Projections of Solids

Introduction

An object having three dimensions, i.e., length, breadth and height is called as solid. In orthographic projection, minimums of two views are necessary to represent a solid. Front view is used to represent length and height and the top view is used to represent length and breadth. Sometimes the above two views are not sufficient to represent the details. So a third view called as side view either from left or from right is necessary.

Objectives

At the end of this session, you will be able to

- Classify the different types of solids
- Draw the projections of solids in various positions in the given quadrant

Classification of Solids

Solids are classified into two groups. They are

- Polyhedra
- Solids of Revolution

Polyhedra

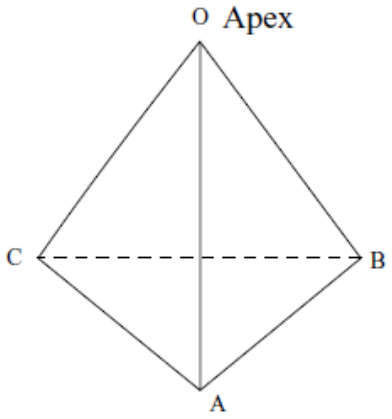
A solid, which is bounded by plane surfaces or faces, is called a polyhedron. Polyhedra are classified into three sub groups; these are

1. Regular Polyhedra
2. Prisms
3. Pyramids

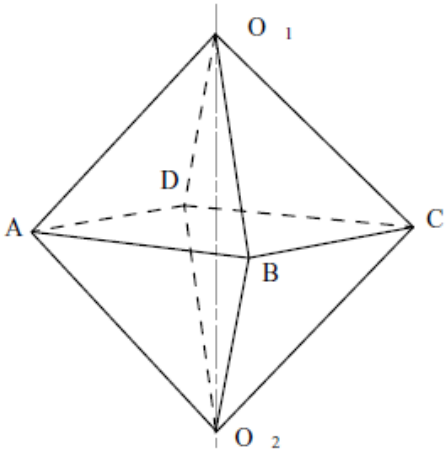
Regular Polyhedra

Polyhedra are regular if all their plane surfaces are regular polygons of the same shape and size. The regular plane surfaces are called "Faces" and the lines connecting adjacent faces are called "edges".

