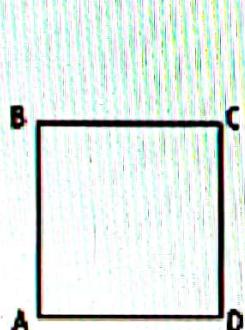
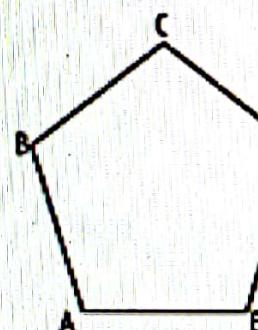


# Plane Plate Lamina

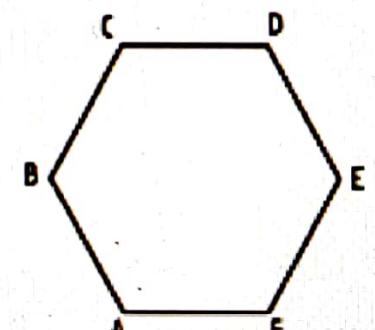
- A plane is a 2 dimensional object having length and breadth. Various shapes of plane figures are shown below.



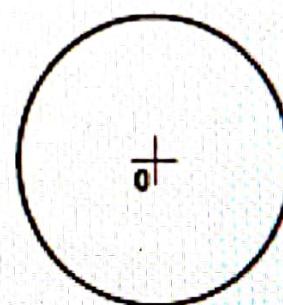
(i) Square



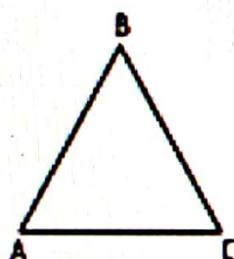
(ii) Pentagon



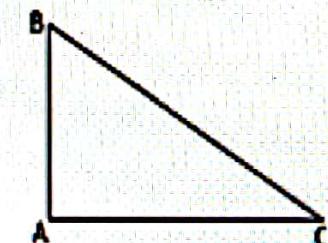
(iii) Hexagon



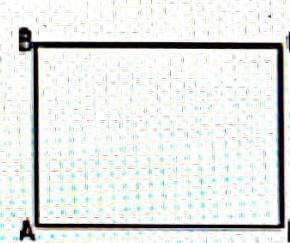
(iv) Circle



(v) Equilateral triangle



(vi) Right-angle triangle



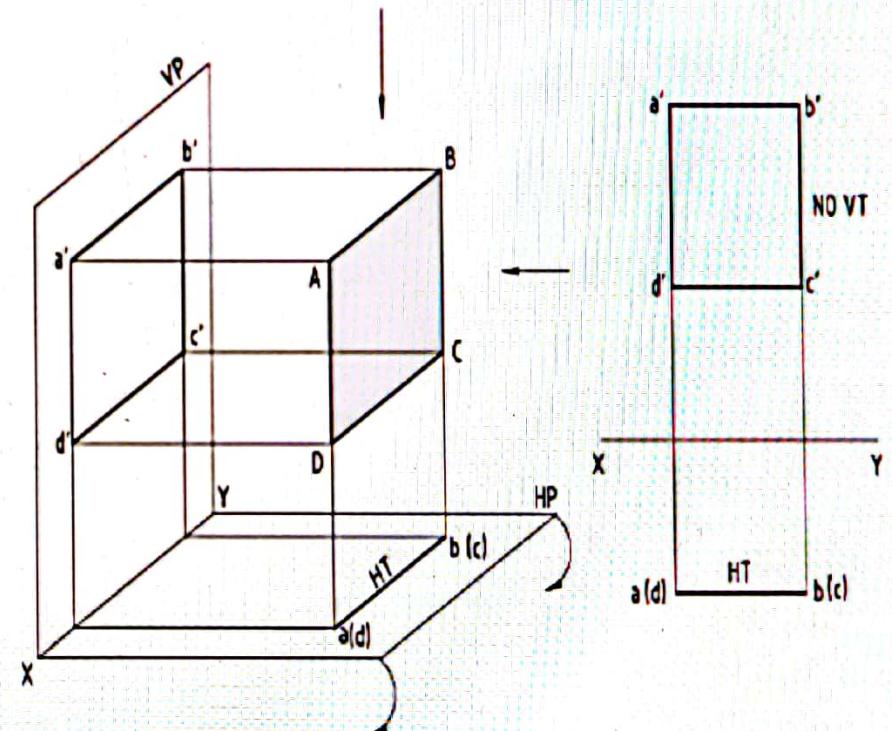
(vii) Rectangle

# **Understanding Projections of a Plane and its Traces**

- Any one of the planes given above is kept in first quadrant with reference to VP and HP.
- Trace of a plane is a line of intersection or meeting of the plane surface with the reference plane.
- There are six different positions in which a plane can be placed with reference to its surface and reference planes (VP & HP) and are discussed below.

