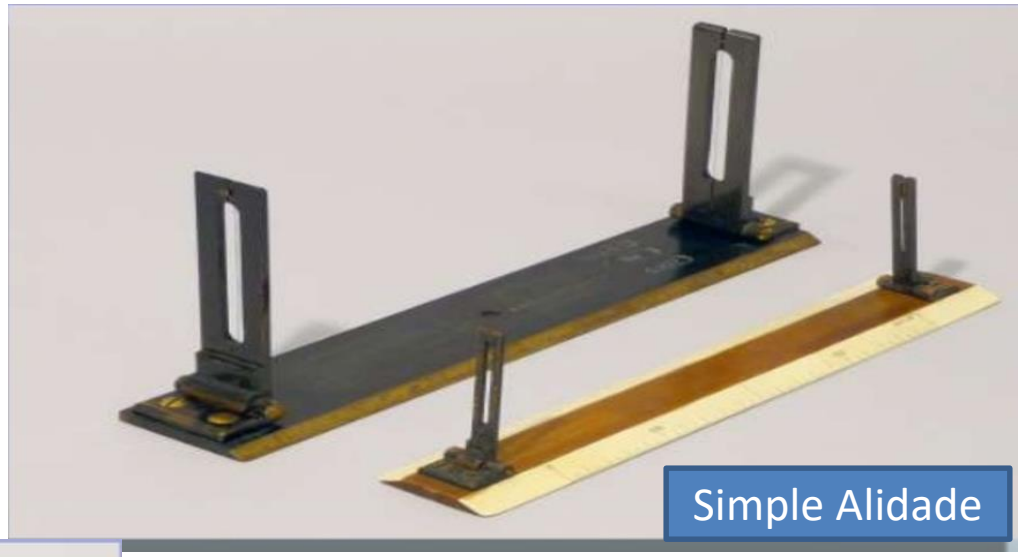


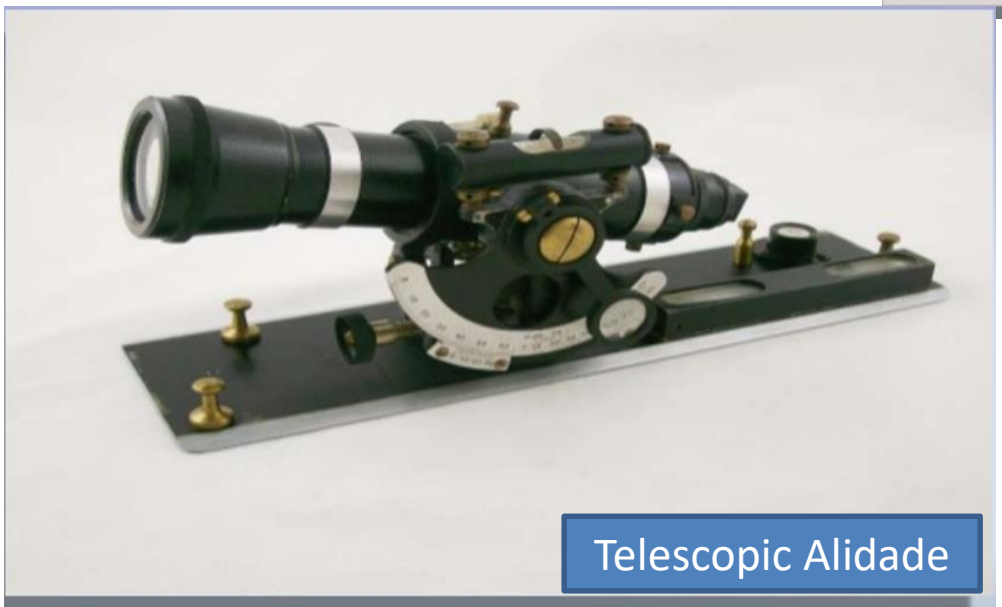


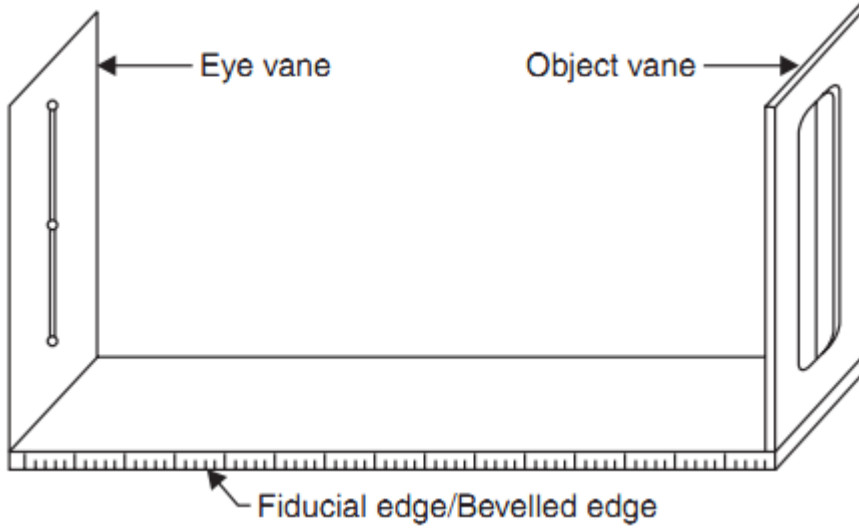


Alidade:

- Useful for **establishing a line of sight**.
- Two types:
  - -Simple Alidade
  - -Telescopic Alidade







Trough Compass and Spirit Level:

