

216U06C105 – Engineering Drawing

Module – IV: Projection of Solids

Parag Sarode
Assistant Professor
Department of Mechanical Engineering
Room – A301
e-mail – parag.sarode@somaiya.edu

■ Projection of Solids Syllabus

- 4.1 Introduction to Projection of Solids, Classification of Solids
- 4.2 Projection of right regular solids (prism, pyramid, cylinder, and cone) inclined to one reference plane only (excluding spheres, hollow and composite solids)

■ Principal planes

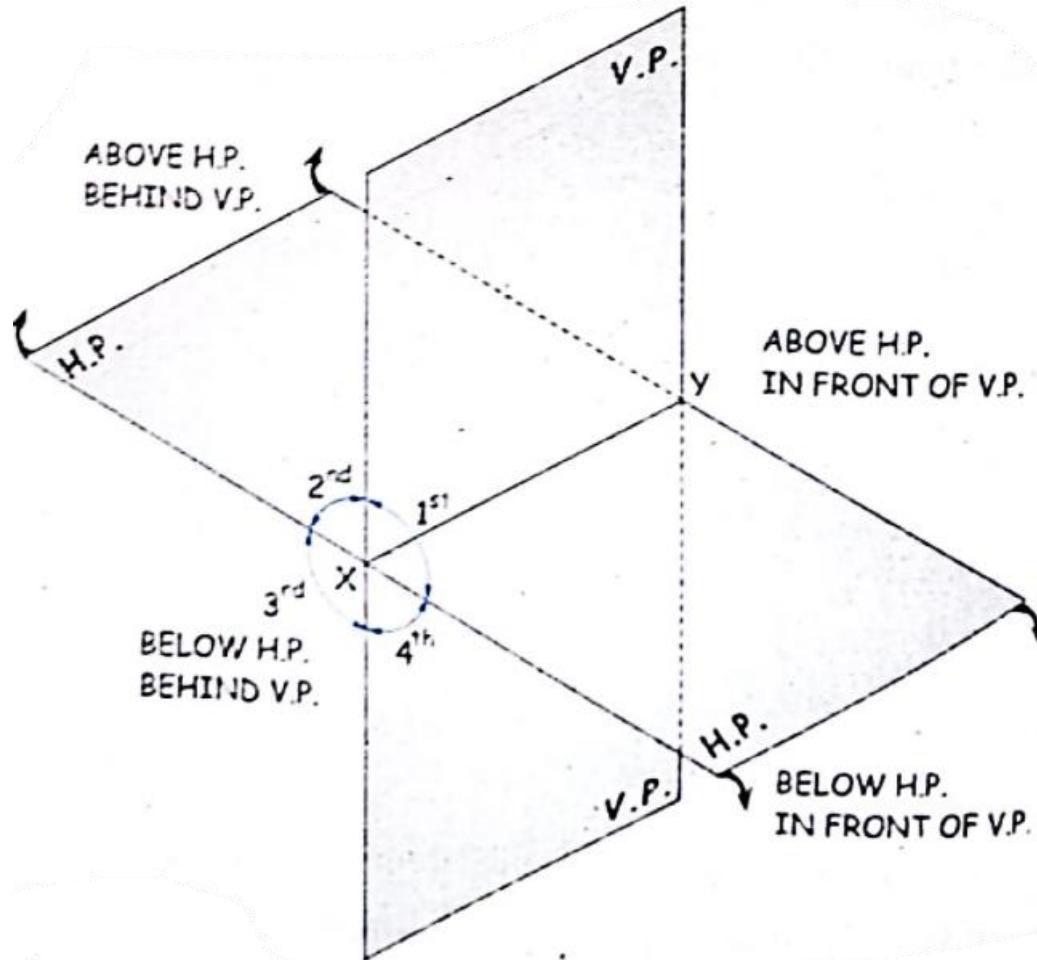


Fig. 1 Principal Planes [1]

Basic Line Types

Types of Lines	Appearance	Name according to application
Continuous thick line	—	Visible line
Continuous thin line	—	Dimension line Extension line Leader line
Dash thick line	- - - - -	Hidden line
Chain thin line	— — — — —	Center line



■ Introduction to solids

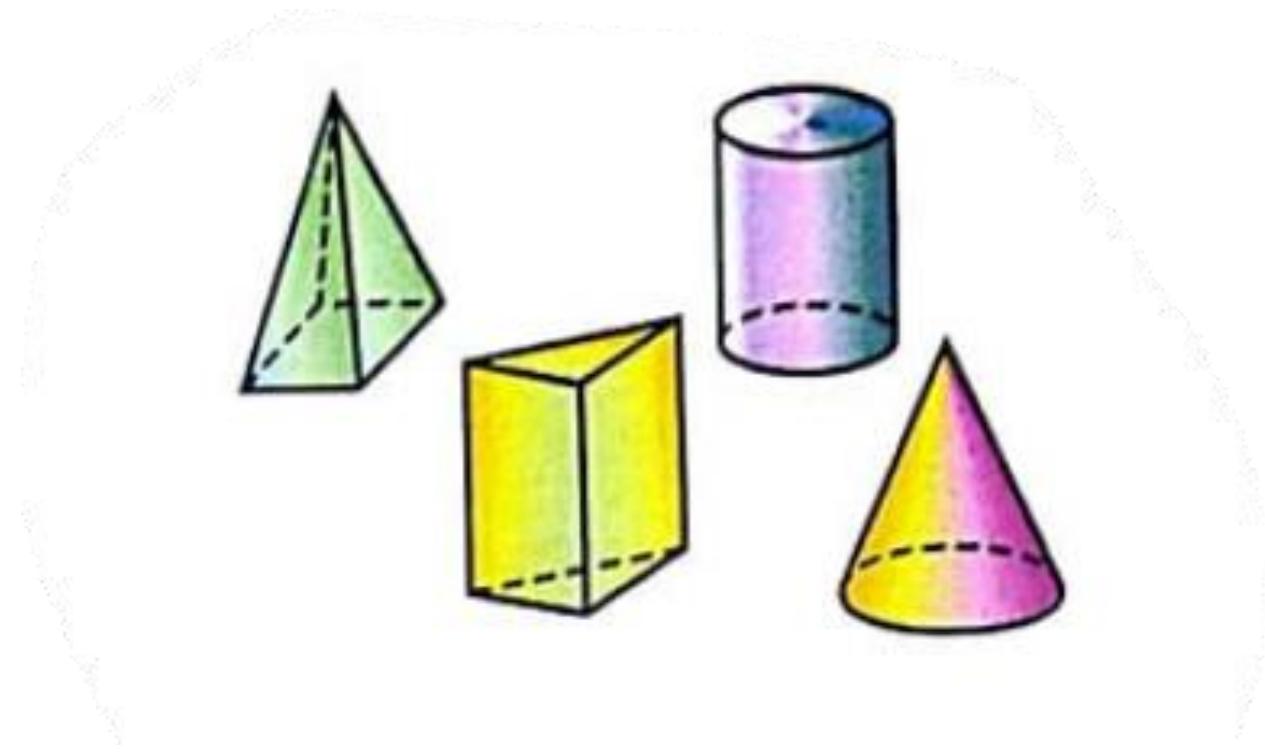


Fig. 2 Solids^[1]