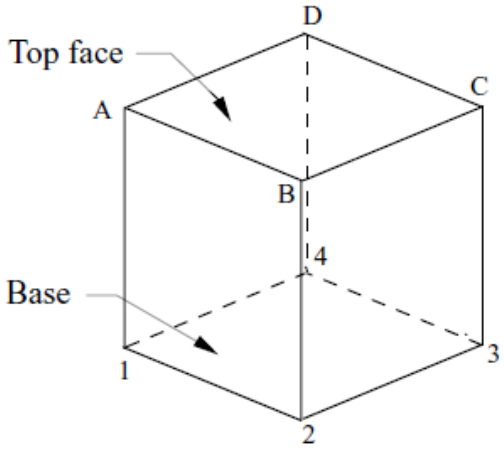
Tetrahedran



Octahedran



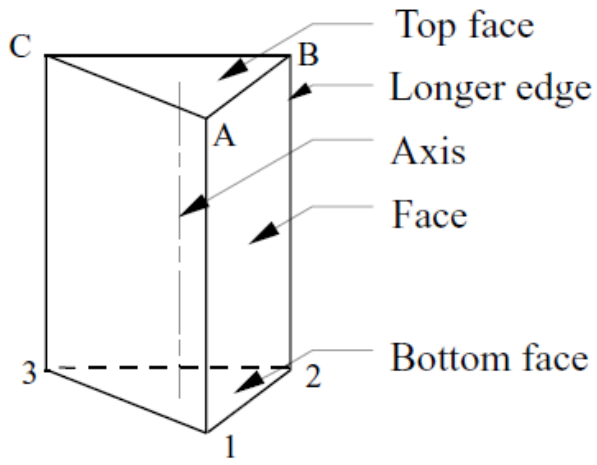
Hexahedran



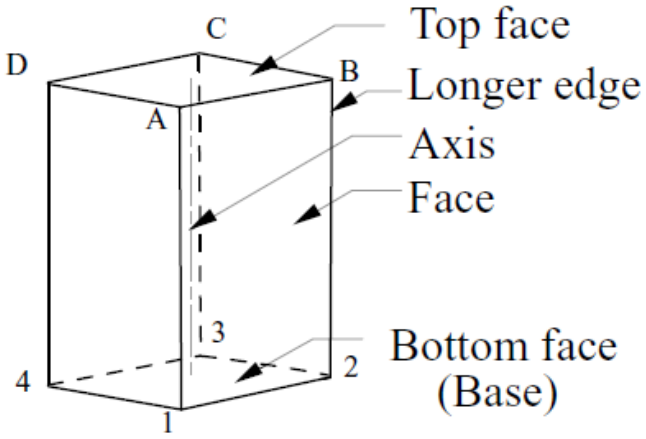
Prisms:

A prism has two equal and similar end faces called the top face and the bottom face or (base) joined by the other faces, which may be rectangles or parallelograms.