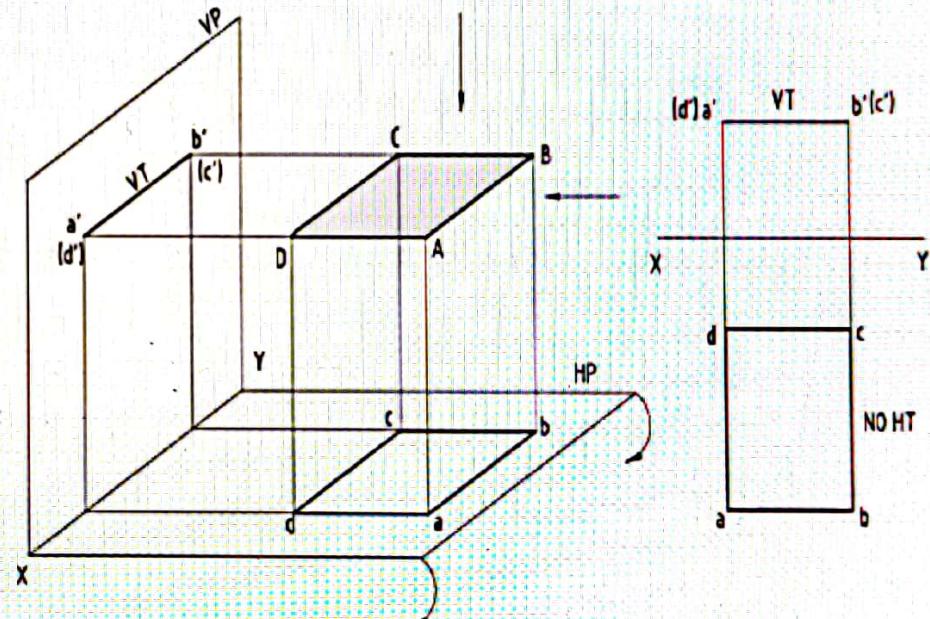
# Projections of a Plane kept perpendicular to HP and parallel to VP

- Consider a square plane ABCD having its surface perpendicular to HP and parallel to VP.
- Front view is a square having true shape and size.
- Top view is a line.
- Since the plane is parallel to VP, no VT and the HT coincides with top view of the plane.



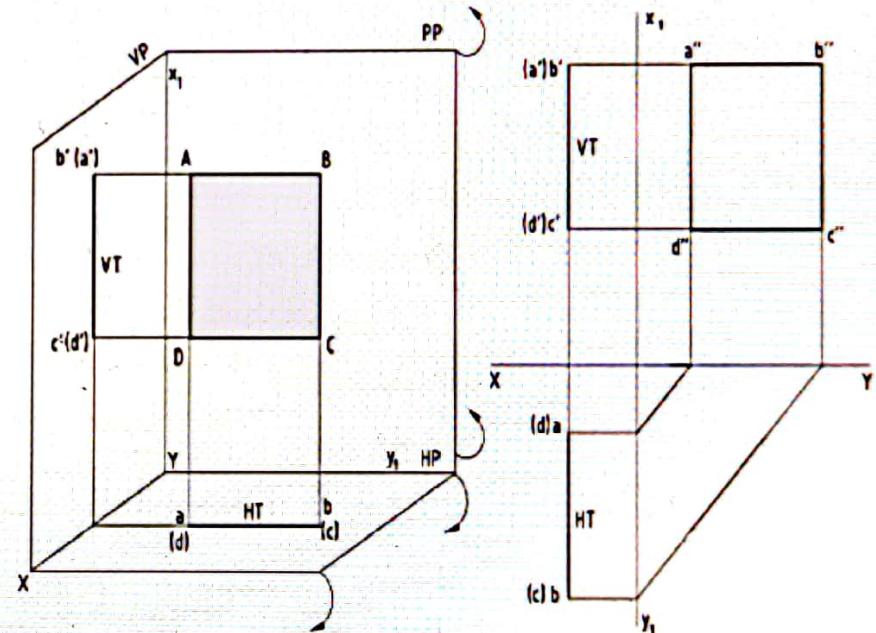
# Projections of a Plane kept perpendicular to VP and parallel to HP

