CHAPTER 14

Understanding 2D and 3D Shapes

3D Shapes:

3D objects:

- 3D shapes are objects that take up space.
- The world around us is made up of 3D shapes. These are the things we can hold such as a book, a soccer ball, dice, a candle or even an ice cream cone!
- A 3D shape/shapes are called SOLIDs.




Classifying objects:

Here are few objects, let us classify them based on shape.

An orange is like a ball.

A beaker is like a candle.

A rubix cube is like dice.

A woollen ball is like a football.

A sugar cube is like a dice.

A briefcase is like a book.

A wooden log is like a candle.

A brick is like a book.

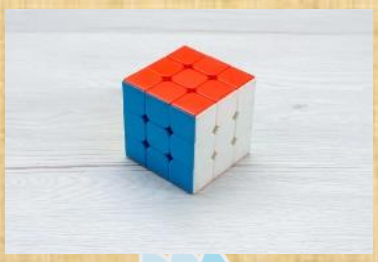
A birthday cap is like an ice cream cone.

Children based on their shapes, these objects have specific name such as

Shape that is like dice is a cube.

Shape that are like a book is a cuboid, shape that is like a ball is called a sphere, shape that is like a candle is called a cylinder and shapes that are like ice cream cones are called CONES.

We shall now understand more about the properties of these SOLIDS.



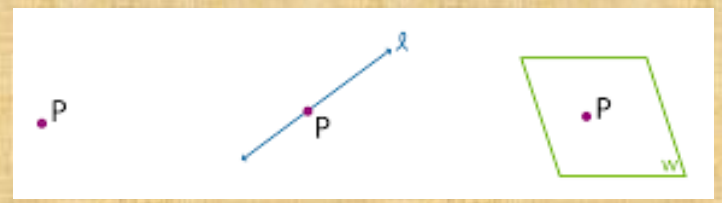
Shapes	Objects	Name
Like a Dice		
Like a book		
Like a ball		
Like a candle		
Like an ice cream cone		

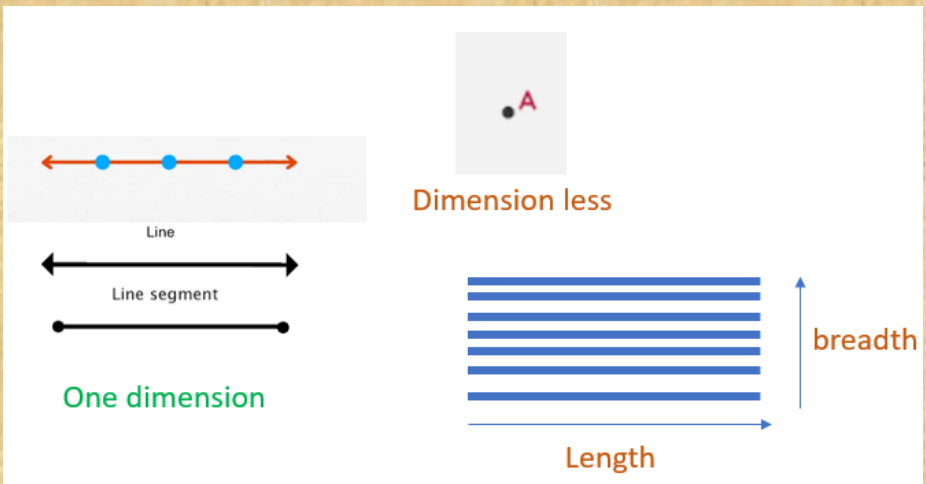
The three dimensions

Let us compare their geometrical property.

A point is dimension less, when we join many points that line next to each other along the same direction, we get a line. The distance between points that is the length of that segment can be measured, hence it has one dimension.