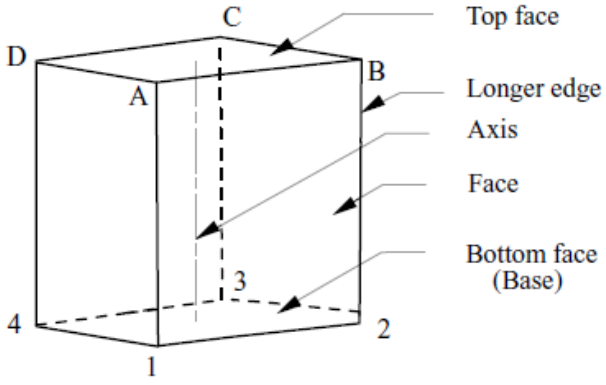
Triangular prism



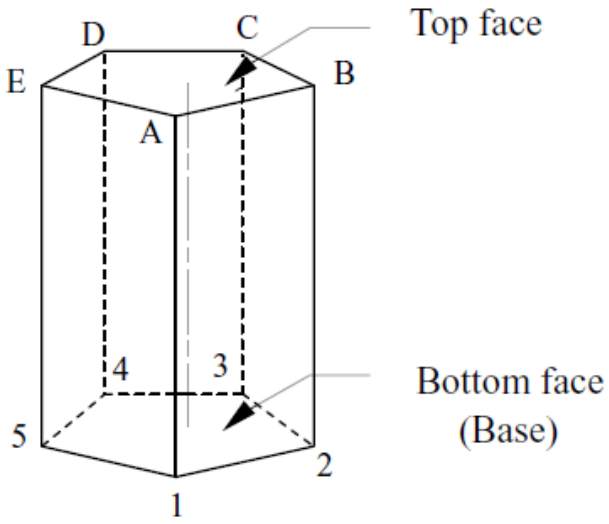
Square Prism



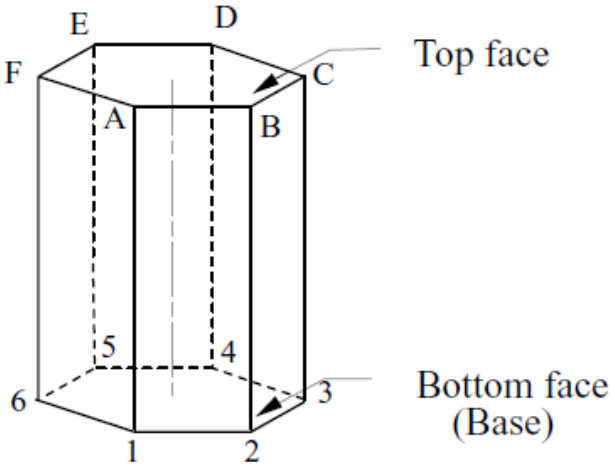
Rectangular Prism



Pentagonal Prism



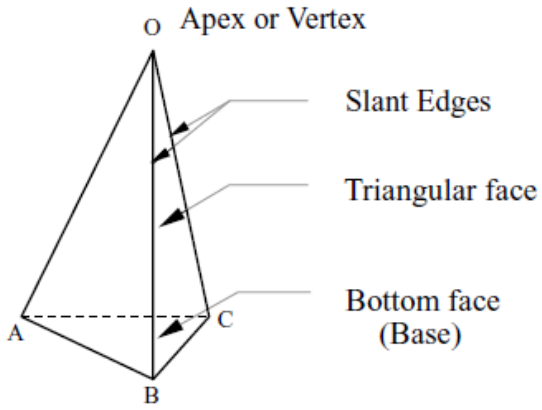
Hexagonal Prism



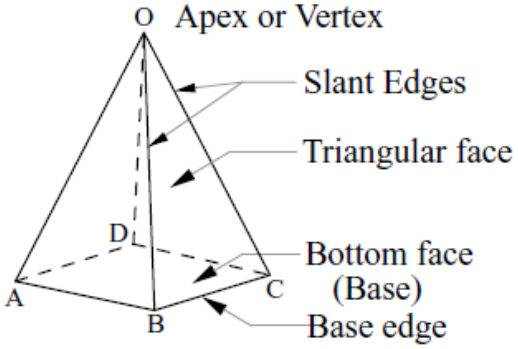
3. Pyramids:

A pyramid has a plane figure as at its base and an equal number of isosceles triangular faces that meet at a common point called the "vertex" or "apex". The line joining the apex and a corner of its base is called the slant edge. Pyramids are named according to the shapes of their bases.

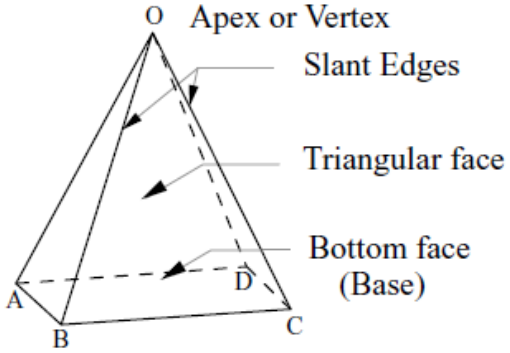
Triangular Pyramid



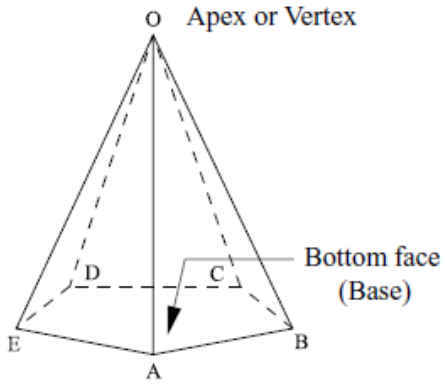
Square Pyramid



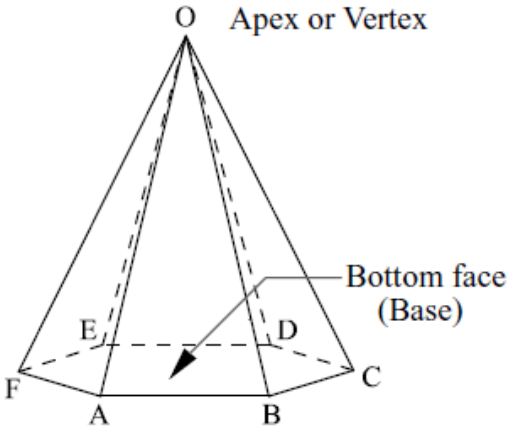
Rectangular Pyramid



Pentagonal Pyramid



Hexagonal Pyramid

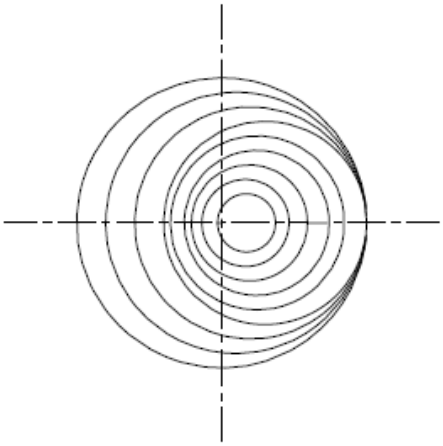


Solids of Revolution:

If a plane surface is revolved about one of its edges, the solid generated is called a Solid of Revolution.

