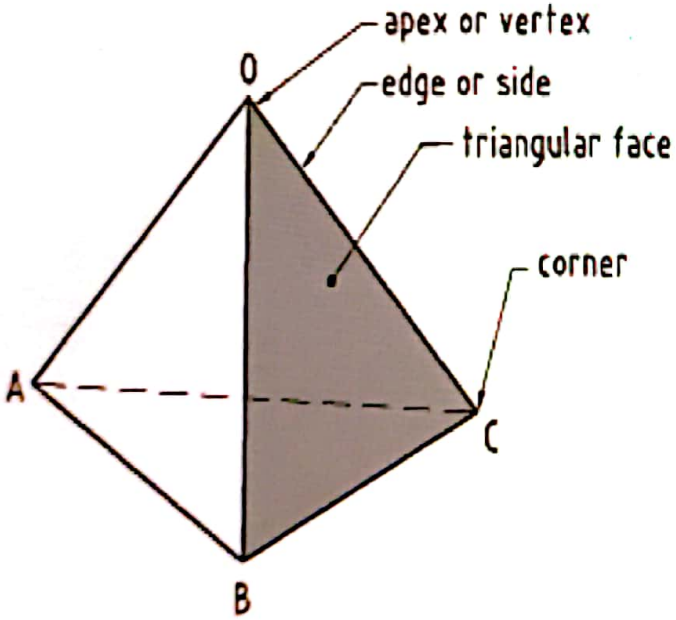
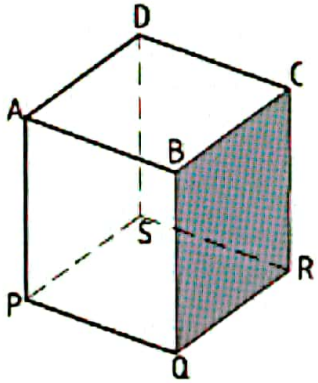
SOLIDS

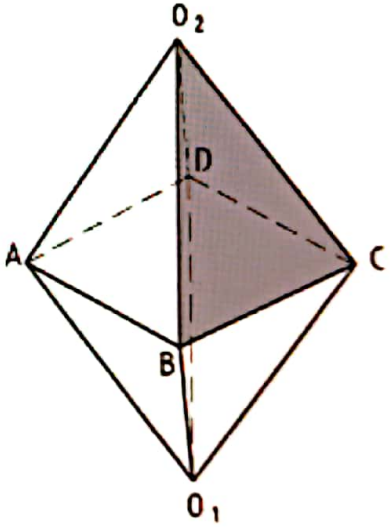
- A SOLID is a 3 dimensional object having length, breadth and height. Commonly used solids are shown below.



