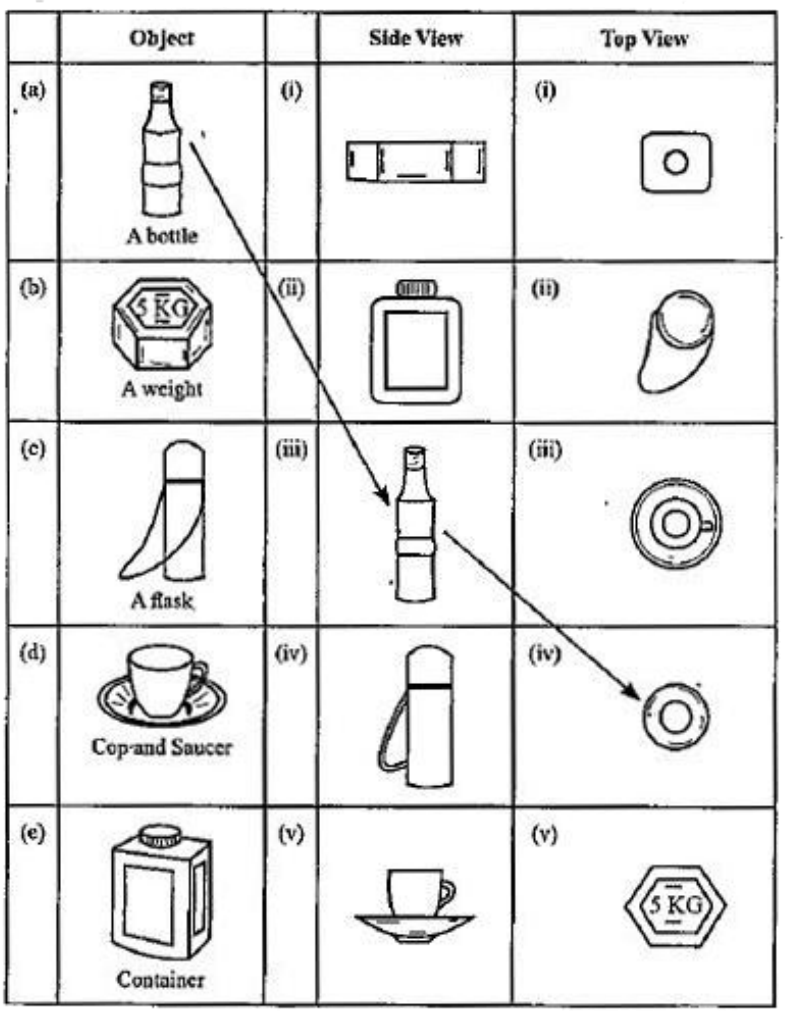
Exercise 10.1

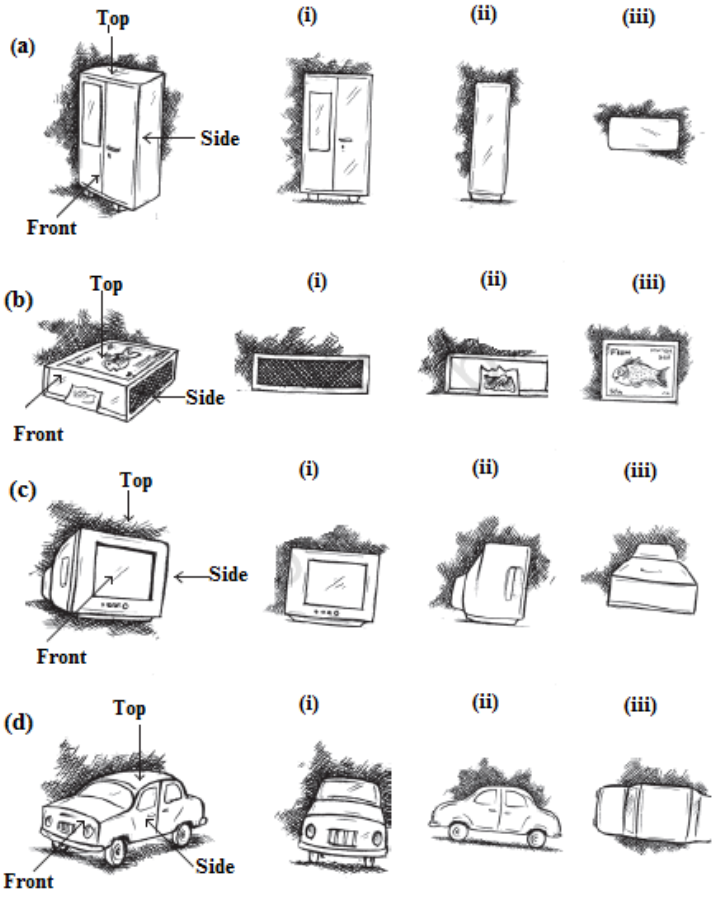
1. For each of the given solids, the two views are given. Match for each solid the corresponding top and front views. The first one is done for you.



