

# PROJECTION OF SOLIDS

# INTRODUCTION

A solid has three dimensions, viz. length, breadth and thickness. To represent a solid on a flat surface having only length and breadth, at least two orthographic views are necessary.

# SOLIDS OF REVOLUTION



SPHERE

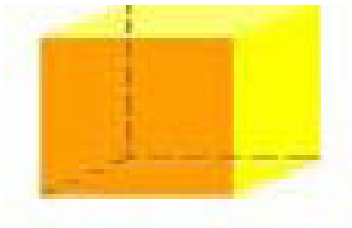


CYLINDER

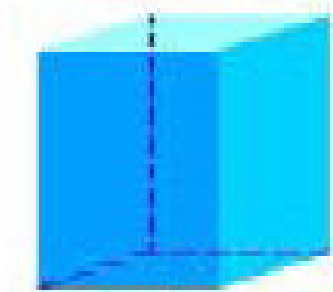


CONE

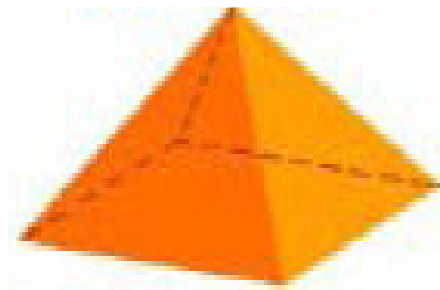
# POLYHEDRONS



CUBE



PRISM



PYRAMID

# Overview

1. Types of solids.
2. Projections of solids in simple positions.
  - a. Axis perpendicular to the H.P.
  - b. Axis perpendicular to the V.P.
  - c. Axis parallel to both the H.P. and the V.P
3. Projections of solids with axes inclined to one of the reference planes and parallel to the other.
  - a. Axis inclined to the V.P. and parallel to the H.P.
  - b. Axis inclined to the H.P. and parallel to the V.P.
4. Projections of solids with axes inclined to both the H.P. and the V.P.
5. Projections of spheres.

# Types of Solids

Solids may be divided into two main groups:

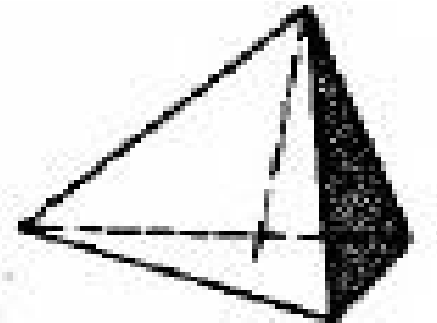
## i. Polyhedron

## ii. Solids of revolution.

**i. Polyhedron:** A polyhedron is defined as a solid bounded by planes called faces. When all the faces are equal and regular, the polyhedron is said to be regular.

There are six regular polyhedron

- **Tetrahedron :**  
It has four equal faces, each an equilateral triangle.

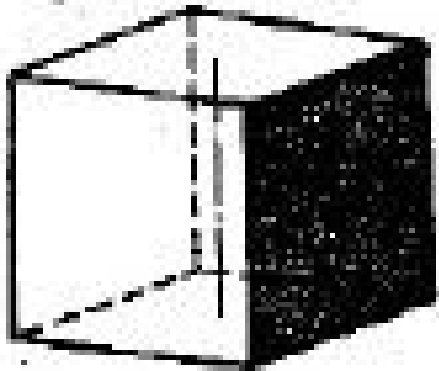


Tetrahedron

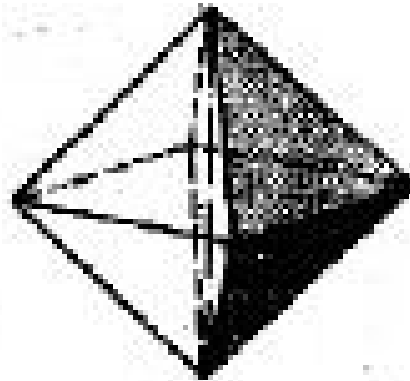
b. **Cube or Hexahedron** : It has six faces, all equal squares.

c. **Octahedron** : It has eight equal equilateral triangles as faces.

