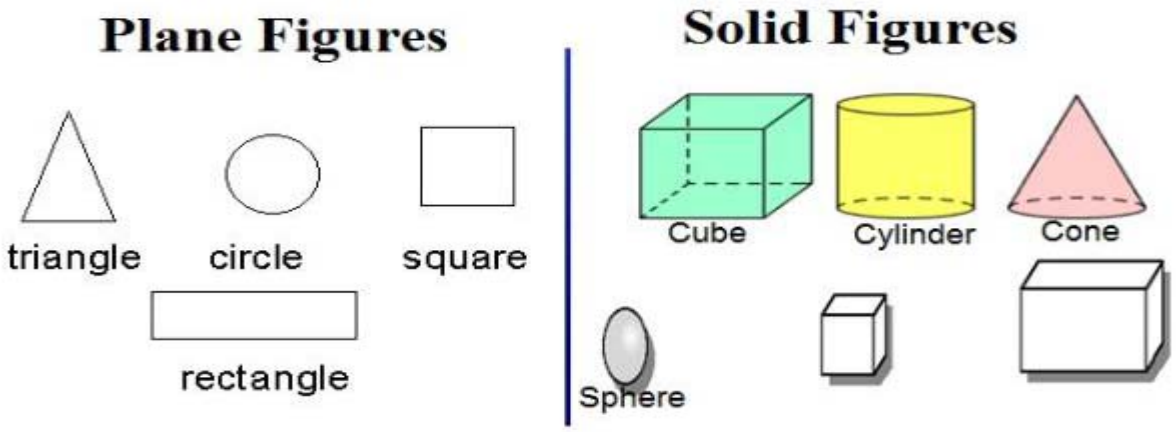
Visualising Solid and shapes

Introduction

Plane shapes have two measurements like length and breadth and therefore they are called two-dimensional shapes whereas a solid object has three measurements like length, breadth, height or depth. Hence, they are called three-dimensional shapes.

Also, a solid object occupies some space. Two-dimensional and three-dimensional figures can also be briefly named as 2-D and 3-D figures.

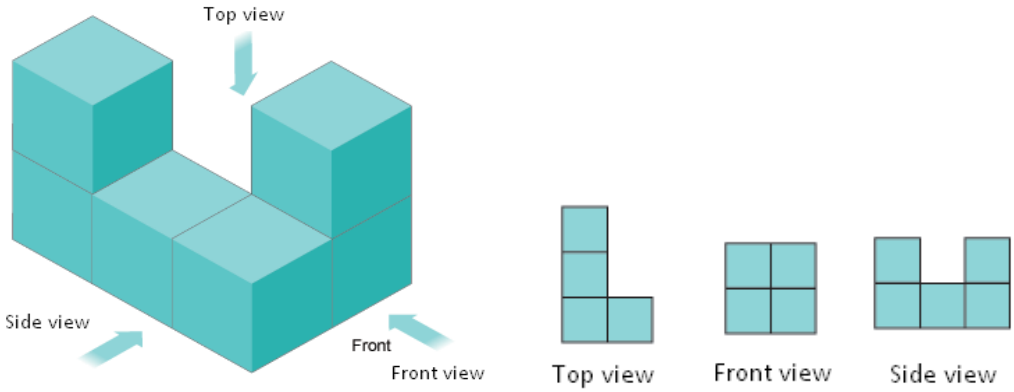
Here are some plane (2-D) and solid (3-D) figures

