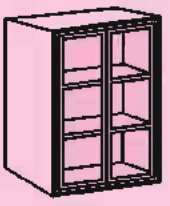
Chapter

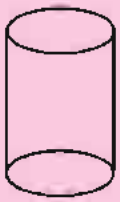
8 Visualization of Solids

8.1 In previous class, we have studied about the various solid figures like cube, cuboids, cone, cylinder, sphere etc. Some figures are given below. Look these pictures carefully and give the answers of the given questions.


Almirah


Ball


Dice

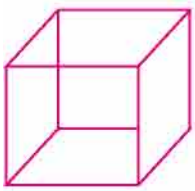

Cylindrical Drum

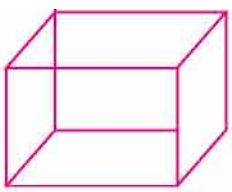

Ice cream Cone

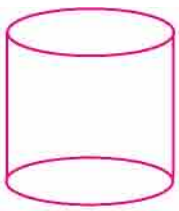
1. Name of figure	.....	.....	.....	.....	.....
2. Number of faces	.....	.....	.....	.....	.....
3. All faces are plane	yes/ no	yes/no	yes/no	yes/no	yes/no
4. Figure of plane face	.....	.....	.....	.....	.....

In the above table, which figures have all the faces plane? You will find that cube and cuboid have all the faces plane. A figure which has all the faces flat is called the Polyhedron. All the faces of ployhedron are polygon.

1. All faces of cube are of which shape? _____
2. All faces of cuboid are of which shape? _____
3. What is the shape of flat face of cylinder? _____


Cube


Cuboid


Cylinder

You see that all the faces of cube are square and all the faces of cuboid are rectangular.

Now discuss on the following shapes:

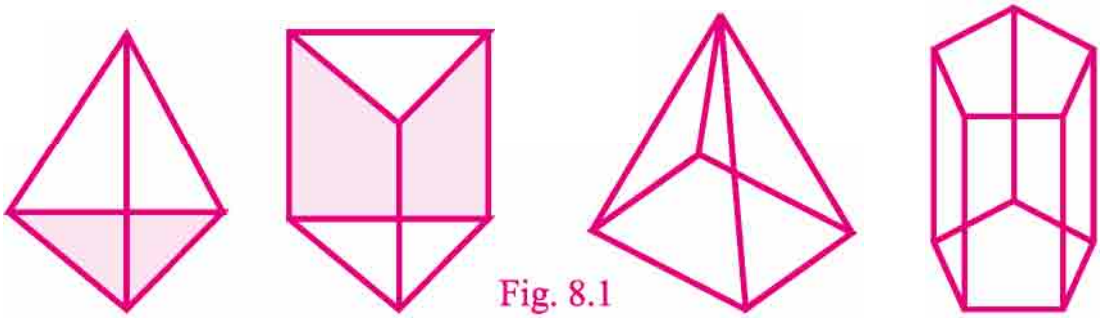
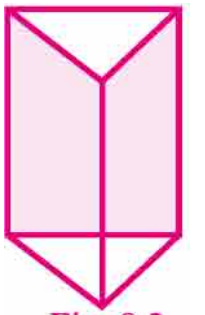


Fig. 8.1

In the above shapes, four or more than four faces are plane and these plane faces are polygon. These shapes are prism and pyramid. Let us study about these shapes.

8.2 Prism:

A polyhedron, whose base and upper part are congruent polygons and the side (Lateral faces) faces are parallelograms (rectangle or square).



← Triangular Prism

Fig. 8.2

8.2.1 Draw the Triangular Prism:

Take a triangular piece of cardboard and draw two triangles with some distance according the following figure. By joining the adjacent vertices, we get a triangular prism. You also try to make it on your note book.