■ Classification of Solids

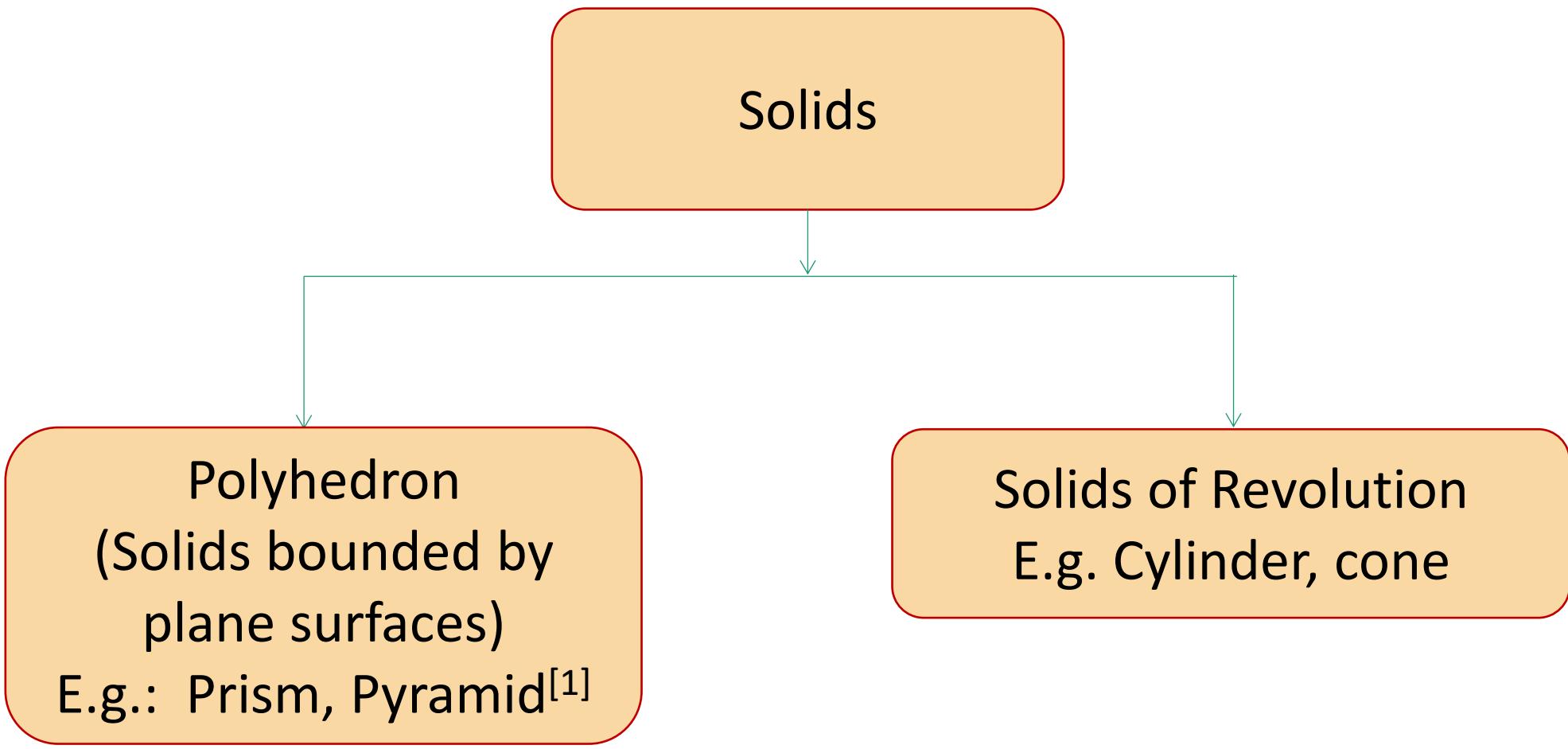


Fig. 3 Classification of
Solids^[1]

■ Polyhedron Solids

- Important Terminologies in Solids
 - **Faces of solids:** The plane surfaces
 - **Edges:** The lines of Intersection of faces of solid
 - **Corner:** The point at which any three faces meet
 - **Regular polyhedron:** When the faces are equal and regular polygon

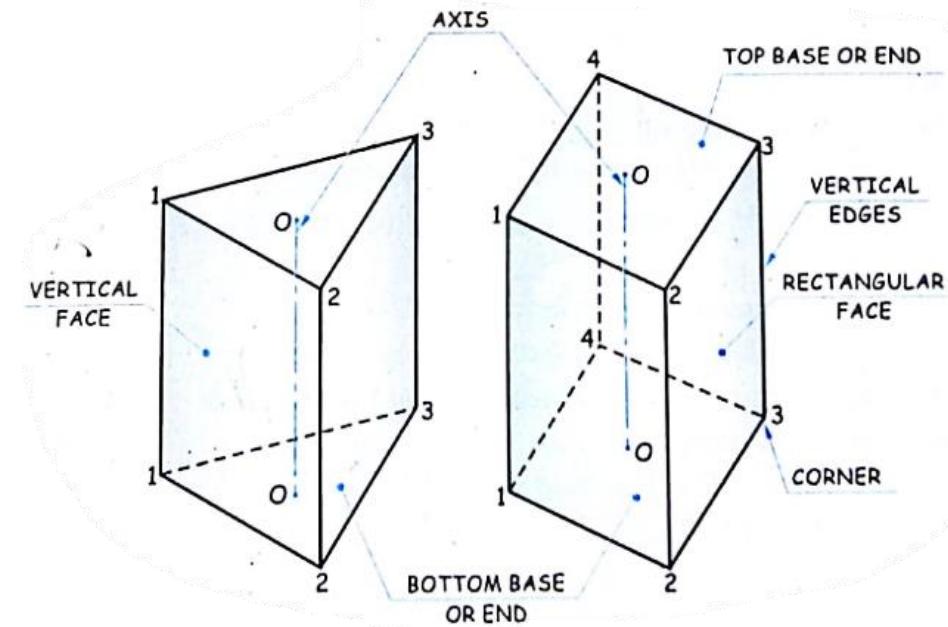


Fig. 4.1 Triangular Prism

Fig. 4.2 square Prism

Fig. 4 Polyhedron Solids^[1]

■ Polyhedron Solids: Prism

□ Important Terminologies in Prism

➤ **Axis:** Imaginary straight line passing through the centre of bases

➤ **Vertical Edge (longer or lateral edge):** Two rectangular faces meet to form the vertical edge

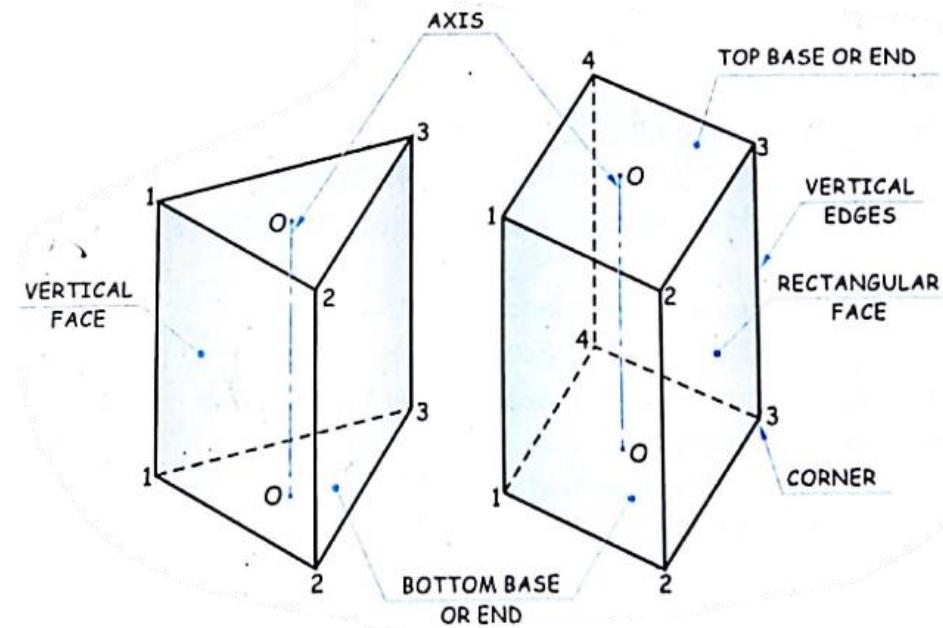


Fig. 4.1 Triangular Prism

Fig. 4.2 Square Prism

Fig. 4 Polyhedron Solids^[1]