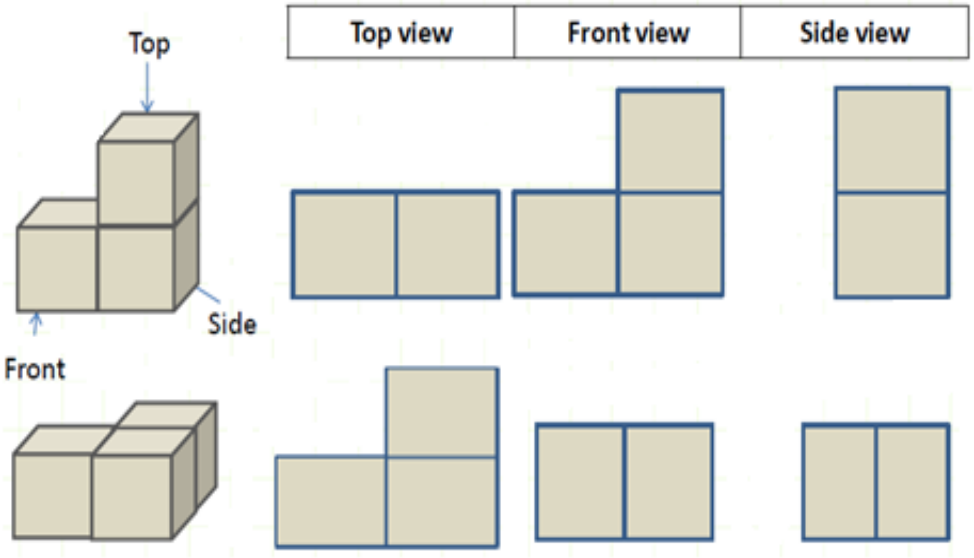


Views of 3D-Shapes

A 3-dimensional object can be looked differently from different positions so that, they can be drawn from different perspectives.

For example: 3-dimensional objects can be drawn from the top view, side view and front view.