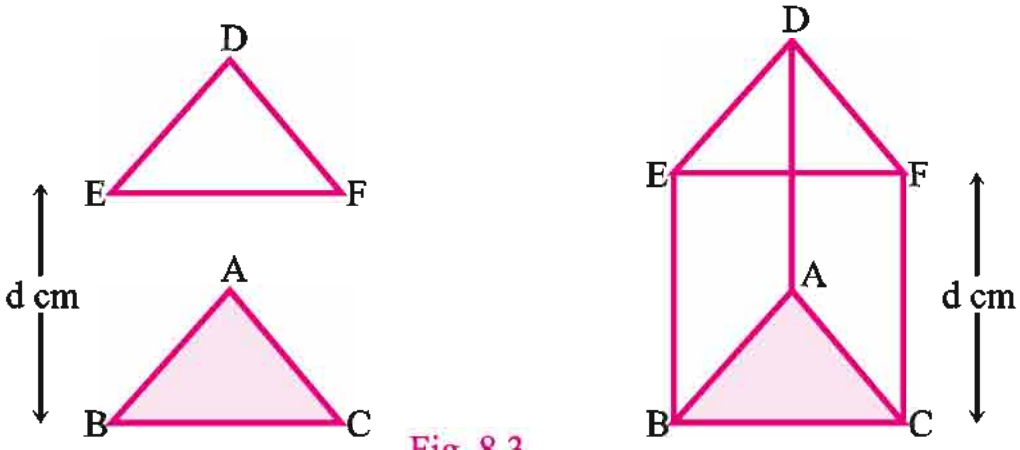


Fig. 8.3

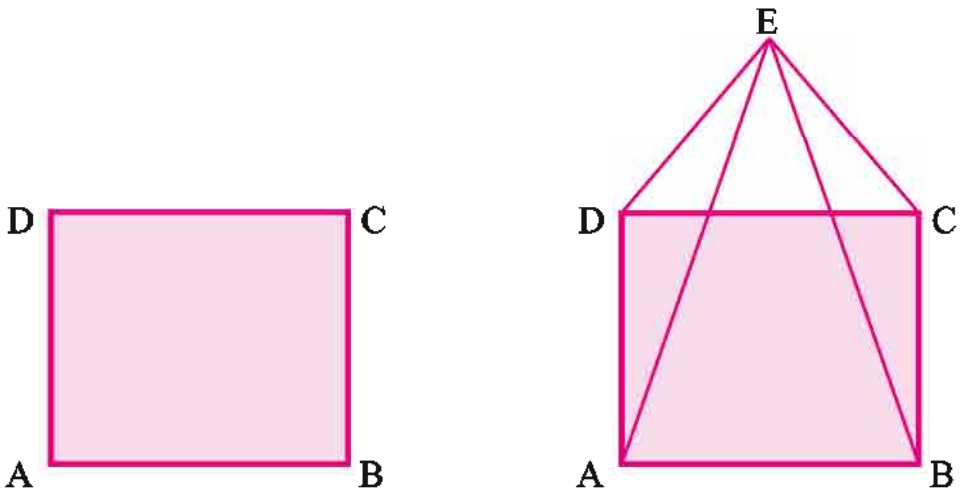
In the given triangular prism, there are three rectangular faces ABED, ADFC and BEFC and two triangular faces ABC and DEF respectively. Therefore, triangular prism has total five faces. In the triangular prism, there are the 6 vertices A,B,C,D,E and F and 9 edges AB, BC, CA,DE, EF,FD,BE,AD and CF respectively.

8.3 Pyramid

A polyhedron whose base is polygon and all the side faces are triangular having a common vertex, called the vertex of pyramid.

8.3.1 Draw a Square Pyramid:

Let us draw a square ABCD and shaded it. Now take a point E drove the middle of the square at some distance and join each vertex of the square to the point E. Obtained figure will be the shape of a square pyramid.



In this pyramid, there is a square face ABCD and four triangular faces EAB,EBC, ECD and EDA respectively. This pyramid has 8 edges AB, BC,CD,DA, EA, EB,EC and ED and 5 vertices A,B,C,D and E respectively.

8.4 Euler Formula for Polyhedrons

According to this formula, for every polyhedron there is a relationship between number of vertices V, edges E and faces F.