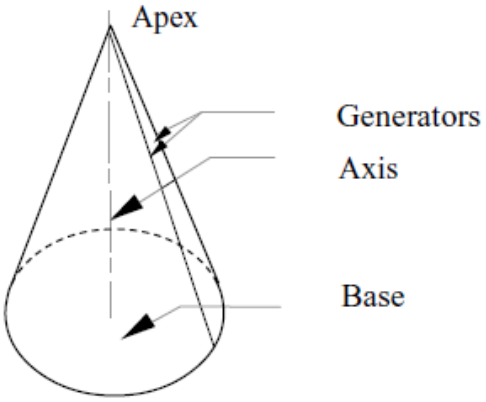
Sphere

A sphere can be generated by the revolution of a semi-circle about its diameter that remains fixed.



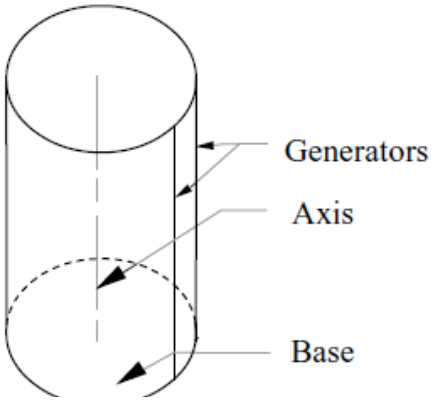
Cone

A cone can be generated by the revolution of a right-angled triangle about one of its perpendicular sides, which remains fixed. A cone has a circular base and an apex. The line joining apex and the centre of the base is called the "Axis" of the cone.



Cylinder

A right circular cylinder is a solid generated by the revolution of a rectangular surface about one of its sides, which remains fixed. It has two circular faces. The line joining the centres of the top and the bottom faces is called "Axis".

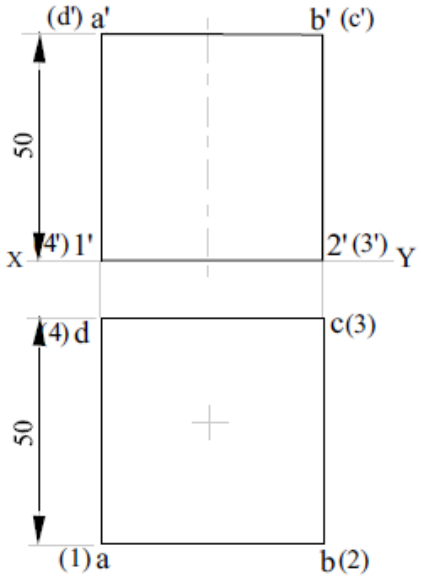


Projections of Solids

Perpendicular to the HP

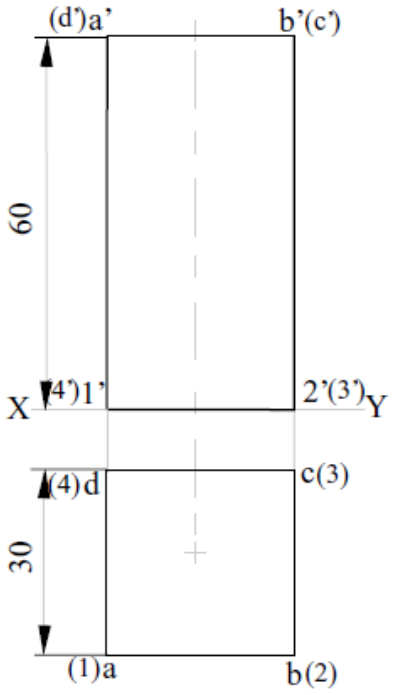
1. OK...! Let us imagine that a cube of 50mm side is resting with one of its square faces on the HP.

1. Draw the line XY.
2. Draw the top view as a square (Side 50 mm) and name its corners.
3. Draw projectors at each corner of the top view through line XY.
4. Draw the front view as a square (Side 50 mm) and name its corners.
5. Dimension the completed drawing.



2. **Ok...!** Let us imagine that a square prism of base 30mm and height 60mm is resting with its base on the HP and one of its vertical faces perpendicular to the VP.