■ Polyhedron Solids: Prism

□ Important Terminologies in Prism

- **Edge of base (Side of base or shorter edge):** The rectangular face and end face (base) meets to form the edge of base.
- **Corner:** Three faces meet to form a corner

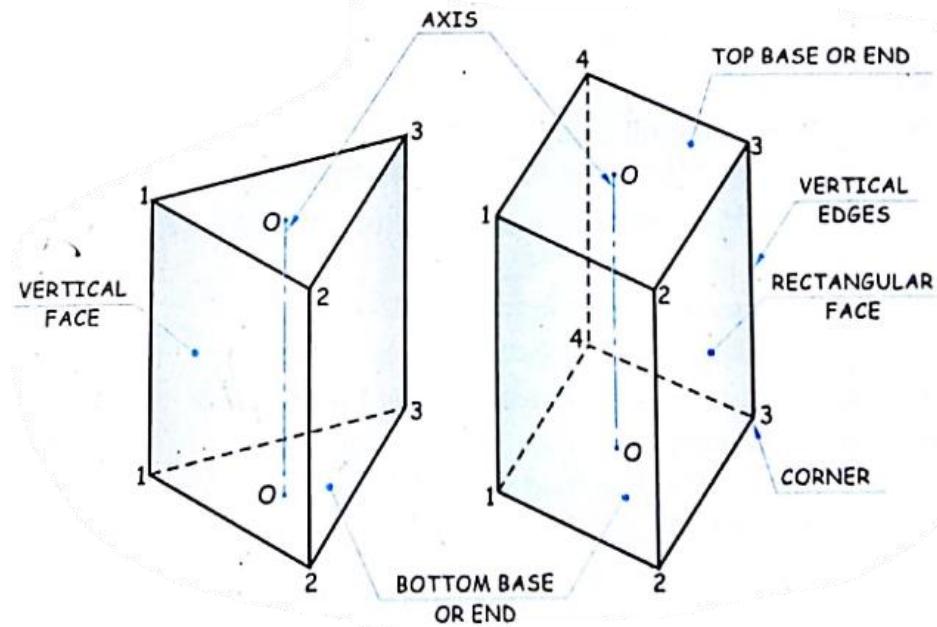


Fig. 4.1 Triangular Prism

Fig. 4.2 Triangular Prism

Fig. 4 Polyhedron Solids[1]

■ Polyhedron Solids: Prism (Right Regular, Oblique, truncated)

□ Important Terminologies in Prism

➤ Right regular Prism

If axis of prism is perpendicular to its base and its faces, they are right regular prism

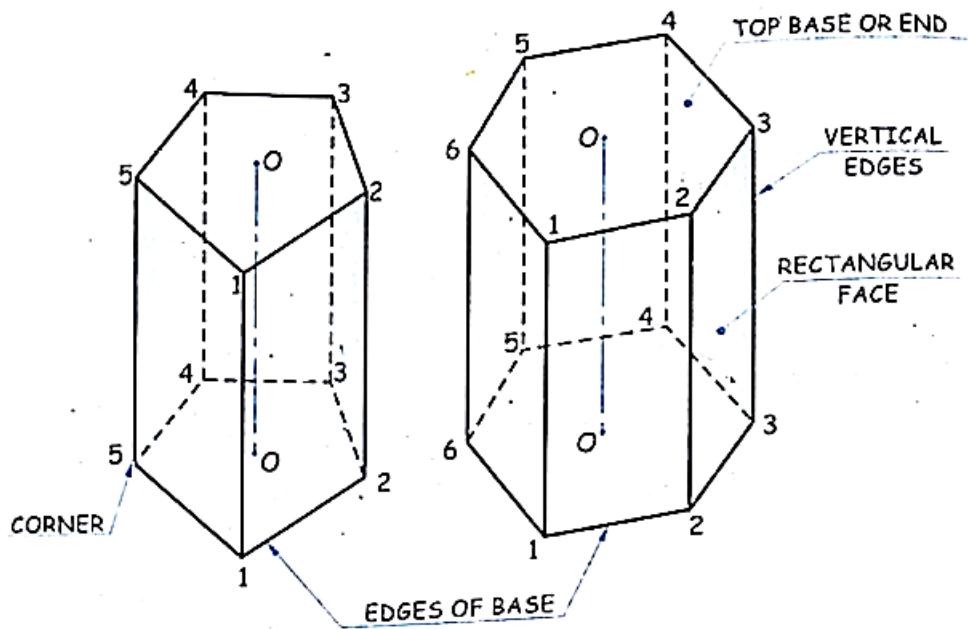


Fig. 5.1 Pentagonal
Prism

Fig. 5.2 Hexagonal
Prism

Fig. 5 Right Regular Prism^[1]

■ Polyhedron Solids: Prism (Right Regular, Oblique, truncated)

□ Important Terminologies in Prism

- **Oblique Prism:** If prism axis inclined to its base and its faces are regular parallelogram, then it is said to oblique prism.
- **Truncated Prism:** When the prism is cut by cutting plane inclined to the base and if the top portion is removed, it is said to be truncated prism

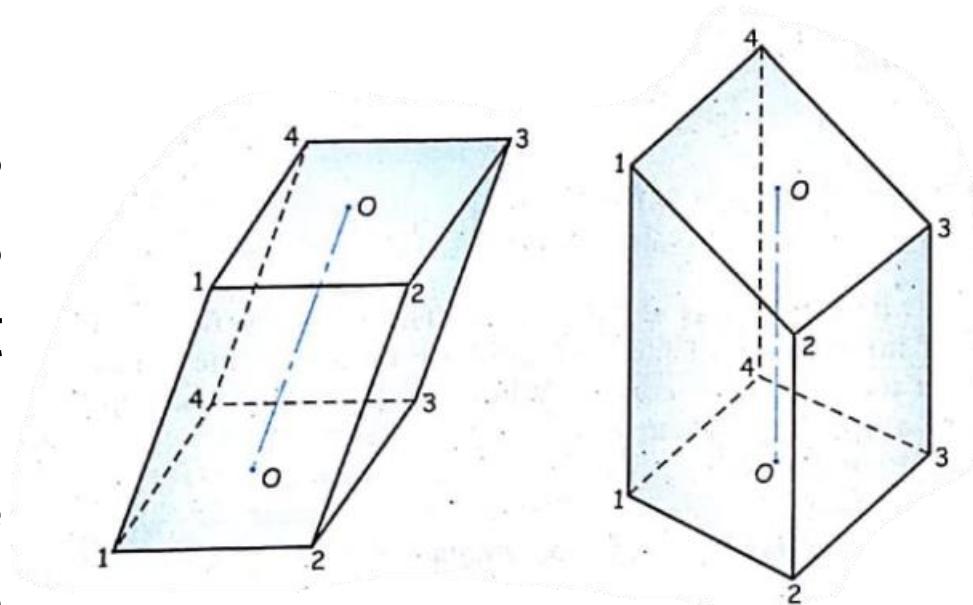


Fig.6.1 Oblique Prism

Fig. 6.2 Truncated Prism

Fig. 6 Prism^[1]

