



Engineering Graphics I

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Learning objectives

- ” To study concept of principle planes
- ” To understand theory of projections
- ” Analysis of a point in various quadrants
- ” Analysis of a point in 1st quadrant, different cases
- ” Summarization of concepts & observations
- ” Theory of projections by auxiliary plane method: AVP & AIP

Concept of Plane

” **Plane:**

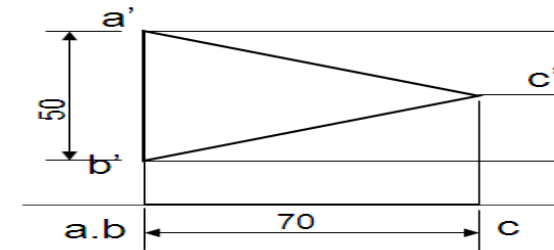
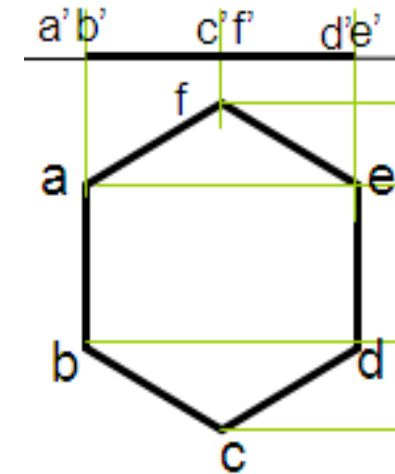
- . Also known as Plane or Polygon or Lamina or Plate
- . Are two dimensional figures i.e. length & width, or width & height, or height & width.
- . Every plane is bounded by the true lines; hence it has only one **True Shape (TS)**.

” **Regular polygons:**

- . Triangle (Equilateral, Isosceles, Right angle)
- . Square, Rectangle, Rhombus
- . Pentagon, Hexagon, Circle.

Projections of Plane

- “ If any polygon is parallel to any one reference plane, then view obtained in that reference plane is always **True Shape** of polygon while its corresponding view is an **Edge View**, parallel to XY or in XY, and vice-a-versa.
- “ Inclination made by the plane with HP is (θ_p)
- “ Inclination made by the plane with VP is (Φ_p)



Types of Problems on Projections of a Plane

There are two types of problems on projections of plane;

Type A: The true shape of plane and data to make it inclined to HP & VP are given, and then draw the projections to find its inclinations with HP and VP.

- . Plane resting in HP on its side or corner
- . Plane resting in VP on its side or corner

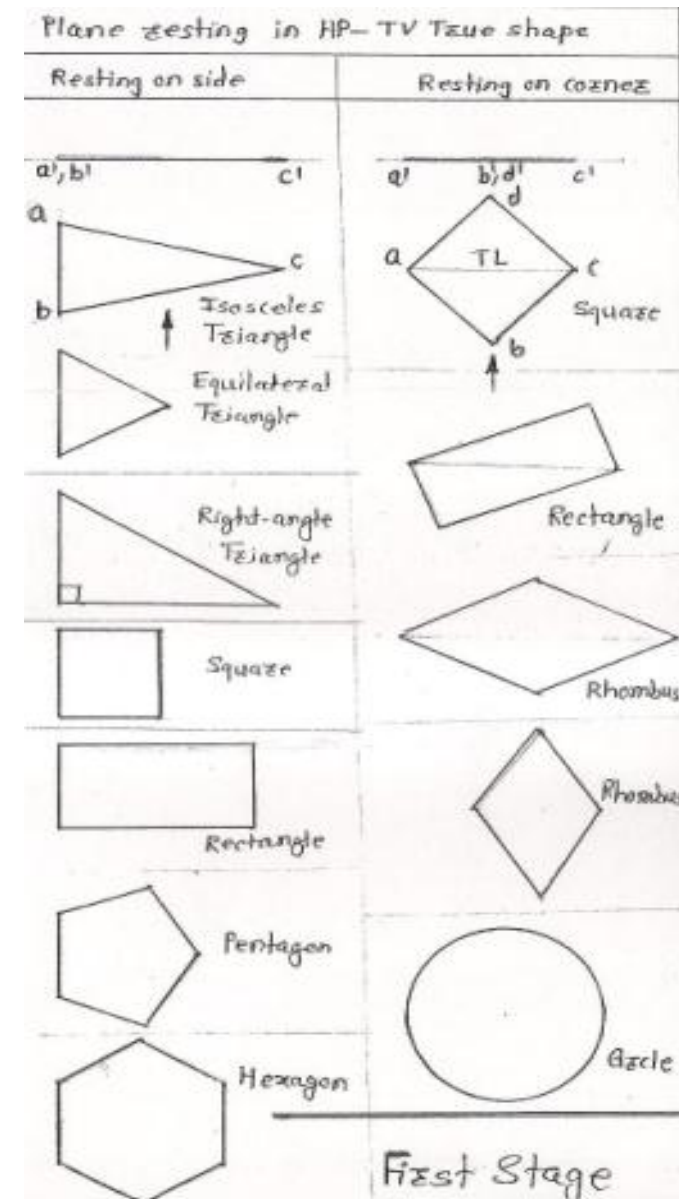
Type B: The apparent views – FV and TV, of a plane are given, and then draw the projections to find its inclinations with HP and VP. Also, find the true shape of a plane.