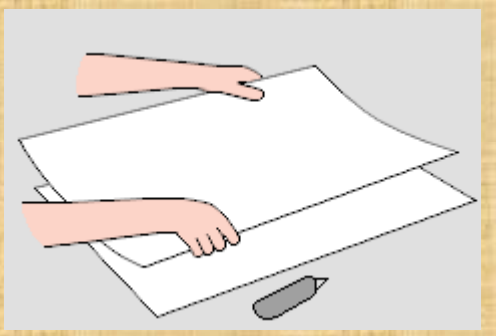
When we stack or collect many line one on top of each other, (show the lines one on top of each other) we get two dimensions, the length (As the voice says, let the arrow move from left to right) and breadth (As the voice says, let the arrow move from bottom to top) that makes a two dimensional figure (during this voice , let the line be replaced by a rectangle shape.

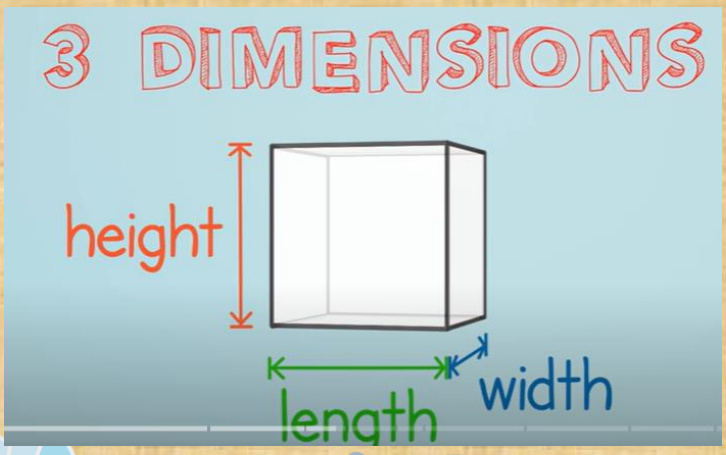


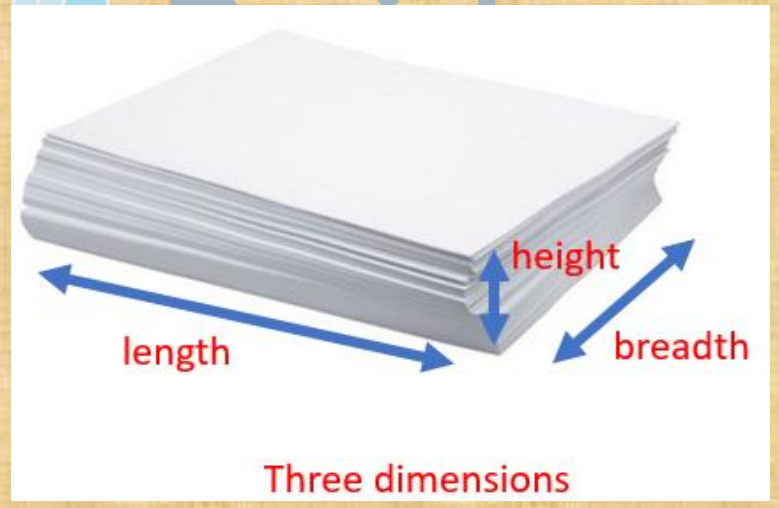


Now going forward when we stack many 2d shapes one on top of each other, for example we can consider sheets of paper being placed on top of each other, we get 3 dimensions, length, breadth and height. Hence, it is a 3 dimension.

All these objects cube, cuboid, sphere, cone, cylinder are 3D objects with 3 dimensions length, width (BREADTH) and height.