■ Polyhedron Solids: Cube

□ Cube/Hexahedron:

- For a cube length, breadth and height are equal
- A cube has six equal squares faces

□ Number of edges:

- Number of edges of a prism are three times of the side of a base polygon

□ Number of edges = $3n$, n = number of sides of a base polygon

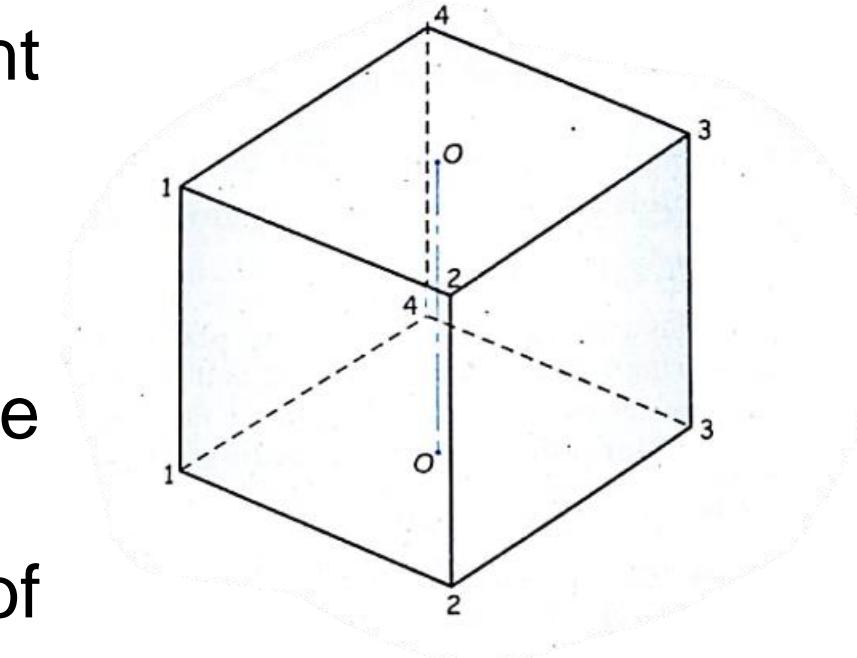


Fig.7.1 Cube

■ Polyhedron Solids: Prism: General practice for naming the points

- Top edges of base and bottom edges of base
 - 1-2, 2-3,
- Vertical Edges
 - 1-1, 2-2,
- Rectangular faces or vertical faces or lateral faces
 - 1-1-2-2, 2-2-3-3,
- Corner of top base and corner of bottom base
 - 1,2,3....
- Axis
 - O-O

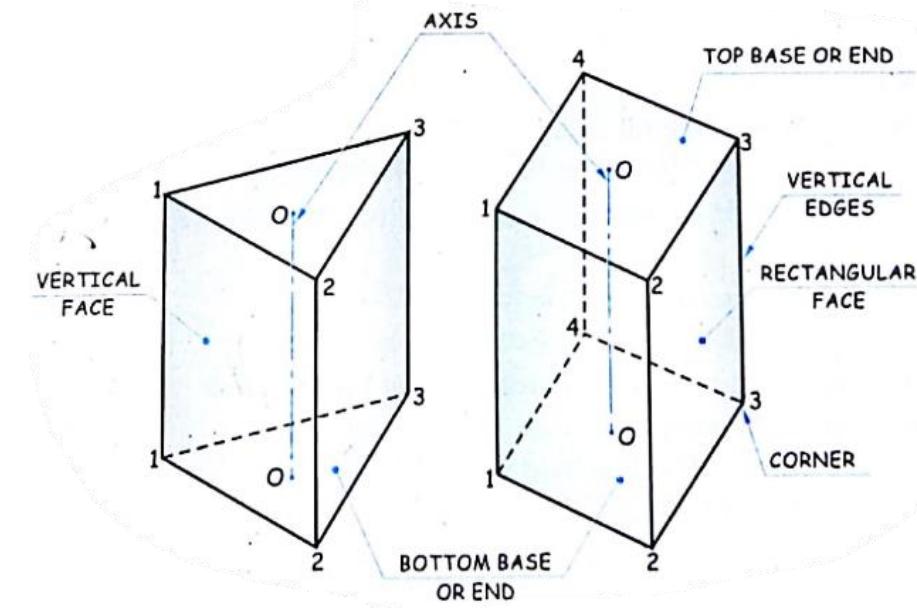


Fig. 4.1 Triangular Prism

Fig. 4.2 Square Prism

Fig. 8 prism^[1]

■ Polyhedron Solids: Pyramid

□ Axis

- The imaginary straight line passing through the apex and the centre of base

□ Slant Edge/edge of triangular face/lateral edge/inclined edge/longer edge

- Two triangular faces meet to form the slant edge.

□ Edge of base/side of base/shorter edge

- The triangular face and end face (base) meet to form the edge of base.

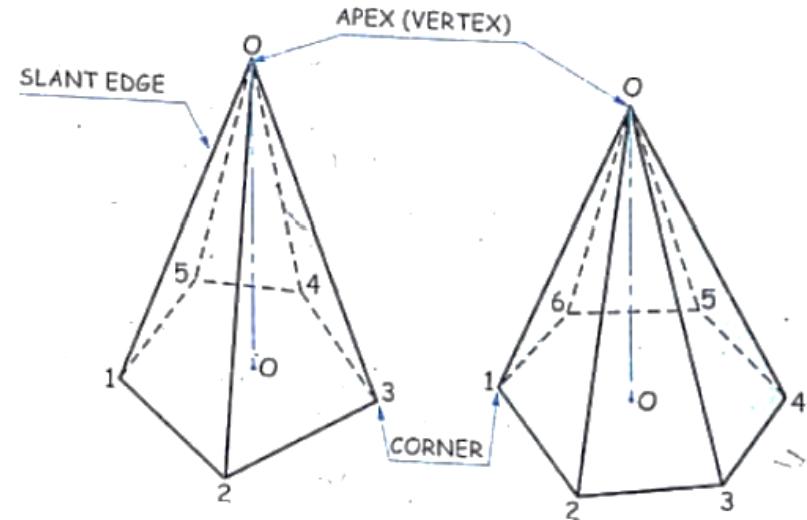


Fig. 9.3 Pentagonal Fig. 9.4 Hexagon
Pyramid Pyramids

■ Polyhedron Solids: Pyramid

□ Corner

- Three faces meet to form the corner. The pyramid are named as per the shape of base

E.g. triangular, square, pentagonal, hexagonal

□ A right regular pyramid

- For a right regular pyramid, its axis is perpendicular to its base and its faces are regular triangles