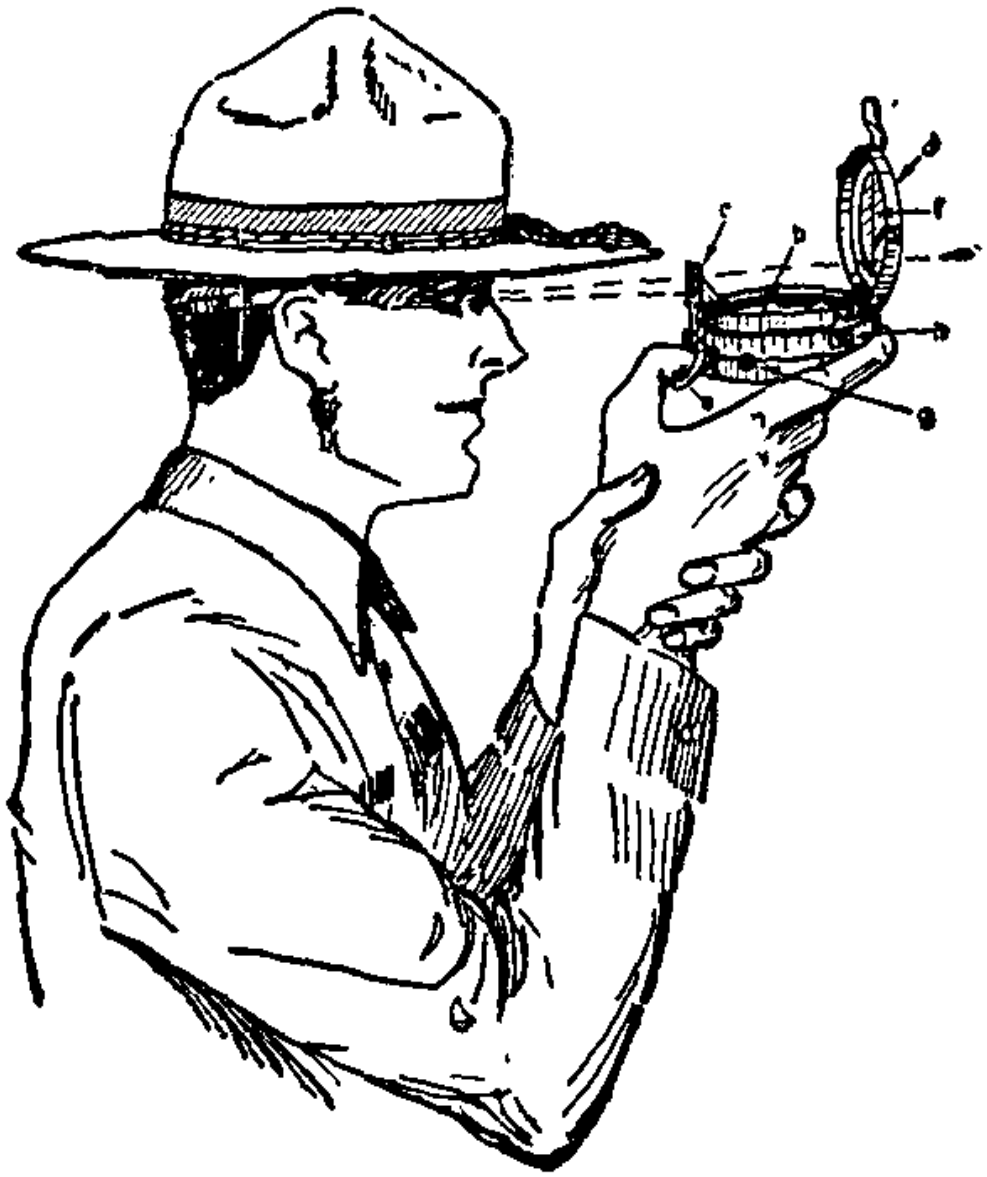
- Used for **marking the magnetic north line** on the drawing sheet of the plane table.





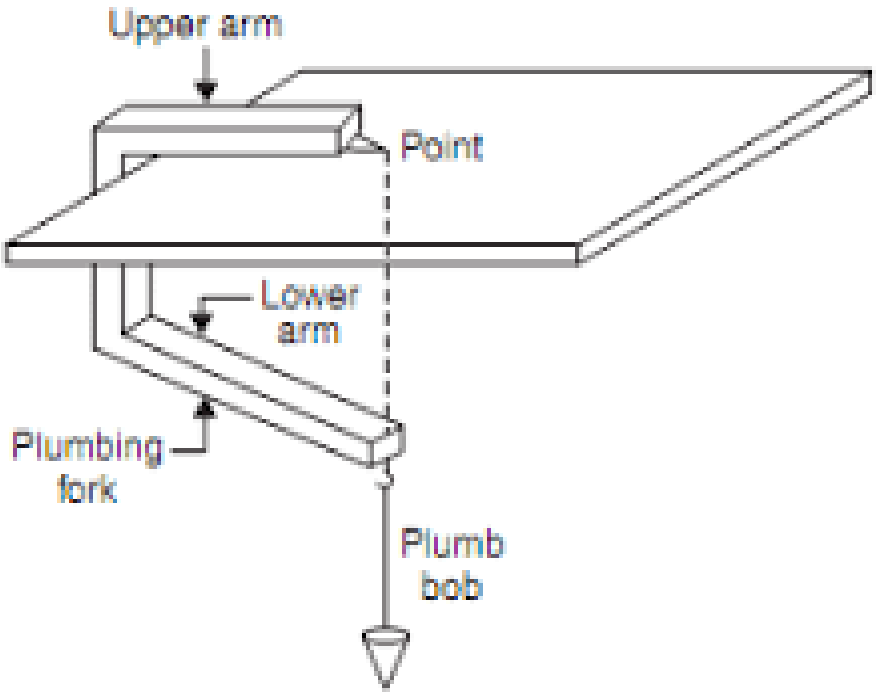


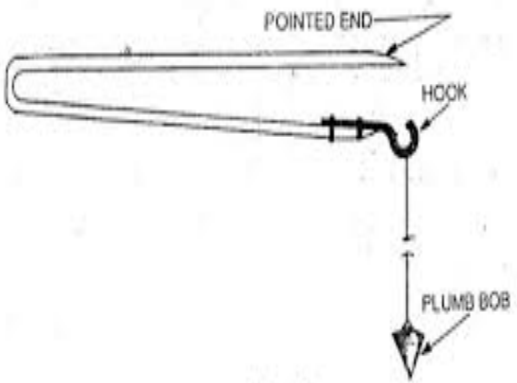

Pentagon

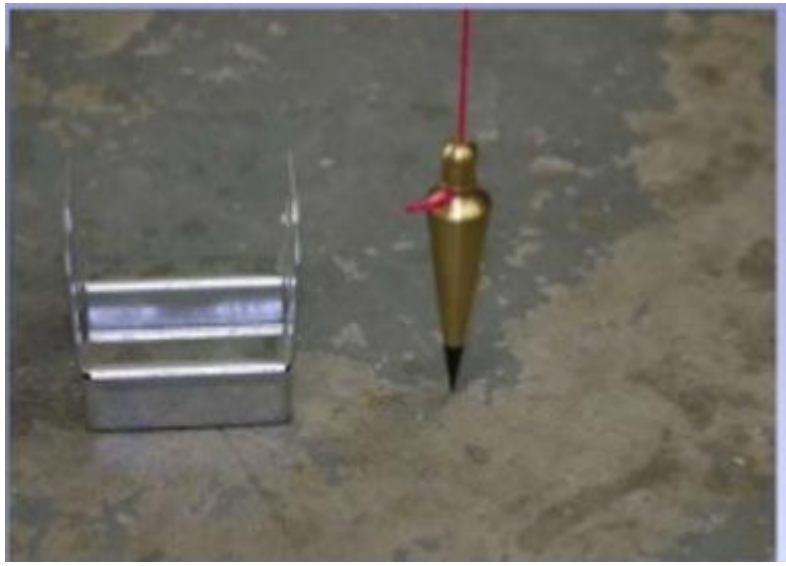



E
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U-fork with Plumb bob:







Water Proof Cover:

- Normally an **umbrella** is used to protect the drawing paper.



