CHAPTER 10- Visualising Solid Shapes

MODULE 2-2

Mapping Space around Us

A map shows the location of a particular thing with respect to others.

Some important points related to map:

- To represent different objects or place different symbols are used.
- A map represents everything proportional to their actual size not on the basis of perspective. It means that the size of the object will remain the same irrespective of the observer's viewpoint.
- A particular scale is used to draw a map so that the lengths drawn are proportional with respect to the size of the original figures.

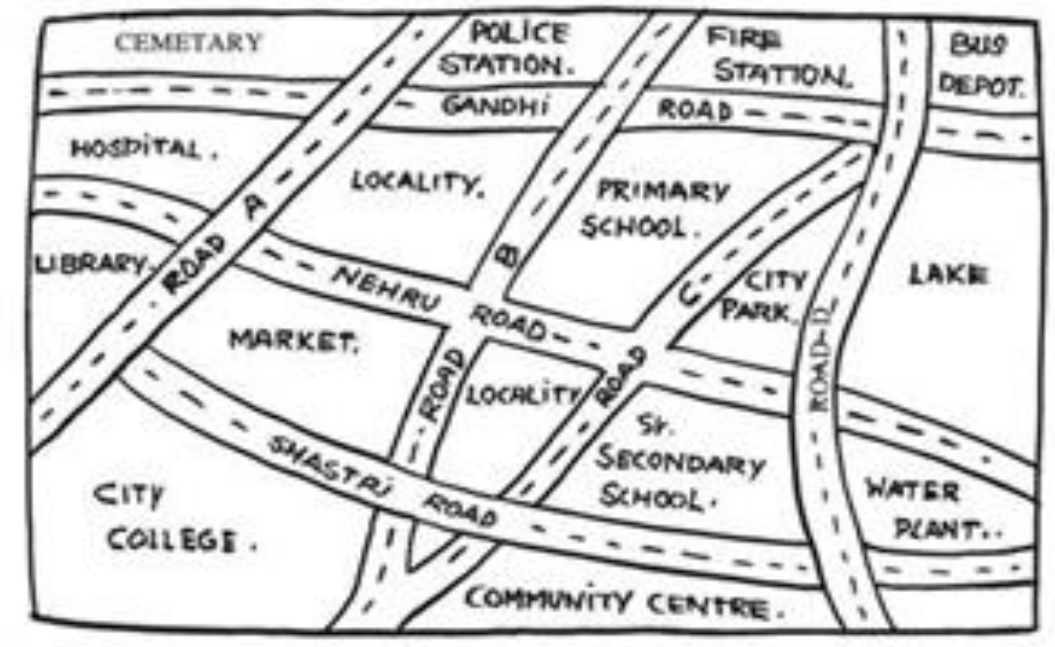
Thus,

1.A map depicts the location of a particular object/place in relation to other objects/places.

2.Symbols are used to depict the different objects/places.

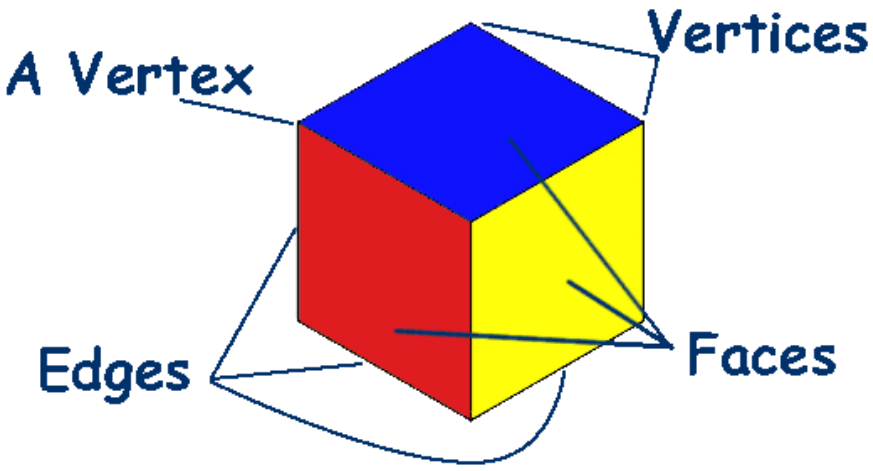
3.There is no reference or perspective in map, i.e., objects that are closer to the observer are shown to be of the same size as those that are farther away.