Tetrahedron

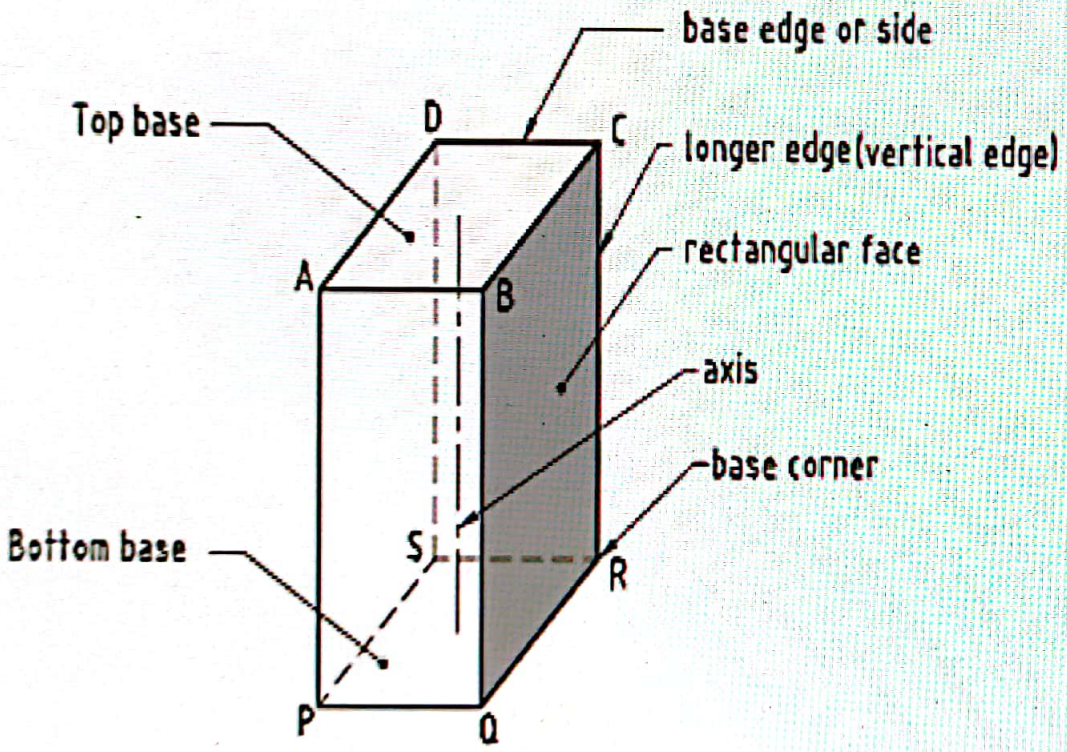


Cube

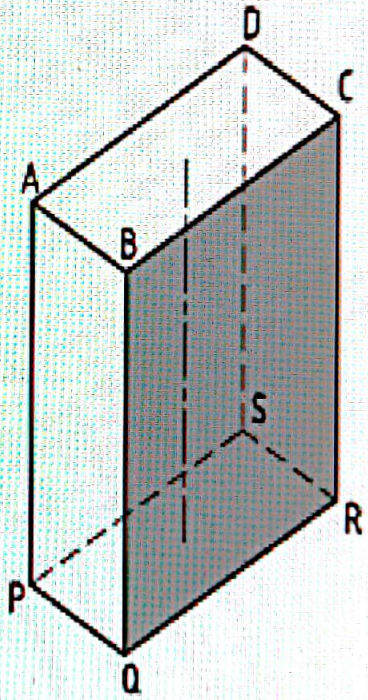


Octahedron

SOLIDS

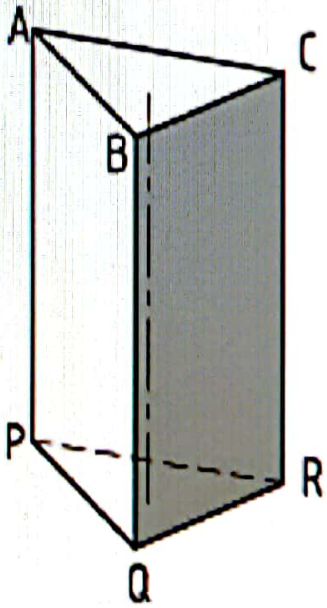


Square prism

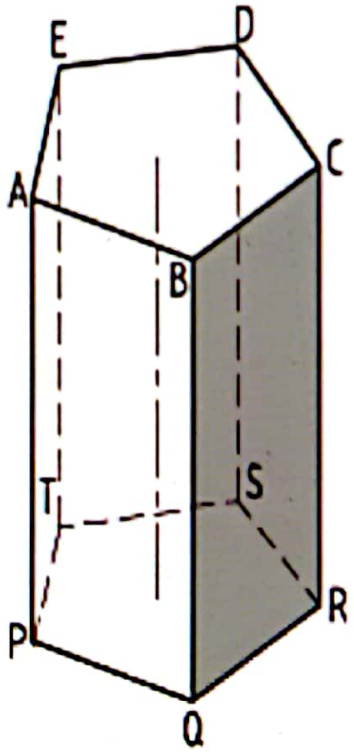


Rectangular prism

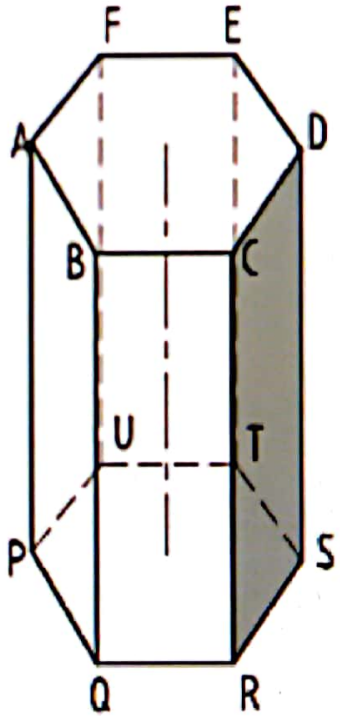
SOLIDS



Triangular prism

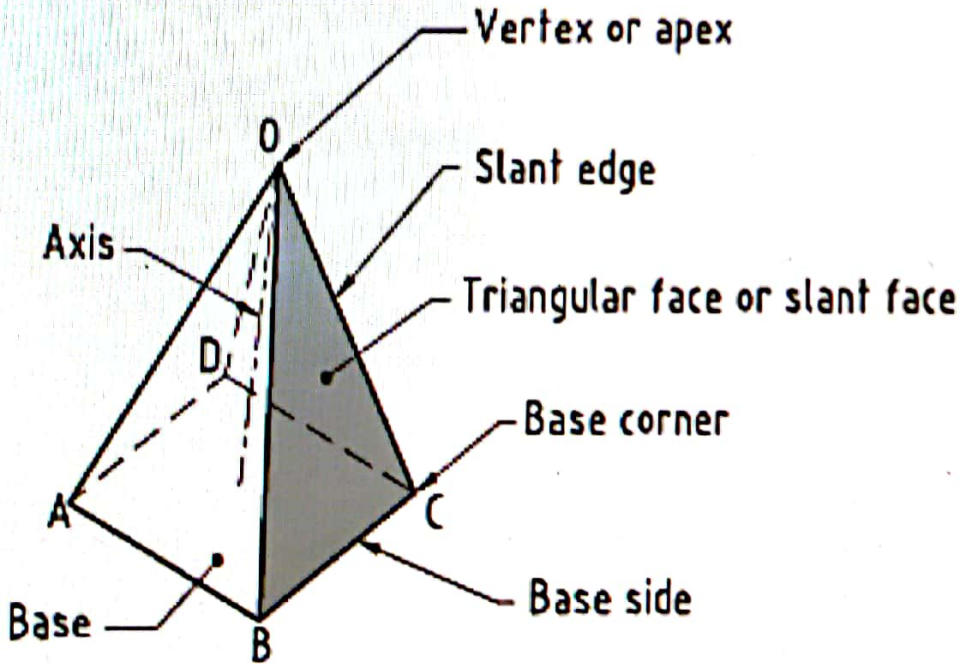


Pentagonal prism

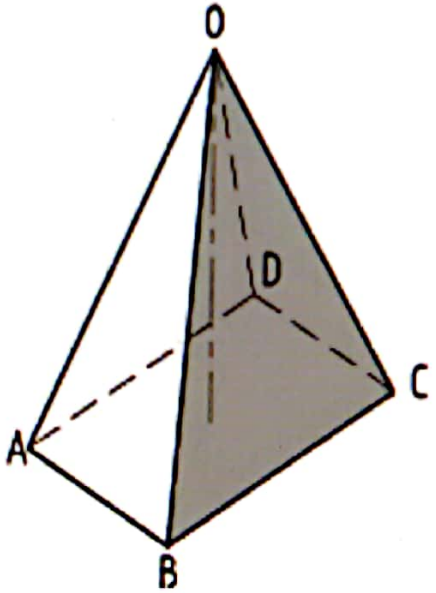


Hexagonal prism

SOLIDS

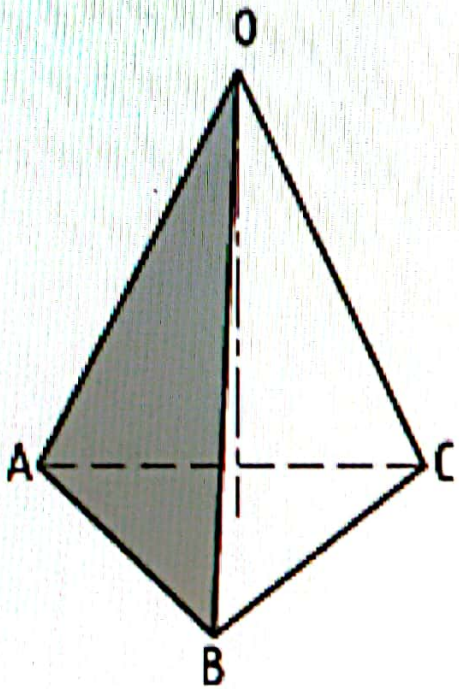


Square pyramid

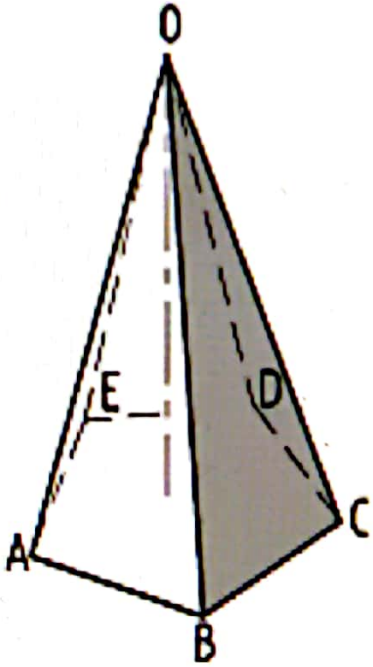


Rectangular pyramid

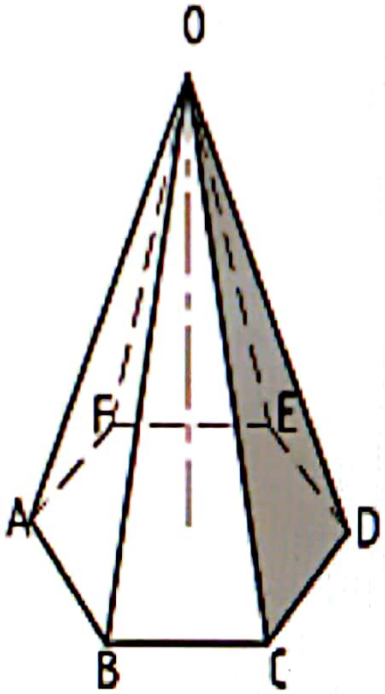
SOLIDS



Triangular pyramid

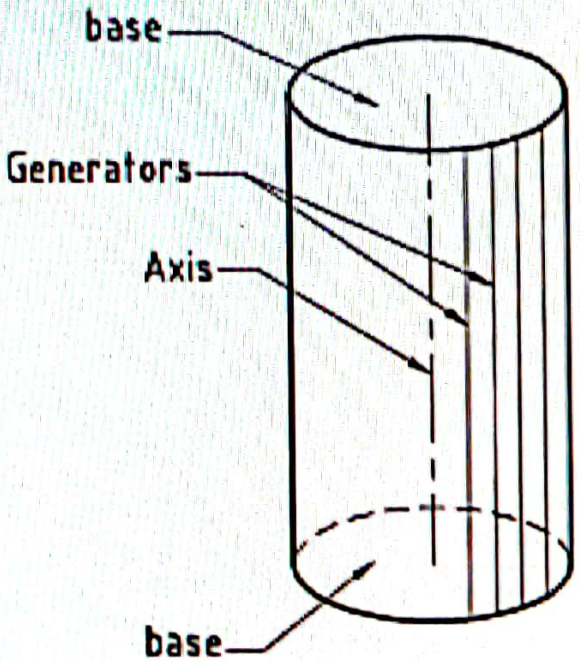


Pentagonal pyramid

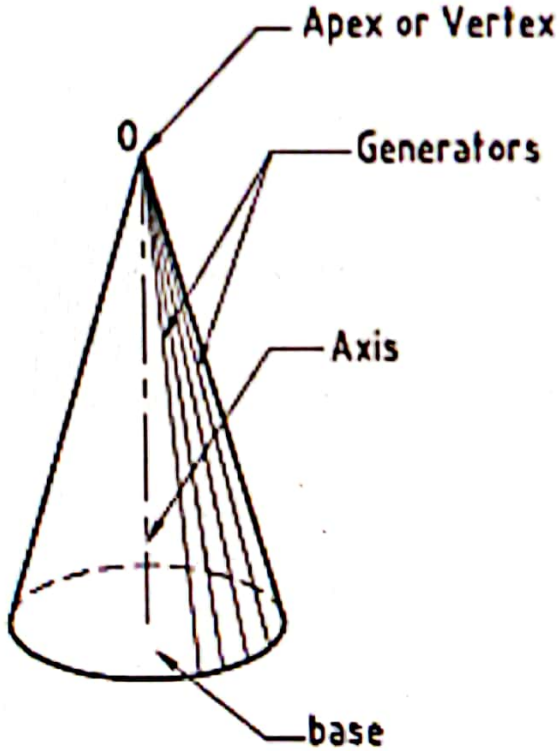


Hexagonal pyramid

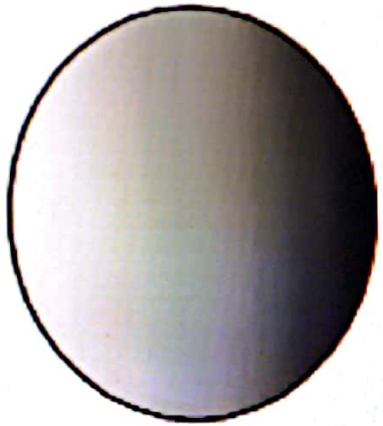
SOLIDS



Cylinder