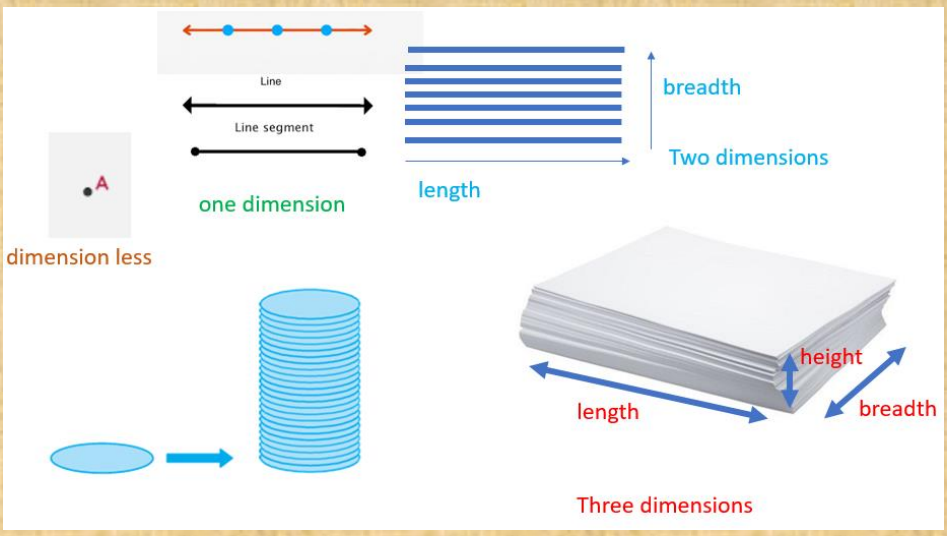




Hence, we move from a dimensionless object to one dimension (length), to two dimensions (length and breadth) and 3 dimensions (length, breadth and height)

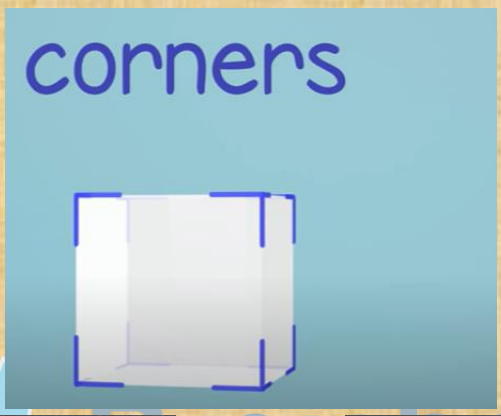
Similarly, if you stack circular paper you will get a cylinder that looks like a pepsi tin.

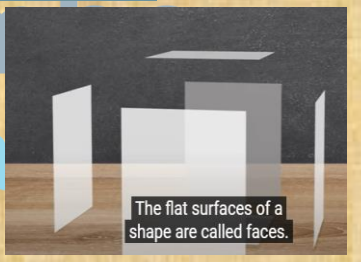
We shall now learn about the properties of 3D objects

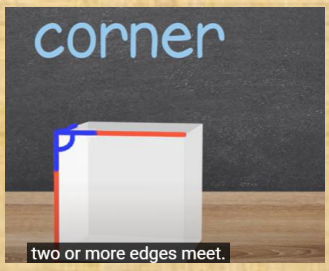


FEATURES OF 3D OBJECTS

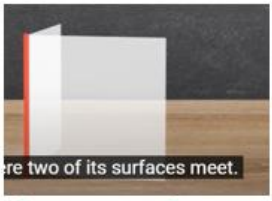
- There are certain properties that are common to all these , that is
- Faces,
- Edges
- Corners or Vertices
- The faces are the flat surfaces of the object.
- An edge is the line where two surfaces meet.
- A vertex is point where two or more edges meet.
- Let us know look at each of the 3D objects in detail.







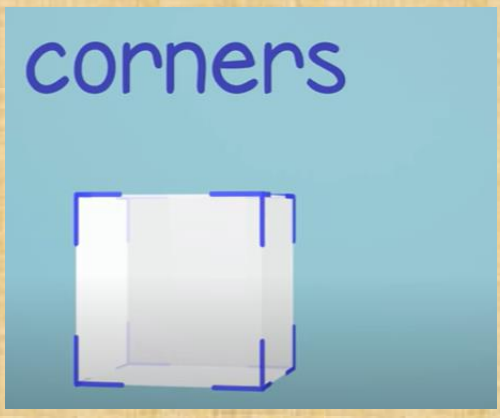
A vertex is point where two or more edges meet.