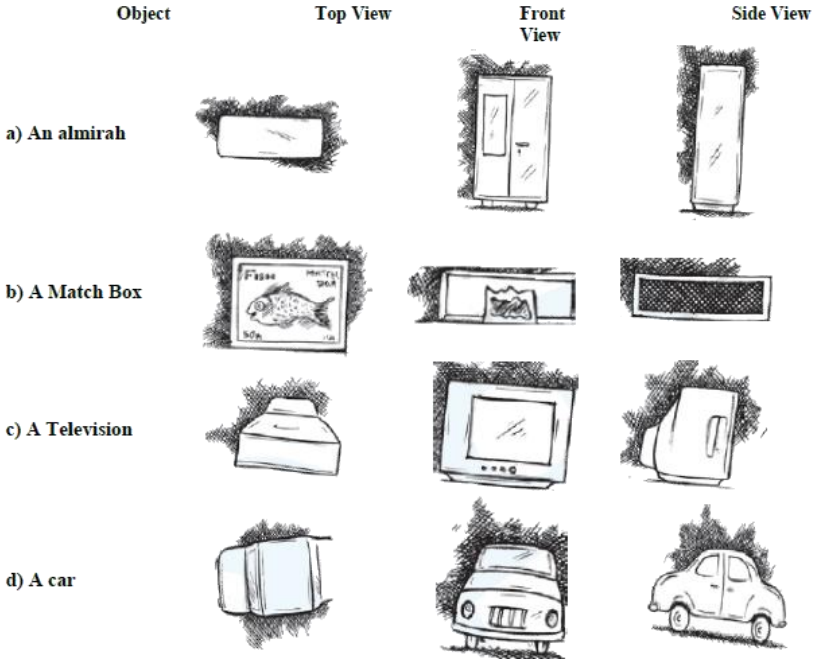
Answer:

Object	Side view	Top view
a)	(iii)	(iv)
b)	(i)	(v)
c)	(iv)	(ii)
d)	(v)	(iii)
e)	(ii)	(i)