Cone



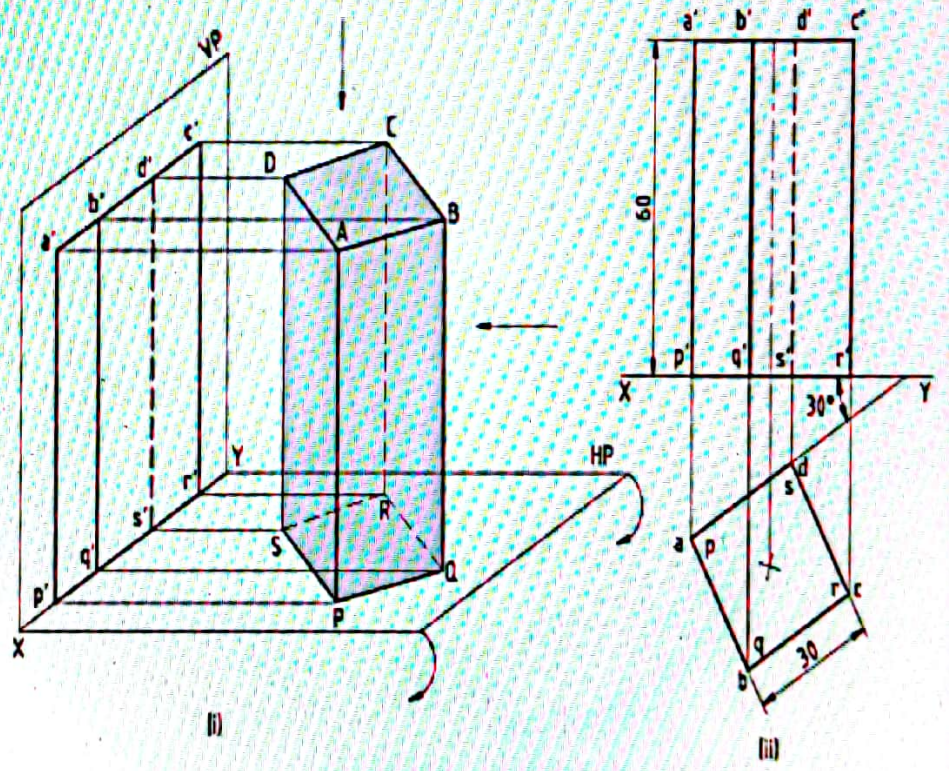
Sphere

Understanding Projections of Solid

- Any one of the solids given above is kept in first quadrant to draw its projections (TV, FV etc.).
- There are six different positions in which a solid can be placed with reference to its axis and reference planes (VP & HP).
- Your ability to visualize the solid and imagining the correct position is necessary to understand and draw the projections of the solid.

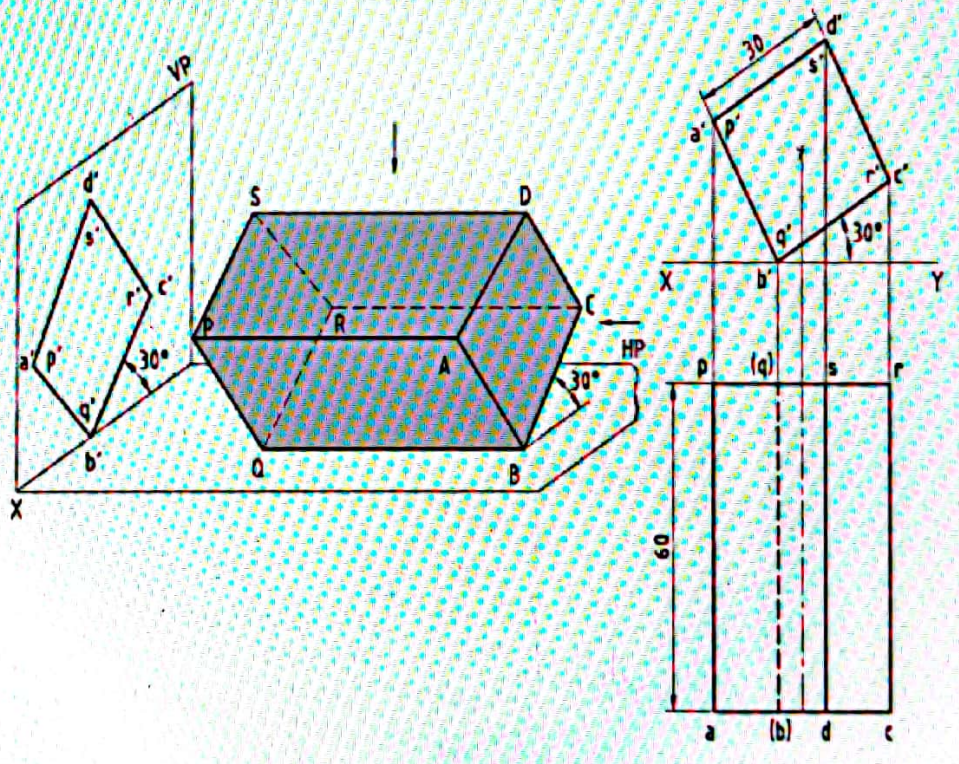
Projections of a Solid kept with its axis perpendicular to HP and parallel to VP

- Consider a square prism having its axis perpendicular to HP and parallel to VP.
- Top view is a square, note that the top and bottom bases are coinciding.
- Front view is a rectangle with visible and hidden longer edges of the prism.