- Consider a square plane ABCD having its surface perpendicular to VP and parallel to HP.
- Top view is a square having true shape and size.
- Front view is a line.
- Since the plane is parallel to HP, no HT and the VT coincides with front view of the plane.



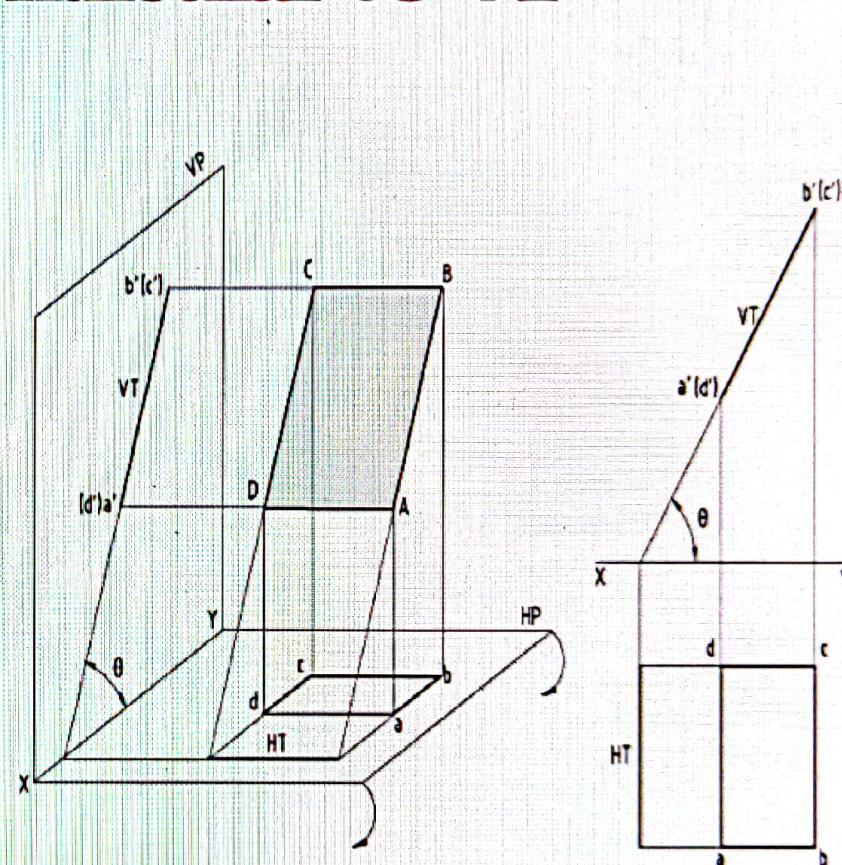
# Projections of a Plane kept perpendicular to both HP and VP

- Consider a square plane ABCD having its surface perpendicular to both HP and VP.
- Side view of the plane is a square having true shape and size.
- Top and Front views are lines.
- Since the plane is perpendicular to both HP and VP, both HT and VT are obtained perpendicular to XY line and are coinciding with TV and FV of the plane.