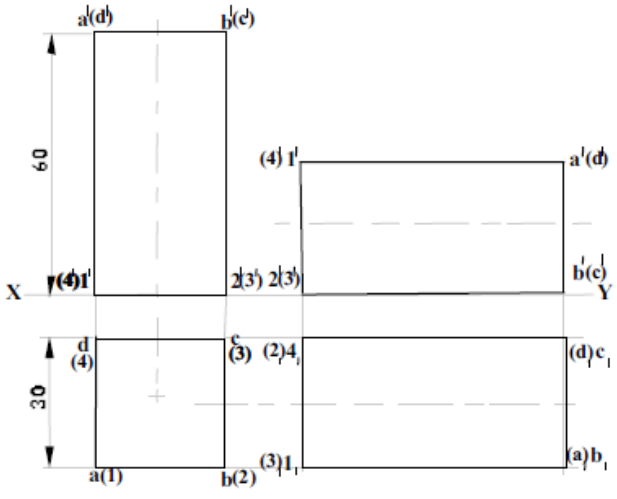
1. Draw the line XY
2. Draw the top view as square and name its corners.
3. Draw projectors from each corner of the top view through XY.
4. Draw the front view as shown and name its corners.
5. Dimension the completed drawing.



Parallel to the HP and the VP

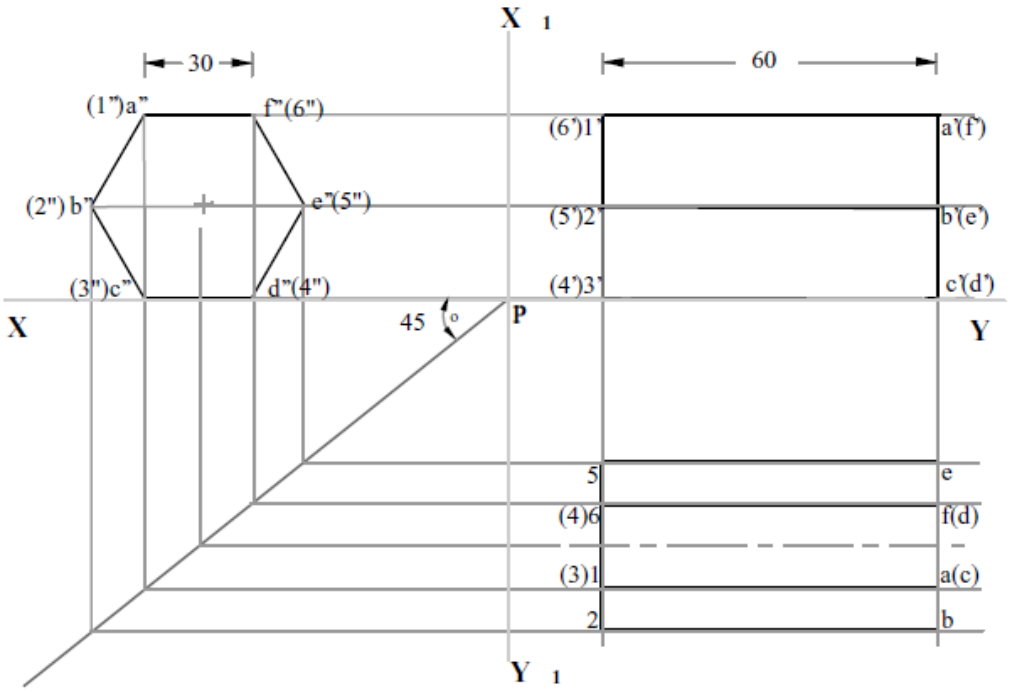
1. OK...! Let us imagine that a square prism of base 30mm and axis 60mm long lies on the HP, such that its axis is parallel to both the HP and the VP.

1. Draw the line XY.
2. Draw the projections (top and front views) of the solid in simple position (an edge of its base is perpendicular to the VP).
3. Rotate the front view through 90°.
4. Draw projectors from the rotated front view and the initial top view and name the points of intersection.
5. Join the points correspondingly to get the final top view.



