Chapter—16

FIGURES (TWO AND THREE DIMENSIONAL)

We have learnt about many types of figures and know their characteristic. Out of these figure, many of them are seen surrounding us directly or indirectly. We have learnt about, line segment. Line, triangle, quadrilateral and its kinds (Rhombus, rectangle, square, trapezium etc.) and about the figure with some more sides.

In previous classes, you have recognized about the figure found in your surroundings. Can tell where did you find a shape of rectangle?

And where did you find a triangle?

Triangle, all kinds of quadrilateral, polygons, circle etc. are made up of some kinds of faces, It mean they have length and breadth but no height. But in real, height is there. Then how will you exhibit these height in figure?

Come do and observe:

You are already familiar with following figure you also knew about their construction –

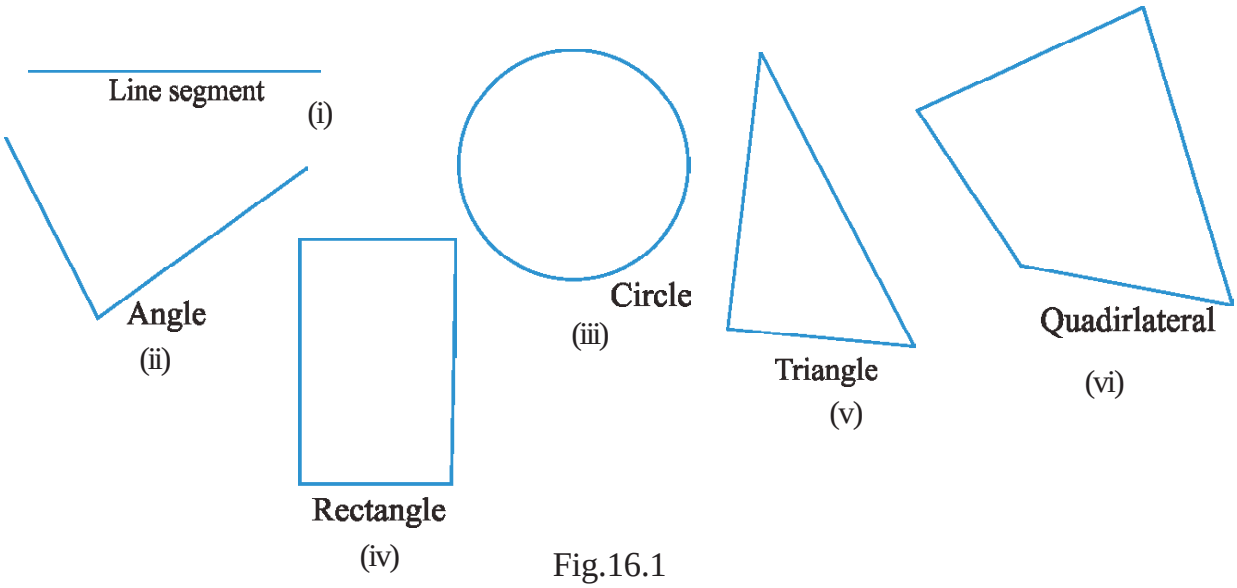


Fig.16.1

Can you draw brick, box like substances on paper?

Some students drawn figure of brick as follows-

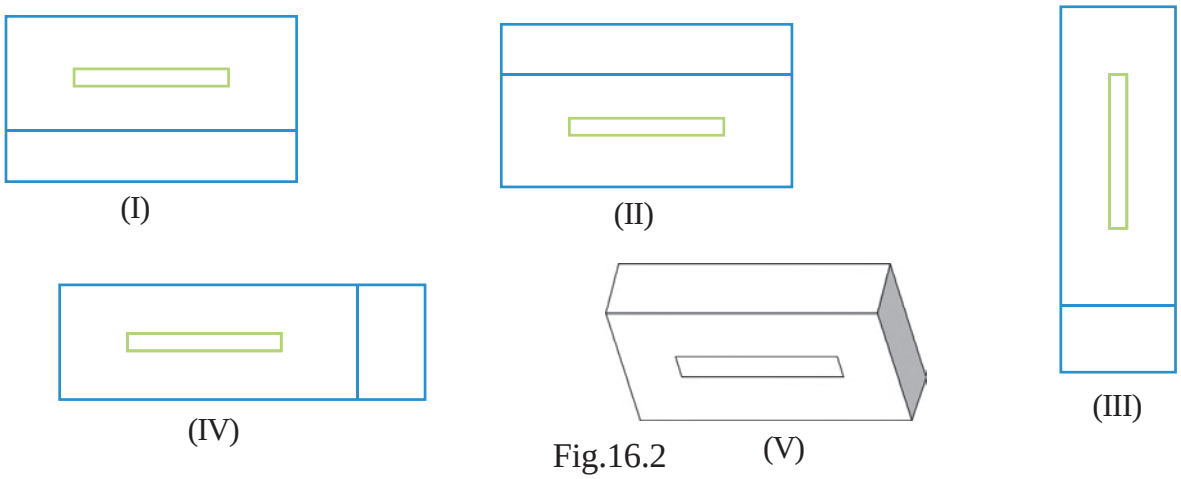


Fig.16.2

Are they all look like bricks? These all figures are different from each other. Can you tell why these are all different?

Activity 1

To understand this take one empty match box, make is stand on it combustible (gunpowder) face.

Now keep it on its larger face.