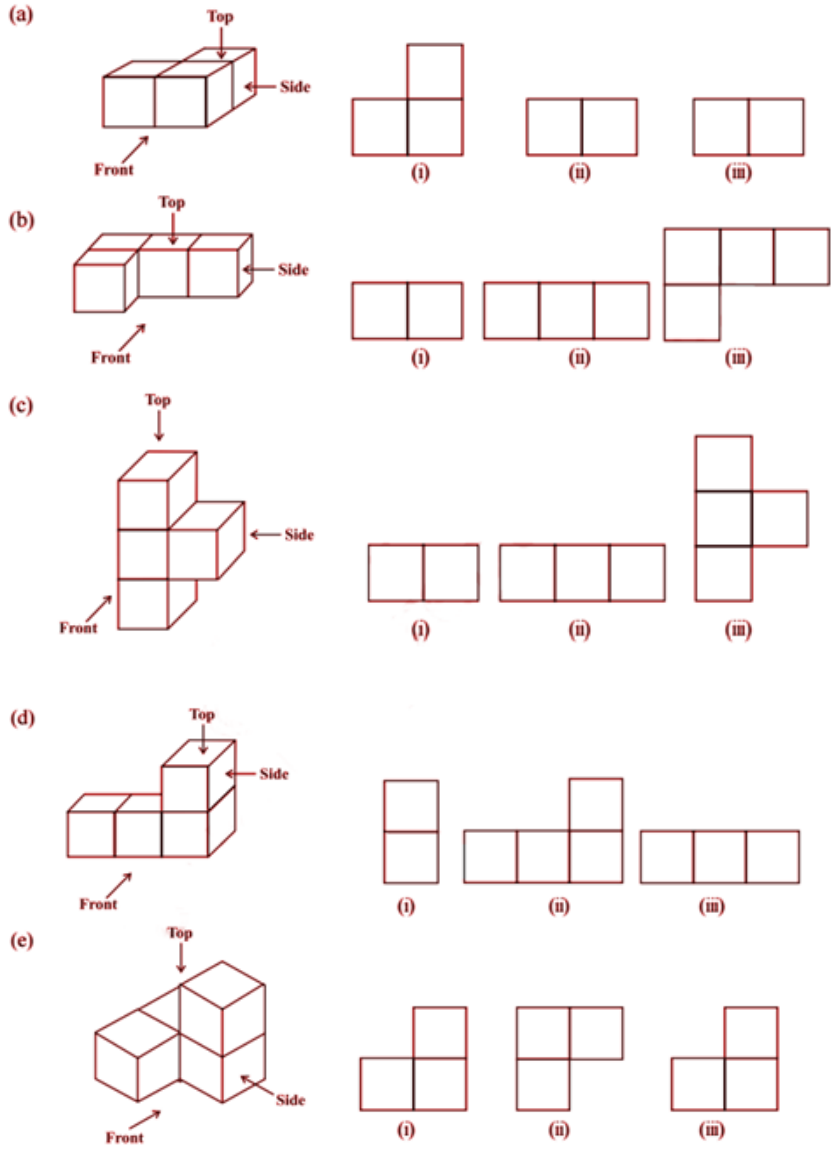
2. For each of the given solids, the three views are given. Identify for each solid the corresponding top, front, and side views



Answer:



3. For each given solid, identify the top view, front view, and side view.



Answer:

(a) (i) Top view (ii) Front view (iii) Side view

(b) (i) Side view (ii) Front view (iii) Top view

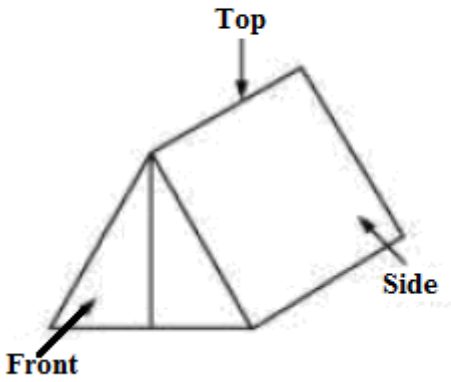
(c) (i) Top view (ii) Side view (iii) Front view

(d) (i) Side view (ii) Front View (iii) Top view

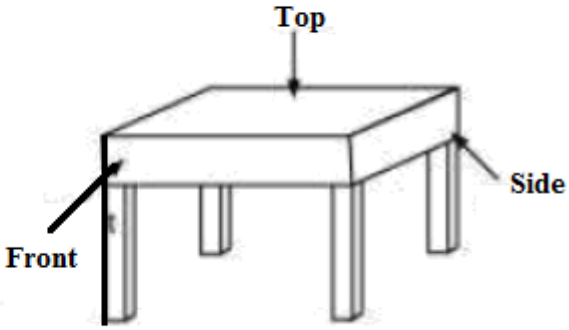
(e) (i) Front view (ii) Top view (iii) Side view