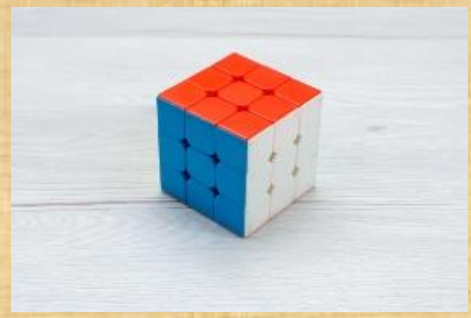


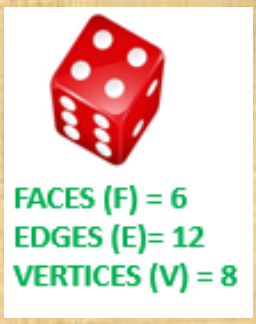
An edge is the line where two surfaces meet.

A CUBE

- A cube is a solid with 6 identical faces. 12 edges and 8 vertices.
- Note that faces, edges and vertices are of the same size in a cube.
- Observe that each face of the cube is a square shape. (Use one colour for all the faces of the square, turn the cube and show all faces. Do not use yellow colour)
- A rubix cube, a dice are examples of cube around us.

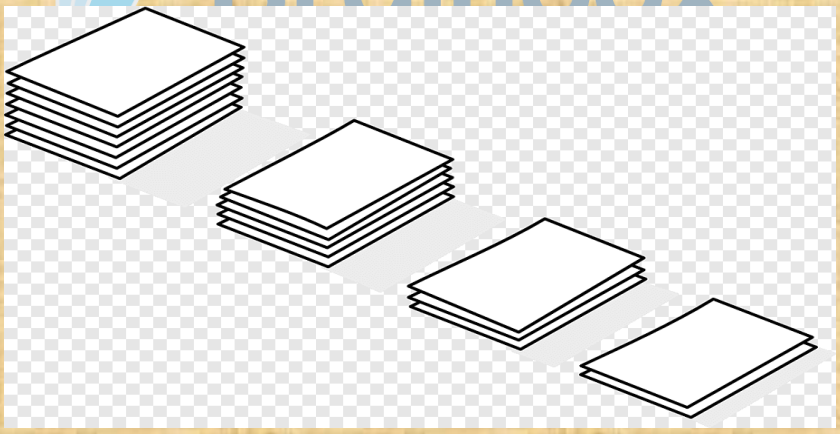


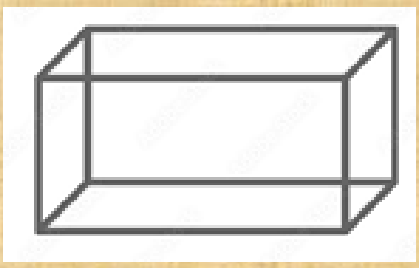


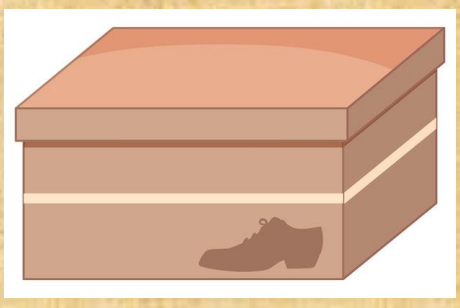


A CUBOID

- Remember we stacked up sheets of paper to get a 3D object!
- Yes! When we collect and pile rectangular shapes, we get a 3D object that is called a CUBOID.
- Shoebox, matchbox, tissue holder, erasers are some examples of cuboid you will see around you.