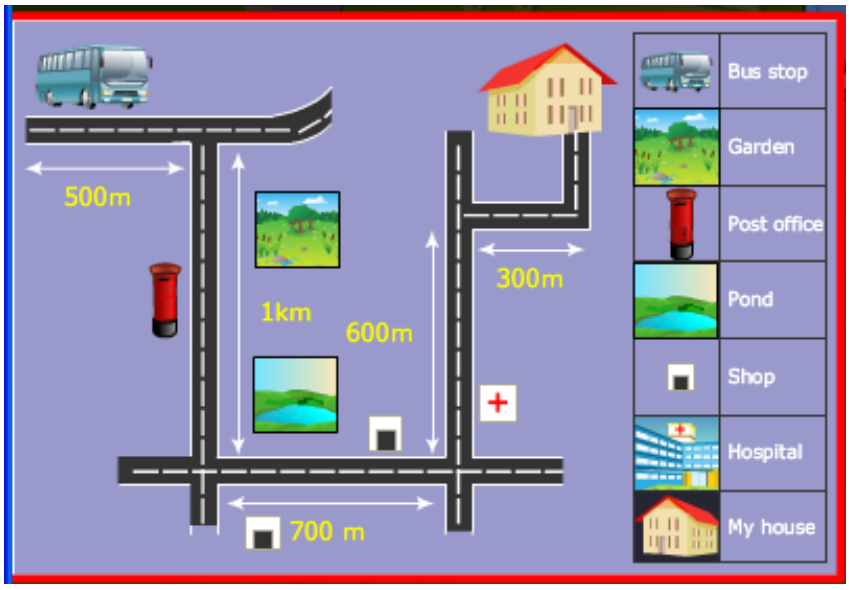


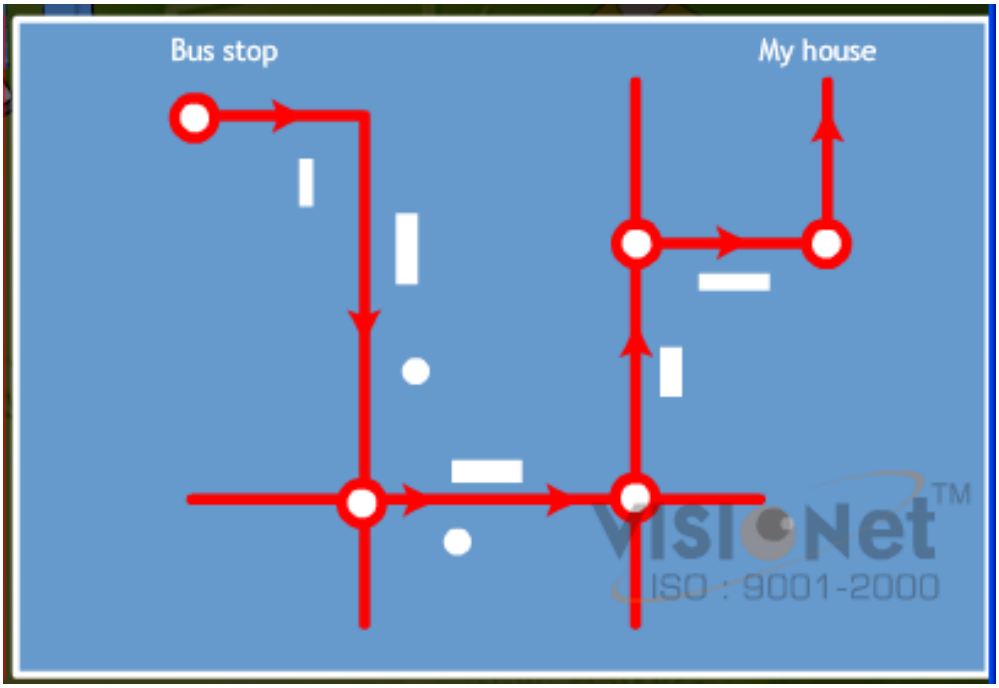


In our practical life we come across different combination of different shapes.

Mapping Space around Us

A map is different from a picture. A map depicts the location of a particular object/place in relation to other objects/places.





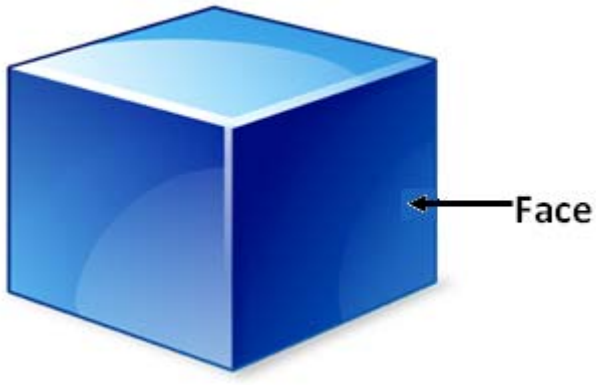
Symbols are used to depict the different objects/places. There is no reference or perspective in a map. Maps involve a scale which is fixed for a particular map.

Faces, Edges and Vertices

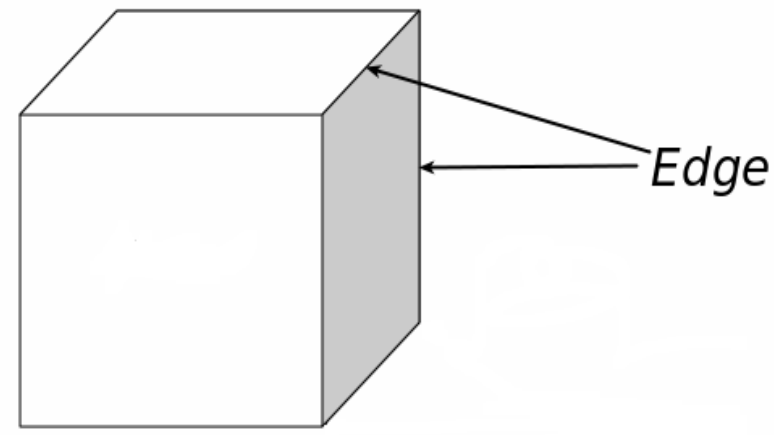
A face is any of the plane or curved surface of a solid object.

A polyhedron is a three dimensional shape bounded by a series of flat planes which are known as faces.