4. Draw the front view, side view, and top view of the given objects:

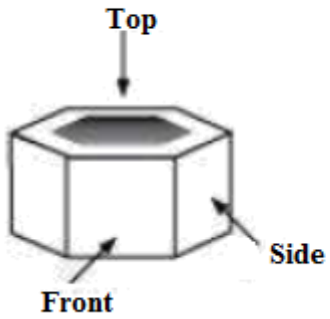
(a) A Military Tent



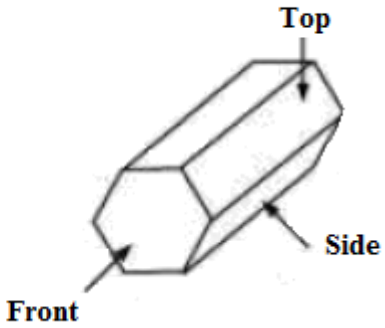
(b) A Table



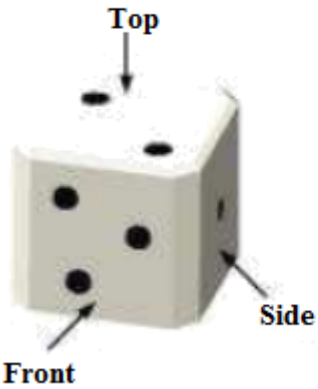
(c) A Nut



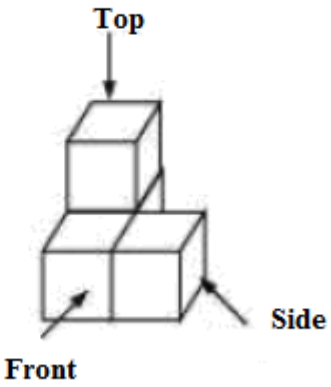
(d) A Hexagonal block



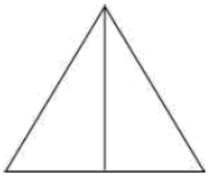
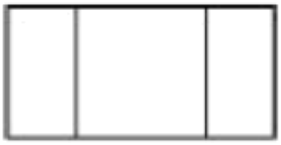
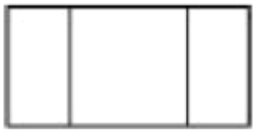
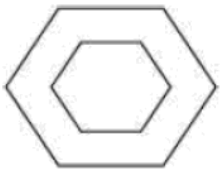
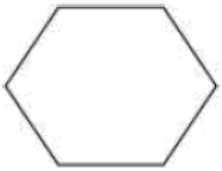
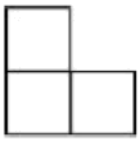
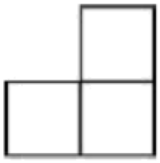
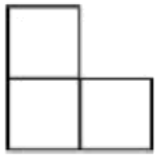
(e) A Dice



(f) A Solid



Answer:

Name of objects	Front view	Side view	Top view
(a) A Military tent			
(b) A table			
	Front view	**Side view**	**Top view**
(c) A Nut			
(d) A Hexagonal Block			
(e) A Dice			
(f) A Solid			

Exercise 10.3

1. Can a polyhedron have its faces

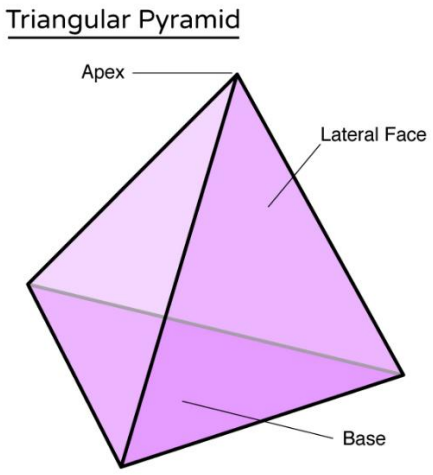
(i) 3 triangles? (ii) 4 triangles? (iii) a square and four triangles?

Answer: A solid figure consists of four or more plane faces (all polygons), pairs of which meet along an edge, three or more edges meeting at a vertex.

