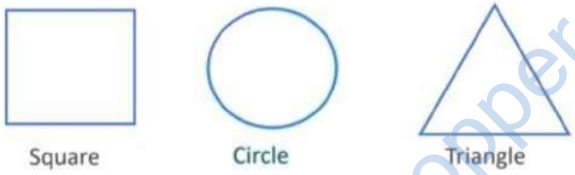
Chapter 15

Visualizing solid and shapes

Introduction to Visualising Solid Shapes

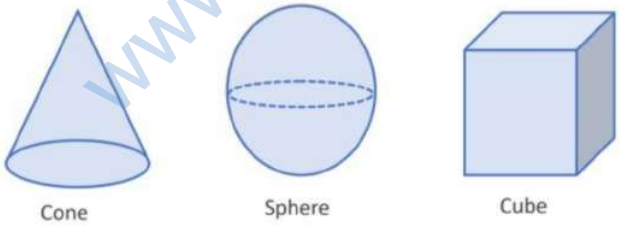
Plane Figures

They have two dimensions like length and breadth. They are also called Two-dimensional figures(2-D). Examples : Square, Triangle, Rectangle, Circle etc.



Solid Figures

They have three dimensions like length, breadth and height or depth.They are also called Three dimensional Figures(3-D). Examples: Cone, Spheres, Cubes, Cylinders etc.



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Faces, Edges and Vertices

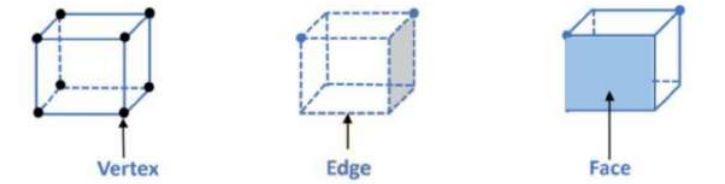
Polyhedra

Faces
The flat surface of any solid is called a face.

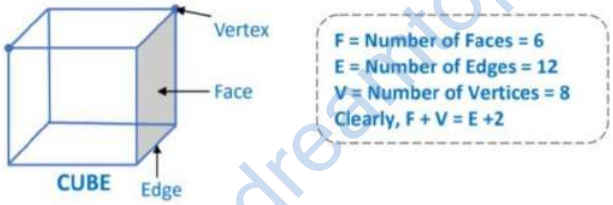
Edges

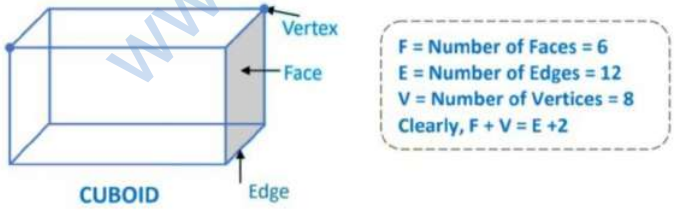
Line segments common to intersecting faces of a polyhedron are known as its edges. Line segments that form the solid are called edges.

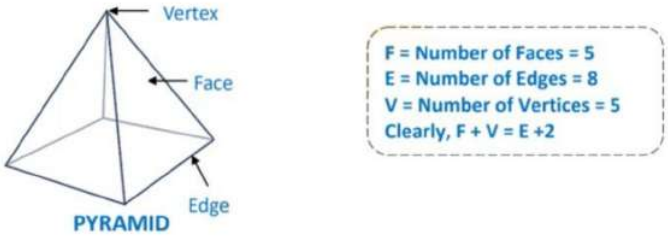
Vertices
Points of intersection of edges of a polyhedron are known as its vertices.
Corners of the solid are its vertices.



Each of these solids is made up of polygonal regions which are called its faces. These faces meet at edges which are line segments and the edges meet at vertices which are points. Such solids are called as polyhedrons.







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Shapes			
Faces(F)	6	5	10
Edges(E)	12	8	16
Vertices(V)	8	5	9

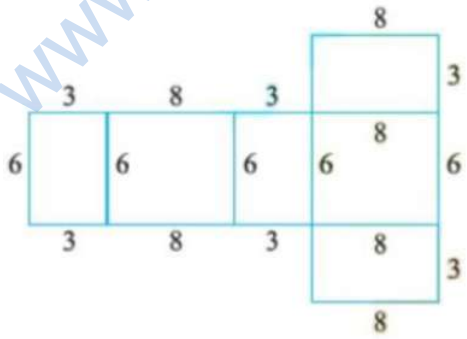
Nets for Building 3D Shapes

A net is a pattern or a 2D figure that when folded can be converted into 3D shapes.

A solid may have different nets.

Let us see nets for some of the common solids

1. Cuboid
Example: Cuboid of dimension 8 by 6 by 3.



(IMAGE REFERENCE: NCERT)
Here, it can be folded along with the edges and when completed it will be a cuboid.