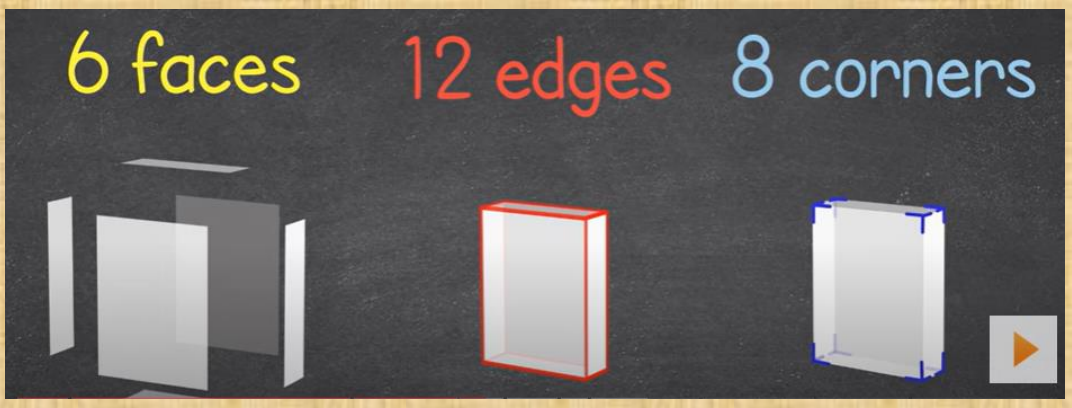


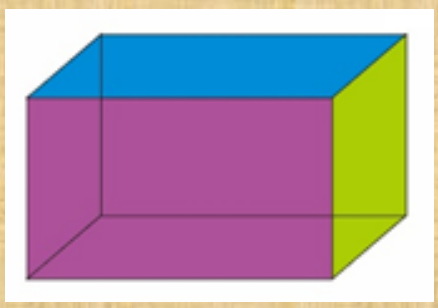


A CUBOID

- A cuboid has 6 rectangular identical faces, 12 edges and 8 vertices (use the above fig 1 to show cuboid not the one in the black picture, but show the splitting of the faces and text, do not show "corner", instead show "vertices").

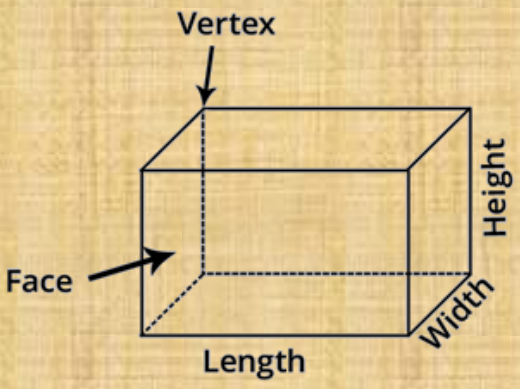
If you observe all the faces of the cuboid are rectangular in shape (keep turning the cuboid and highlight opposite faces with different colours).





A CUBOID

- So a cuboid is a 3d solid with,
- 6 faces
- 12 edges
- 8 vertices



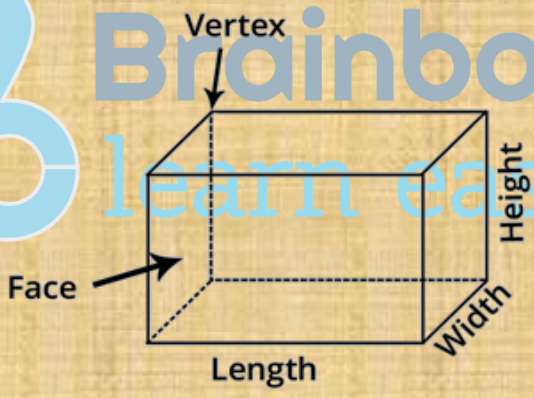
FACES (F) = 6

EDGES (E) = 12

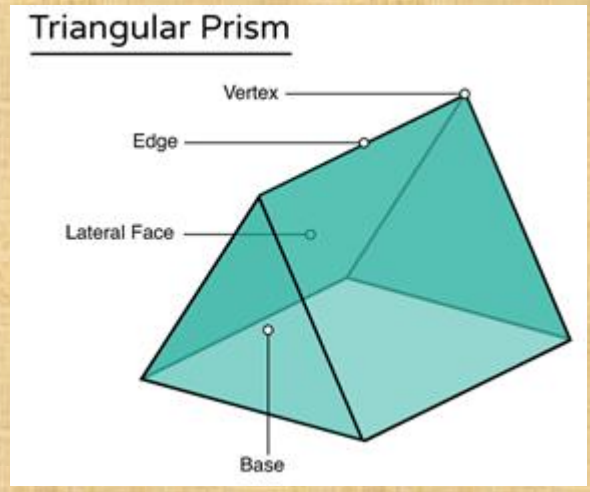
VERTICES (V) = 8

A PRISM

- A prism is 3d solid object in which two ends are identical.
- Since a cuboid has rectangular shape faces as the two bases, it a rectangular prism.
- If the bases of the prism are triangular shape then it is a triangular prism.
- A triangular prism is often in the shape of a kaleidoscope.