Projections of a Plane: Type A

1. The true shape of plane is given along with the inclinations made by the plane and line with HP or VP or special cases.
2. Draw the projections to make the plane inclined to both reference planes (oblique plane).
3. Find the inclinations made by the plane with HP and VP.

Type A: Stage I

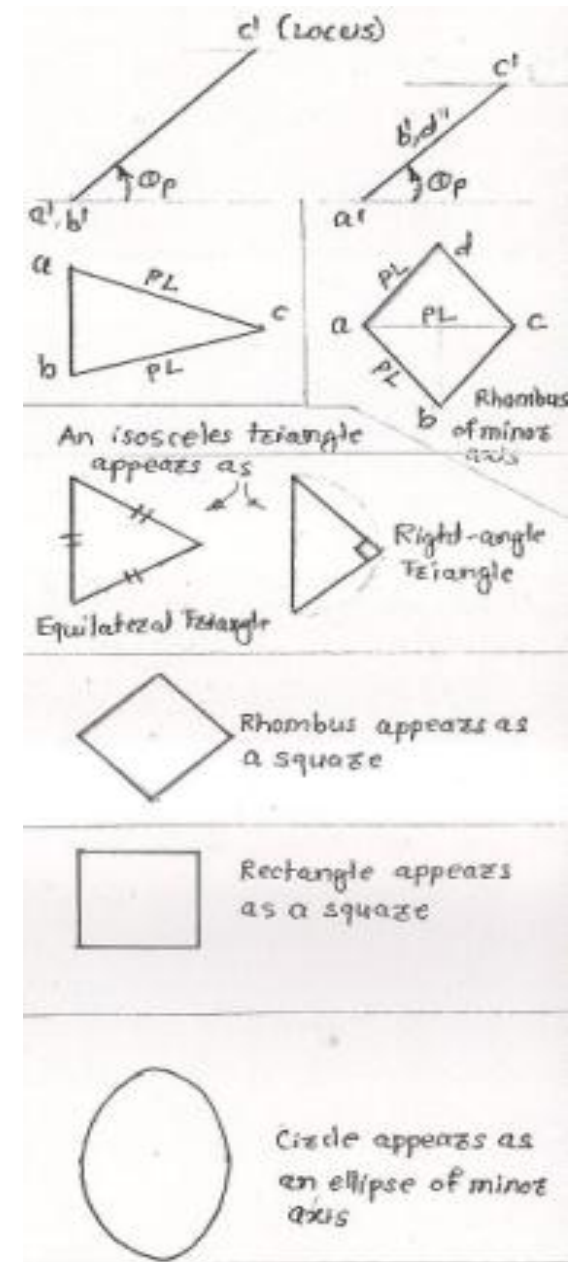
- “ If plane is resting in HP, then first draw TV as true shape.
- “ While drawing true shape check that whether it is resting on its side or corner.
- “ If resting on its side, draw that side extreme left, perpendicular to XY.
- “ If resting on corner, locate that corner extreme left with specific cases mentioned if any.
- “ *[And vice-a-versa, if plane is resting in VP].*