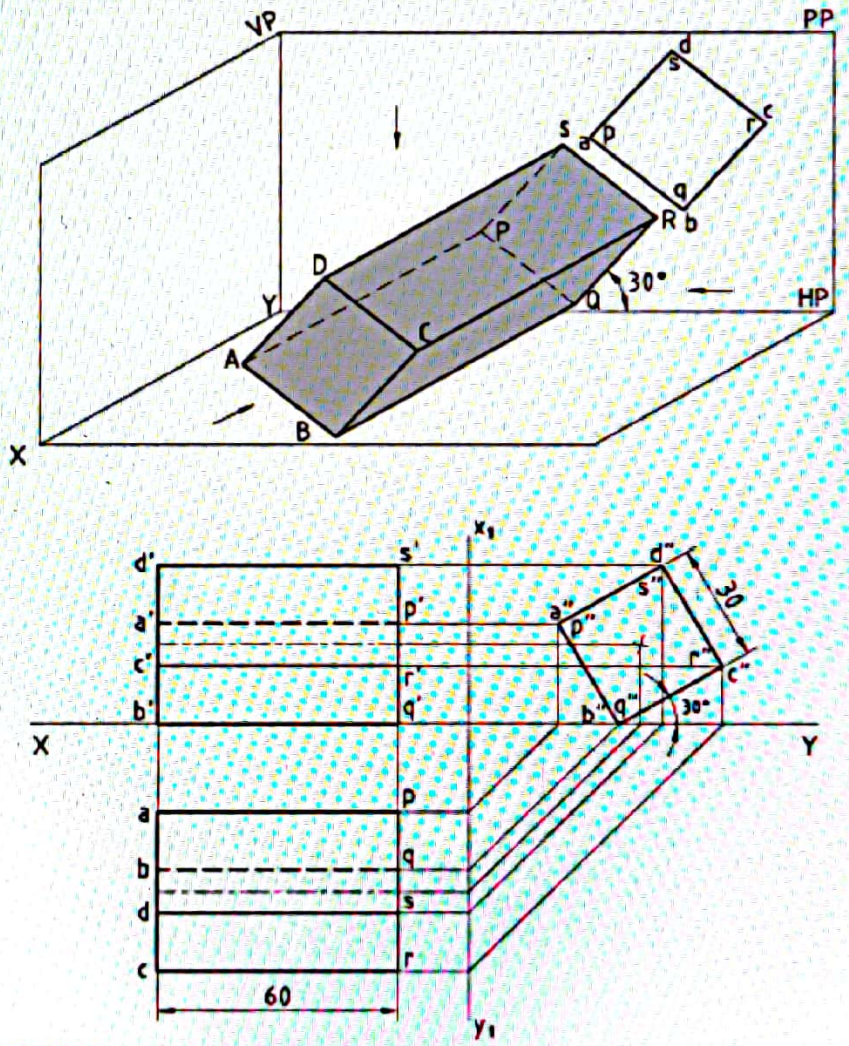
Projections of a Solid kept with its axis perpendicular to VP and parallel to HP

- Consider a square prism having its axis perpendicular to VP and parallel to HP.
- Front view is a square, note that the front and rear bases are coinciding.
- Top view is a rectangle with visible and hidden longer edges of the prism.



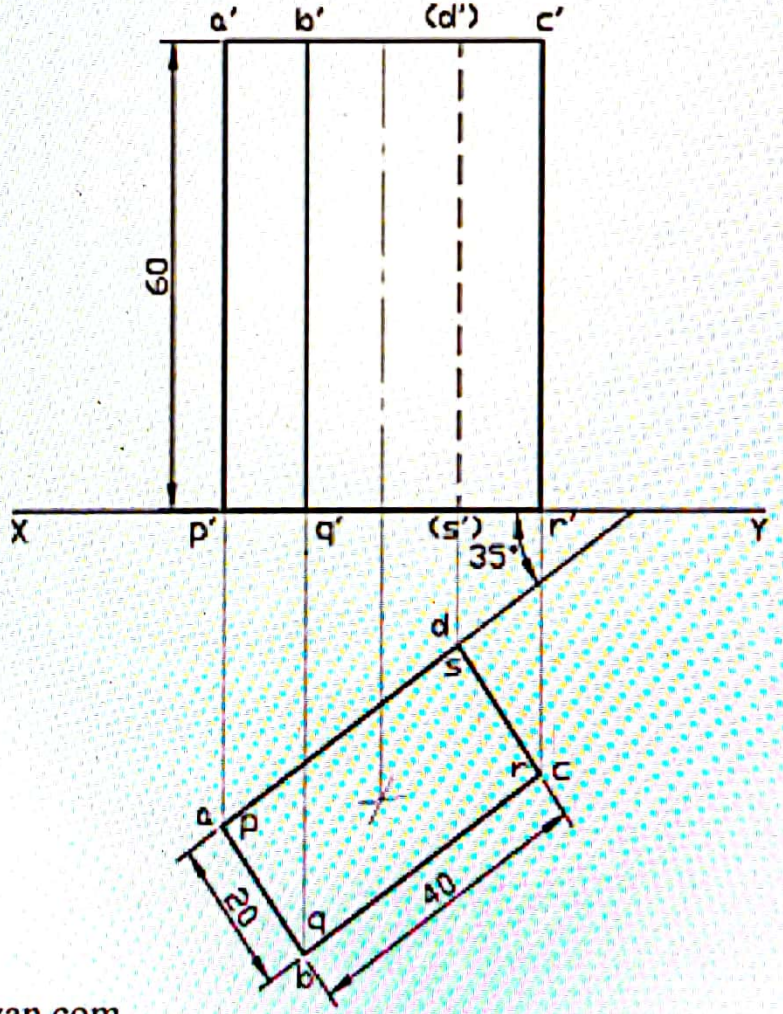
Projections of a Solid kept with its axis parallel to both HP and VP

- Consider a square prism having its axis parallel to both HP and VP.
- Side view is a square, note that the left and right bases are coinciding.
- Top view is a rectangle with visible and hidden longer edges of the prism.
- Front view is also a rectangle with visible and hidden longer edges of the prism.