2. OK...!Let us imagine that a hexagonal prism of base 30mm and axis 60mm long lies on one of its rectangular faces on the HP, such that its axis is parallel to both the HP and the VP. (Side View Method)

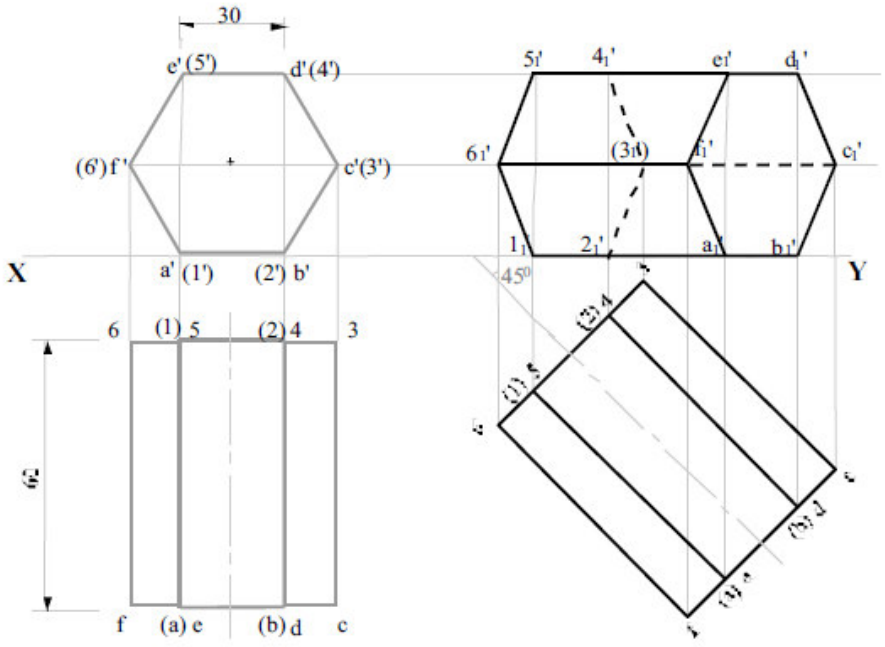
1. Draw the lines XY and X_1Y_1 perpendicular to each other, intersecting at P as shown.
2. Draw the side view of the hexagonal prism and name its corners.
3. Draw projectors from the corners of the side view perpendicular to X_1Y_1.
4. Draw the front view and name its corners.
5. From P draw a line at 45° to XY and X_1Y_1. (This line is called the Miter line).
6. From the side view draw projectors to meet the Miter line.
7. From the Miter line draw projectors parallel to XY.
8. From the front view draw projectors parallel to X_1Y_1 and name the intersection points.
9. Draw the final top view.



Parallel to the HP and Inclined to the VP

1. Ok...! Let us imagine that a hexagonal prism of base 30mm and height 60mm lies on one of its rectangular faces lies on the HP, such that its axis is inclined at 45° to the VP.

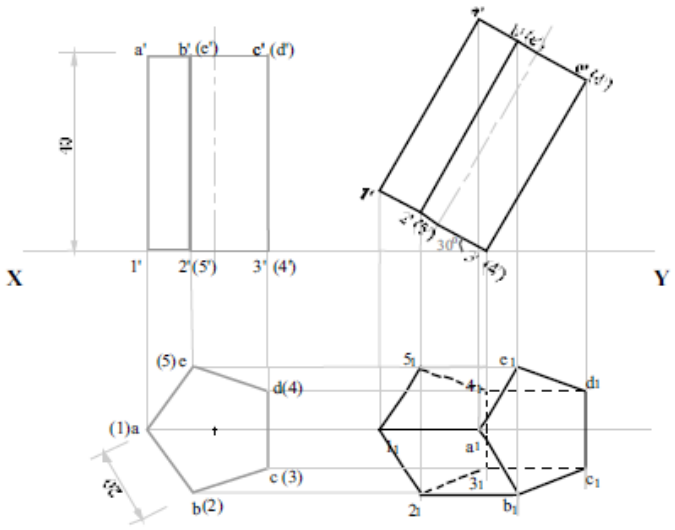
1. Draw the line XY.
2. Draw the projections of the prism in simple position.
3. Rotate the axis of the top view through 45° with respect to XY.
4. Draw projectors from the rotated top view and the initial front view and name the points of intersection..
5. Join all the points correspondingly to get the final front view.