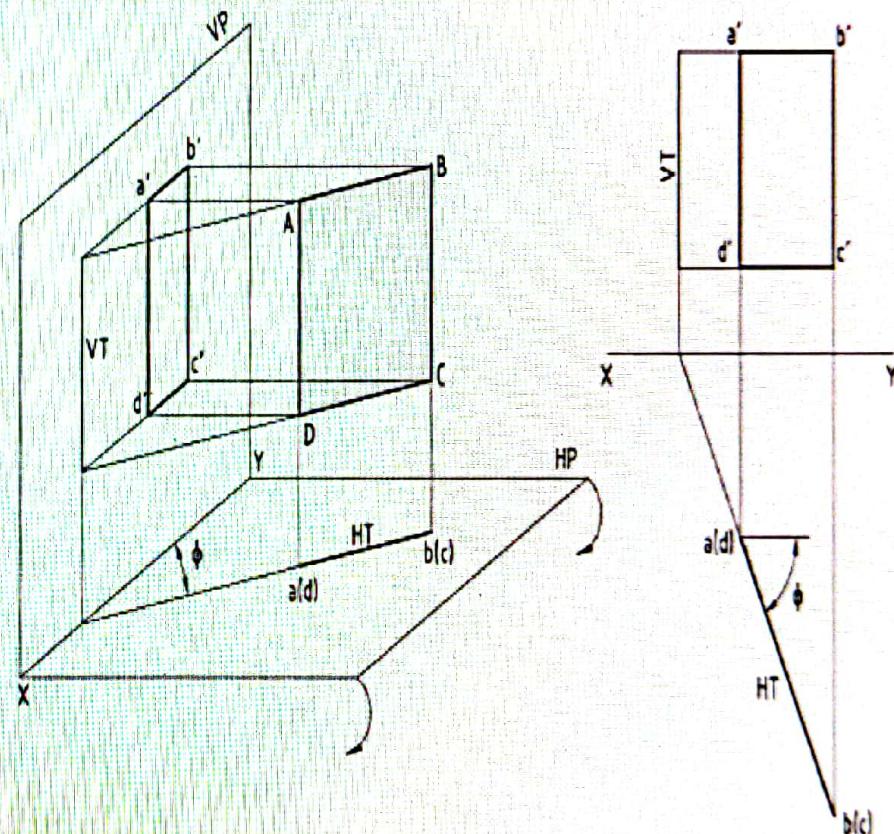
# Projections of a Plane kept inclined to HP and perpendicular to VP

- Consider a square plane ABCD having its surface perpendicular to VP and inclined to HP.
- Front view is an inclined line at  $\theta$ .
- Top view is smaller in size.
- Note:** The projections are obtained in two steps and will be discussed later.



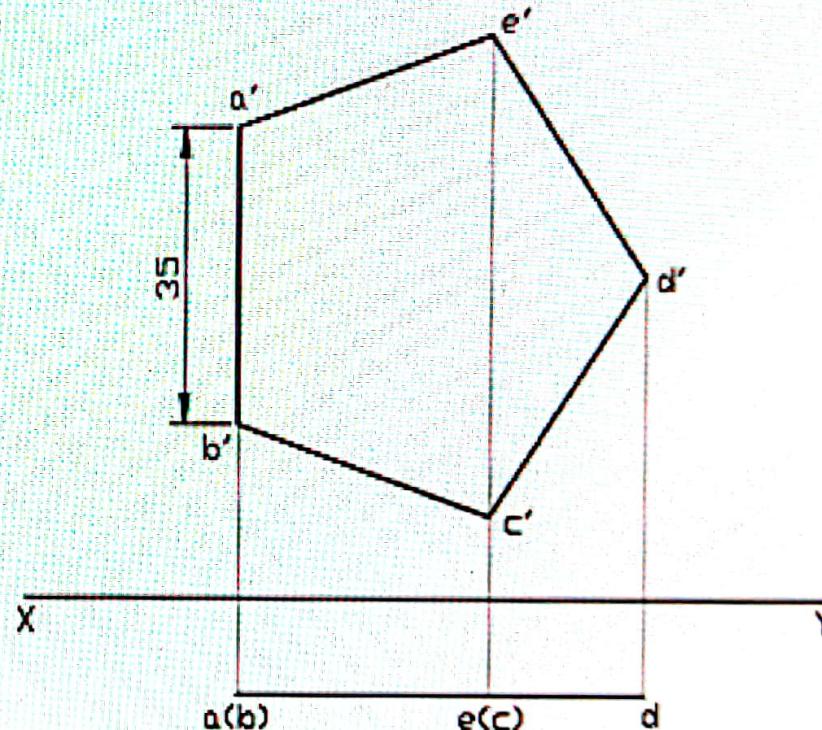
# Projections of a Plane kept inclined to VP and perpendicular to HP

- Consider a square plane ABCD having its surface perpendicular to VP and inclined to HP.
- Top view is an inclined line at  $\Phi$ .
- Front view is smaller in size.
- **Note:** The projections are obtained in two steps and will be discussed later.