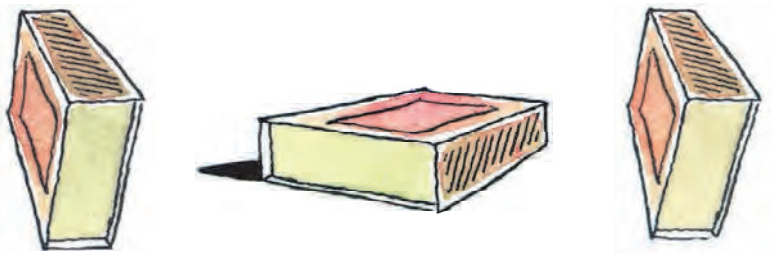


Fig.16.3

It is clear, that match box look differently now. Look at fig 16.3 (iii) in this figure, the match box is kept on smaller face. All the three figure are of match box but in different positions.

The figure of brick is also of different positions. Take bricks and keep them in different position according to the figure. Have you been able to keep those bricks according to the figure 16.2?

Activity -2

You must have seen box of chalk. Chalks are kept straight in it. Take a full box of chalk and look from the above. You will be able to see the circular portions of the chalk but not its length.

Fig. 16.4

If you draw its figure how it looks like? Anita has drawn its figure as shown in fig. 16.4.

If you draw the figure of an open box of chalk how will it look like? Now in it the upper portion of chalk will not seen.

Practice - 1

Take 5 items observe them from different positions and draw their figures.

Figure of an item with different position -

Come and observe the shape of the cuboid in fig. 16.5.

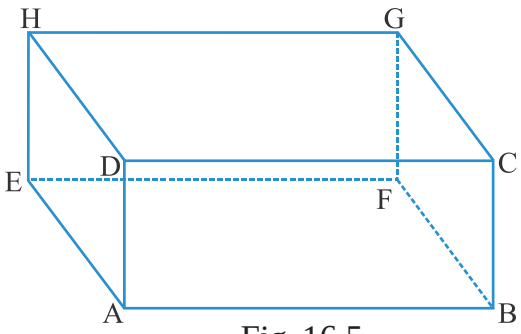


Fig. 16.5

This cuboid figure if observed from different positions looks as follows:

If you observe it from the front

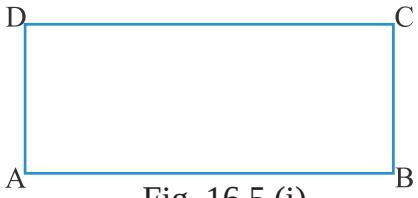


Fig. 16.5 (i)

If you observe it from the above fig. 16.5 (ii)

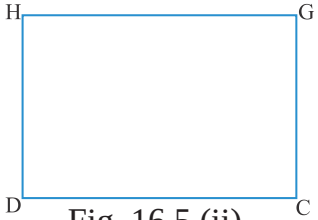


Fig. 16.5 (ii)

If you observe it from the left side

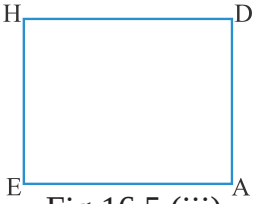


Fig.16.5 (iii)

If you prepare figure, after joining all the three true figures given above (16.5 i, ii, iii) then it should be like the previous one i.e. fig 16.5. As in the previous figure there is a particular kind of bending (angle) between the face of the figure. In the same way if all the three above figure are joined with same

particular kind of bending (angle) again we get the same figure. Here, all the three face of the cuboid are joined with one another fig. 16.5 (iv).

Now if you join all the six face of the cuboid then will get the same figure as in fig. 16.5.

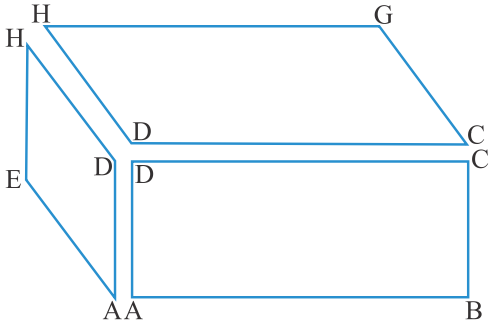
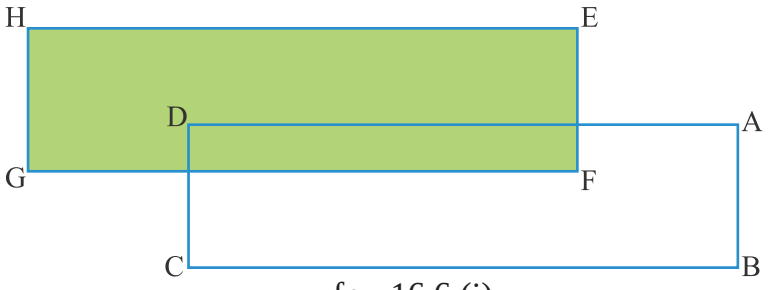


Fig.16.5 (iv)

Activity -3

Construct a figure of cuboid :-

Construction : Take piece of rectangular hard board. Keep the piece on a plane paper and draw an outline with a pencil. In this figure it is exhibited by ABCD. Now, according to the figure shift the hard board piece on the paper and again draw an outline with pencil. It is exhibited in the figure by EFGH. EFGH is shaded.



fp= 16.6 (i)