A cuboid is also called a RECTANGULAR PRISM.



FACES (F) = 5

EDGES (E) = 9

VERTICES (V) = 6

A PYRAMID

- A pyramid is a shape with a single base with vertex and the other faces are triangles.
- Based on the shape of the base, it takes it name.
- If a pyramid has square base it is called a SQUARE BASED PYRAMID or SQUARE PYRAMID, like the one you see in the diagram 1.
- If a base of the pyramid is triangular in shape then it is called TRIANGULAR PYRAMID.
- It is also known as a tetrahedron.

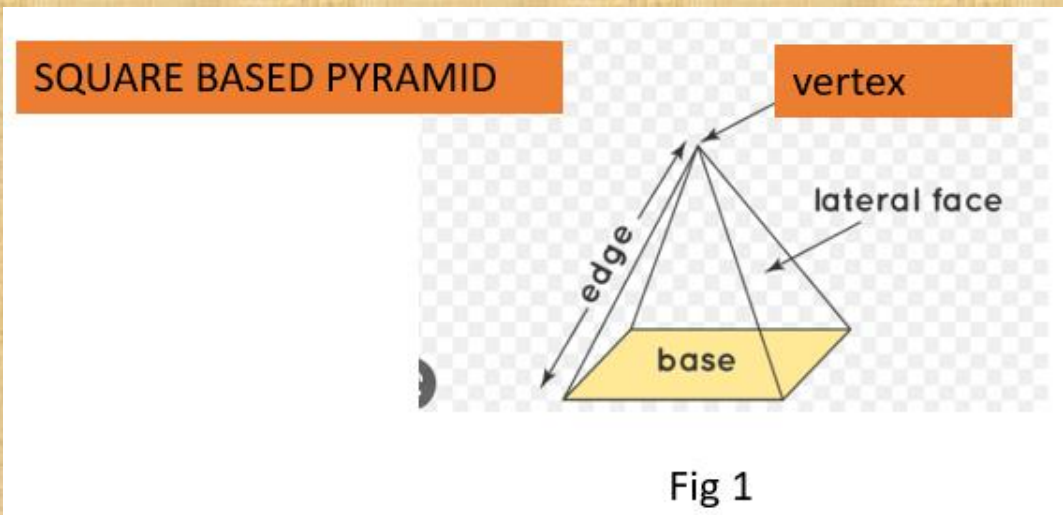
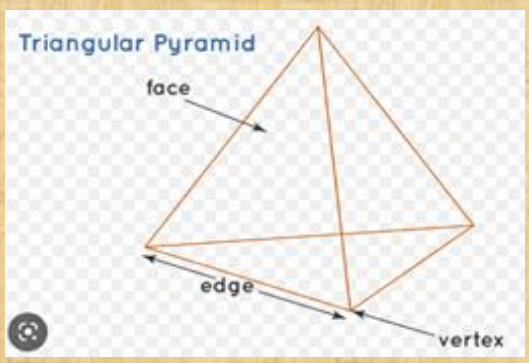