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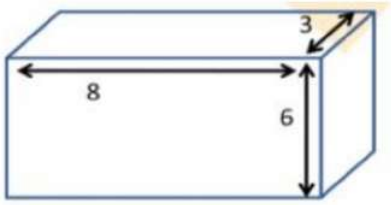
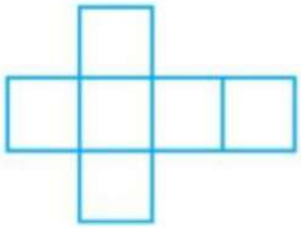
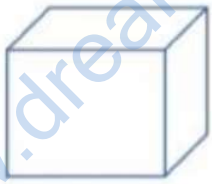


2. Cube

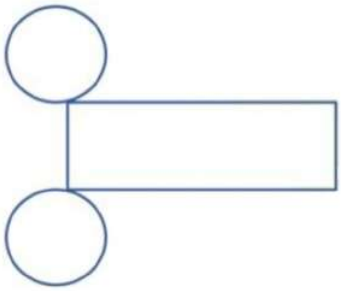


(IMAGE REFERENCE: NCERT)

Here, it can be folded along with the edges and when completed it will be a cube.



3. Cylinder



Here, it can be folded along with the edges in the direction of arrows as shown below.

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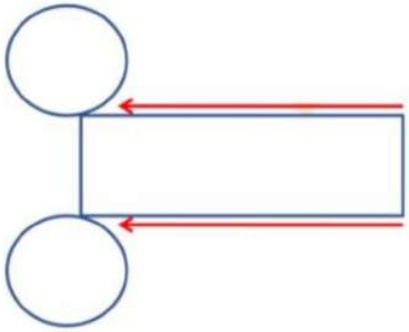
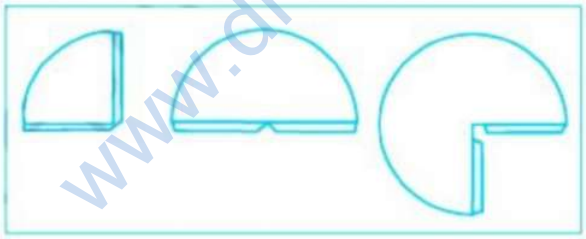


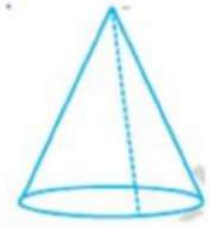
When completed it will be a cylinder as shown,

4. Cone



(IMAGE REFERENCE: NCERT)

Here, it can be folded along with the edges and when completed it will be a cone.



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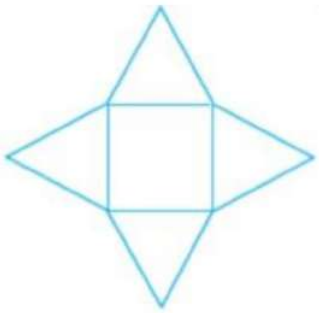
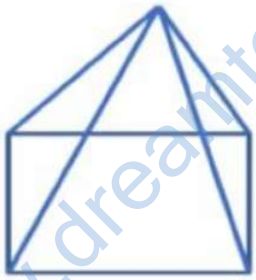
(IMAGE REFERENCE: NCERT)

5. Pyramid with square base



(IMAGE REFERENCE: NCERT)

Here, it can be folded along with the edges and when completed it will be a pyramid with square base.



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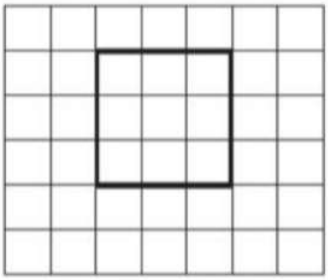
Drawing Solids on a Flat Surface

We can draw solid shapes on flat surfaces using two techniques:-

i) Oblique sketches
ii) ii) Isometric sketches

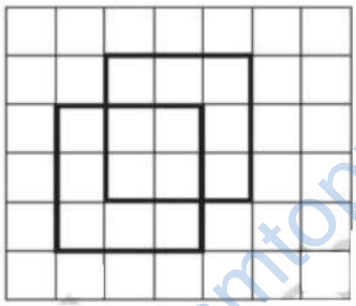
Oblique Sketches
We need a squared paper.
By following given steps we can draw a cube.

Step 1: Draw the front face of cube.



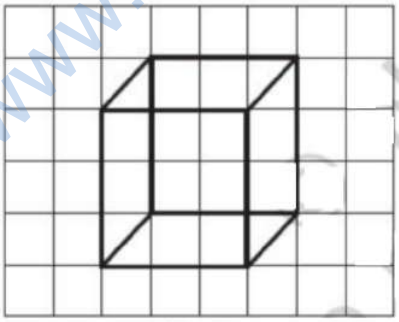
Step 1

Step 2: Draw the opposite face. Sizes of the faces have to be same, but the sketch is somewhat off-set from step 1.



Step 2

Step 3: Join the corresponding



Step 3

Step 4: Join the corresponding corners Redraw using dotted lines for hidden edges. (It is a convention)
The sketch is ready now.