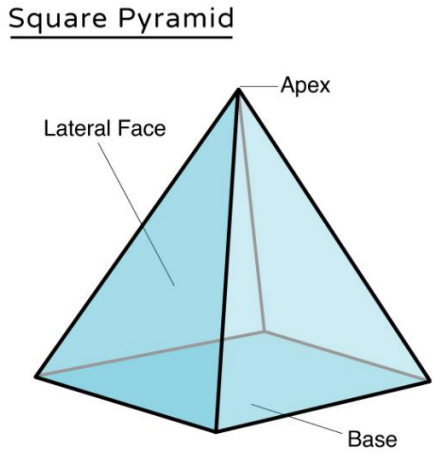
Polyhedron: A three-dimensional figure whose faces are all polygons. A polyhedron has to have a minimum of four faces.

(i) No, a polyhedron cannot have 3 triangles for its faces. Because a polyhedron must have edge meetings at vertices which are points.

(ii) Yes, a polyhedron can have four triangles which is known as a pyramid on a triangular base. Because all the edges meet at the vertices.



(iii) Yes, a polyhedron has its faces a square and four triangles which makes a pyramid on a square base. Because all the eight edges meet at the vertices.



Hence, a polyhedron can be made from 4 triangles and a square and four triangles. But it cannot be made from 3 triangles.

Note- A polyhedron is a three-dimensional shape with flat polygonal faces, straight edges, and sharp corners or vertices. A polyhedron with 4 triangles as faces is called a triangular pyramid and one with one square and four triangles is called a square-based pyramid.

2. Is it possible to have a polyhedron with any given number of faces? (Hint: Think of a pyramid)

Answer: A polyhedron is a three-dimensional solid made up of polygons. It has flat faces, straight edges, and vertices. The edges of a polyhedron meet at the vertices which are points. A polyhedron must have at least 4 faces.

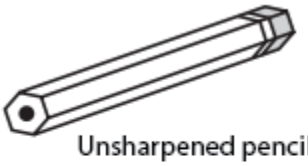
Yes. It is possible to have a polyhedron only when the number of faces is 4 or more than 4. The least number of faces in a polyhedron is 4. We cannot have a polyhedron with a number of faces to be less than 4.

3. Which are prisms among the following?

(i)

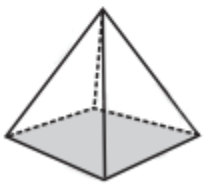
A nail

(ii)



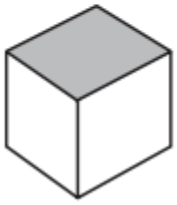
Unsharpened pencil

(iii)



A table weight

(iv)



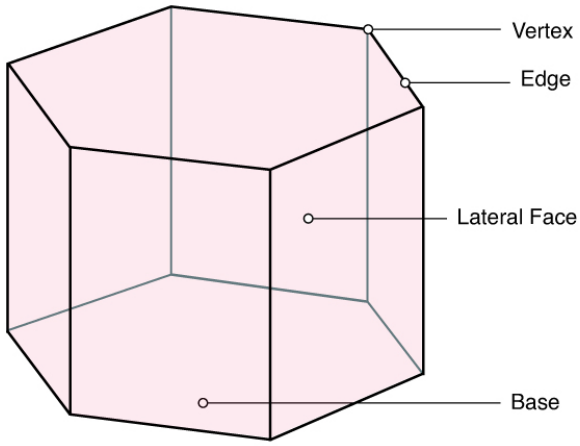
A box

Answer: A prism is a polyhedron whose base and top are congruent polygons and whose other faces, i.e., lateral faces are flat in shape. It is a solid shape that does not have curved faces.