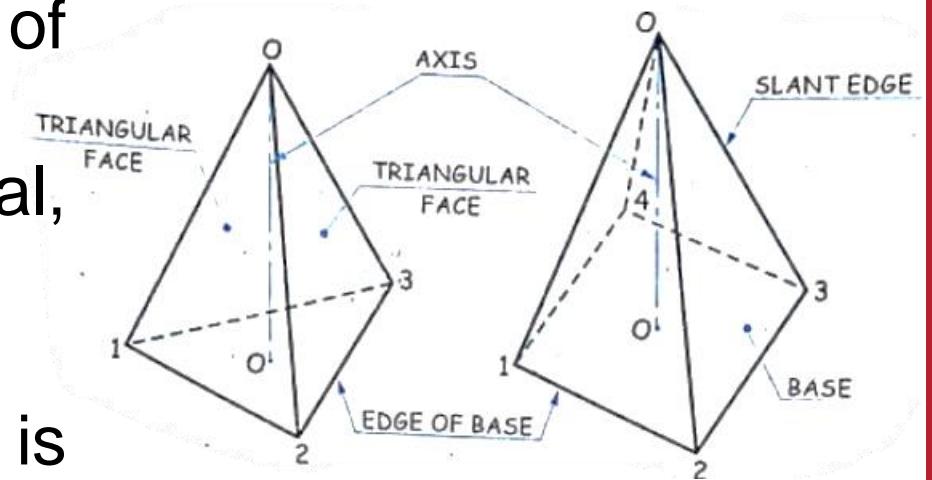


Fig. 9.1 Triangular
Pyramid

Fig. 9.2 Square
Pyramid

Fig. 9 Pyramid^[1]

■ Polyhedron Solids: Pyramid

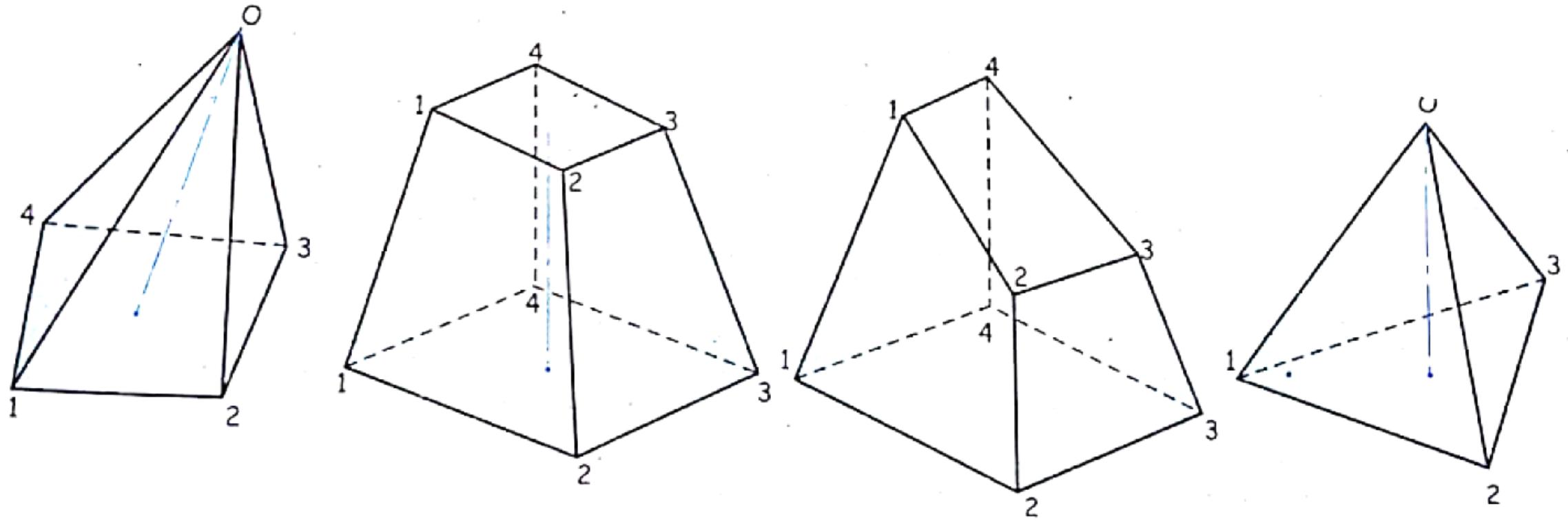


Fig. 9.5 oblique
Pyramid

Fig. 9.6 Frustum of
Pyramid

Fig. 9.7 Truncated
Pyramid

Fig. 9.8
Tetrahedron

- Axis of the solid perpendicular to H.P. and parallel to V.P.
- Polyhedron Solids: Prism

Q.1 A square prism, edge of base 40 mm and axis height 60 mm standing on its base on the H.P. Draw the projection of solid if its edges of a base are equally inclined to the V.P.

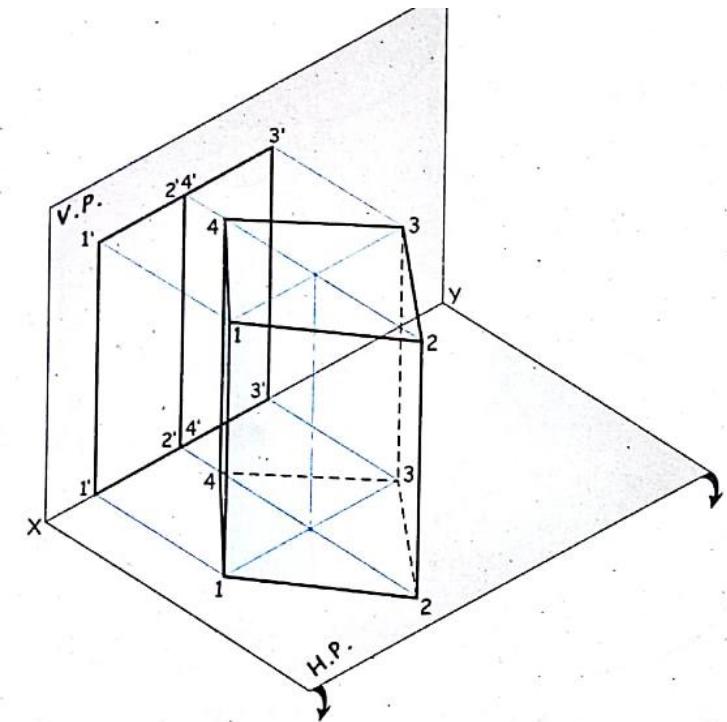


Fig. 10 Square Prism^[1]

- Axis of the solid perpendicular to H.P. and parallel to V.P.
- Polyhedron Solids: Pyramid

Q.2 A square pyramid, base 40 mm side and axis height 60 mm long has its base in the H.P. with two sides of base perpendicular to the V.P. Draw its projections.