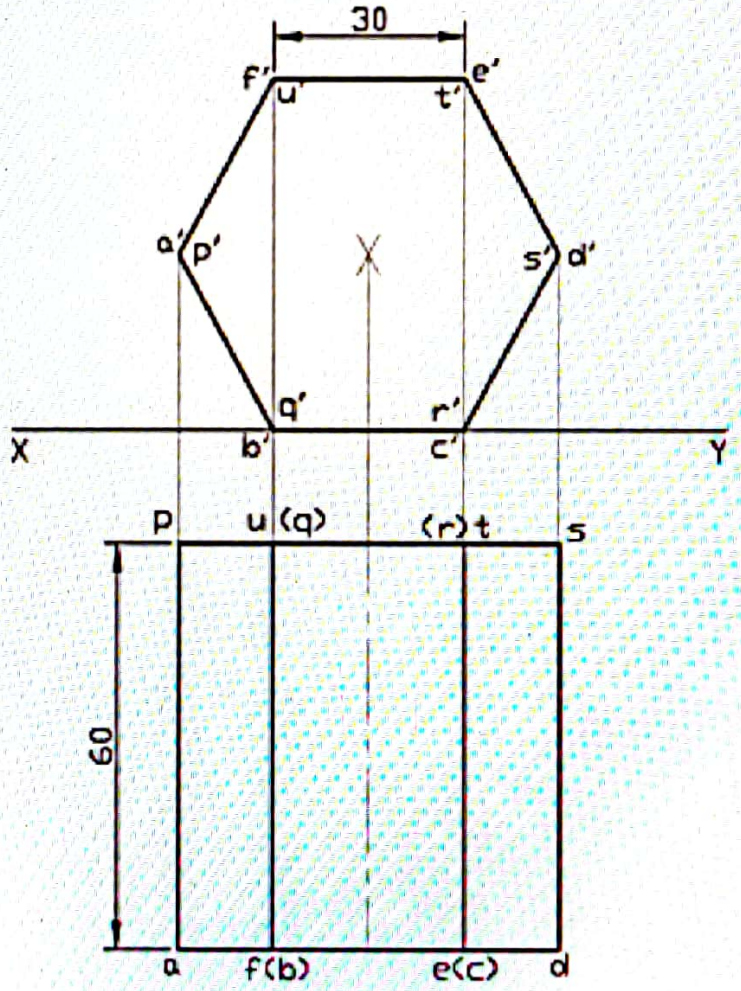
Example 1: A rectangular prism of base sides 40 × 20 mm and axis length 60 mm is resting on HP on one of its bases, with a longer base side inclined at 35° to VP. Draw its projections.

- Step: when the axis of the solid is perpendicular to HP and parallel to VP, Draw the TV and project the FV.
- Draw the TV which is rectangle with a side inclined at 35° to XY.
- Project and get the FV as a rectangle showing the visible and hidden edges.
- Note that hidden edges are shown in dashed lines.



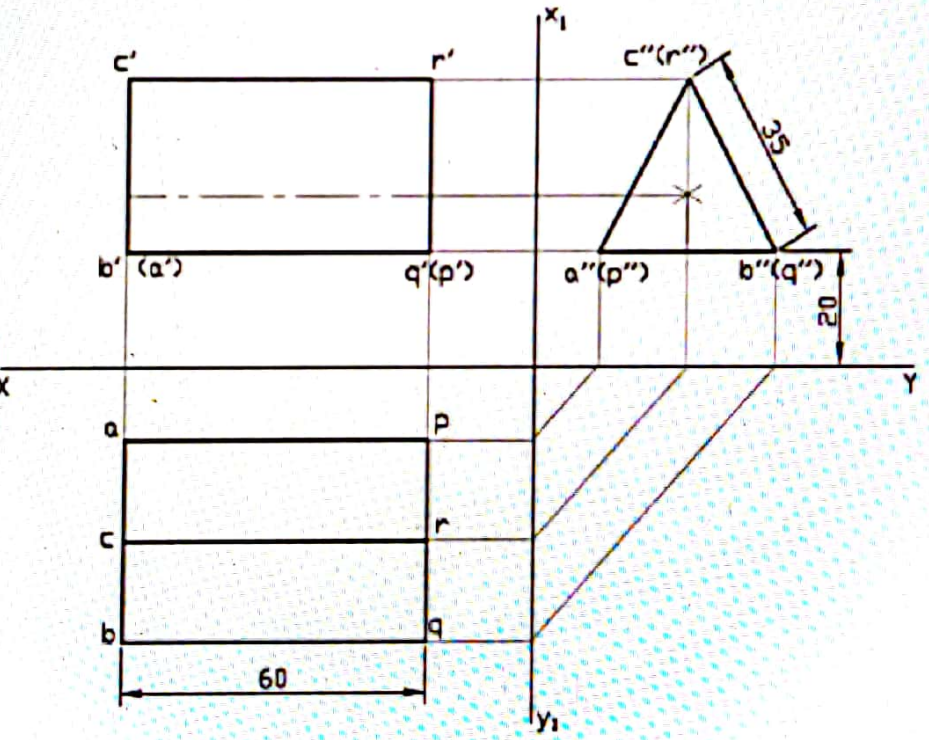
Example 2: A hexagonal prism of base side 30 mm and axis length 60 mm is resting on HP on one of its rectangular faces with its axis perpendicular to VP. Draw its projections.

- Step: when the solid axis is perpendicular to VP and parallel to HP, Draw the FV and project the TV.
- Draw the FV which is a hexagon with a side on XY.
- Project and get the TV as a rectangle showing visible and hidden edges.
- Note: When a visible edge coincides with a hidden edge, only the visible edge is drawn.



Example 3: A triangular prism of base side 35 mm and axis length 60 mm has one of its rectangular faces parallel to and 20 mm above HP. Draw its projections when the longer edges are parallel to VP.

- Step: when the axis of the solid is parallel to both HP and VP, Draw the Side view and project TV and FV.
- Draw the left side view (LSV) which is a triangle with a side parallel to XY.
- Project the TV which is a rectangle.
- Project the FV which is also a rectangle.



Tips to draw visible and hidden edges

- Read the given problem carefully and understand the FV and TV in that position and follow the steps as given against each position.
- Draw one of the views and project the other view.
- All boundary edges in any view are always visible.
- Edges in upper half of a solid, i.e. above axis in front view, is always visible in top view. Other edges are drawn in dashed lines.
- Edges in front half of a solid, i.e. in front of axis in top view, is always visible in front view. Other edges are drawn in dashed lines.

Projections of a Solid kept with its axis inclined to HP and parallel to VP

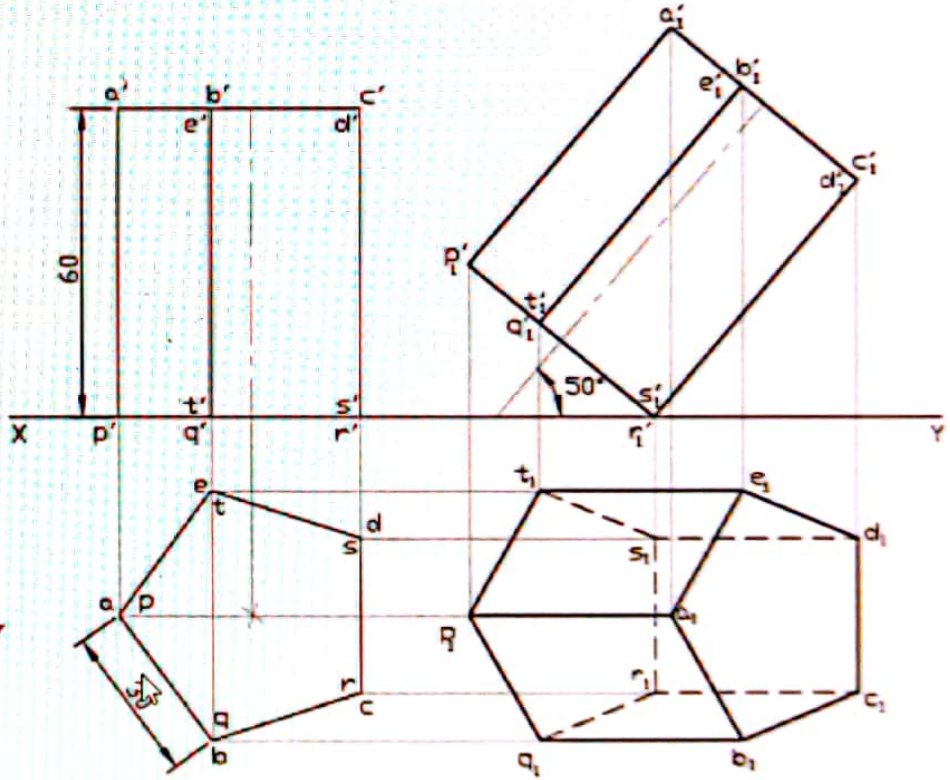
- Whenever the axis of the solid is kept inclined to HP and parallel to VP, the projections of the solid is drawn using the following methods.
  - Change of position method
  - Change of reference line method
- Change of position method is simple and commonly used to draw the projections.