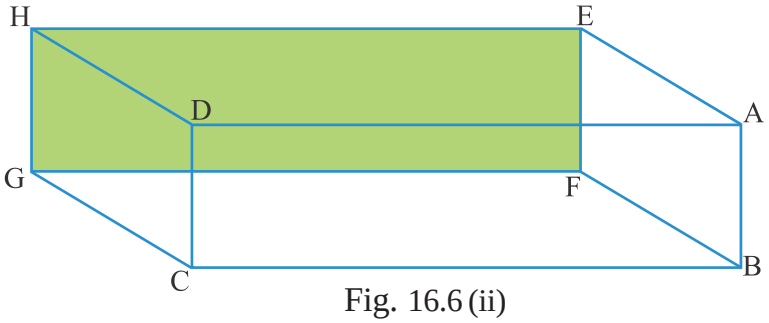


Fig. 16.6 (ii)

According to the figure 16.6 (ii) AE, BF, CG and DH are joined respectively which is the required figure of the cuboid.

In this, there are 6 rectangular face- ABCD, ABFE, BCGF, CDHG, DAEH and EFGH. Eight vertices A,B,C,D,E,F, G and H and 12, edges – AB, BC, CD, DA, AE, BF, CG, DH, EF, FG, GH and HE.

Activity -4

Make a figure of triangular prism:

Construction- Take are triangular hard board pieces and draw two different out lines with pencil, one is figure 'A' and another one is figure 'B' which is at a few distance from figure 'A'. Now label these according to figure 16.7 (iii)

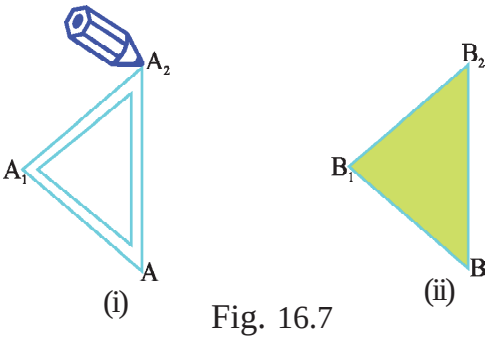


Fig. 16.7

Join AB, A_1, B_1, and A_2 B_2. Now the figure which obtained, are like figure 16.7(iv) (two and three dimensional) which is required triangular prism.

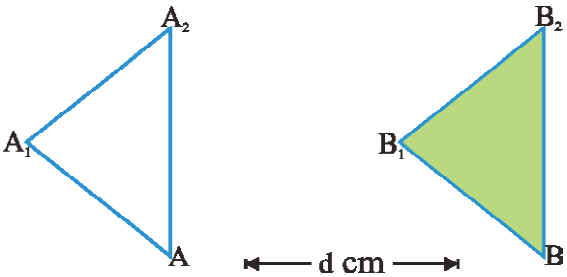


Fig. 16.7 (iii)

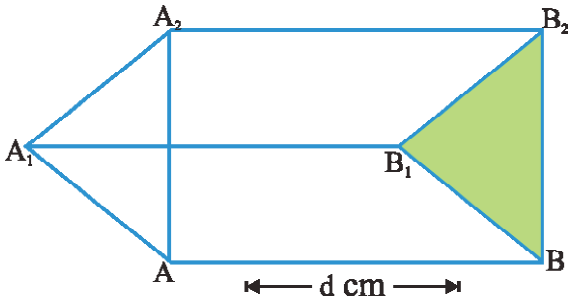


Fig. 16.7 (iv)

In this, there are 3 rectangular face ABB_2A_2, $A_1A_2B_2B_1$, and AA_1B_1B and two triangular face AA_1A_2 and BB_1B_2. There are 9 edges AB, A_1B_1, A_2B_2, AA, A_1A_2 A_2A, B, B_1 and B_2 and six verities A, A_1, A_2 and

Practice - 2

1. Construct a cube with the help of square hard board.
2. Construct a 4 cm long prism with the help of a triangular hard board.

Activity -5

Construct a cylindrical shape (cylinder)

Construction- Take one (circular disc) and draw circumference with pencil and determine the center point fig. 16.8 (i) and 9(ii). Now you have circular figure like figure 16.8 (ii) which is visible only when the disc is seen form the front.

Now you turn the disc a little and observe its diagonal position. Draw the same figure as it is visible. It will looks like figure 16.8 (iv)

After this, again you turn a little more and see it from the corners. Then you find this figure will look like figure 16.8 (iv).

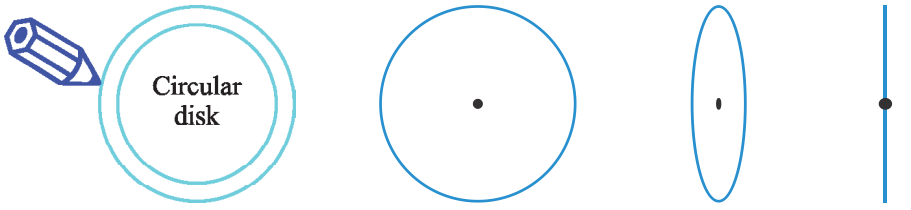


Fig. 16.8

Now draw two more figure as in fig 16.8 (iii) according to fig 16.8 (v) join the diameter A_1B_1 and diameter A_2B_2. After that join A_1B_2 and B_1B_2. In this way, you will obtain a cylindrical figure. In this figure both the ends have two spherical faces and the center part is curved.