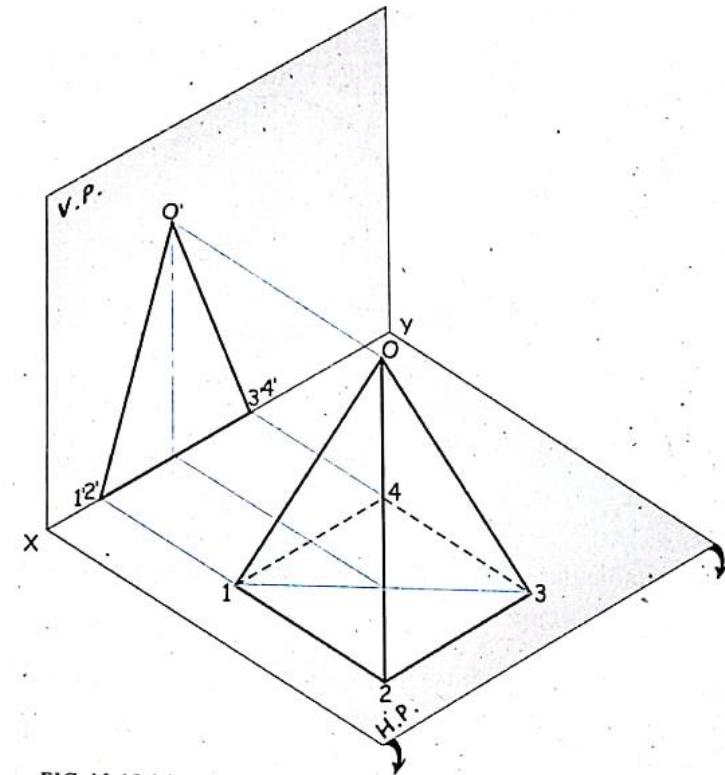


Fig. 11 Square Pyramid^[1]

- Axis of the solid perpendicular to H.P. and parallel to V.P.
- Solids of revolution: Cylinder

Q.3 A cylinder of base diameter 40 mm and axis length 60 mm long has its base in the H.P. Draw its projections.

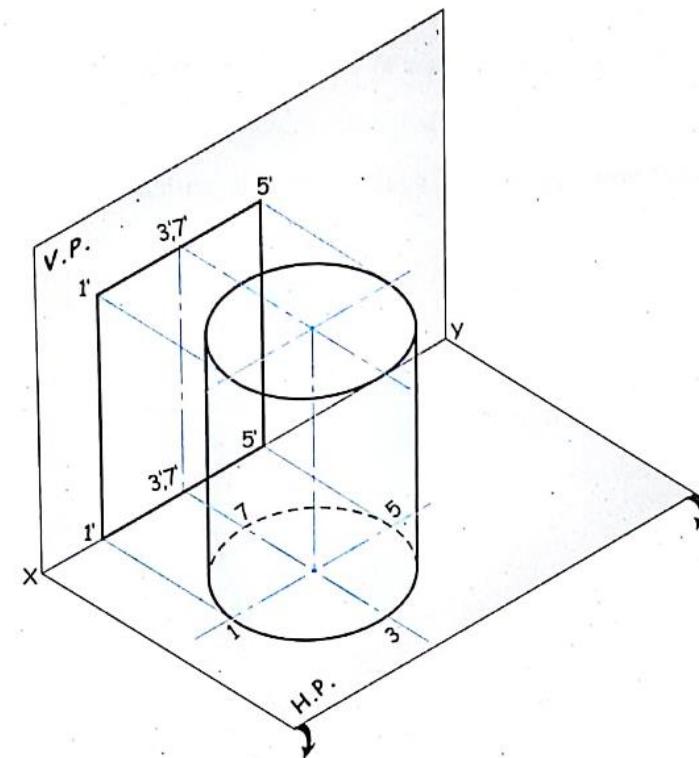


Fig. 12 Cylinder^[1]

- Axis of the solid perpendicular to H.P. and parallel to V.P.
- Solids of revolution: Cone

Q.4 A right circular cone with base diameter 40 mm and axis height 60 mm long stands vertically on its base on the H.P. Draw its projections.

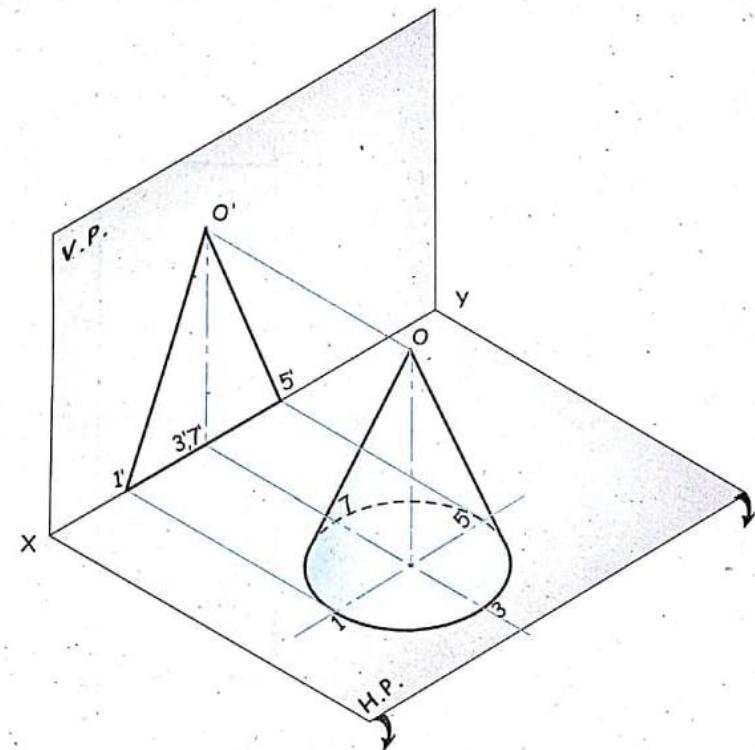


Fig. 13 Cone^[1]

- Axis of the solid perpendicular to V.P. and parallel to H.P.
- Polyhedron Solids: Prism

Q.5 A square prism side of base 40 mm, axis length 60 mm and has its base in the V.P. Draw the projection of a square prism if the side of base is parallel to the H.P.

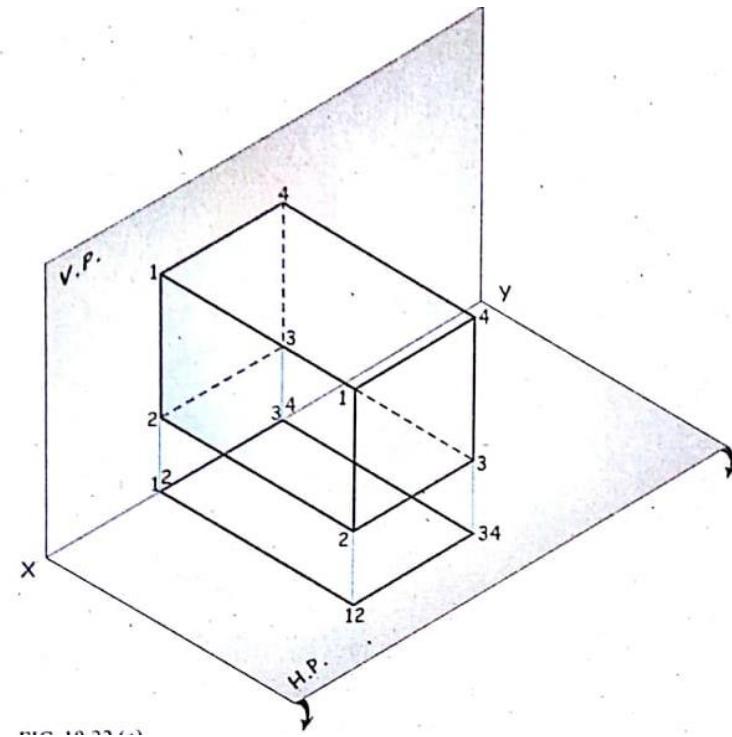


Fig. 14 Square prism^[1]

- Axis of the solid perpendicular to V.P. and parallel to H.P.
- **Polyhedron Solids: Pyramid**

Q.6 A square pyramid having edge of base 40 mm, axis 60 mm long has its base in the V.P. such that its edges of base are equally inclined to the H.P. Draw the projection.