Change of position method

- Change of position method has 2 steps
- Step 1: Assume the axis of the solid is kept perpendicular to HP and parallel to VP, draw the TV and project the FV. Care is taken to draw the polygon in TV.
- Step 2: Tilt and reproduce the FV obtained in STEP 1 and project the TV. Show the visible and hidden edges to complete the projections.

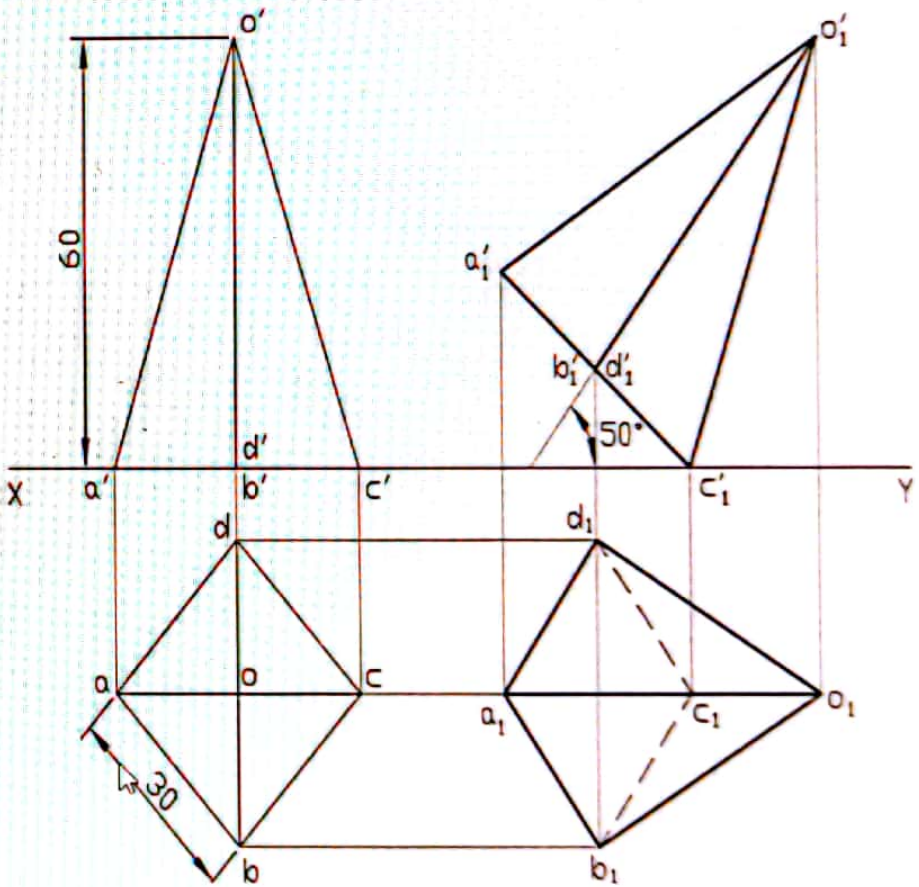
Example 1: A pentagonal prism of base side 30 mm axis length 60 mm is resting on *HP* on one of its base sides with its axis inclined at 50° to HP and parallel to VP. Draw its projections.

- Step1: Assume the axis perpendicular to HP and parallel to VP. Draw the TV and project the FV. Note that one of the sides of the pentagon is taken perpendicular to XY.
- Step 2: Tilt and reproduce the FV of STEP 1, axis at 50° to XY and project the TV. Show the visible and hidden edges to complete the projections.



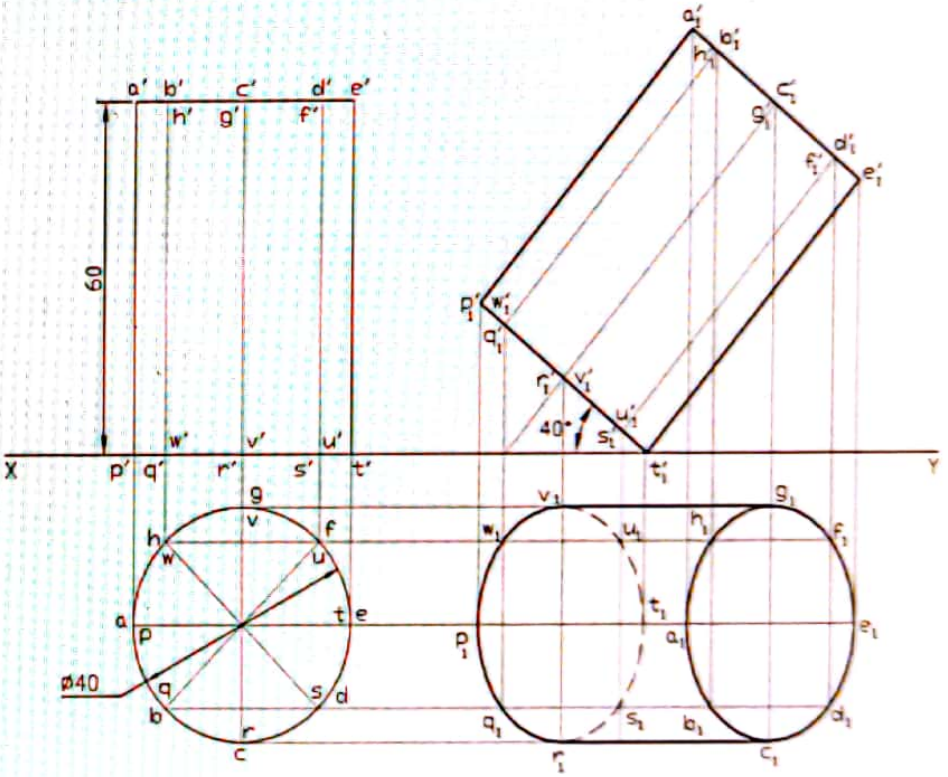
Example 2: A square pyramid of base side 30 mm, axis length 60 mm is resting on one of its base corners with its axis inclined at 50° to HP and parallel to VP. Draw its projections when the base sides containing the resting corner are equally inclined to HP.

- Step1: Assume the axis perpendicular to HP and parallel to VP. Draw the TV and project the FV. Note that two sides of the square are drawn equally inclined to XY.
- Step 2: Tilt and reproduce the FV of STEP 1, axis at 50° to XY and project the TV. Show the visible and hidden edges to complete the projections.