Type A: Stage II

“ If plane is resting in HP, then make its surface inclined to HP first and draw the second TV from various cases below;

- Surface is inclined to HP (θ_p).
- The corner or side opposite to resting side or corner is above HP.
- The side adjacent to resting side or corner appears as plan or TV length.



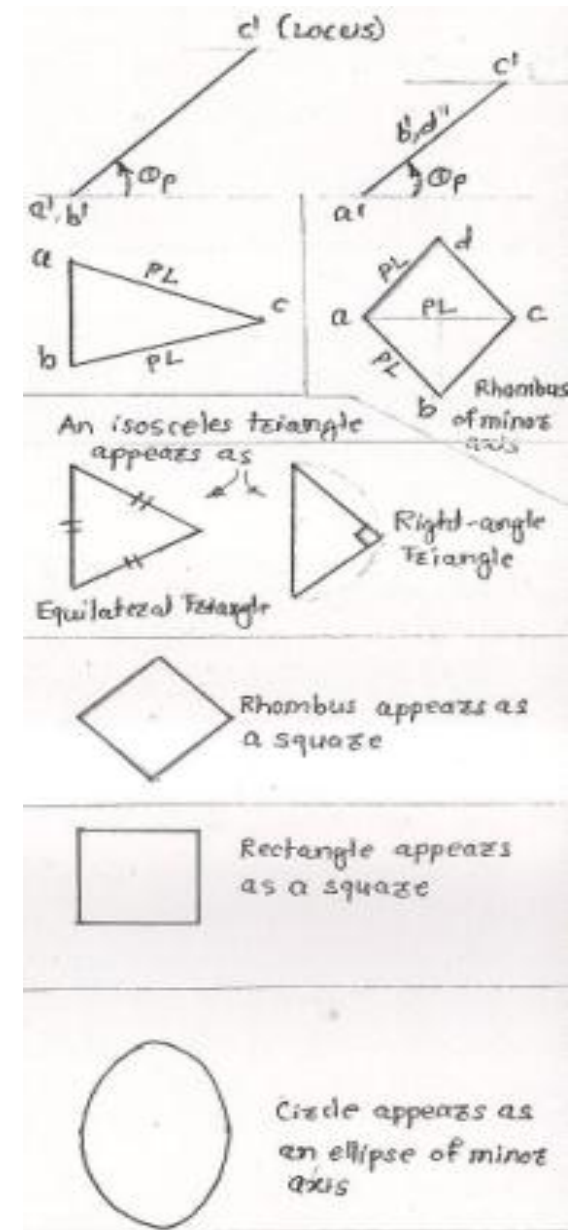
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Type A: Stage II

Some special cases:

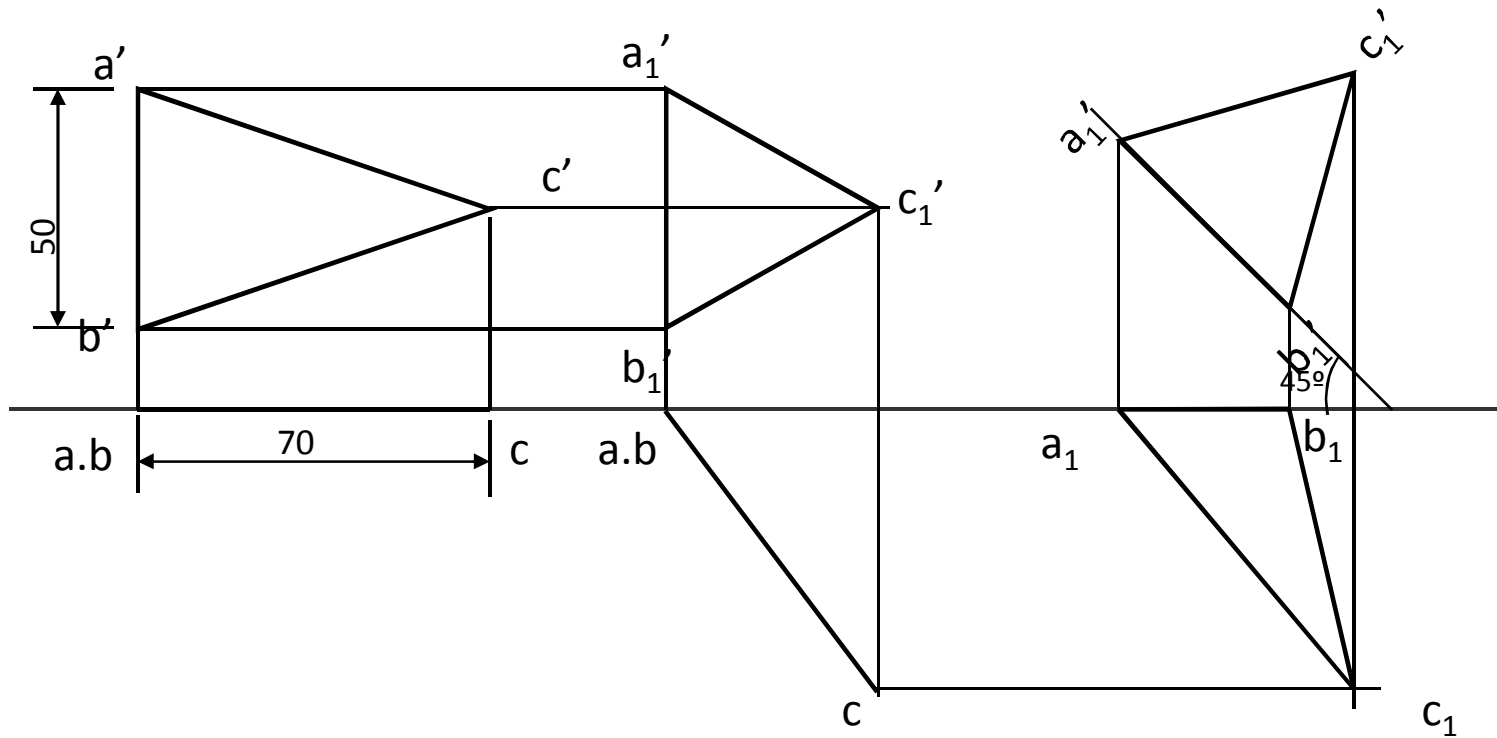
- “ The plan or TV of a plane resting on its side
 - An Isosceles triangle appears as Equilateral triangle or Right angle triangle;
 - Rectangle appears as Square