Among the given figures,

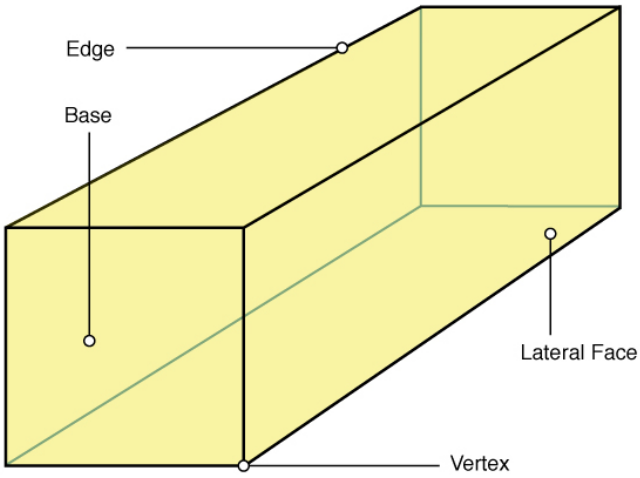
(ii) an Unsharpened pencil is a prism because the top and bottom faces are congruent which is hexagonal in shape and the lateral faces are all flat faces i.e., parallelograms.

Hexagonal Prism



(iv) A box is a prism as the top and the bottom faces are congruent which is square in shape are prisms and the lateral faces are all flat faces i.e., square.

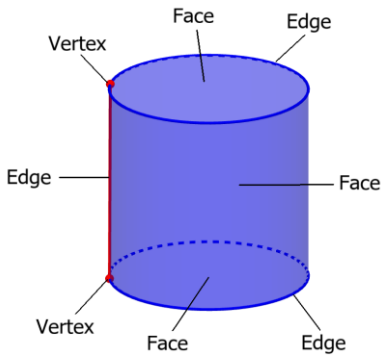
Square Prism

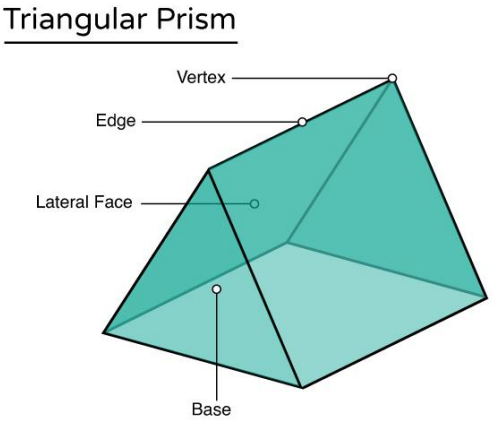


4. (i) How are prisms and cylinders alike?
(ii) How are pyramids and cones alike?

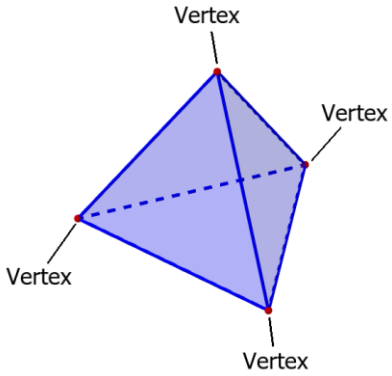
Answer: A prism is a polyhedron whose base and top are congruent polygons and whose other faces, i.e., lateral faces are flat in shape. A pyramid is a polyhedron whose base is a polygon (of any number of sides) and whose lateral faces are triangles with a common vertex.

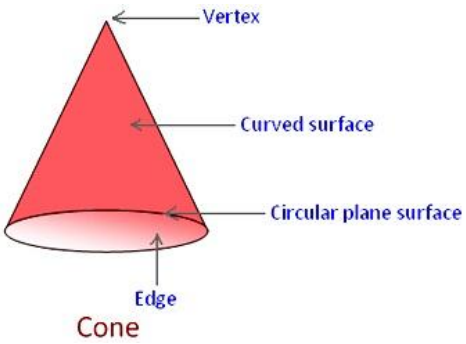
(i) A prism and a cylinder are alike because it can be considered as a circular prism having a curved face. Thus the opposite faces are congruent and parallel.





(ii) A pyramid and a cone are alike because they can be considered as a circular pyramid having a vertex at the top with a lateral curved face.