This is the map which shows the different routes from Nehru road.



Similarly, we can draw the map of our classroom and school compound using proper scale and symbols for different objects.

Faces, Edges and Vertices

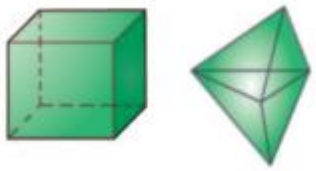


- **Faces** – All the flat surfaces of the three 3-D shapes are the faces. Solid shapes are made up of these plane figures called faces.
- **Edges** – The line segments which make the structure of the solid shapes are called edges. The two faces meet at the edges of the 3D shapes.
- **Vertex** – The corner of the solid shapes is called vertex. The two edges meet at the vertex. The plural of the vertex is vertices.

Polyhedrons

A **Polyhedron** is a **solid** in three dimensions with flat polygonal faces, straight edges and sharp corners or vertices. In short, **Solids** with flat surfaces are called **Polyhedrons. (or Polyhedra)**

Regular polyhedron: All faces constitute regular polygons and at each vertex the same number of faces intersect. Example: Cube

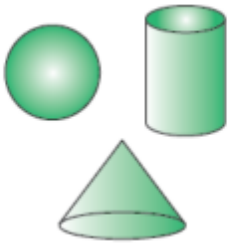


(i) Regular polyhedron (ii) Irregular Polyhedra

Non-Polyhedrons

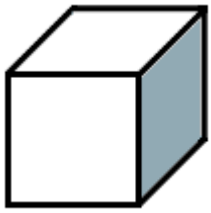
Solids with **curved faces** are called **Non polyhedrons.** They also can be described as solids which have sides that are not polygons.

Example: Sphere, Cylinder, Cone, etc.



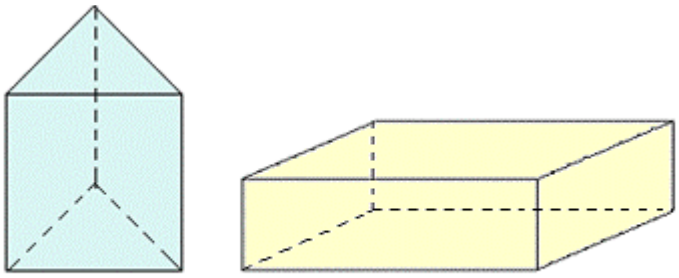
Regular Polyhedron

If all the faces of a polyhedron are regular polygons and its same number of faces meets at each vertex then it is called regular polyhedron.



Prism

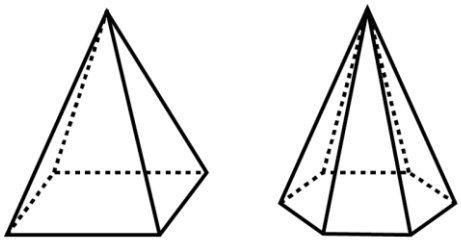
If the top and bottom of a polyhedron are a congruent polygon and its lateral faces are parallelogram in shape, then it is said to be a prism.



Triangular Prism Rectangular Prism

Pyramid

If the base of a polyhedron is the polygon and its lateral faces are triangular in shape with a common vertex, then it is said to be a pyramid.



rectangular pyramid hexagonal pyramid

A prism or a pyramid is named after its base. Thus a hexagonal prism has a hexagon as its base; and a triangular pyramid has a triangle as its base.

Euler's formula

Euler's formula shows the relationship between edges, faces and vertices of a polyhedron.

Every polyhedron will satisfy the criterion

$F+V=E+2$

i.e. $F + V – E = 2$,

Where F is the number of faces of the polyhedron, V is the vertices of the polyhedron and E is the number of edges of the polyhedron.

Example

Using Euler's formula, find the number of faces if the number of vertices is 6 and the number of edges is 12.

Solution

Given, $V = 6$ and $E = 12$.

We know Euler's formula, $F + V – E = 2$

So, $F + 6 – 12 = 2$.

Hence, $F = 8$.