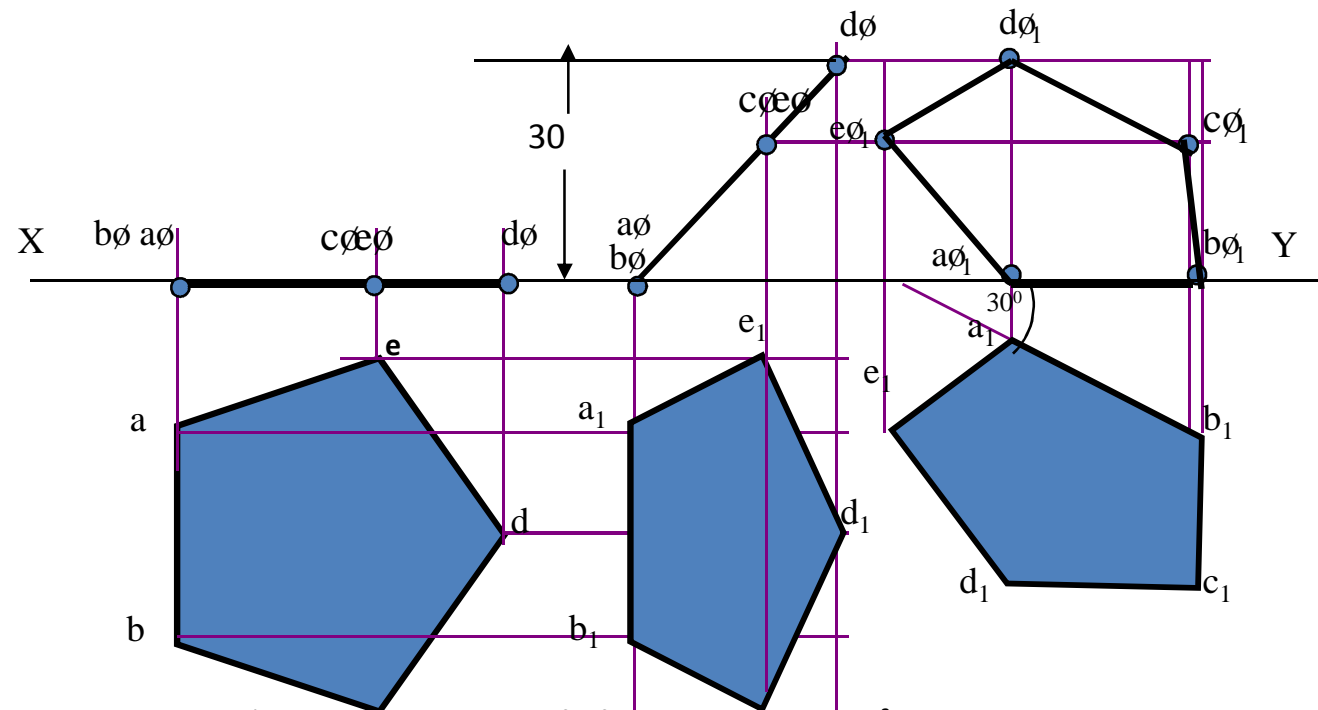
- “ The plan or TV of a plane resting on its corner
 - Square appears as a Rhombus of minor axis,
 - Rectangle appears as a Square,
 - Circle appears as an ellipse of minor axis etc.



Type A: Stage III

- ” Draw the final FV and TV by reference plane method or by auxiliary plane method.
- . If the resting side of plane is inclined to VP (Φ L).
 - . If resting on the corner of polygon, then a line passing through resting corner is inclined to VP (Φ L). Then, this line is TL, its 2nd TV line is PL inclined to VP i.e. ‘ β ’.
 - . Find angle made by PL with VP i.e. ‘ β ’, external construction.
- ” *[And vice-a-versa, if plane is resting in VP]*