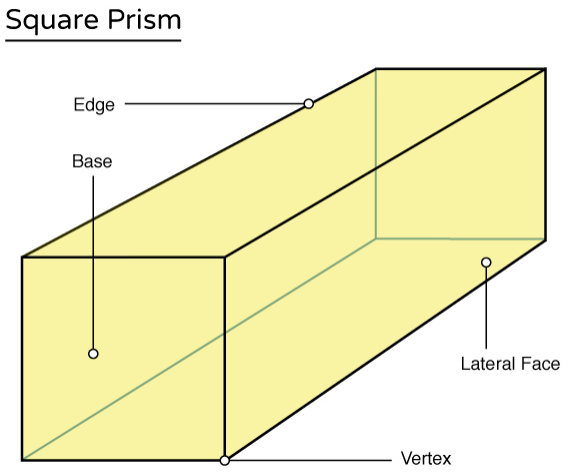


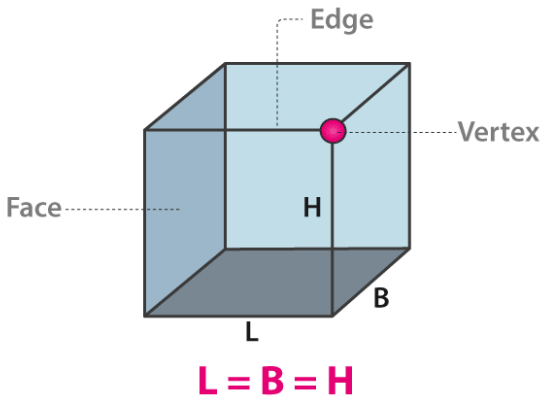


5. Is a square prism the same as a cube? Explain

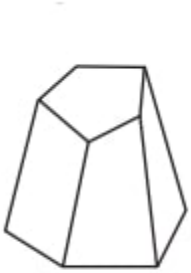
Answer: A prism is a polyhedron whose base and top are congruent polygons and whose other faces, i.e., lateral faces are flat in shape.

No, a square prism does not have to necessarily be a cube, as a square prism has a square base but the height need not be of the same dimension. A cube is a three-dimensional solid shape that has equal length, breadth, and height. Hence, a square prism can also be a cuboid.

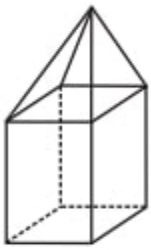




6. Verify Euler's formula for these solids.



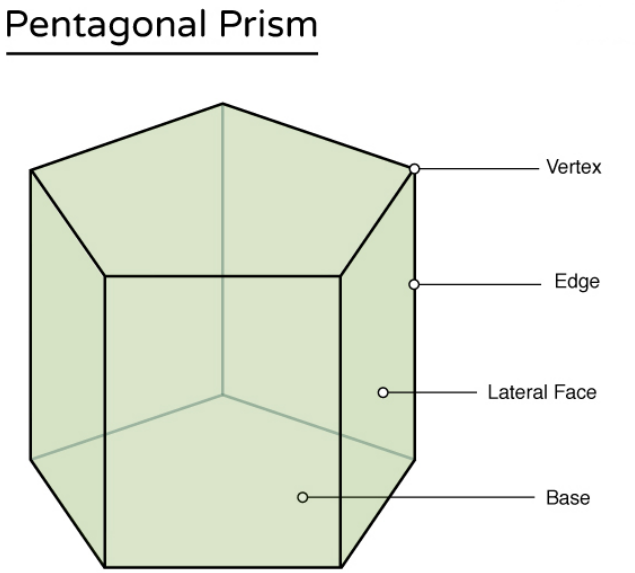
(i)



(ii)

Answer: According to Euler's formula, in any polyhedron, F + V - E = 2, where 'F' stands for the number of faces, 'V' stands for the number of vertices, and 'E' stands for the number of edges.

(i) In the figure we can see that the top and bottom faces are pentagons.