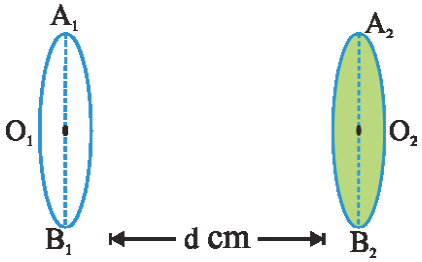


Fig. 16.8 (v)

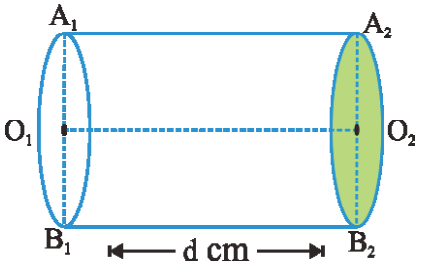
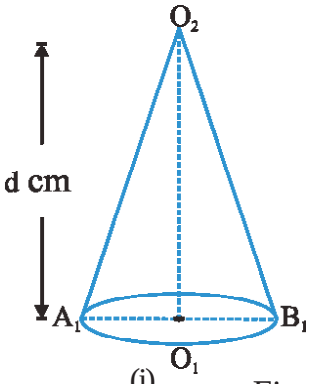


Fig. 16.8 (vi)

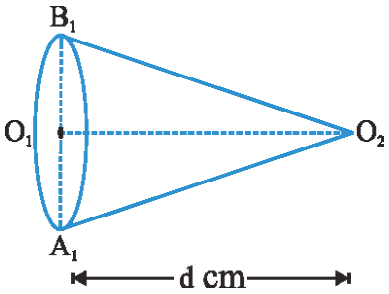
Activity -6

Construction of cone: construct a figure like fig. 16.8 (iii) and at some distance take a point 'O_2' in the canter. Join O_2A_1 and O_2. You will get a figure of cone fig. 16.9(i&ii) In this figure, one circular spherical face, one top part (vertex) and the bottom part is curved.



(i)

Fig. 16.9



(ii)

Practice - 3

1. Construct a cylindrical structure of 5 cm length.
2. Construct a cone of conical structure of 3 cm height.
3. Prepare model of cylindrical structure or a cylinder and conical structure or 'cone' by folding papers.

Activity -7

Construction of quadrilateral:

Construction:

1. According to figure 16.10 (i) construct a triangle and shade it.
2. Take a point 'P' at some distance above the triangle according to fig. 16.10 (ii).

Now join the vertices A,B,C to the point 'P' respectively. Obtained figure will be like 16.10 (iii) It is the required figure quadrilateral.

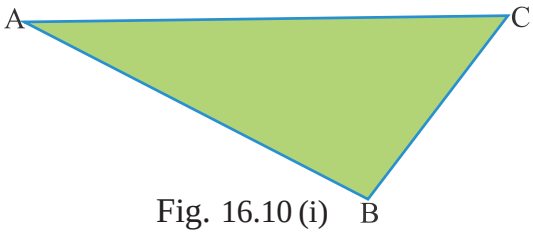


Fig. 16.10 (i)

In this figure there are four triangular face ABC, BCP, CAP and ABP, They are called triangular face also, In this figure there are 6 edges AB, BC, CA, AP, BP and CP and vertices A, B, C and P. There are 3 edges in each vertices.

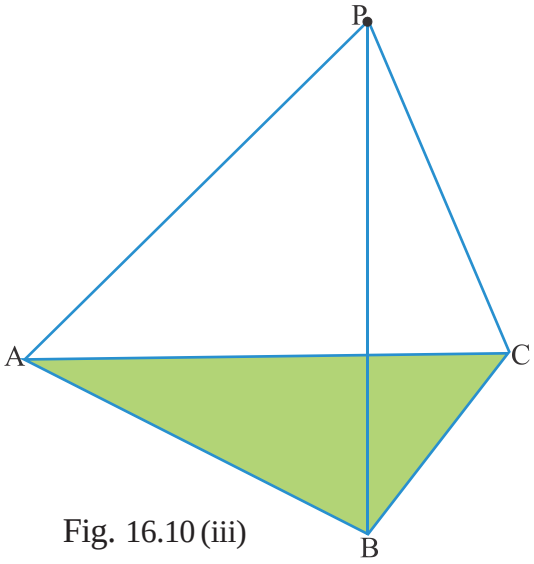


Fig. 16.10 (iii)

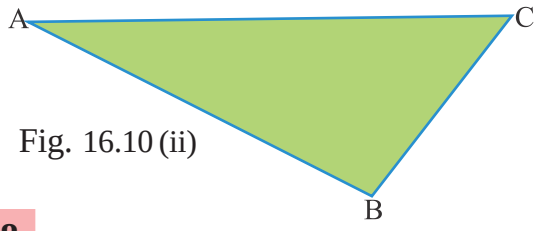


Fig. 16.10 (ii)

Activity -8

Construction of pyramid –

Construction

1. According to figure 16.11 (i),

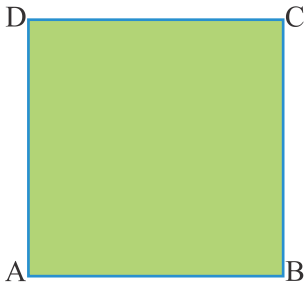


Fig. 16.11 (i)

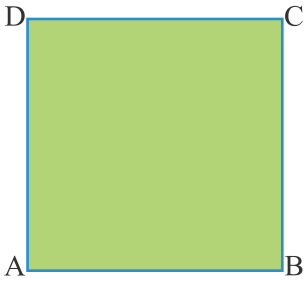


Fig. 16.11 (ii)

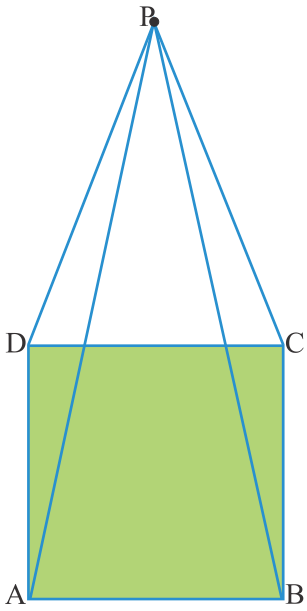


Fig. 16.11 (iii)

construct a figure of square and shade it.