Advantages and disadvantages of Plane Table Survey

Advantages:

- Plan is **drawn the** eyes of surveyor.
- Can **compare the plotted work** with the actual features of the area.
- **Simple and cheaper** than any other survey.
- Suitable for **small scale maps**.
- **No great skill** is required for the survey.
- Mistakes in writing in **Field Books** are eliminated.

Disadvantages (limitations):

- Not intended for **very accurate works**.
- Not suitable in **monsoon**.

Methods/processes of Setting Up the Plane Table:

- **Fixing the Plane Table**
- Leveling,
- **Centering** and
- Orientation.

Methods/processes of Setting Up the Plane Table:

Fixing the Plane Table

- Fix the plane table to **the tripod stand**.
- **Arrange the drawing sheet** on the plane table using paper clips or thumb screws.
- Sheet should be in one position from first to last.

Leveling of Plane Table

- Plane table should be **leveled using spirit level**. For small works, eye estimation can be alright.





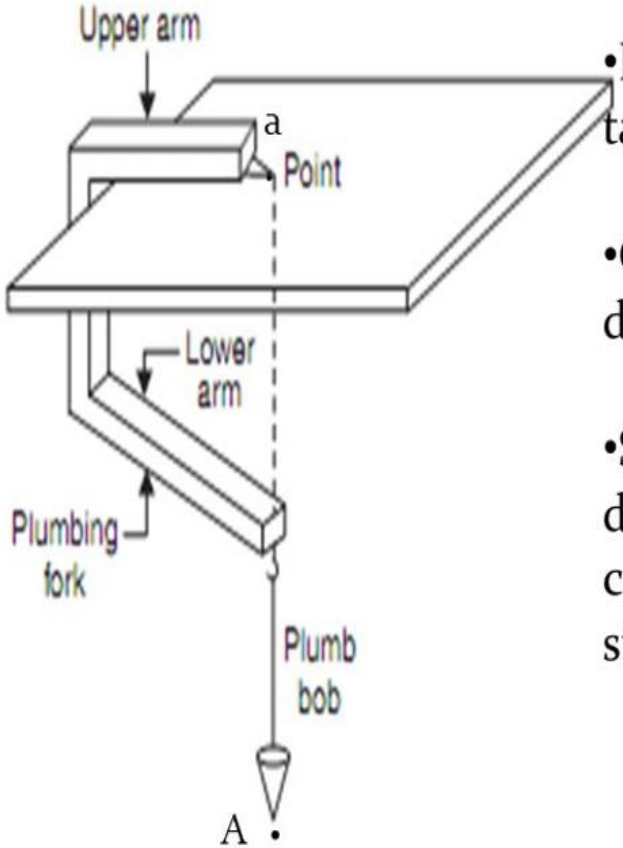
Plane Table with Tripod:

Centering of Plane Table

- Table should be **centered** by using **plumbing fork**.
- By which we can **arrange the plotted point exactly over the ground point.**



It is done by U-fork and plumb bob.



- Drawing sheet is fixed on the table
- Capital letters (A,B,C...) to denote ground stations.
- Small letters (a,b,c...) to denote plotted points corresponding the ground stations

Orientation:

- Whenever **more than one instrument stations** are used, **orientation is essential.**
- **Process** by which the **positions occupied by the board at various survey stations are kept parallel** is known as orientation.
- When a plane **table is properly oriented**, the **lines on the board are parallel to the lines on ground** which they represent.

Methods of Orientation:

- By **magnetic needle** ie.