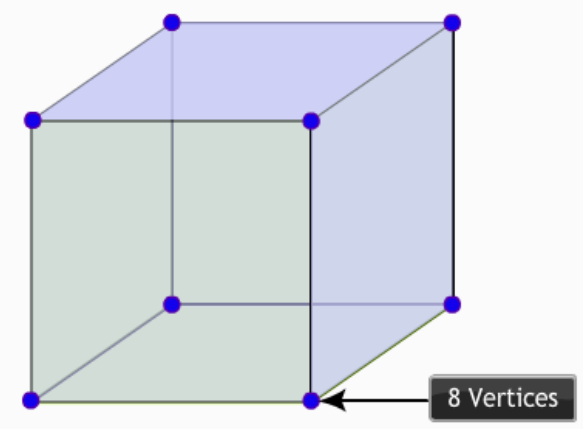
For example: Cube is a polyhedron.



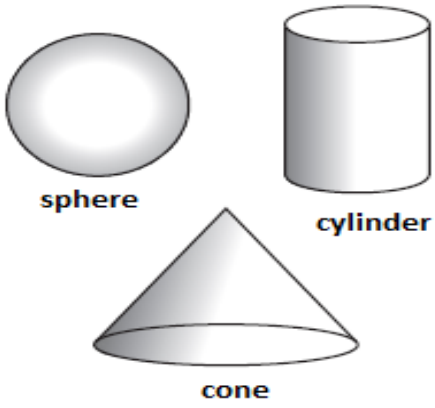
An edge is a line segment that joins two vertexes.



A **vertex or vertices** is a point where two or more straight lines meet.

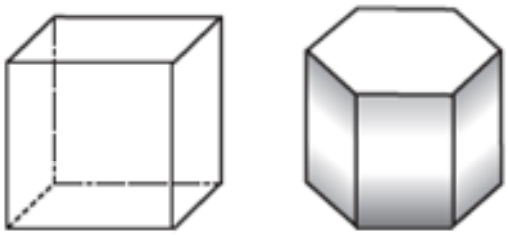


For a shape to be a polyhedron there should not be any curved surfaces.
The figure given below shows non polyhedrons



These are non polyhedron

Convex polyhedrons



These are convex polyhedrons

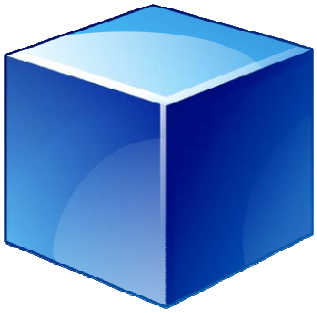
A convex polyhedron is a figure composed of finitely many planar polygons that

1. It is possible to pass from one polygon to another through polygons having common sides or segments of sides.
2. The entire figure lies on one side of the plane of each constituent polygon.

Regular polyhedrons:

A regular polyhedron is a polyhedron with congruent faces and identical vertices.

For Example:



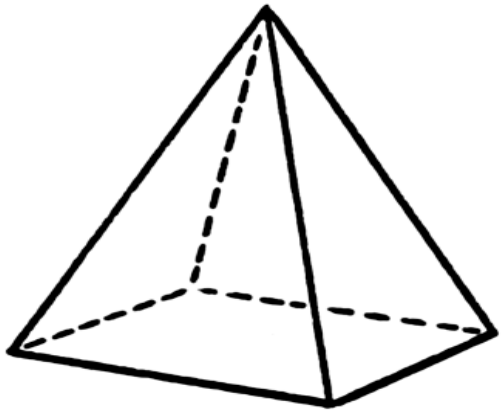
A cube is a regular polyhedron.

A prism is a solid with cross-sections that are parallel to its base.

For Example:

Triangular prism

A pyramid is a polyhedron with one face known as the base and all the other faces triangles meeting at a common polygon vertex known as the **apex**.



Pyramid - a polyhedron

The relationship between faces, edges and vertices of a polyhedron is

Let F be the number of faces

V be the number of vertices

E be the number of edges

$$F + V = E + 2$$

This is called "**Euler relationship**".

Example: A polyhedron has 12 vertices and 30 edges. How many faces does it have?

Solution:

Given: V = 12, E = 30

Using Euler's formula:

$F + V - E = 2$

Number of faces:

$F = 2 - V + E$
$F = 2 - 12 + 30$
$F = 30 - 10$
$F = 20$