Let us see the table

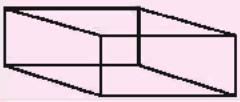
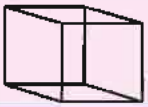
Sr. No.	Shape and its name	no. of vertices	no. of faces	no. of edges	V+F	E+2
1	 cuboid	8	6	12	8 + 6	12 + 2
2	 cube	--	--	12	-- --	-- --
3	 square pyramid	4	--	--	-- --	-- --
4	 pyramid	4	--	--	-- --	-- --
5	 prism	--	--	--	-- --	-- --

Table 8.1

We see that values in column 6 and 7 are same. Therefore, V+F = E+2

This relation was proposed by Euler that is why the name given to this formula on his name.

Exercise 8.1

1. Fill in the blanks:

(i) The base of pyramid is a polygon and other faces have the.....shape. (triangle/parallelogram).

(ii) Base face and top face of prism are .....of each other. (congruent/similar)

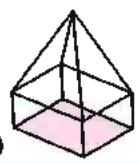
(iii) A polyhedron whose vertices are 10 and faces are 7 then its edges are.....(15/19).

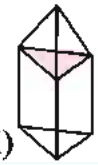
(iv) Cube and cuboid are also a kind of.....(prism/pyramid).

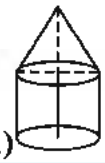
2. Write any four solid polyhedrons surrounding you with number of its vertices, faces and edges.

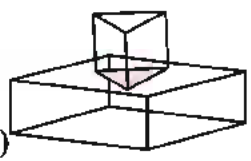
3. Draw a triangular prism taking a 4cm base of equilateral triangal.

4. Recognize polyhedron shapes in the following organized shapes also tell that which shapes are used to organized these shapes.

(i) 

(ii) 

(iii) 

(iv) 

8.5 Two-Dimensional Representation of Three-Dimensional Shapes (in net form)

In earlier classes, we studied about two dimensional representation of various solids i.e. three-dimensional shapes. Expanding the all 3d shapes, its faces are obtained in 2d shapes. Let us expand some solid shapes and see their whole faces in form of net.

8.5.1 Cuboid:

A cuboid having vertices A,B,C,D,E,F,G,H. Its visual faces are ABCD, ABGH and BGFC and shaded faces EFGH, EFCD, and AHED are side faces. By opening this cuboid we get the shape like the following figure.

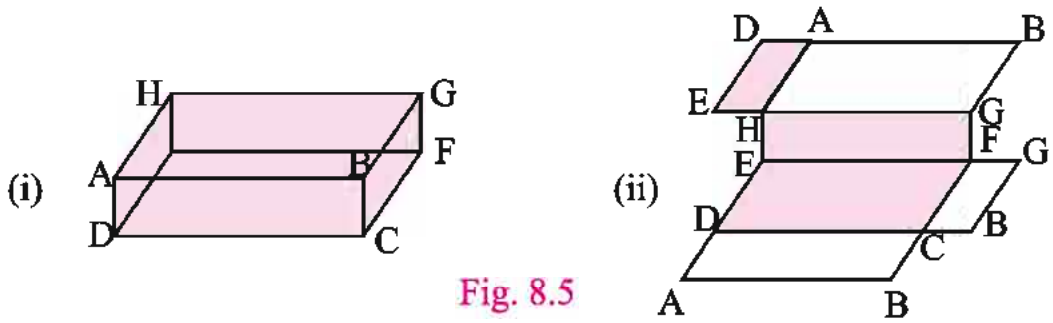


Fig. 8.5

Can the expanding figure(net) of this cuboid be of other shape. Think on this.

8.5.2 Cube

A cube having visual faces ABCD, DCGH and BFGC and shaded faces EFGH, ABFE, and AEHD are side faces. Opening this cube we get the net pattern like the following figure whose all 6 faces are equal and square.