2. Take a point p at some distance near about from the center, according to fig. 16.11 (ii).

3. Now join each vertices to the point 'p' obtained figure will be like figure 16.11 (iii). This figure is pyramid.

In this there are one square face ABCD and four triangular face ABP, BCP CDP and

DAP. There are 8 edges AB, BC, CD, DA, AP, BP, CP and DP and 5 vertices A, B, C, D and P also present in this figure.

Exhibit the hidden faces with the help of dotted lines:

There are some figures of cuboid given below. The main figure of cuboid is 16.12 (a) remaining other figures of cuboid are made by observing the coboid from different position. In such conditions, some parts of cuboid (vertex, edges and faces) are not seen these are exhibited by dotted lines.

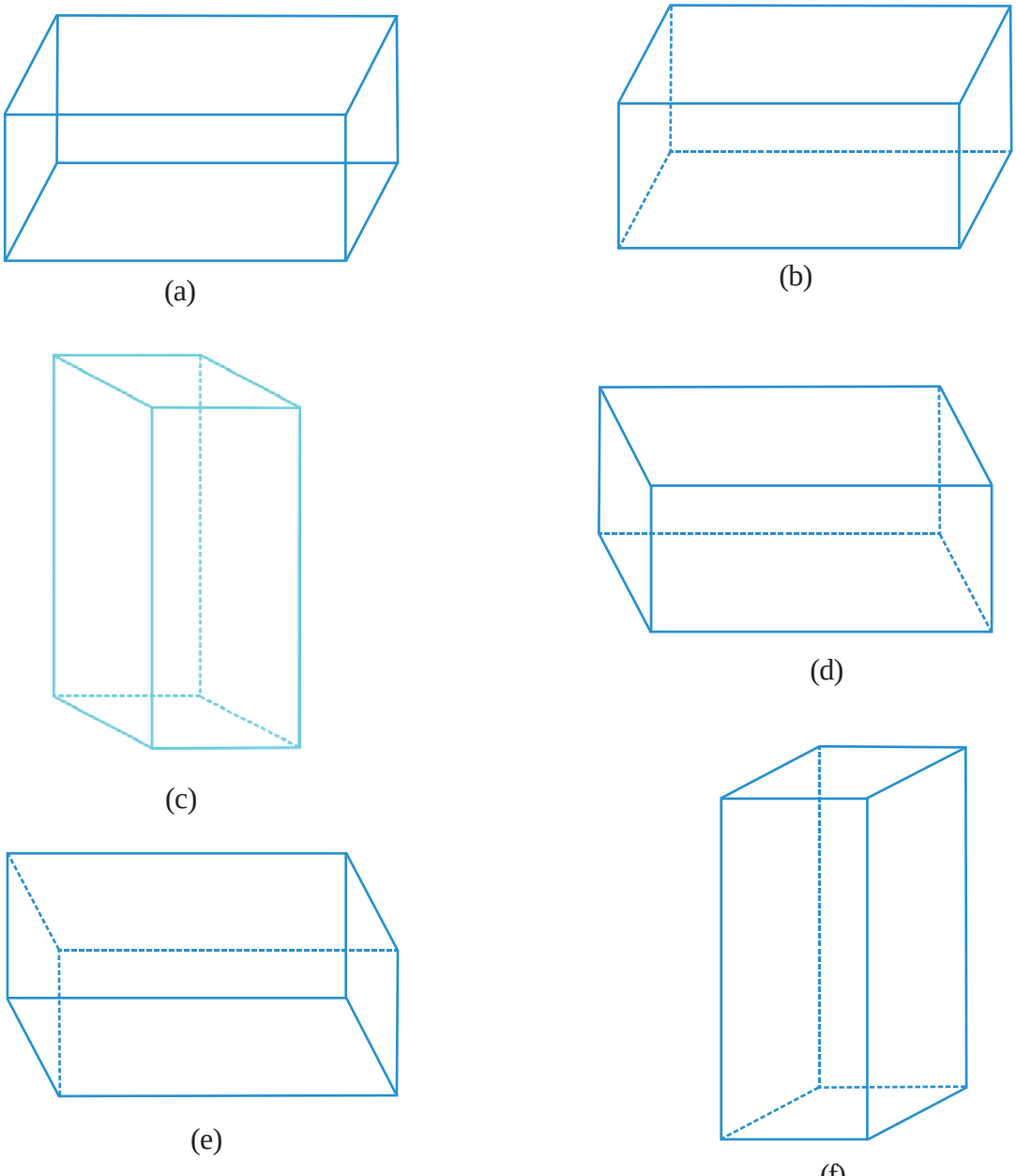
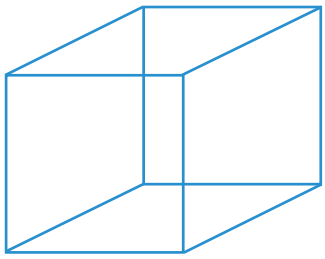


Fig. 16.12

Practice - 4

Now can you show the hidden faces by dotted lines in the following figure.