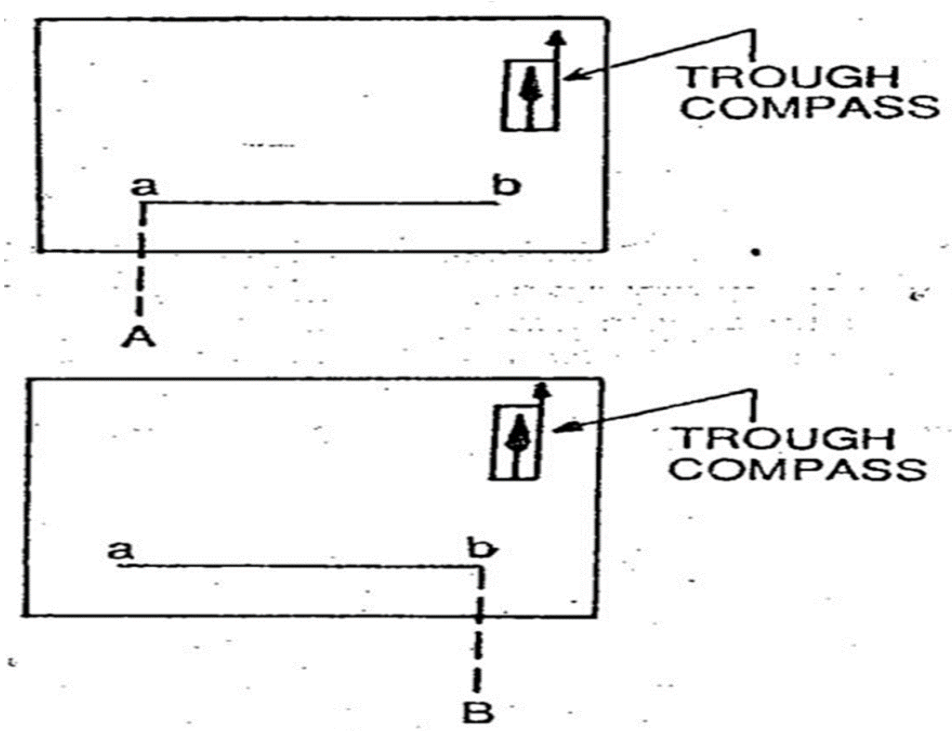
Compass

- **By back sighting**



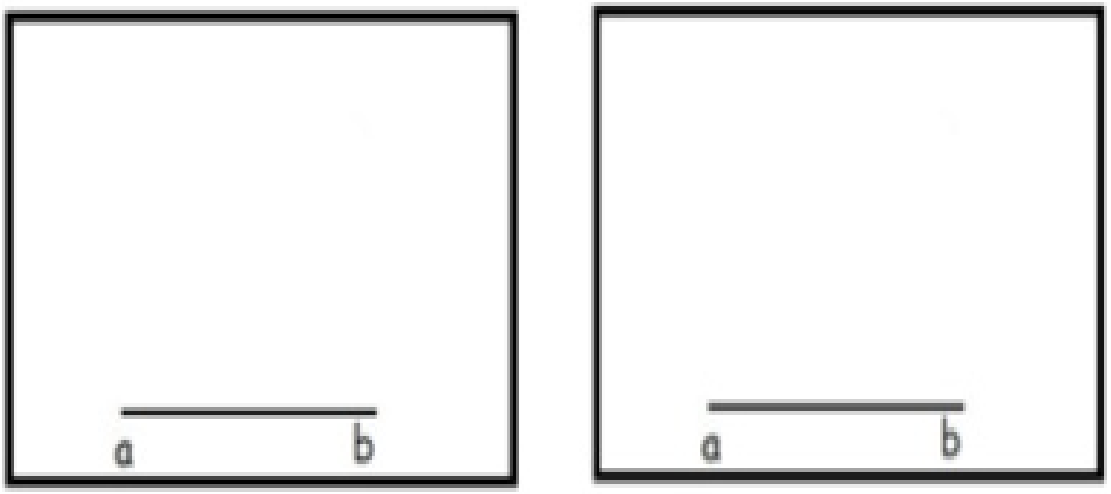
Orientation by Magnetic Needle:

- North line is marked on the **top right corner of the sheet**.
- When the plane table is **shifted from one station to another**, the table is oriented with the help of magnetic needle.
- Compass is kept along the north line marked on the earlier station, and the **table is rotated** so that the **needle is parallel to the north line.**
- Then **centering** and **leveling** is done and **orientation is completed.**



Orientation by back-sighting:

- Table is set up on first station and the **next station is bisected with the help of alidade**, and line is drawn with appropriate scale.
- On moving the table to the next station, the table is oriented with the help of alidade.
- Alidade is kept parallel to the previously drawn line, and the **table is rotated** so as to the **previous station is bisected** along the same line.



- **Methods of plane table surveying/plane tabling**



Methods of Plane Table Surveying:

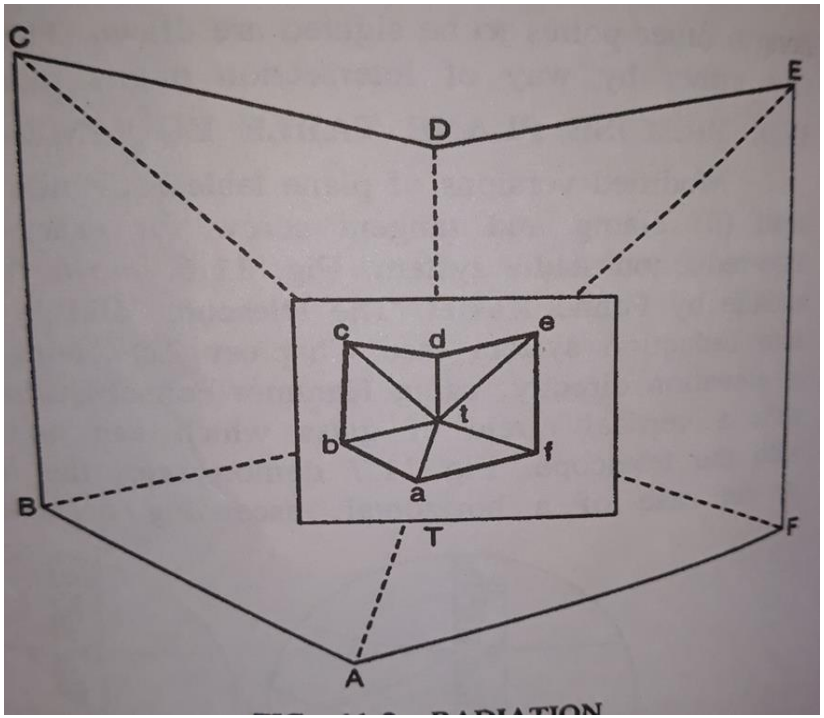
Generally there are **four methods** are available to perform plane table surveying:

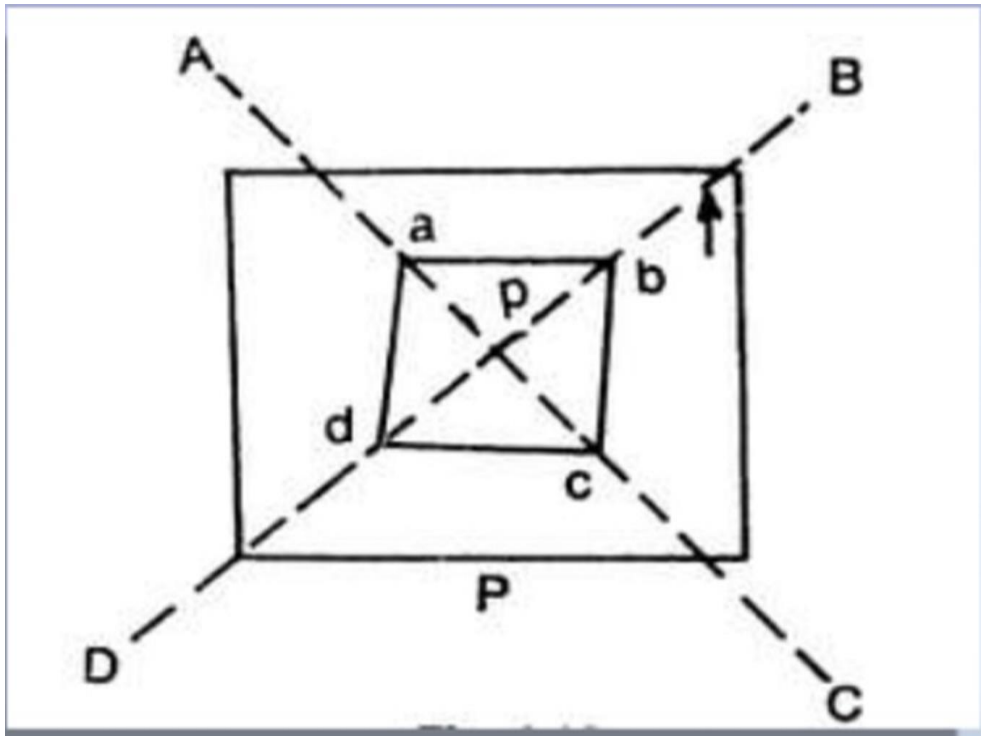
- **Radiation**
- **Intersection**
- **Traversing**
- **Resection**