Number of faces, F = 7

Number of edges, E =15

Number of vertices, V =10

Let's verify Euler's formula,

F + V - E = 7 + 10 - 15

= 17 - 15 = 2

Thus, Euler's formula is verified.

(ii) In the figure we can see that its top is a square pyramid and the bottom is a square prism.

Number of faces, F = 9

Number of edges, E = 16

Number of vertices, V = 9

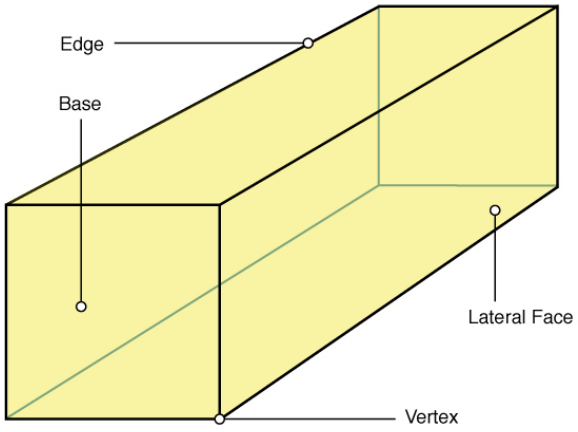
Let's verify Euler's formula,

F + V - E = 9 + 9 - 16

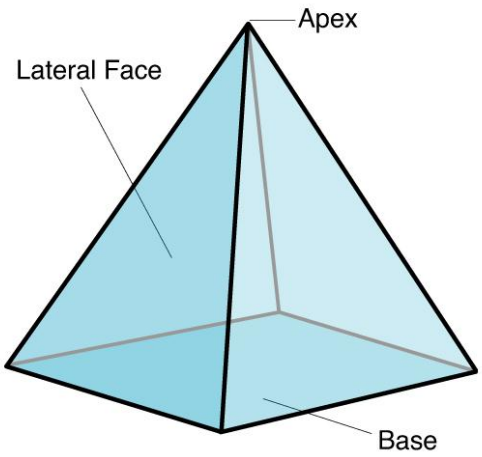
= 18 - 16 = 2

Thus, Euler's formula is verified.

Square Prism



Square Pyramid



7. Using Euler's formula find the unknown

Faces	**?**	**5**	**20**
Vertices	**6**	**?**	**12**
Edges	**12**	**9**	**?**

Answer: According to Euler's formula, in any polyhedron, F + V - E = 2, where 'F' stands for the number of faces, 'V' stands for the number of vertices, and 'E' stands for the number of edges.

(i) Number of faces, F =?

Number of edges, E =12

Number of vertices, V = 6

According to Euler's formula in any polyhedron,

F + V - E = 2

F + 6 - 12 = 2

F - 6 = 2

F = 2 + 6 = 8

(ii) Number of faces, F = 5

Number of edges, E = 9

Number of vertices, V = ?

According to Euler's formula in any polyhedron,

F + V - E = 2

5 + V - 9 = 2

V - 4 = 2

V = 2 + 4 = 6

(iii) Number of faces, F = 20

Number of edges, E = ?

Number of vertices, V = 12

According to Euler's formula in any polyhedron,

F + V - E = 2

20 + 12 - E = 2

32 - E = 2

E = 32 - 2 = 30

Faces	8	5	20
Vertices	6	6	12
Edges	12	9	30

8. Can a polyhedron have 10 faces, 20 edges, and 15 vertices?

Answer: According to Euler's formula in any polyhedron, F + V - E = 2, where 'F' stands for a number of faces, 'V' stands for a number of vertices, and 'E' stands for a number of edges.

Given that,

Number of faces, F = 10

Number of edges, E = 20

Number of vertices, V =15

Let's verify Euler's formula,

F + V - E = 10 + 15 - 20

= 25 - 20

= 5 ≠ 2

As we know according to Euler’s formula in any polyhedron, F + V - E = 2. The above condition doesn't satisfy Euler's formula. Thus, we cannot have a polyhedron with 10 faces, 20 edges, and 15 vertices.