VISUALISING 3-D SHAPES

3D SHAPES (SOLIDS)

The shapes like cube, cuboid, cylinder, pyramid etc. which require three dimensions i.e.length, breadth and height or depth are called solid figures or 3-dimensional figures.

The objects having definite shape and size are called solids. A solid occupies a fixed amount of space and has three dimensions.

Cuboid

It is the shape of a matchbox, a chalk box, a brick, a tile, a book, an almirah etc.

It is made of rectangles.

Definition : A solid bounded by six rectangular faces (not all equal) is called a cuboid. It has three dimensions, namely length, breadth and height.



Various parts of a cuboid are

- **1. Faces :** A cuboid has 6 rectangular faces. The opposite faces of a cuboid are identical. In figure ABCD, EFGH, ADHE, BCGF, ABFE, DCGH are faces.
- 2. Edges : Two adjacent faces of a cuboid meet in a line segment, which is called edge of the cuboid. A cuboid has 12 edges. In figure edges are AB, BC, CD, DA, EF, GH, FG, EH, CG, BF, AE, DH.
- **3.** Vertices : Three edges of a cuboid meet at a point, called a vertex. A cuboid has 8 vertices. In figure 8 vertices are A, B, C, D, E, F, G, H.
- Cube

It is the shape of sugar lump, dice etc. A cube is made up of square faces.

Definition : A cuboid whose length, breadth and height are all equal, is called a cube. Length breadth and height of a cube are equal.



Various parts of a cube are :

- **1. Faces :** A cube has six square faces. In figure, ABCD, EFGH, ADHE, BCGF, ABFE, DCGH are faces.
- **2. Edges :** A cube has 12 edges. In figure, 12 edges are AB, BC, CD, DA, EF, GH, FG, EH, CG, BF, AE, DH.
- 3. Vertices : A cube has 8 vertices. 8 vertices are A, B, C, D, E, F, G, H.

Prism

A prism is a solid whose bases are identical polygon faces (triangles, quadrilaterals, pentagons etc.) and the other faces are rectangles.

Remember that if the bases of the prism are pentagon, then the prism is known as pentagonal prism.



Triangular Prism

A triangular prism is made up of two triangles at each end and three rectangles. A ridge tent is an example of a triangular prism.



Pyramid

A pyramid is a solid whose base is a flat rectilinear figure and whose side faces are triangles having a common vertex outside the surface of the base. This shape is usually found in ancient Egyptian sculptures.

Triangular Pyramid

A triangular pyramid (tetrahedron) is a solid which stands on a triangular base. It tapers to a point called the vertex of the pyramid. A pyramid is called triangular pyramid if its base is a triangle.



A triangular pyramid in which all faces are equal is called **tetrahedron.**



۲ **Square pyramid**

A square pyramid is a solid which stands on a square base. Its side faces are triangles having a common vertex, called the vertex of the Pyramid.



۲ **Rectangular Pyramid**

A rectangular pyramid is a solid which stands on a rectangular base. It also tapers to a point. Its side faces are triangles having a common vertex, called vertex of the pyramid.



Solid	Name	No. of Vertices	No. of Edges	No.of Faces
	Cuboid	8	12	6
	Cube	8	12	6
00	Cylinder	_	2	3
	Cone	1	1	2
	Sphere	_	_	1
	Triangular Prism	6	9	5
	Triangular Pyramid	4	6	4
	Square Pyramid	5	8	5
	Rectangular Pyramid	5	8	5

The following table gives the summary of all above observations :

NETS FOR BUILDING DIFFERENT 3-D SHAPES

Net of a Cube

The following figure is a net of a cube which is formed by six squares.



Net of a Cuboid

Given below is the net of a cuboid. This contains two pairs of congruent rectangle.



Net of a Cone

The given below is the net of a cone. This is obtained by cutting a segment of a circle.



۲ **Net of a Cylinder**

Given below is the net of a cylinder. It is a rectangle with two congruent circle whose circumference is the length of the rectangle.



۲ **Net of a Triangular Prism**

Given below is the net of a triangular prism. The net consists of three rectangles and two equilateral triangles.



۲ **Net of a Triangular Pyramid**

This net consists of four triangles in which three are identical isosceles triangles and one is an equilateral triangle.



Net of a Triangular Pyramid Triangular Pyramid

۲ **Net of a Tetrahedron**

To construct this, make an equilateral triangle of any measure. Then join the midpoints of these sides to form the inner dotted triangle.





Tetrahedron

Net of a Square Pyramid

This net consists of a square with an isosceles triangle on each side of the square.



DRAWING SOLID ON A FLAT SURFACE

When we draw a solid shape, the images are somewhat distorted to make them appear three-dimensional as our drawing surface is paper which is flat. It is a visual illusion. There are two methods to draw 3-D figures :

- (i) Oblique Sketches
- (ii) Isometric Sketches.

Oblique Sketches

If we look at figure, just by look we can say that it is a figure of cube although its all edges are not equal. This type of sketch by which we just get the idea of the given solid is called the **oblique sketch**.



Let us learn the technique for drawing a cube.



Draw a square



Draw the second square where the mid-points of two sides of both squares coincide



Join the corresponding vertices of both the squares



Cube

Similarly, we can draw a cuboid on squared graph sheet :



Isometric Sketches

An isometric sheet is a special sheet on which dots are formed on a pattern of equilateral triangle. On isometric sheet we can draw sketches in which measurements also agree with those of a given solid.



The lines on the paper are in the three directions, each of which represents a dimensions. The lines up and down represent the vertical dimension (height). The other two dimensions represent the horizontal dimensions (length and breadth). Therefore to draw a 3-D figure, we use a isometric graph sheet or isometric dot paper.

A dot sheet, on which dots are marked at equal distances is also used to draw a 3-D figure. Such a sheet is called isometric dot sheet.

A sample of each one is given below :



Let us draw cubes and cuboids using isometric dot paper or isometric graph sheet :



We can make other shapes also by using isometric sheets.