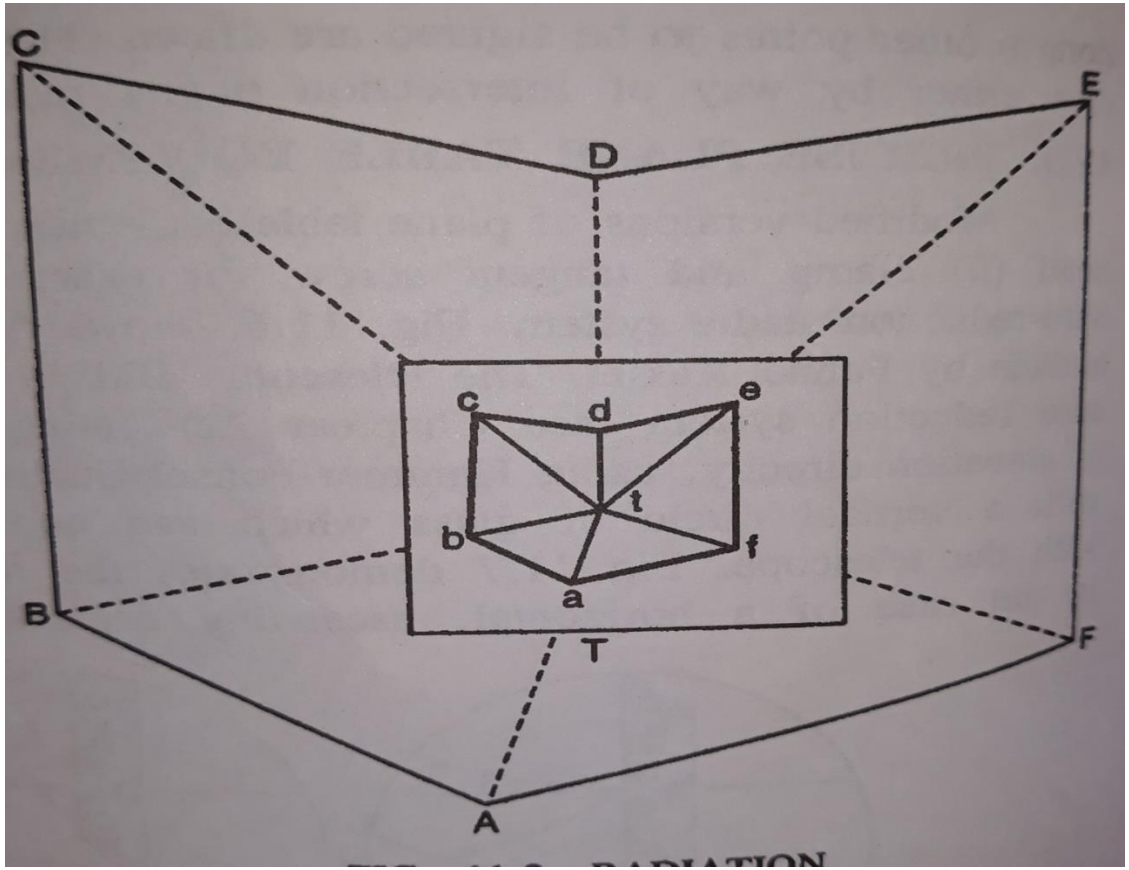
Radiation method:

- Direction of **objects or points to be located** by **drawing radial lines** drawn along fiducial edge of alidade after getting the objects or points **bisected along the line of sight of alidade.**

- **Horizontal distances are then measured** and **scaled off** on the corresponding radial lines to mark their positions on the drawing.






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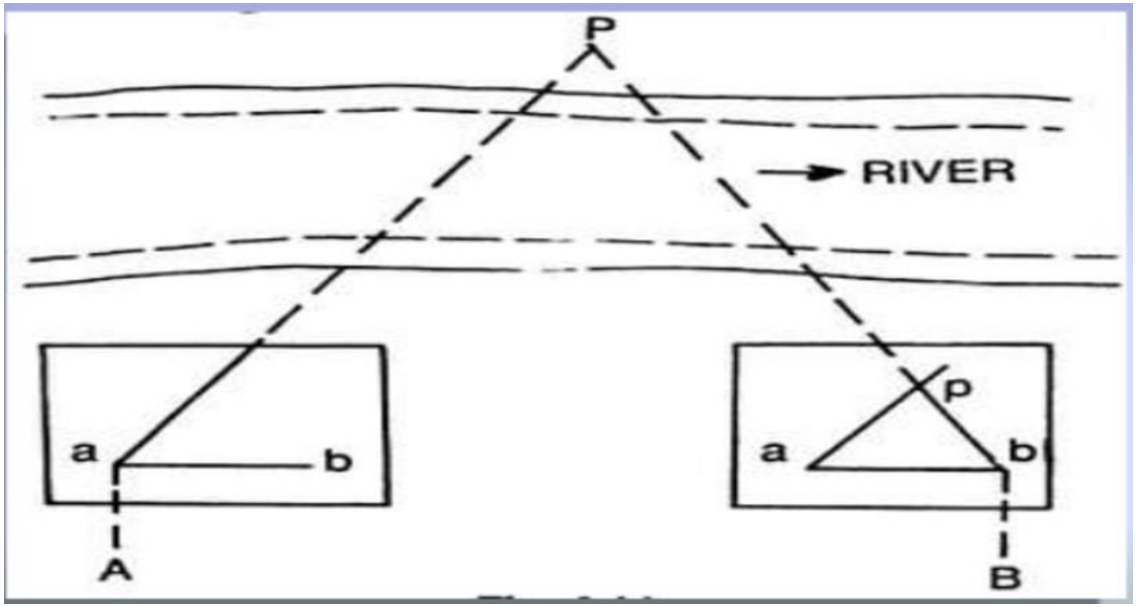
Intersection Method:

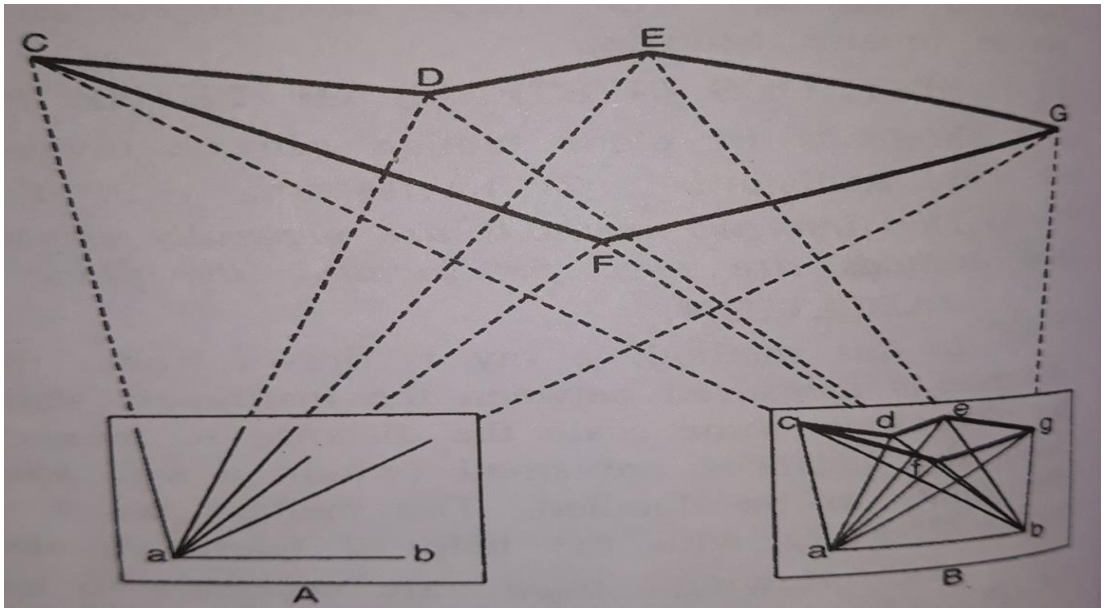
- **Objects or points to be located** at the points to be located are obtained **at the point of intersection of radial lines** drawn from two different stations.
- Plotting of plane table stations are to be carried out accurately. Checking is important and thus done by **taking third sight from another station.**

- Suitable when **distances of objects are large** or **can not be measured properly.**

- Preferred in **small scale survey and mountainous region**.

Intersection Method





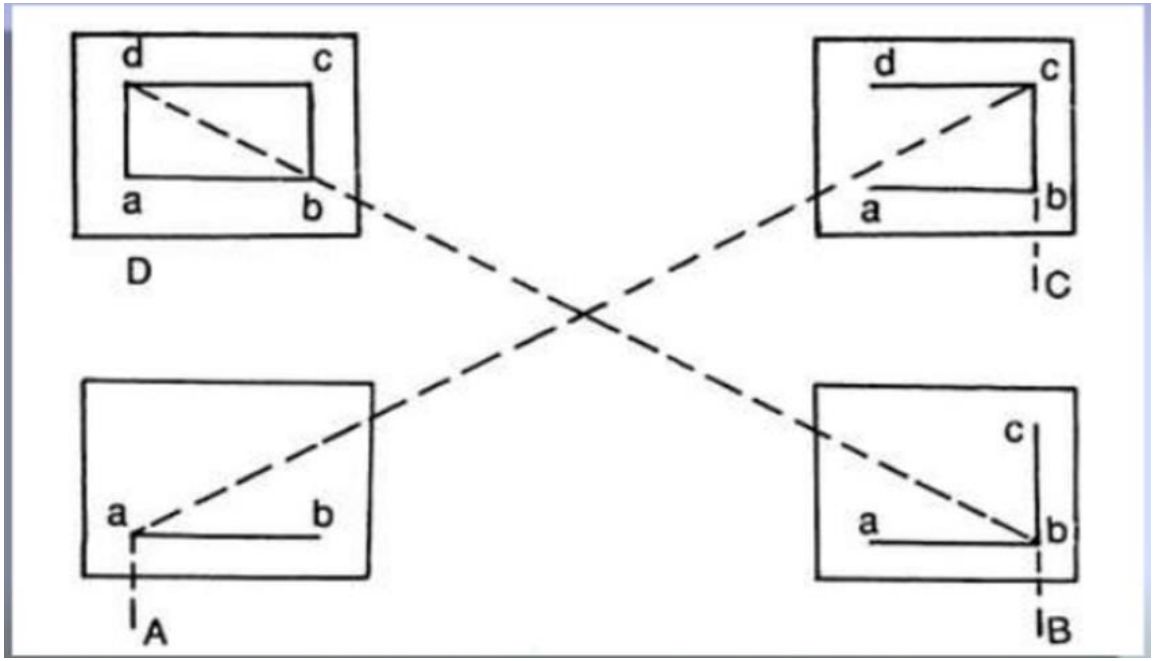
Method of Traversing:

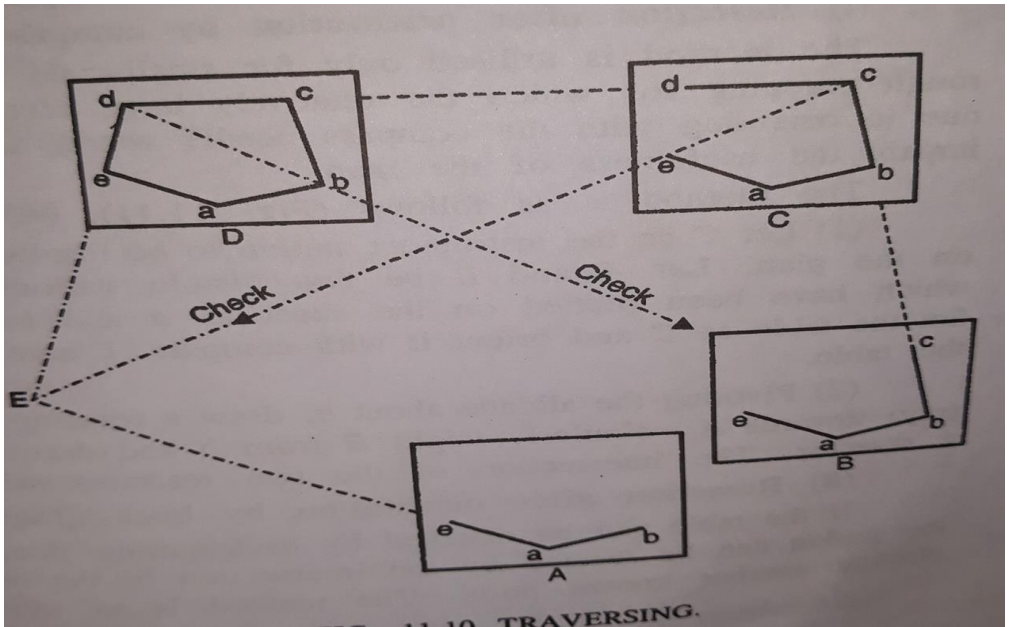
- **Used to plot a traverse** in cases, **stations have not been previously plotted by** some other methods.
- **Travers stations** are **first selected**.
- **Stations are plotted by methods of radiations** by taking back sight on the following stations and fore sight to the following station.
- **Distances are measured** by **tachometric method** and surveying work has to be done with great care.