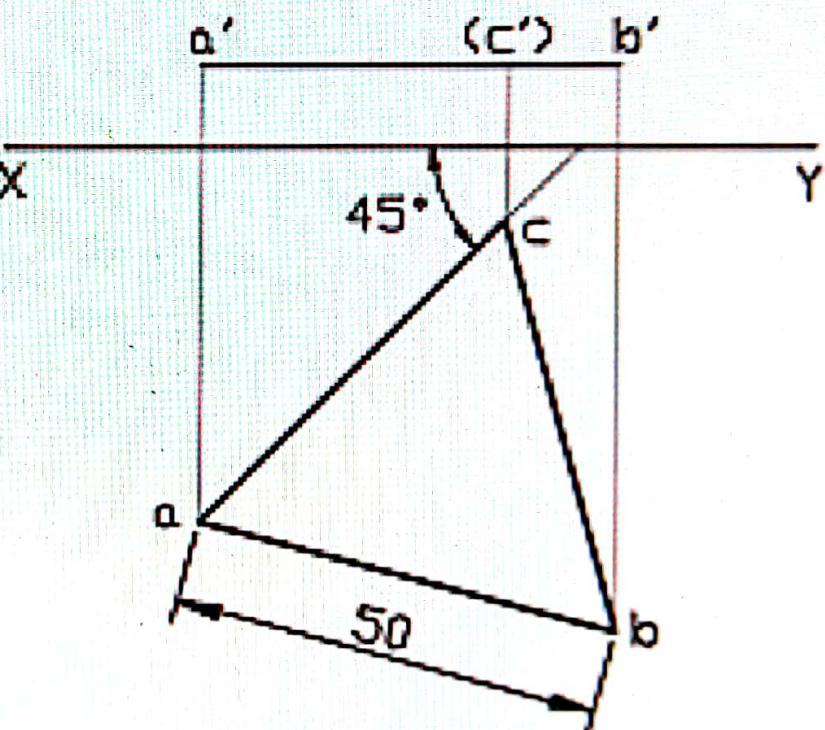
**Example 1:** A pentagonal plate of side 35mm is placed with its surface vertical and parallel to VP. Draw its projections when one of the sides is perpendicular to HP.

- **Step:** when the plane surface is perpendicular to HP and parallel to VP, Draw the FV and project the TV.
- Draw the FV which is pentagon with a side vertical.
- Project and get the TV as a Line parallel to XY.



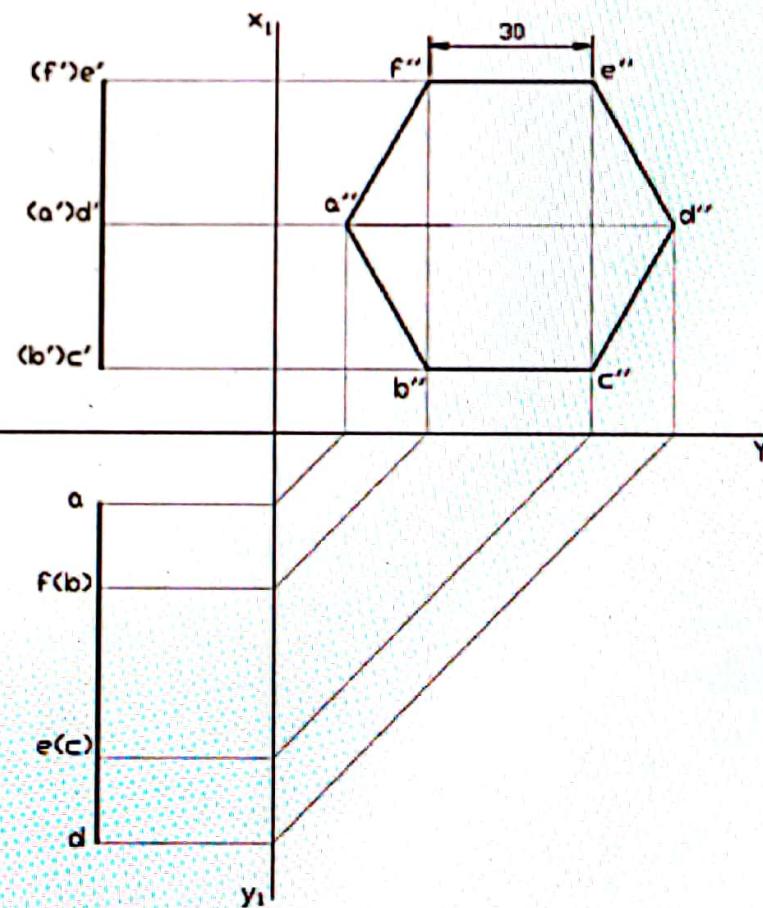
**Example 2:** An equilateral triangular plate of side 50mm is kept with its surface parallel to HP and one of the sides of the plate inclined at  $45^\circ$  to VP. Draw its projections.