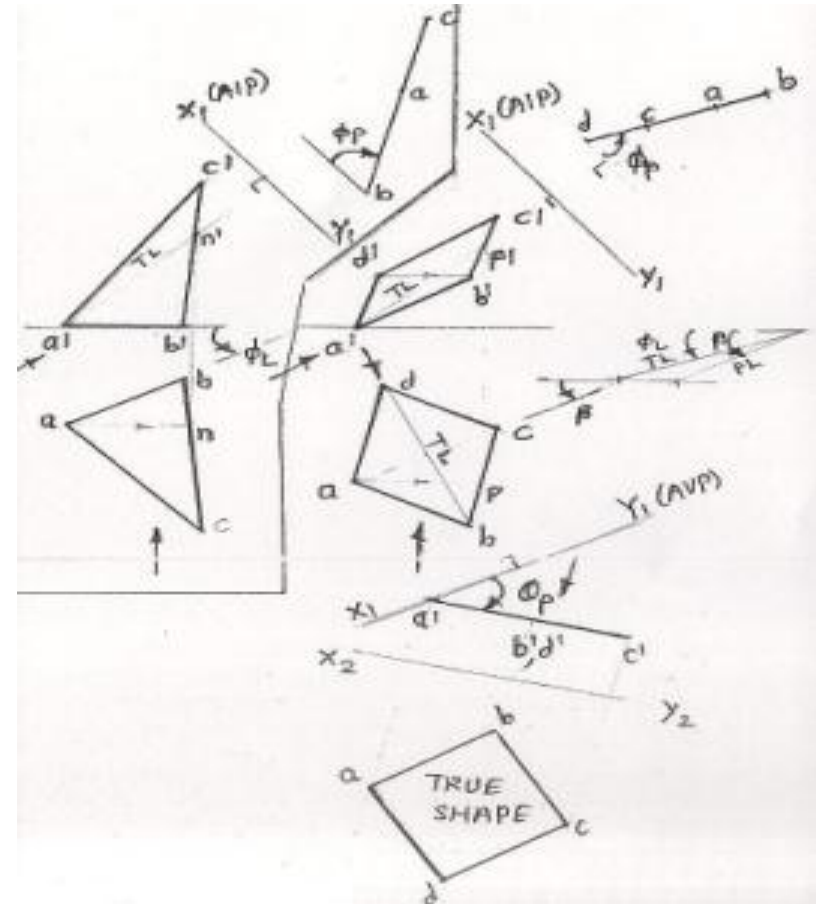
Type A: Stage III

- “ If resting on the corner of polygon, then a TV line passing through resting corner is inclined to VP i.e. ‘ β ’.
- “ Then, it’s a line of 2nd TV as PL and it is inclined to VP at any angle of ‘ β ’.
- “ No external construction. [And vice-a-versa, if plane is resting in VP].

- “ If resting on the corner of polygon, then the side opposite to resting corner (e.g. all triangles and pentagon) is inclined to VP (Φ L).
- “ [And vice-a-versa, if plane is resting in VP].

Type A: Stage IV

- “ By using auxiliary plane method, find the inclinations made by the plane with HP (θ_p) and with VP (Φ_p).
- “ Procedure to find (θ_p) and (Φ_p) will be discussed in problems of Type B
- “ *Summarization of various stages of problems in Type A*