Tachometric Surveying is a branch of surveying in which horizontal and vertical **distances** are determined by taking **angular observation** with an instrument known as a tachometer.



Method of Traversing(cont..):



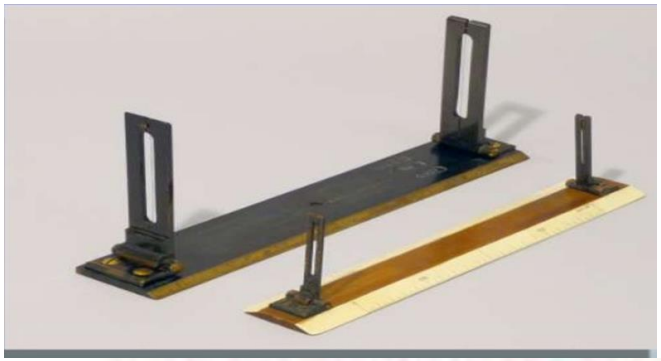


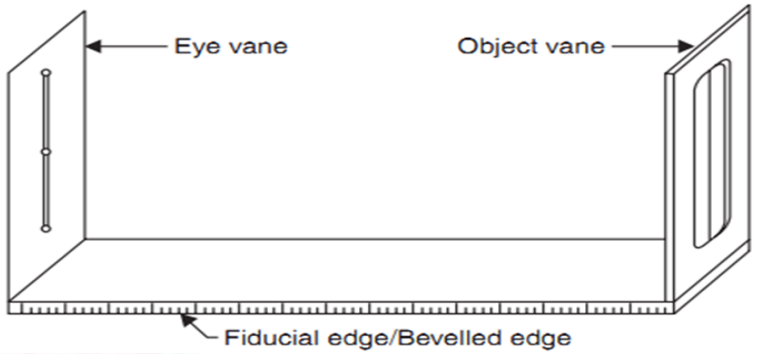
TRAVERSING.

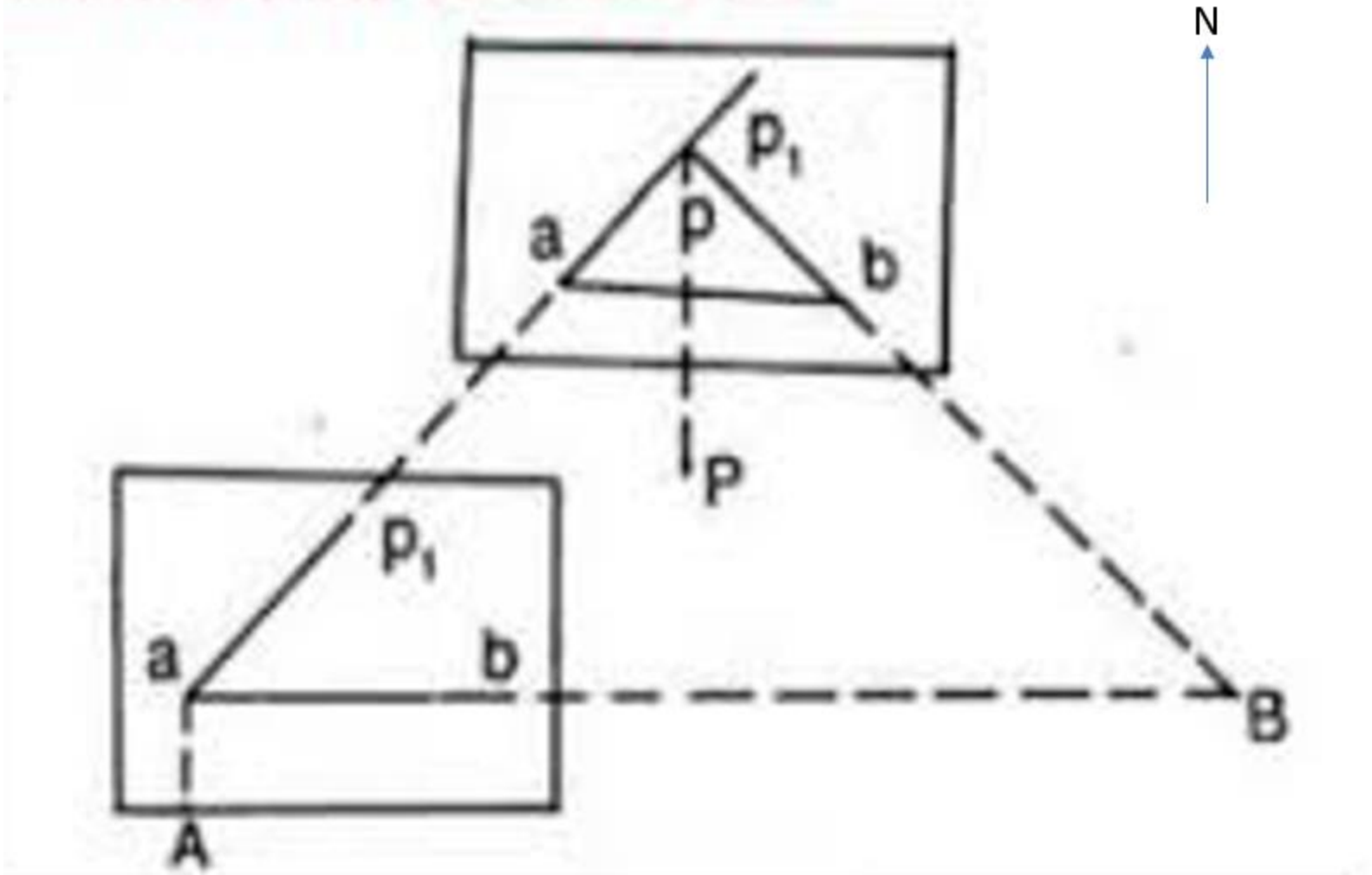
Resection:

- **Only Stations are fixed.**
- L**ocates the same station** over which the table is placed.
- Method will have small error if the scale of the map is too small.

Question: What is resection method? Describe the resection method of plane table surveying/plane tabling.




Eye vane
Object vane
Fiducial edge/Bevelled edge


N
p1
a
p
b
P
p1
a
b
B
A

Resection:

- A **base line AB is measured very accurately** on the ground **and plotted to a suitable scale** on the drawing sheet as ab.
- **Table is placed over station A,** centered and levelled in such a way that the point on the drawing sheet is exactly vertical over station A.
- By the help of trough compass, a **magnetic line is drawn** on one side of the drawing sheet.
- **Alidade is placed** just touching the point 'a' and **ranging rod at P is sighted through it.**
- Position '**p_1' is marked** on the ray drawn **by rough estimation.**

- **Plane Table is then shifted to P,** centered and levelled in such way the point **p_1 is exactly over point P** on the ground.