(A) Cube



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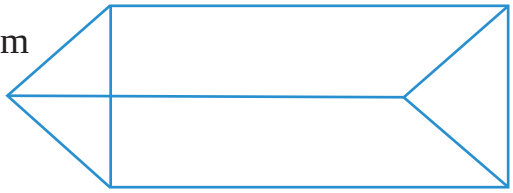
(B) Triangular Prism



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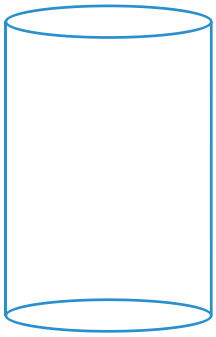
(C) Cylinder



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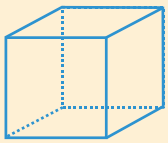
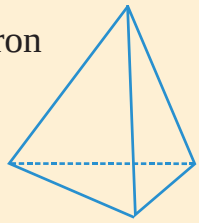
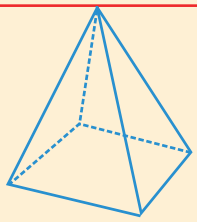
Recognition and calculation of vertices, faces and edges of the given figure.

Activity -9

In the given figure, name the vertices, face and edges, recognize them and write their numbers in the table.

Here a relation among the number of vertices, faces and edges of cuboid has been established. Now you establish the relation among the number of related parts in the remaining figure.

Table 16.1

S.No.	Figure and its name	Vertex(V)	Edge(E)	Face(F)	V-E+F
1.	Cuboid 	8	12	6	8-12+6=2
2.	Cube 				
3.	Tetra Hedron 				
4.	Pyramid 				
5.	Prism 				

After completing this table you will find there for every polygonal (figure made by 4 or more than 4 face) the value of V – E+F will always be 2. This relationship was established by Euler. So this relationship is named Euler relation after his name.

Activity 10

Construct a cuboid of any measurement and made one pyramid on the upper face, with a radius which is less than the breadth of cuboid. The figure, made by you, is like fig.16.13 in which there is a cuboid and a pyramid is seen.

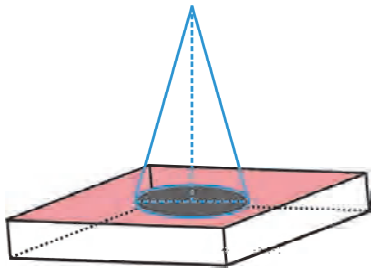
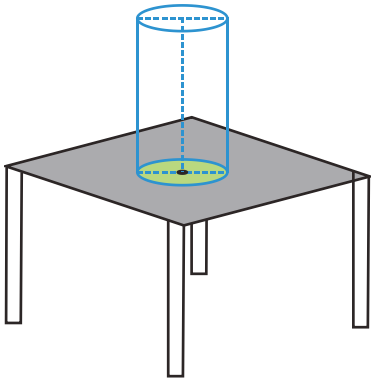


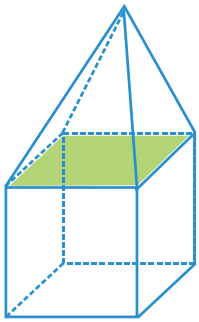
Fig. 16.13

Activity -11

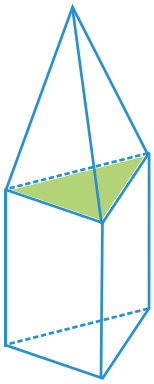
In each figure given below, there are more than one figure is joined. Recognize the figure and write their name.



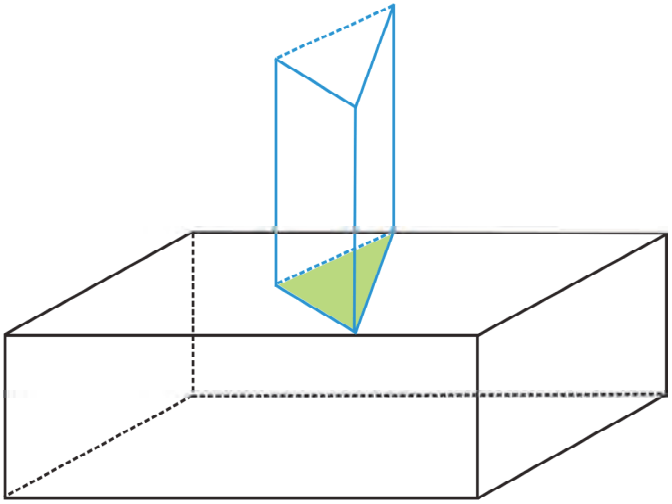
(a) Cylinder and table



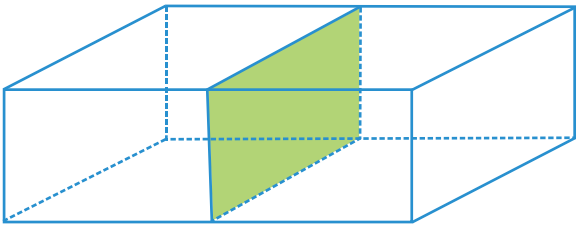
(b) ----------



(c) ----------



(d) ----------



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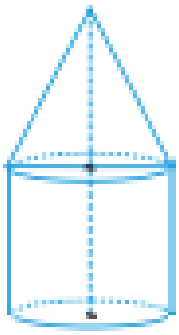
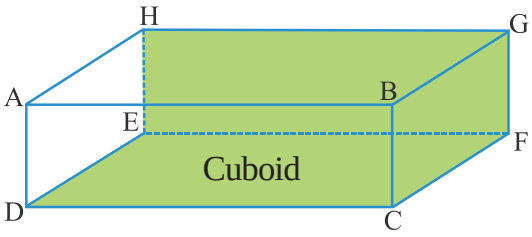