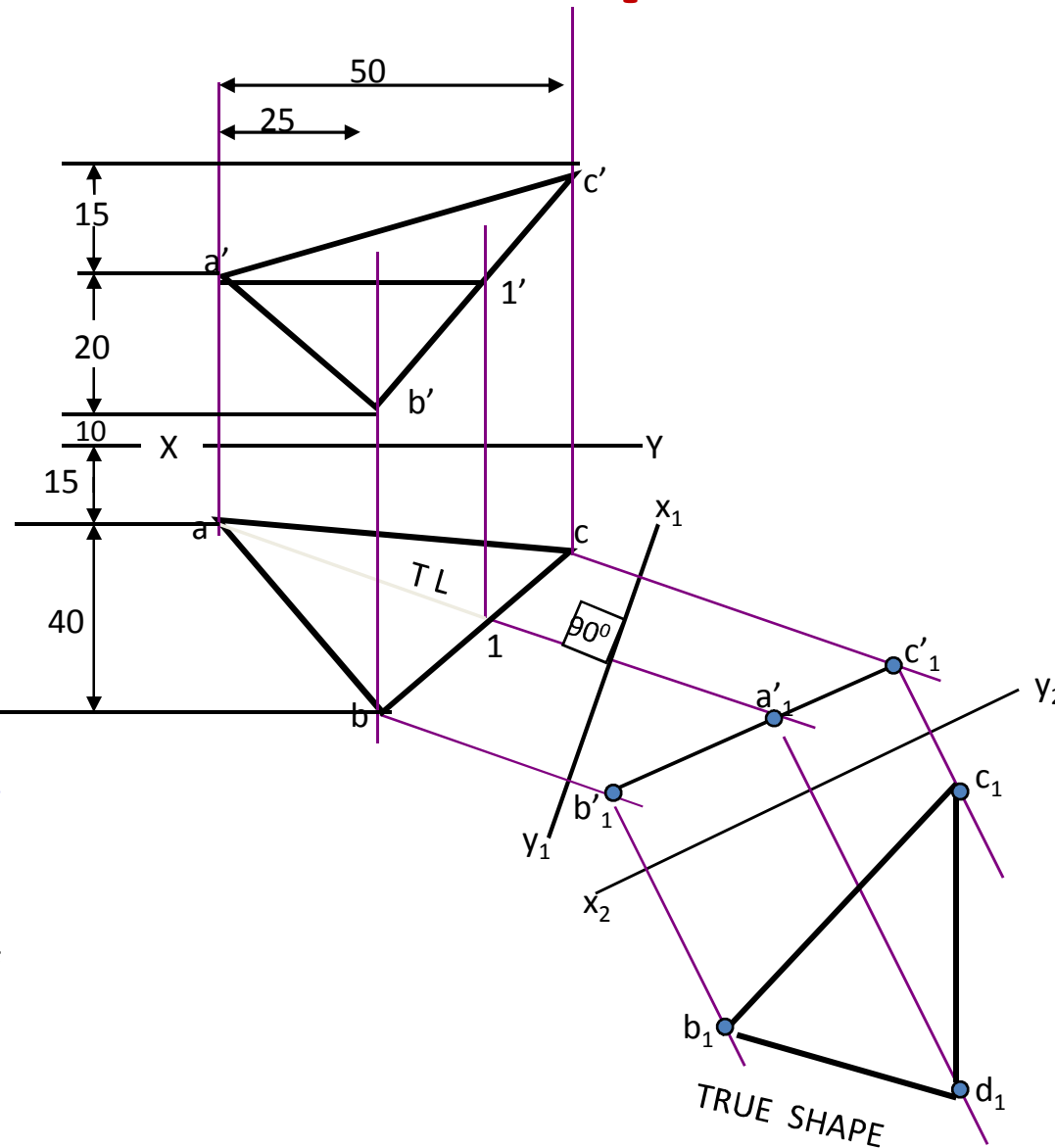
Projections of a Plane: Type B

“ The apparent views – Elevation (FV) and Plan (TV), of a plane are given with point coordinates and line dimensions.

- . Draw the given views FV and TV.
- . Draw the projections by using auxiliary plane method to find its inclinations with HP and VP.
- . Draw the true shape of a plane by auxiliary plane method for any one edge view of earlier stage.