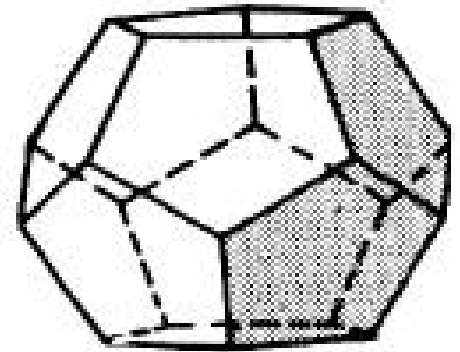
d. **Dodecahedron** : It has twelve equal and regular pentagons as faces.



Cube



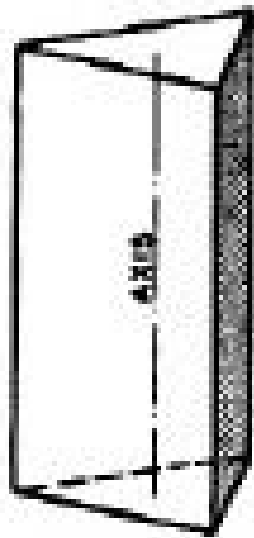
Octahedron ✓



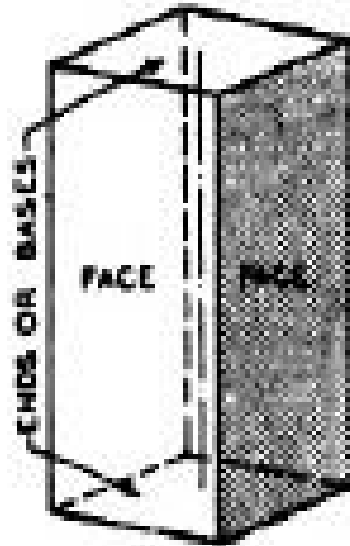
Dodecahedron

**Prism:** This is a polyhedron having two equal and similar faces called its ends or bases, parallel to each other and joined by other faces, which are parallelograms. The imaginary line joining the centers of the bases is called the axis.

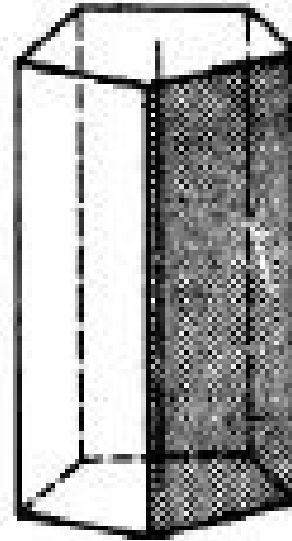
A right and regular prism has its axis perpendicular to the bases. All its faces are equal rectangles.



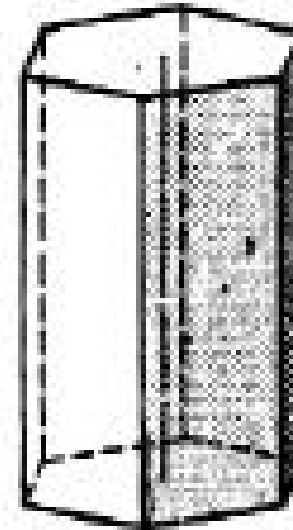
Triangular



Square



Pentagonal



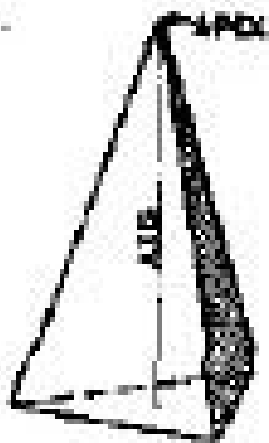
Hexagonal

Prisms

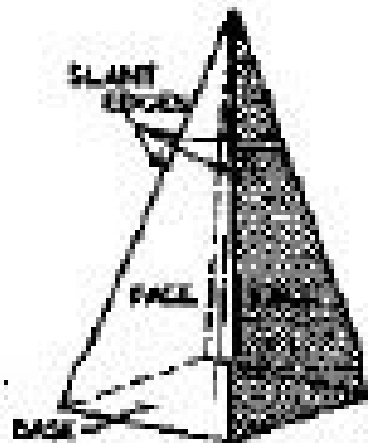


**Pyramid:** This is a polyhedron having a plane figure as a base and a number of triangular faces meeting at a point called the vertex or apex. The imaginary line joining the apex with the centre of the base is its axis.