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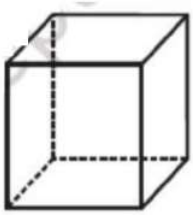
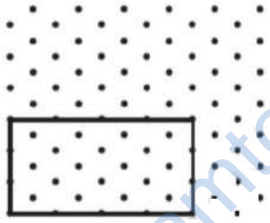


Step 4

(IMAGE REFERENCE: NCERT)

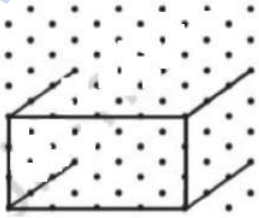
Isometric Sketches
We need a dotted paper.
By following given steps we can draw a cube.
1.



Step 1

Draw a rectangle to show the front face

2.



Step 2

Draw four parallel line segments of length 3 starting from the four corners of the rectangle.

3.

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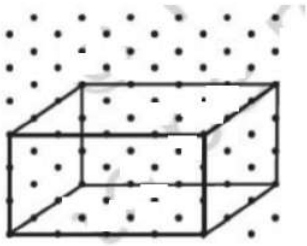
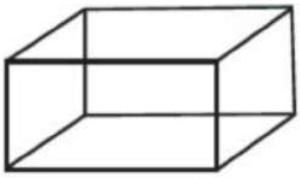


Step 3

Connect the matching corners with appropriate line segments.

4.



Step 4

This is an isometric sketch of the cuboid.

Visualising Solid Shapes

Drawing solids on a flat surface

There are three ways we can visualize solids:-

- By cutting and slicing
- By shadow play
- By looking at an object from certain angles to get different views

Visualizing solid shapes by cutting and slicing

Here is a loaf of bread. When you give a 'vertical' cut, you get several pieces, as shown in the figure.

Each face of the piece is a square! We call this face a 'cross-section' of the whole bread. The cross section is nearly a square in this case.

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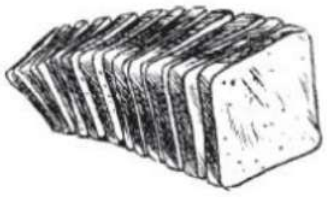
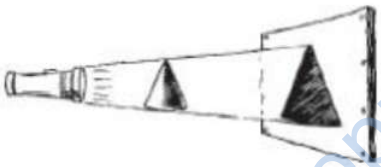


(REFERENCE: NCERT)

Visualizing solid shapes by shadow play

We will study this with the help of an experiment.

Keep a torch (or any source of light) in front of a cone.

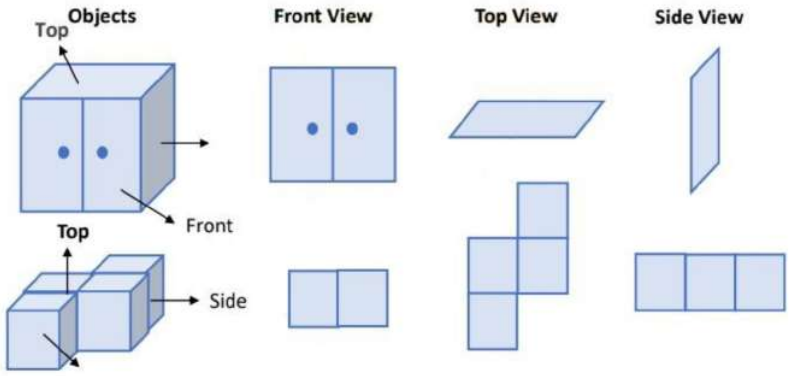


(IMAGE REFERENCE: NCERT)

Now cone is a 3D shape but the shadow that will be casted due to source of light will be 2D.

Visualizing solid shapes by visualizing it from different angles

A 3-dimensional object can look different from different positions and can be viewed from different perspective.



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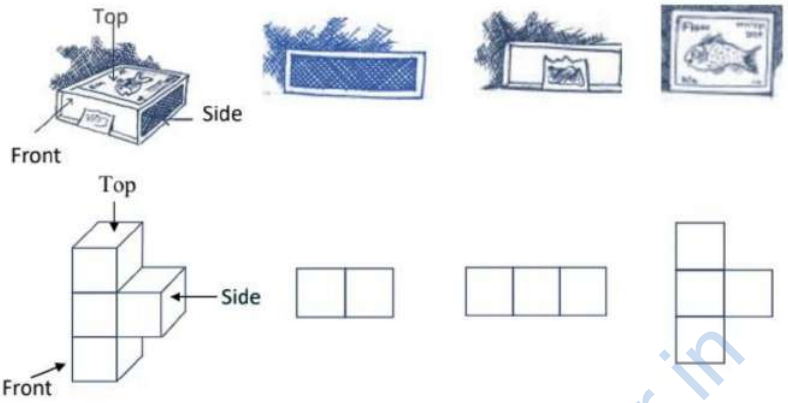
For each of the given solid, the three views are given. Identify for each solid the corresponding top, front and side views.
(REFERENCE: NCERT)



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