- Axis of the solid is inclined directly/indirectly to the H.P. at an angle θ and parallel to the V.P.
- Polyhedron Solids: Prism

Q.8 A square prism with side of base 40 mm and axis height 60 mm is resting on the H.P. on one of its base corner such that its axis is inclined at 30° to the H.P. and parallel to the V.P. Draw its projection.

- Axis of the solid is inclined directly/indirectly to the H.P. at an angle θ and parallel to the V.P.
- Polyhedron Solids: Prism

Q.9 A square prism with side of base 40 mm and axis height 60 mm is resting on the H.P. on one of its base edge such that its axis is inclined at 60° to the H.P. and parallel to the V.P. Draw its projections.

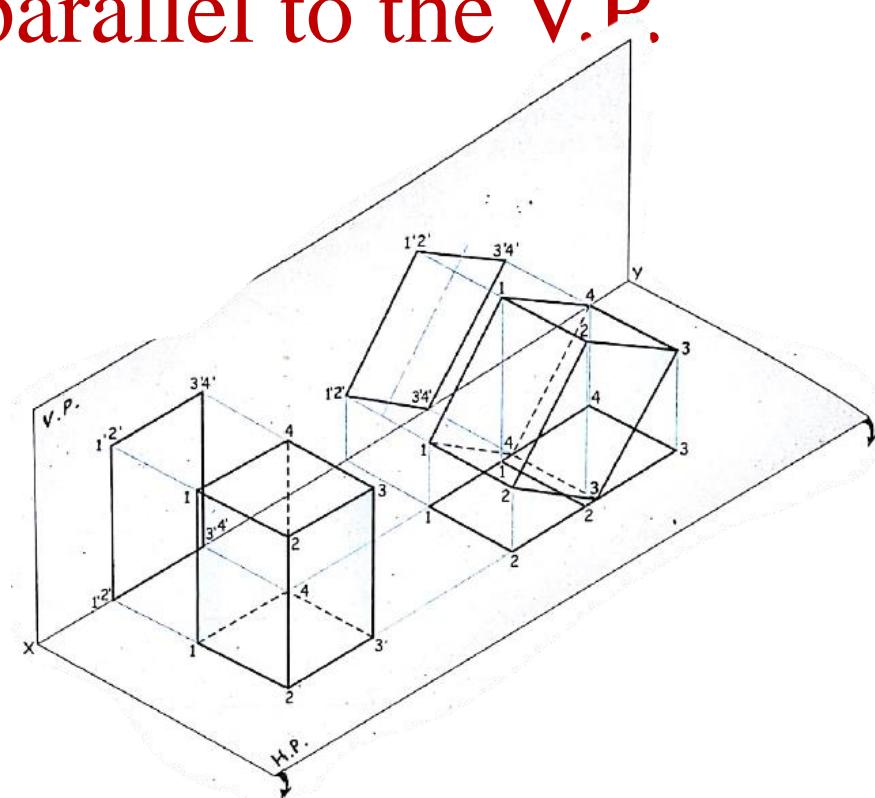


Fig. 15 Square prism^[1]

- Axis of the solid is inclined directly/indirectly to the H.P. at an angle θ and parallel to the V.P.
- Polyhedron Solids: Pyramid

Q.10 A square pyramid side of base 40 mm and axis length 60 mm has one of the side of a base in the H.P. Draw the projection of pyramid if the axis is inclined at 45^0 to the H.P. and parallel to the V.P..

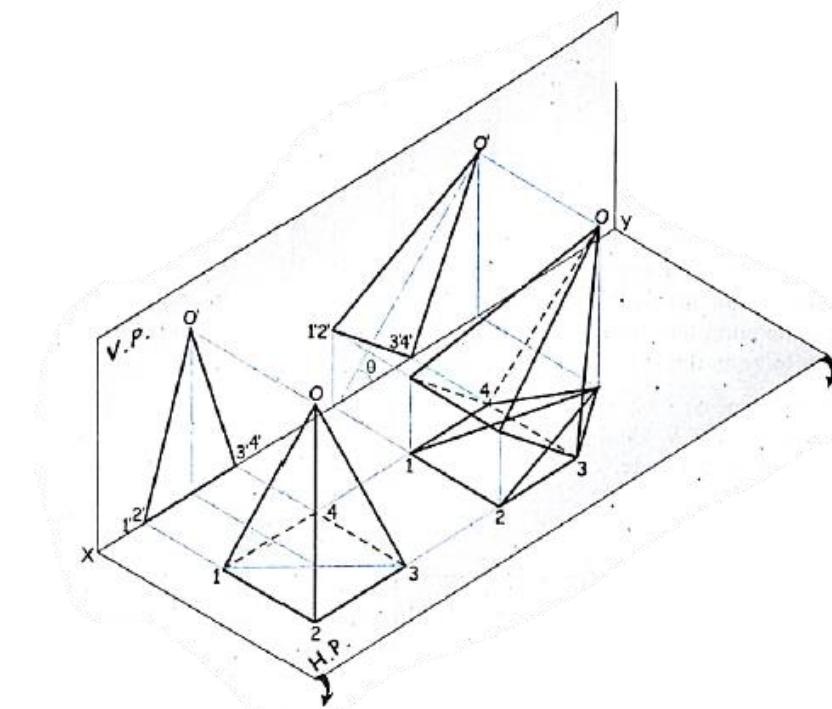


Fig. 16 Square pyramid^[1]

- Axis of the solid is inclined directly/indirectly to the H.P. at an angle θ and parallel to the V.P.
- Solids of revolution: Cylinder

Q.11 A right circular cylinder of base diameter 40 mm and axis length 60 mm has a point of base circle on the H.P. with the axis making an angle 45^0 with the H.P. and parallel to the V.P.

- Axis of the solid is inclined **indirectly** to the H.P. at an angle θ and parallel to the V.P.
- Polyhedron Solids: Square pyramid

Q.12 A square pyramid of 40 mm edge of base and axis length 60 mm is resting on one of its triangular face on the H.P. Draw the projection of the pyramid when edge of base contained by the triangular face is perpendicular to the V.P.