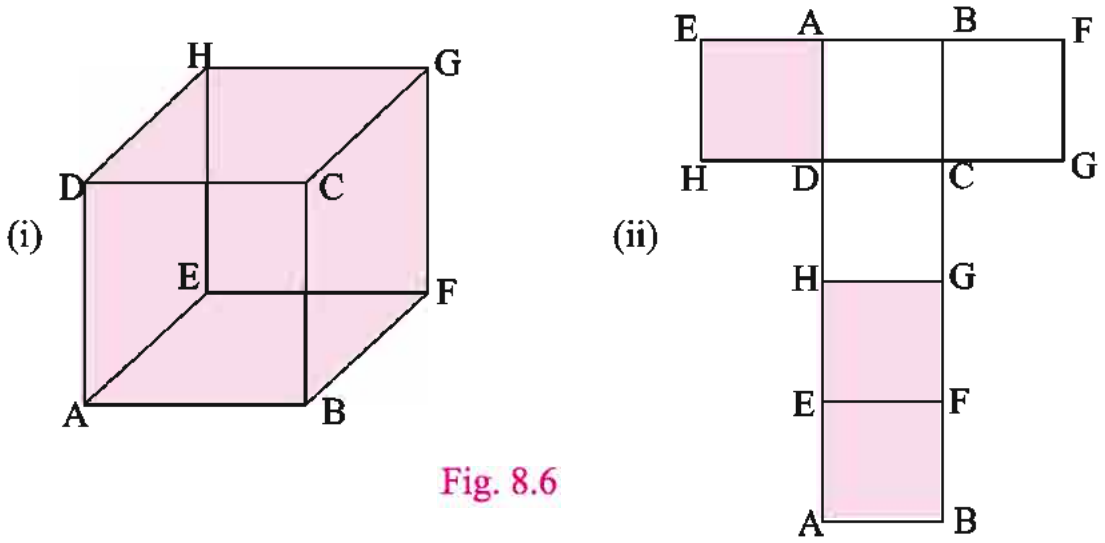


Fig. 8.6

8.5.3 Cylinder

When the solid right circular cylinder is opened with supporting a point then the curve face is obtain in form of the rectangular or square. Both parts of cylinder i.e.,top and bottom are obtain in form of circle.

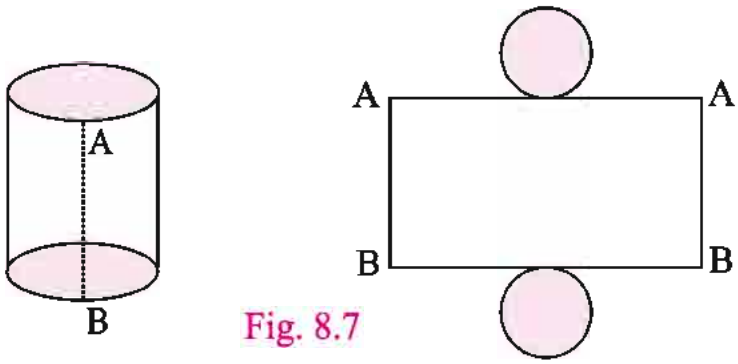


Fig. 8.7

8.5.4 Cone

There are two faces in given cone. In which one surface is curved and second surface is circular. To cut the cone supporting the AB we get the following 2d figures. One of which is equivalent to radial part and second is circular.

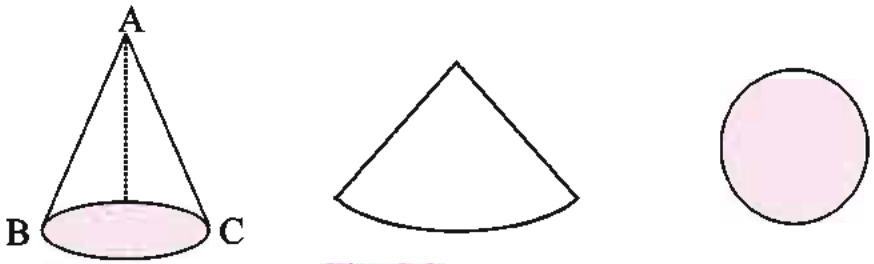


Fig. 8.8

8.5.5 Prism According to figure, a prism having the vertices A,B,C,D,E,F by expanding, three rectangular faces ABED, CADF, and BCFE are obtained respectively. Its both end are obtained in form of triangle ABC and DEF.