- **Step:** when the plane surface is perpendicular to VP and parallel to HP, Draw the TV and project the FV.
- Draw the TV which is triangle with a side inclined at  $45^\circ$  to XY.
- Project and get the FV as a Line parallel to XY.



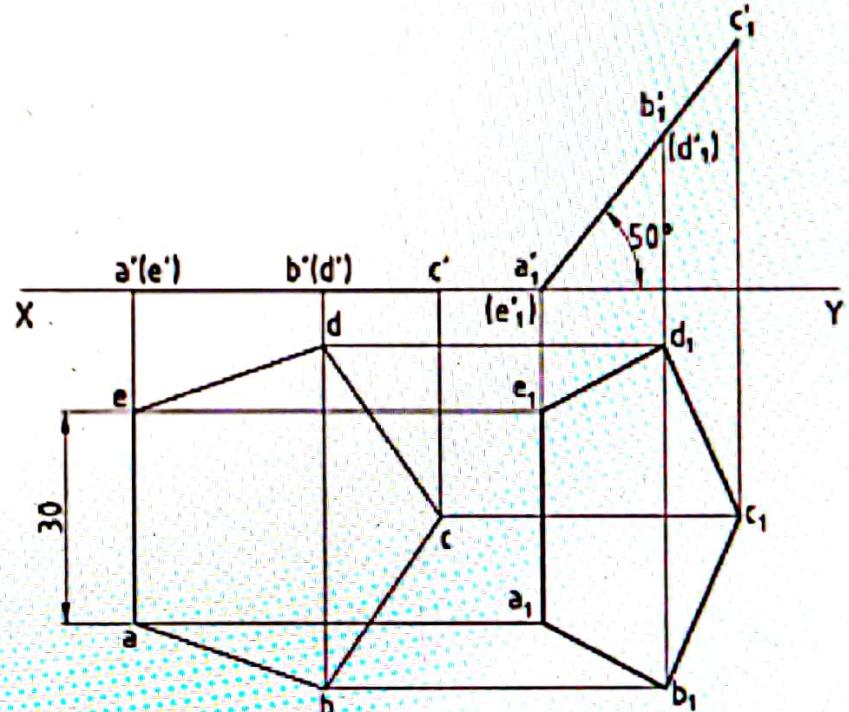
**Example 3:** A regular hexagonal plate of side 30mm has its surface perpendicular to both HP and VP. Draw its projections when two of its sides are parallel to HP.

- **Step:** when the plane surface is perpendicular to both HP and VP, Draw the Side view on Auxiliary Vertical Plane (AVP) and project TV & FV.
- Draw the left side view (LSV) which is a hexagon with a side parallel to XY.
- Project the TV which is a line perpendicular to XY.
- Project the FV which is also a line perpendicular to XY.