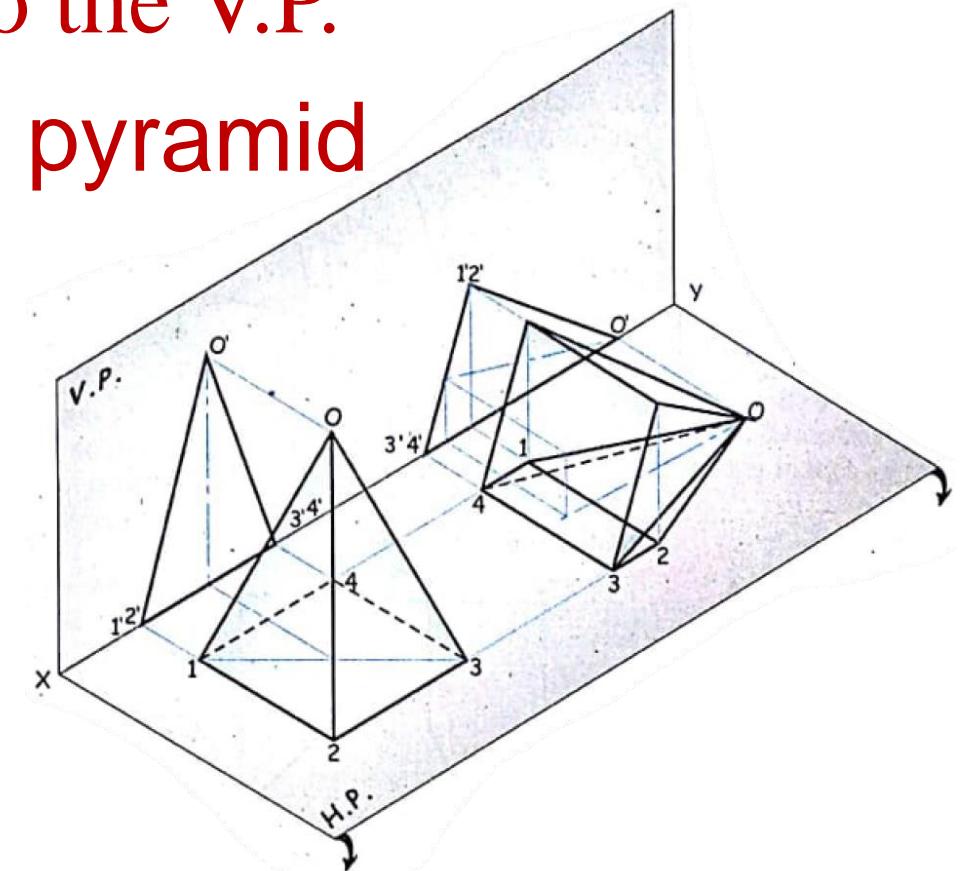


Fig. 17 Square pyramid^[1]

- Axis of the solid is inclined directly/indirectly to the H.P. at an angle θ and parallel to the V.P.
- Solids of revolution: Cone

Q.13 A cone, diameter of base 40 mm, axis height 60 mm has a one of its generator in the H.P. and axis parallel to the V.P. Draw its projections.

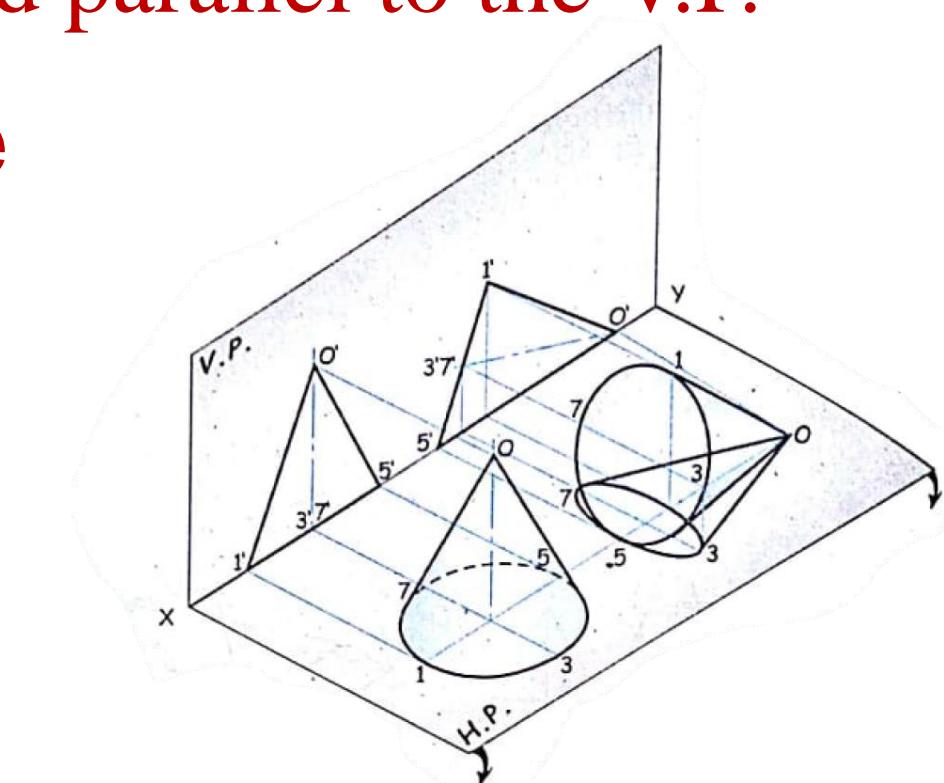


Fig. 18 Cone^[1]

- Axis of the solid is inclined directly/indirectly to the H.P. at an angle θ and parallel to the V.P.

Q.14 A **regular pentagonal prism**, side of base 30 mm and axis height 60 mm rests on one of the corner of its base on the H.P. and an axis makes an angle of 40° with the H.P. Draw its projections when the side of a base opposite to the corner which is in the H.P. remains parallel to the H.P. and perpendicular to the V.P.

OR A **right pentagonal prism**, edge of base 30 mm and axis length 60 mm is standing on one of its corner of the base on the H.P. with longer edge containing that corner inclined at 40° to the H.P. and parallel to the V.P. Draw its projections.

OR A **pentagonal prism** with 30 mm edge of base and 60 mm length of an axis is having one of the corner of the base in the H.P. and the base of a prism makes an angle of 50° with the H.P. Draw projection of a prism when the two base edges passing through the corner on which it rests, makes an equal inclination with the H.P.

OR A **pentagonal prism** with side of base 30 mm, axis length 60 mm has one of its corner of the base in the H.P. such that the rectangular face opposite to this corner makes an angle 40° with the H.P. and perpendicular to the V.P. Draw its projections.

- Axis of the solid is inclined directly/indirectly to the V.P. at an angle ϕ and parallel to the H.P.
- Polyhedron Solids: Prism

Q.15 A square prism with side of base 40 mm and axis height 70 mm has one of its corner of base in the V.P. The axis of a prism is inclined to the V.P. at an angle 40° and parallel to the H.P. Draw its projections.

- Axis of the solid is inclined directly/indirectly to the V.P. at an angle ϕ and parallel to the H.P.
- Polyhedron Solids: Pyramid

Q.16 A square pyramid, edge of base 40 mm and axis length 70 mm has one of the edge of base in the V.P. Draw the projection of a pyramid if axis is inclined at 30° to the V.P. and parallel to the H.P.

- Axis of the solid is inclined directly/indirectly to the V.P. at an angle ϕ and parallel to the H.P.
- Polyhedron Solids: Pyramid

Q.17 A square pyramid, 40 mm edge of base and axis length 70 mm is resting on one of its triangular face in the V.P. Draw the projection of a pyramid if axis is parallel to the H.P.

- Axis of the solid is inclined directly/indirectly to the V.P. at an angle ϕ and parallel to the H.P.
- Polyhedron Solids: Pentagonal Prism

Q.18 A pentagonal prism of 30 mm edge of a base and 65 mm length of an axis is having an edge of base in the V.P. Draw the projection of a prism if the rectangular side face containing that edge is inclined at 30° to the V.P.

- Axis of the solid is inclined directly/indirectly to the V.P. at an angle ϕ and parallel to the H.P.
- Polyhedron Solids: Cube

Q.19 Draw the plan and elevation of a cube of solid diagonal 80 mm length when the solid diagonal is parallel to the H.P. and the corner of a cube is in the H.P.

References

- [1] Engineering Drawing, N. H. Dubey



SOMAIYA
VIDYAVIHAR UNIVERSITY

K J Somaiya College of Engineering

Thank you !!