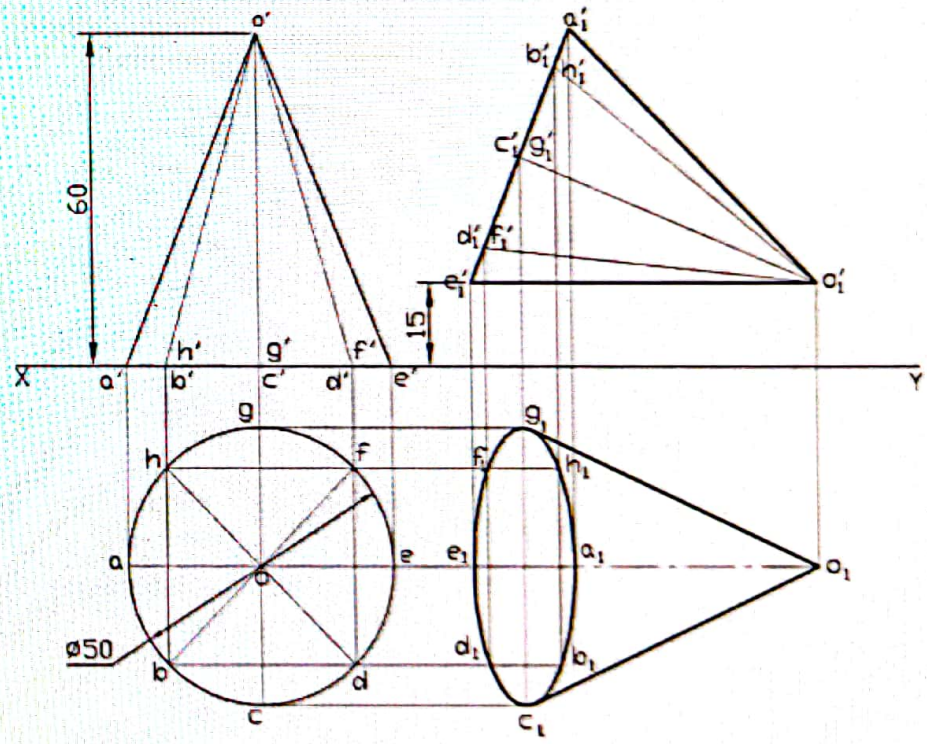
Example 3: A cylinder of base diameter 40 mm and axis length 60 mm is resting on HP on a point on the circumference of the base. Draw its projections when the bases are inclined at 40° to HP and perpendicular to VP.

- Step1: Assume the axis of the cylinder perpendicular to HP and parallel to VP. Draw TV and project FV. Divide the circle into 8 equal parts to show 8 generators.
- Step 2: Tilt and reproduce the FV of STEP 1, axis at 40° to XY and project the TV. Show the visible and hidden portion of the bottom base. Note that generators are shown in thin lines.



Example 4: A cone of base diameter 50 mm and axis length 60 mm is placed with a generator parallel to and 15 mm above HP. Draw its projections when the axis is parallel to HP.

- Step1: Assume the axis of the cone perpendicular to HP and parallel to VP. Draw TV and project FV. Divide the circle into 8 equal parts to show 8 generators.
- Step 2: Tilt and reproduce the FV of STEP 1 with a generator parallel to and 15mm above XY and project the TV. Note that generators are shown in thin lines.



Tips to Mark Visible and Hidden Edges

- Read the problem carefully and understand the 2 steps. Draw the polygon in first step of TV correctly and project FV, then follow the second step.
- Boundary edges of top or front view are always visible.
- The portion of the solid in front of the axis (observe from top View) is visible in front view and behind the axis is invisible.
- The base corners, edges and longer edges marked on and in front of the axis of the solid in top view are always visible in front view.

Projections of a Solid kept with its axis inclined to VP and parallel to HP

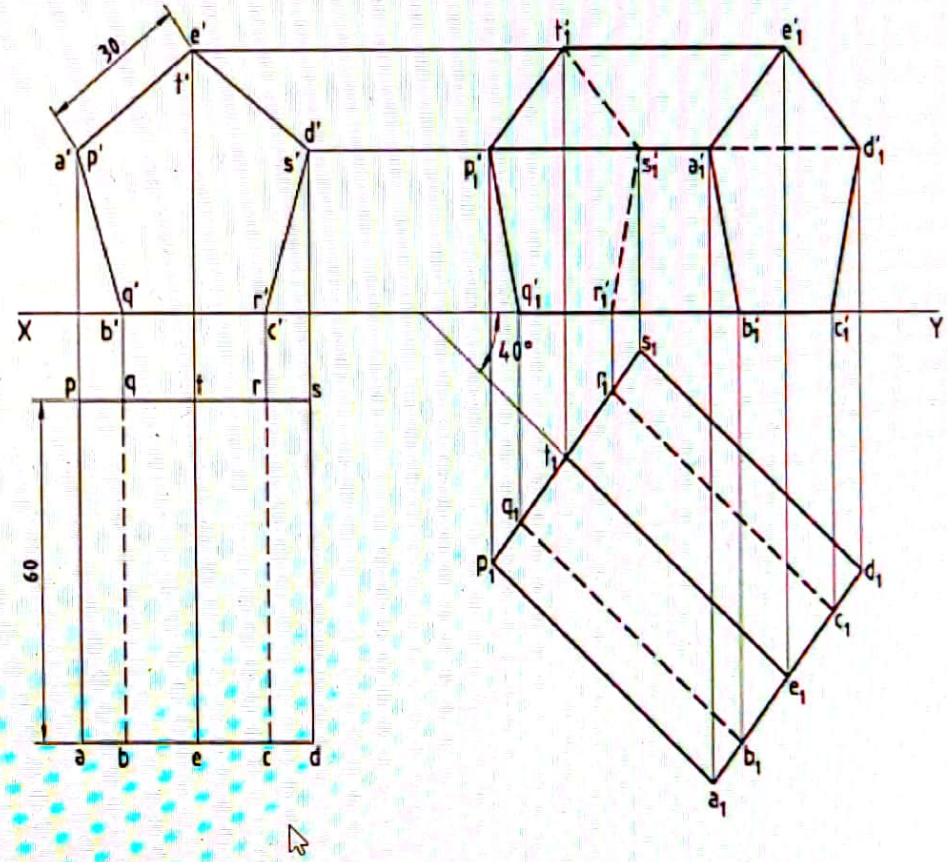
- Whenever the axis of the solid is kept inclined to VP and parallel to HP, the projections of the solid is drawn using the following methods.
  - Change of position method
  - Change of reference line method
- Change of position method is simple and commonly used to draw the projections.

Change of position method

- Change of position method has 2 steps
- Step 1: Assume the axis of the solid is kept perpendicular to VP and parallel to HP, draw the FV and project the TV.
- Step 2: Reproduce the TV obtained in STEP 1 to the required inclination of the axis with XY and project the FV. Show the visible and hidden edges to complete the projections.

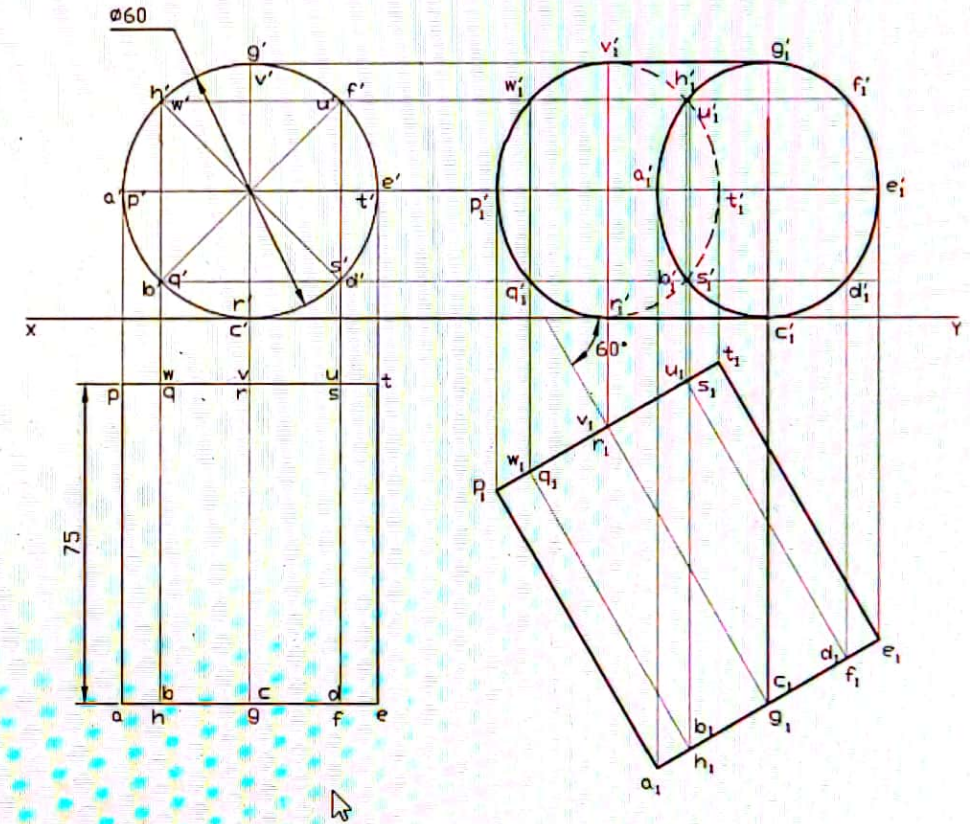
Example 1: A pentagonal prism of base side 30 mm axis length 60 mm is resting on HP on one of its rectangular faces with its axis inclined at 40° to VP. Draw its projections.