(f) ----------

Fig. 16.14

Secondary figure to make a model:

The face of the following figure are shown separately. With the help of these you can make a model by cutting pieces of paper



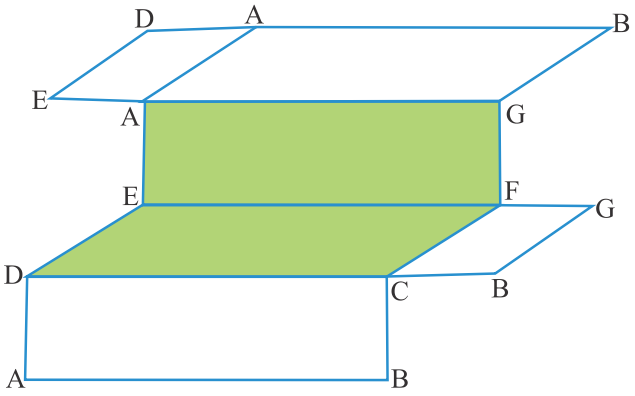
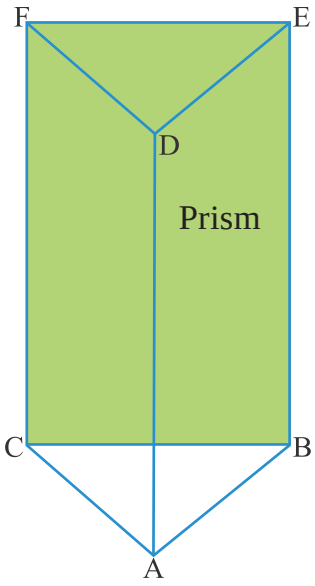


Fig. 16.15



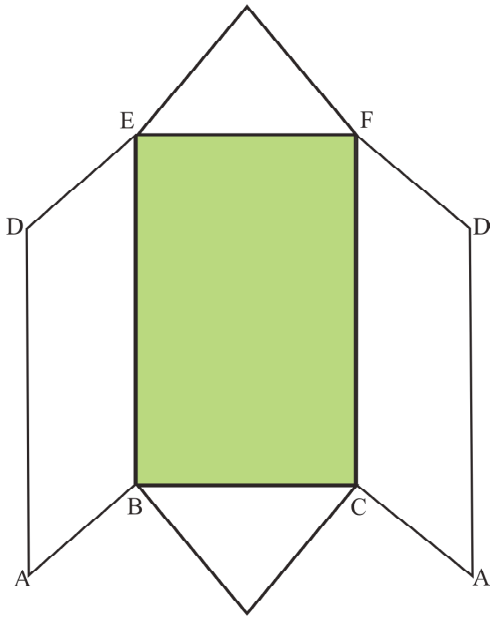
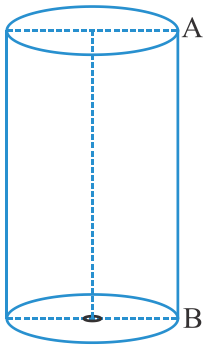


Fig. 16.16



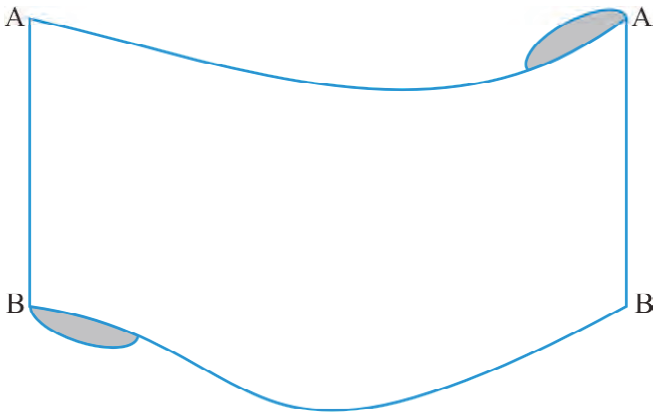
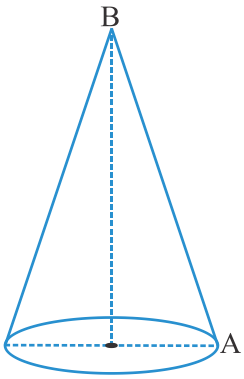