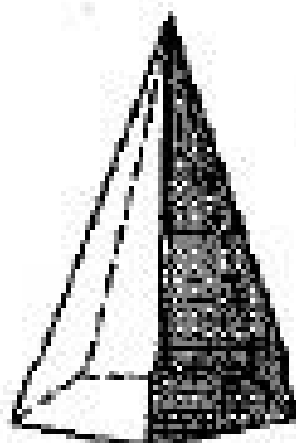
A right and regular pyramid has its axis perpendicular to the base, which is a regular plane figure. Its faces are all equal isosceles triangles.



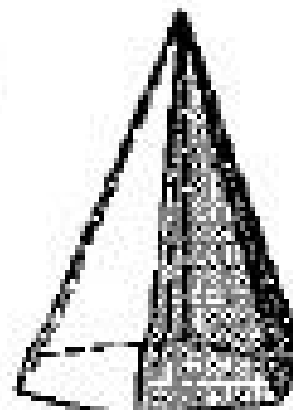
Triangular



Square



Pentagonal



Hexagonal

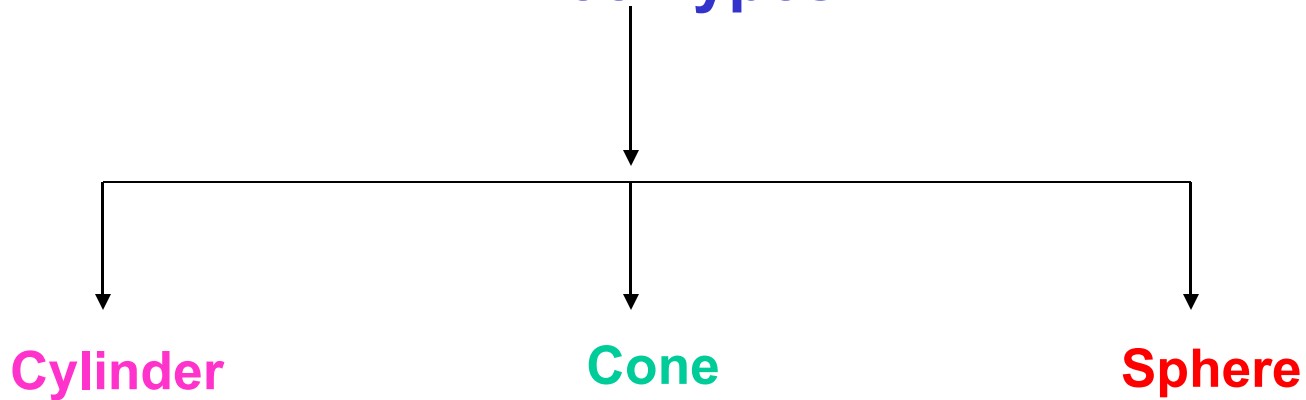
Pyramids

# Solids of Revolution

Definition:

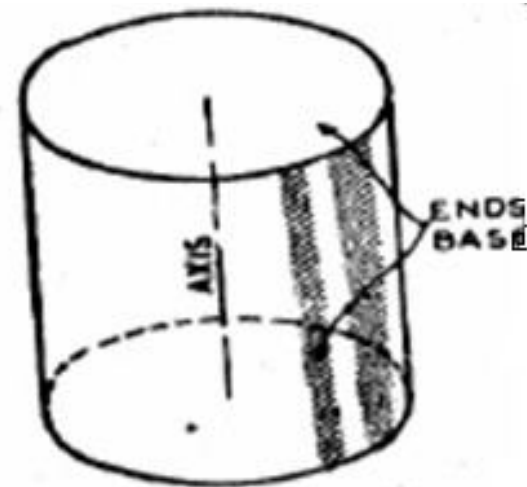
**Solids which are generated by rotating a plane surface about one of its sides**