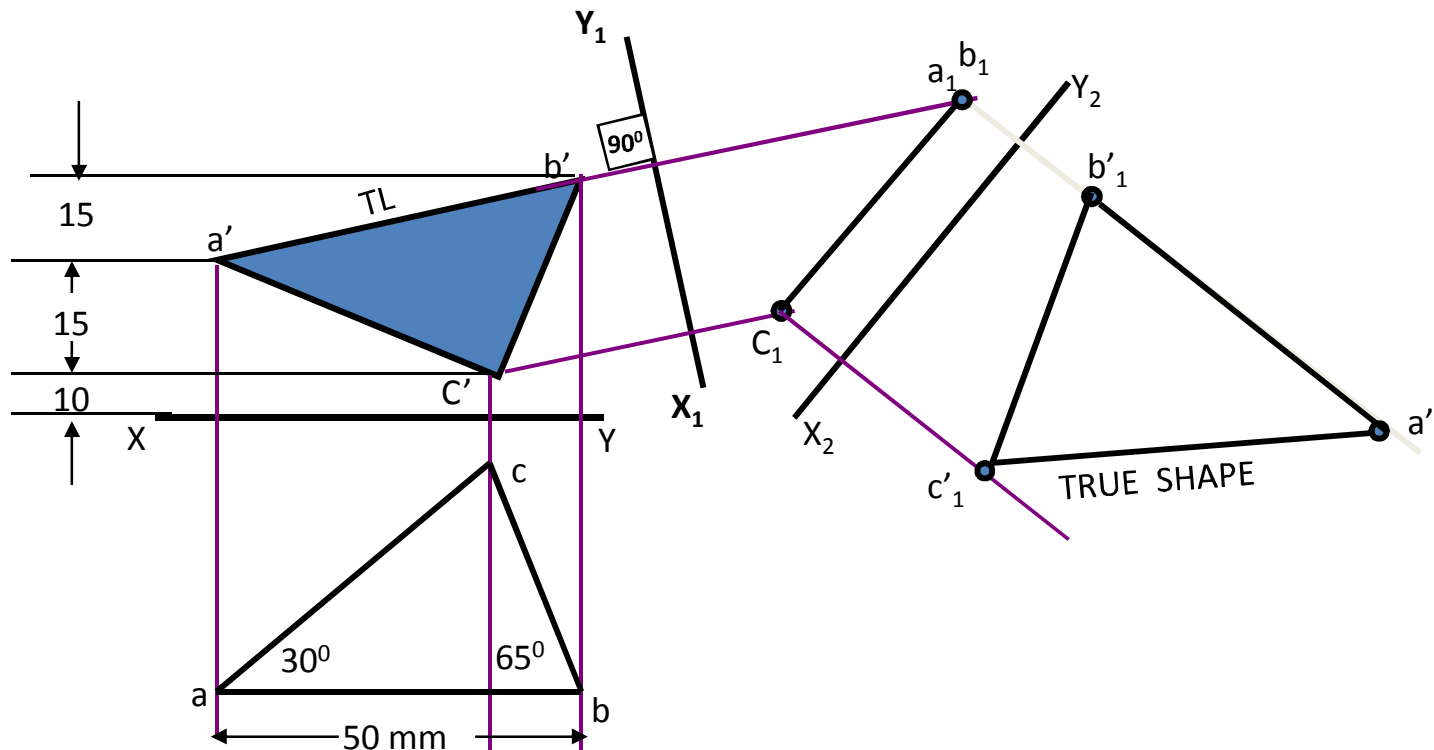
Type B: To find θ_p

- “ Draw auxiliary FV as an edge view, to find (θ_p) .
- “ Hence, any one line in the given TV should be TL.
- “ Check s corresponding line in FV must be parallel to XY.
- “ If yes, find the point view of that TL by auxiliary plane method which will give FV as an edge view of plane. [Extend the TL line, take a line perpendicular to this TL line as new reference line - X_1Y_1 , draw the projections from all the corners of TV polygon to X_1Y_1 and locate their distances of previous FV from XY].
- “ If not, then construct a line parallel to XY inside the plane of given FV. Project it in the corresponding line of TV & find its TL. Then, repeat the procedure explained as above.



Type B: To find Φ_p

- “ Draw auxiliary TV as an edge view, to find (Φ_p).
- “ Hence, any one line in the given FV should be TL.
- “ Check its corresponding line in TV must be parallel to XY.
- “ If yes, find the point view of that TL by auxiliary plane method which will give TV as an edge view of plane. [Extend the TL line, take a line perpendicular to this TL line as new reference line - X_1Y_1 , draw the projections from all the corners of FV polygon to X_1Y_1 and locate their distances of previous TV from XY].
- “ If not, then construct a line parallel to XY inside the plane of given TV. Project it in the corresponding line of FV & find its TL. Then, repeat the procedure explained as above.



Type B: To find True Shape

- “ To find out the TS of a plane, first draw any one edge view of plane by the procedure explained in earlier stages.
- “ When we take the auxiliary projections of any one edge view by drawing the new reference line - X_2Y_2 , parallel to the edge view, we get the True Shape of the plane.
- “ For example: Draw a new reference line - X_2Y_2 , parallel to the FV as edge view, Draw the projections from all the corners of this edge view to X_2Y_2 and locate their distances of previous TV from X_1Y_1 , then we get a new TV as a True Shape. [And vice-a-versa].

Thank you

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