Parallel to the VP and Inclined to the HP

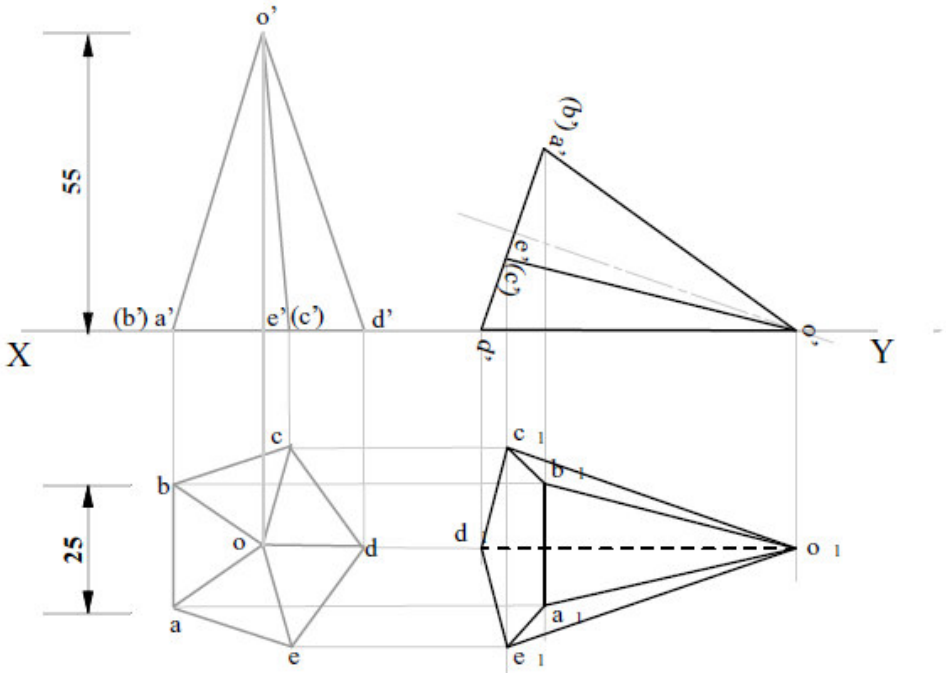
1. OK...! Let us imagine that a pentagonal prism of base 20mm and axis 40mm long rests on one of the edges of its base on the HP. The edge makes an angle of 30° to the HP and the axis of prism is parallel to the VP.

1. Draw the line XY.
2. Draw the projection of the prism in simple position.
3. Rotate the base of the front view through 30^0 with respect to XY so that only the edge (3',4') rests on the HP.
4. Draw projectors from the rotated front view and the initial top view and name the points of intersections.
5. Join the points correspondingly to get the final top view.



2. OK...!Let us imagine that a pentagonal pyramid of base 25mm and axis 55mm long lies on one of its longer edges on the HP and its axis is parallel to the VP.

1. Draw the line XY.
2. Draw the projection of solid in simple position.
3. Rotate the Front view such that one of the slant edge o'd' will lie on XY Line.
4. Draw projectors from the rotated front view and the initial top view and name it.
5. Join the points correspondingly to get the final top view.



Projection of Solids – Exercises

1. A cube of side 55mm resting on the HP on one of its faces with one of its vertical faces inclined at 30^0 to the VP, draw the top view and front view.

2. A pentagonal prism side of base 25mm and axis 55mm resting on the HP on its base with one of the rectangular faces inclined at 45° to VP draw the top view and front view.

3. A hexagonal pyramid side of base 25mm and axis 55mm resting on its base HP, and the base edge is inclined at 45° to VP draw the top view and front view.

4. A cone of radius 20mm and axis 60mm resting with its base on HP, draw the projections.

5. Draw the projection of hexagonal prism of base 30mm and axis 65mm rests with its base on HP and the base side is parallel to and 20mm in front of VP.

6. A tetrahedron of side 50 mm and rests on HP draw the projections when one of its edge is parallel to VP.

7. Draw the projections of hexagonal prism of base 30mm and axis 55mm resting on one corner of the base on HP and the base containing the edge 45° to HP and axis perpendicular to VP.

8. A square prism, side of base 35mm and axis 60mm long lies with one of its longer edge on HP. Draw the projection of prism when the axis is perpendicular to VP and one of its rectangular faces is inclined to 35° to HP.