- Step1: Assume the axis perpendicular to VP and parallel to HP. Draw the FV and project the TV.
- Step 2: Reproduce the TV of STEP 1 at 40° to XY and project the FV. Show the visible and hidden edges to complete the projections.



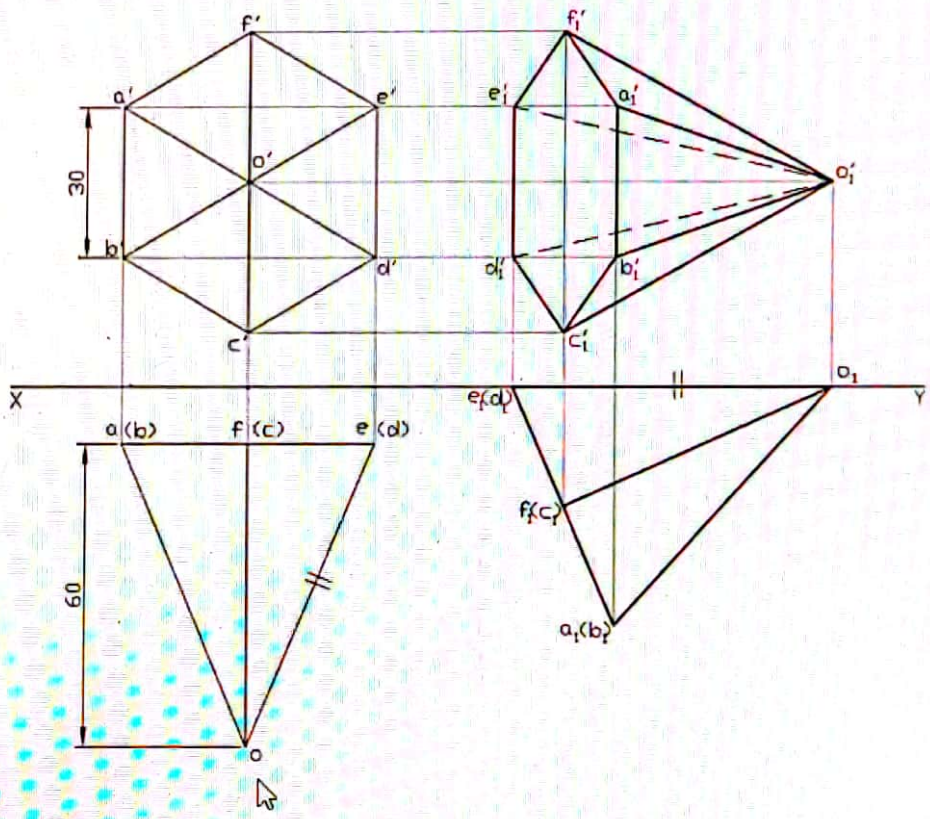
Example 2: Draw the projections of a cylinder 60 mm diameter and 75 mm long, lying on the ground with its axis inclined at 60° to VP. Draw its projections.

- Step1: Assume the axis perpendicular to VP and parallel to HP. Draw the FV and project the TV. Divide the circle into 8 equal parts to show 8 generators.
- Step 2: Reproduce the TV of STEP 1 at 60° to XY and project the FV. Show the visible and hidden edges to complete the projections.



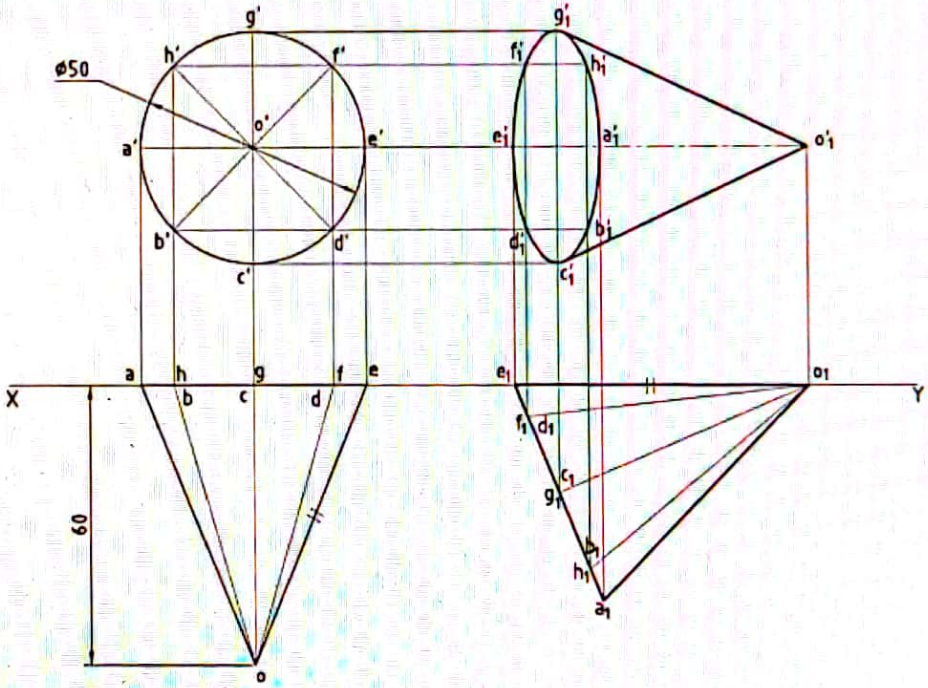
Example 3: A hexagonal pyramid of base side 30 mm and axis length 60 mm is resting on VP on one of its triangular faces with its axis parallel to HP. Draw its projections.

- Step1: Assume the axis perpendicular to VP and parallel to HP. Draw the FV and project the TV. Note that one of the sides of the hexagon is taken perpendicular to XY.
- Step 2: Reproduce the TV of STEP 1 and project the FV. Show the visible and hidden edges. Note that one of the triangular faces is on VP.



Example 4: A cone of base diameter 50 mm and axis length 60 mm is resting on VP on one of its generators with its axis parallel to HP. Draw its projections.

- Step1: Assume the axis perpendicular to VP and parallel to HP. Draw the FV and project the TV. Divide the circle into 8 equal parts to show 8 generators.
- Step 2: Reproduce the TV of STEP 1 such that one of the generators is on XY and project the FV. Note that generators are shown in thin lines.



Tips to Mark Visible and Hidden Edges

- Read the problem carefully and understand the 2 steps. Draw the polygon in first step of FV and project TV, then follow the second step.
- The base corners, edges and longer edges marked on and above the axis of the solid in front view are always visible in top view, other portion is invisible.
- Outer or boundary edges of top or front views are always visible.