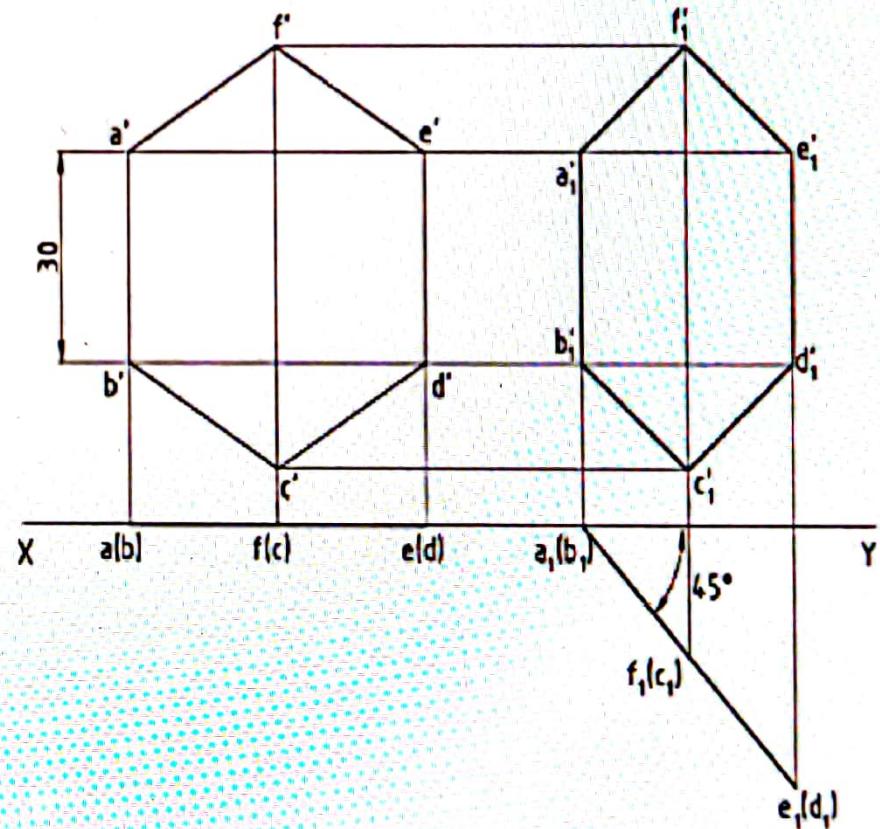
**Example 4:** A pentagonal plate of side 30 mm is placed with one side on *HP* and the surface inclined at  $50^\circ$  to *HP* and perpendicular to *VP*. Draw its projections.

- When the plane surface is inclined to *HP* and perpendicular to *VP*, two steps are used
  - Step 1:** Assume the plane is parallel to *HP* and perpendicular to *VP*. Draw the *TV*, project the *FV*, which is a line drawn as discussed earlier.
  - Step 2:** Tilt and reproduce the *FV* and project the *TV*.
- Note that horizontal and vertical lines are drawn from *TV* & *FV* of respective corner of the plane to complete the *TV* in Step 2.



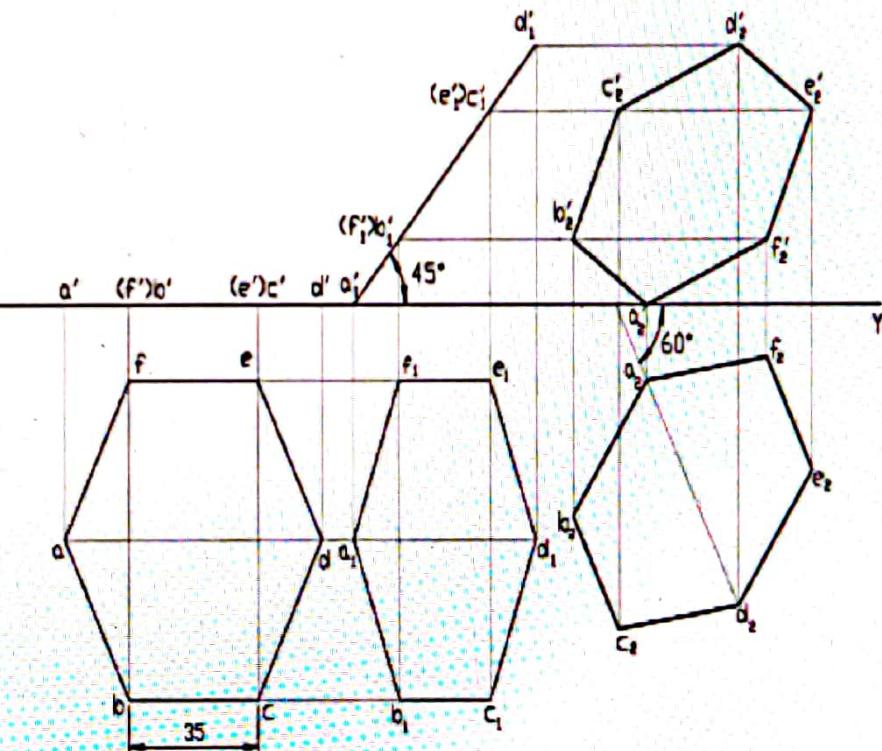
**Example 5:** A hexagonal plate of size 30 mm is placed with a side on *VP* and surface inclined at  $45^\circ$  to *VP* and perpendicular to *HP*. Draw the projections.