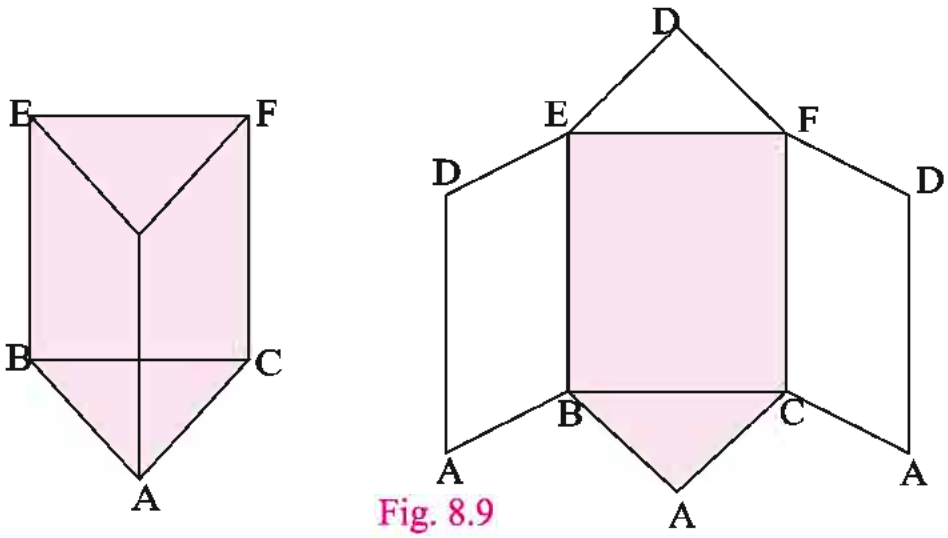


Fig. 8.9

8.5.6 Pyramid

The given pyramid has square base whose visual faces are ABE and BCE. Its side faces are ADE and CDE and its base face is ABCD.

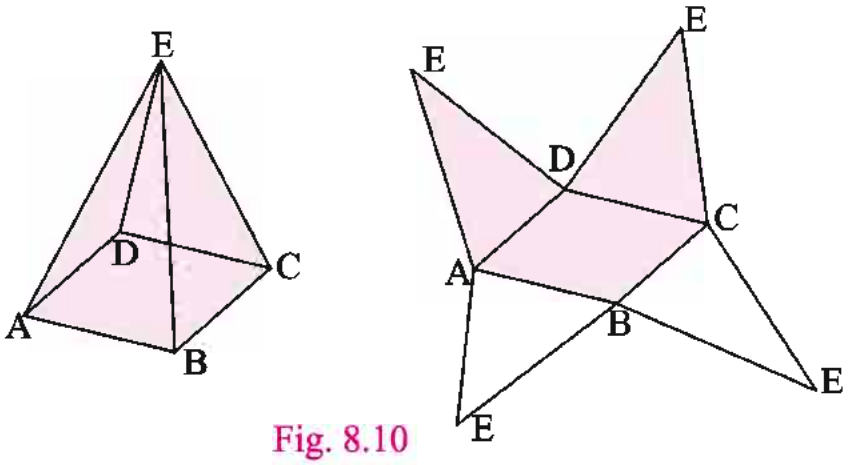


Fig. 8.10

By expanding the above pyramid we get its 2d- pattern according to the figure. In this net pattern, we get one face ABCD of square shape and four faces i.e., ABE, BCE, CDE and DAE of triangle shape.

Exercise 8.2

1. Expanding the solid shape of cube and cuboid draw the different two net pattern of figure other than book.
2. After cutting the hollow right circular cylinder according to the dotted line, show the obtained 2d-shape.