**Three Types**



## a) Cylinder

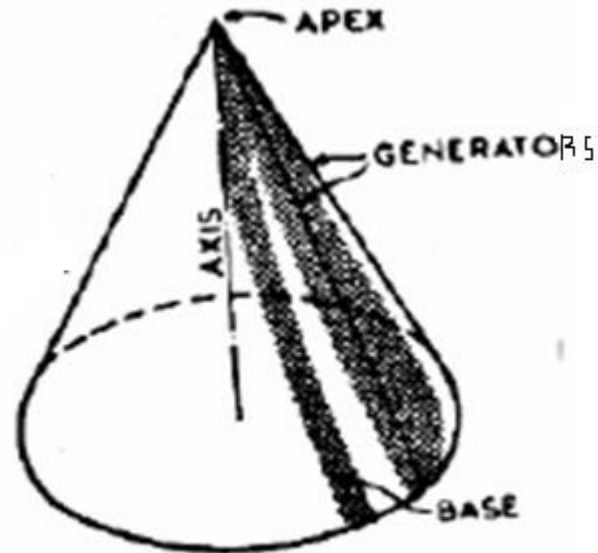
A right circular cylinder is a solid generated by the revolution of a rectangle about one of its sides, which remains fixed. It has two equal circular bases. The line joining the centers of the bases is the axis. It is perpendicular to the bases.



Cylinder

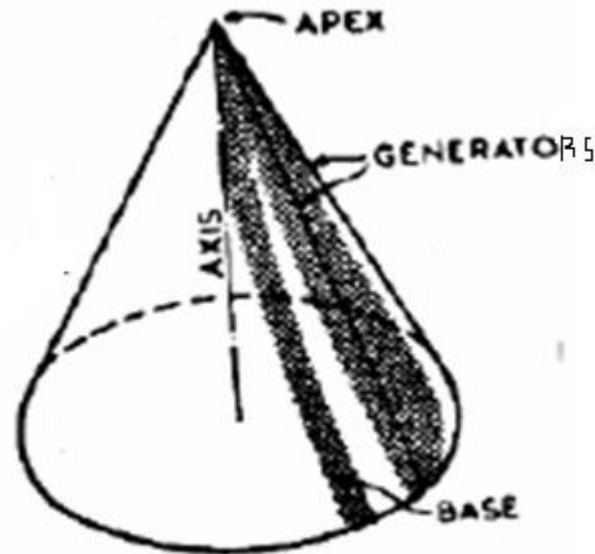
## b. Cone :

A right circular cone is a solid generated by the revolution of right-angled triangles about one of its perpendicular sides, which is fixed.



Cone

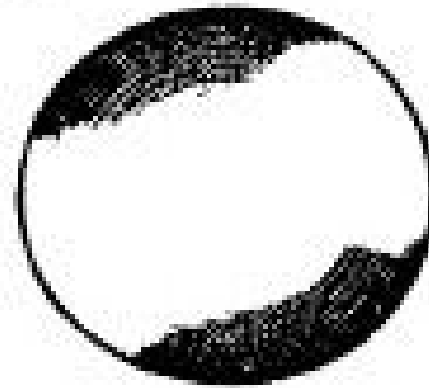
It has one circular base. Its axis joins the apex with the centre of the base to which it is perpendicular. Straight lines drawn from the apex to the circumference of the base-circle are all equal and are called generators of the cone.



Cone

### c. Sphere :

A sphere is a solid generated by the revolution of a semi-circle about its diameter as the axis. The mid-point of the diameter is the centre of the sphere. All points on the surface of the sphere are equidistant from its centre.



Sphere

d. **Frustum:** When a pyramid or a cone is cut by a plane parallel to its base, thus removing the top portion, the remaining portion is called its frustum.

e. **Truncated:** When a solid is cut by a plane inclined to base it is said to be truncated.

Unless and otherwise stated, the given solid should be understood as right and regular.