- Table is **oriented in the direction p_1b,** and clamped.

- A **ray is drawn backward** with the edge of alidade just touching 'b'.
- **Intersection point of this ray and previously ray drawn from 'a' will give required point p.**

- This is the correct position of the station P.

- **Same Procedure** is required for other station.

Two-Point Problem:

- Two-point problem consists of locating on the drawing sheet the **position of a point**, which is occupied by the plane table on the ground; by means of **observation to two known points** which are **visible** from the instrument station and **whose positions are already plotted** on the drawing sheet.

Question: Write down the two-point problem in plane tabling. Describe the two-point problem in resection method of plane table surveying.

Two-Point Problem:

- Suppose **P & Q are two well-defined points**, whose position are plotted on map a p & q.

Requirement: **To locate a new station at A** by perfectly bisecting P & Q.

- An **auxiliary station B is selected** at suitable position.

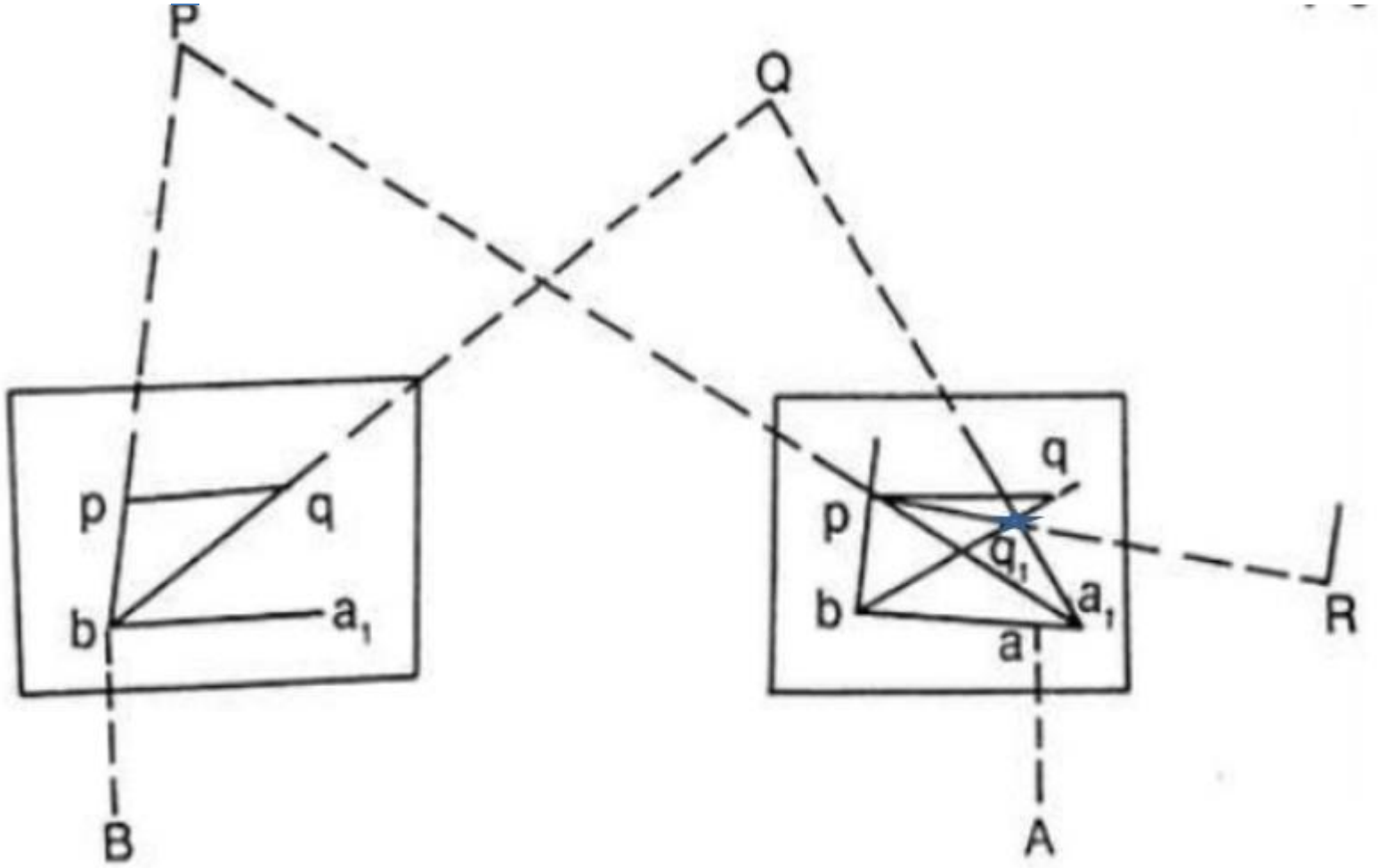
- **Table is set up at B**, levelled and **oriented** by eye estimation and clamped.

- **Alidade touching p and q**, points P and Q are bisected, rays are drawn, **intersect at b**.

Two-Point Problem:

- **Alidade touching point b**, ranging rod at A is bisected, ray is drawn.
- **By eye estimation, a point 'a_1'** is marked on the ray.
- Table is **shifted to position on A**, **with a_1 just over A**.
- Table is **oriented by back sighting**.
- **Alidade touching p**, point P is bisected and ray is drawn.
- Suppose, this ray **intersects line ba_1 at point a_1.**

Two-Point Problem:



Two-Point Problem:

- **Alidade touching a_1**, point Q is bisected and ray is drawn.

- Suppose it **intersects ray bq at a point q_1.**

***Δ* pqq_1** is known as triangle of error, to be eliminated.

- **Alidade placed along line pq_1** and a ranging rod is fixed at R along line **pq_1**, some distance from the table.

- Then **alidade is placed along the line pq** and table is turned to bisect R. And table is perfectly oriented.

- Finally, alidade touching p and q, and bisect P and Q, draw rays are drawn.

- Suppose these rays intersect at point ‘a’, which is the A on the ground.

Three-Point Problem:

- Three-point problem consists of locating on the drawing sheet the position of a point, which is occupied by the plane table on the ground; by means of **observation to three well-defined known points** which are **visible** from the instrument station and **whose positions are already plotted** on the drawing sheet.

Question: State the three point-point problem in plane table surveying.

Errors in Plane Table Surveying:

- Plane table not being **horizontal** ie levelling
- Inaccurate **centering** of the table.
- Incorrect **orientation**.
- Inaccurate **sighting through alidade**.
- Expansion and contraction of **paper**.
- **Movement of board** between stations.

Thank you