Fig. 16.17



Cone

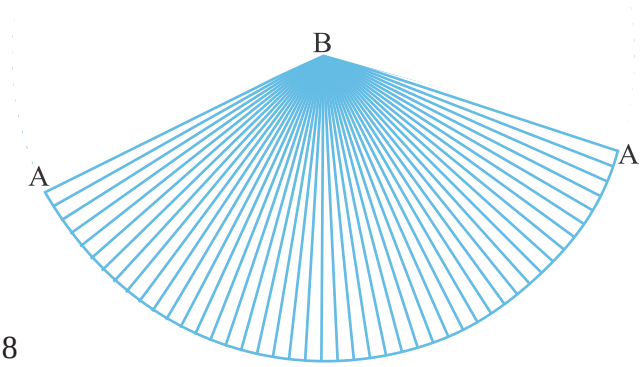
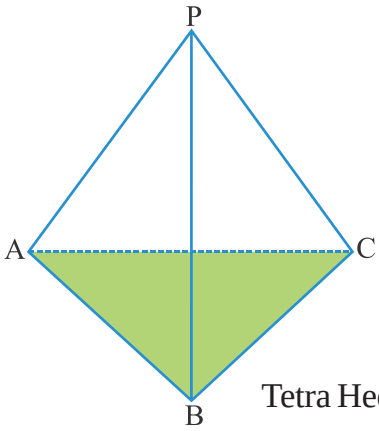
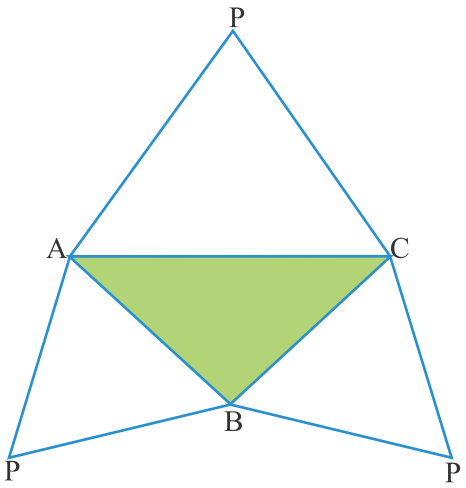


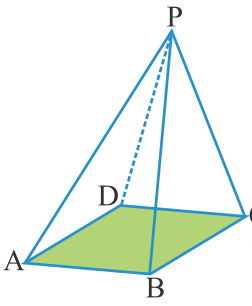
Fig. 16.18



Tetra Hedron

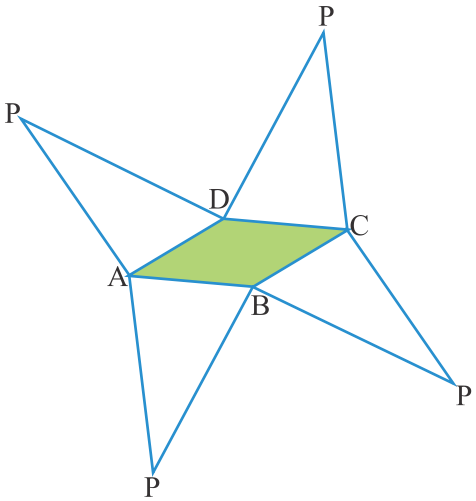
Fig. 16.19

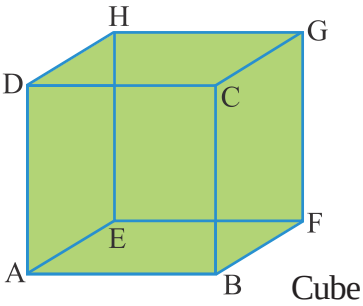




Pyramid

Fig. 16.20





Cube

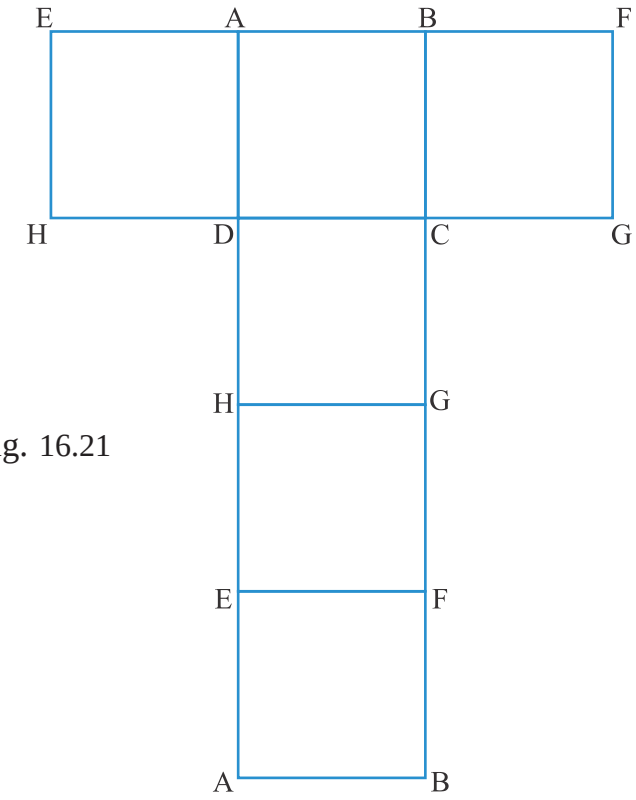


Fig. 16.21

Tip :- The cube can be separated like face of cuboid and cuboid can be separated like the faces of the cube.

Exercise – 16

1. Construct (prepare) a cube with the help of square of 3 cm.
2. Construct a cylinder of 5 cm length.
3. Construct two triangles at a distance of 5 cm in your copy with the help of a triangular hard board and construct a triangular prism with the help of it.
4. Construct a quadrilateral in your copy.
5. If these are 4 faces and 4 vertices in a (polygonal) can you tell how many edges will be there in it.