- When the plane surface is inclined to *VP* and perpendicular to *HP*, two steps are used
  - Step 1:** Assume the plane is parallel to *VP* and perpendicular to *HP*. Draw the FV, project the TV, which is a line drawn as discussed earlier.
  - Step 2:** Tilt and reproduce the TV and project the FV.
- Note that horizontal and vertical lines are drawn from FV & TV of respective corner of the plane to complete the FV in Step 2.



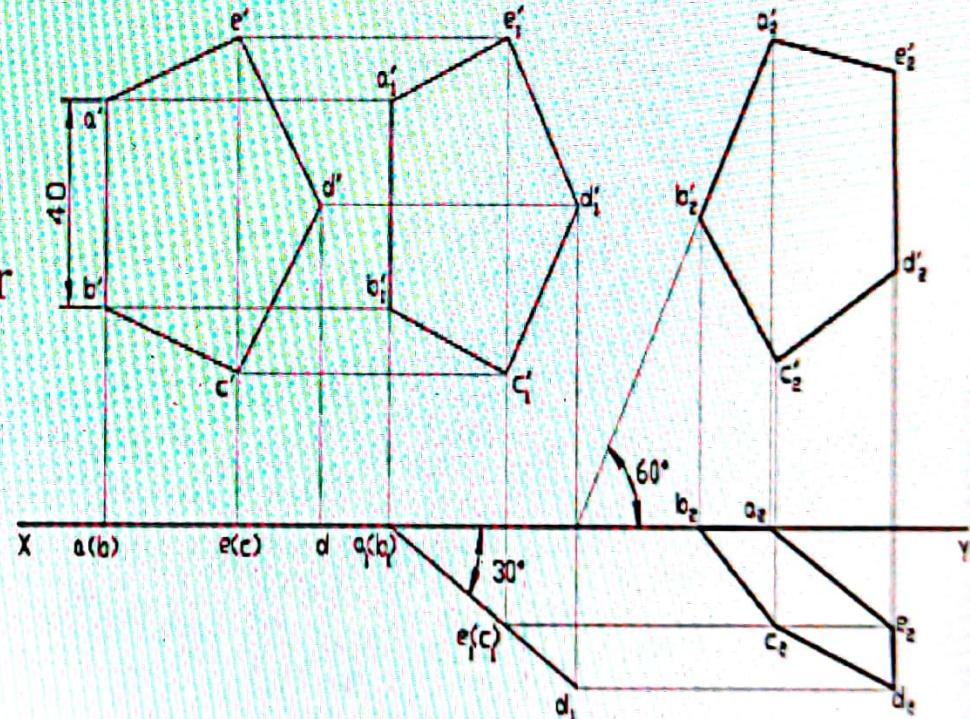
**Example 6:** A regular hexagon of side 35 mm has a corner in the HP. Its surface is inclined at  $45^\circ$  to HP. The top view of the diagonal through the corner in HP makes an angle of  $60^\circ$  with VP. Draw its projections.

- When the plane surface is inclined to HP and VP, three steps are used (Case I)
  - Step 1: Assume the plane is parallel to HP and perpendicular to VP. Draw TV, project FV.
  - Step 2: Tilt and reproduce the FV and project the TV.
  - Step 3: Reproduce the TV such that the diagonal makes an angle of  $60^\circ$  to XY, project FV.
- Note: In the problem, one of the inclinations will be given indirectly by referring to a side or diagonal of the plane.



**Example 7:** Draw the projections of a regular pentagon of side 40 mm which has its surface inclined at  $30^\circ$  to VP and a side parallel to VP and inclined at  $60^\circ$  to HP.

- When the plane surface is inclined to HP and VP, three steps are used (Case II)
  - Step 1: Assume the plane is parallel to VP and perpendicular to HP. Draw FV, project TV.
  - Step 2: Tilt and reproduce the TV and project the FV.
  - Step 3: Reproduce the FV such that the side makes an angle of  $60^\circ$  to XY, project TV.
- Note:** One of the inclinations will be given indirectly by referring to a side or diagonal of the plane.



# Tips to solve problems

- Read the given problem carefully and understand the FV and TV in that position. Follow the steps as given against each position.
- Sometimes the inclinations of the plane surface will be given indirectly.
- When the plane surface is inclined to both HP and VP , read and understand the problem, either to be solved like CASE I or CASE II.