Fig 1

FACES (F) = 5

EDGES (E) = 8

VERTICES (V) = 5



FACES (F) = 4

EDGES (E)= 6

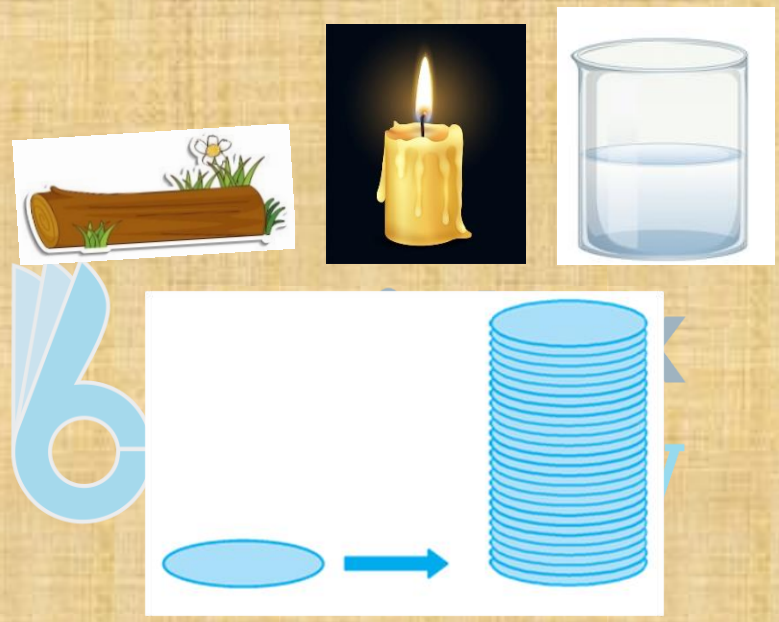
VERTICES (V) = 4

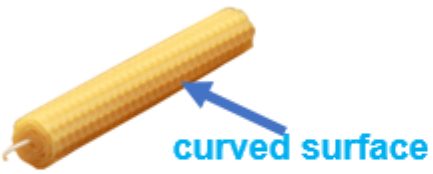
TRIANGULAR PRISM is also known as a TETRAHEDRON.

A CYLINDER

- We have earlier seen some examples of a cylinder such as candles, wooden log or beaker.

- When we stack up circular shaped 2d figures, we get a cylinder.
- Let us consider a candle. The surface on which the candle rolls is called its curved surface. The surface on which the candle does not roll, but stands on vertically is the base, which is circular in shape.



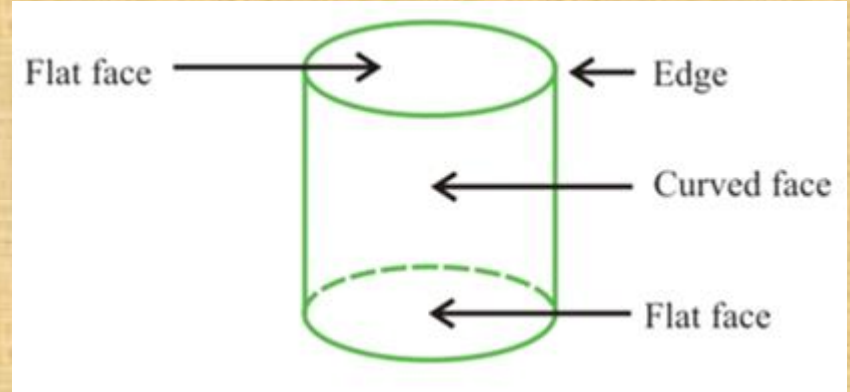


The surface on which the candle rolls is called its curved surface

The surface on which the candle does not roll, but stands on vertically is the base,

A CYLINDER

- A cylinder therefore has,
- 2 flat circular bases or flat faces and 1 curved or lateral face.
- It has 2 edges where the faces meet.
- Note that a cylinder does not have a vertex and it is made up of curved faces.
- So a cylinder has 3 faces , 2 edges and 0 vertices.



FACES (F) = 3

EDGES (E) = 2

VERTICES (V) = 0

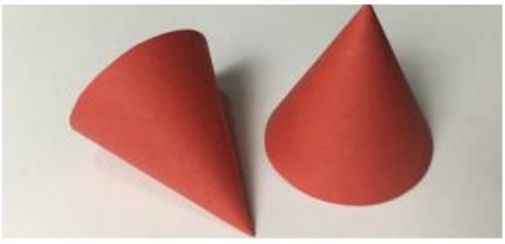
CONE

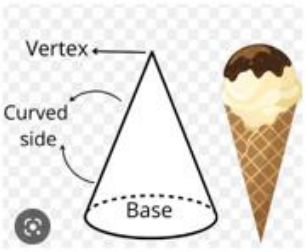
A cone is a shape that we can often make at home.

If we cut a sector of circular sheet, we can fold and a make a cone that is so similar to a birthday cap.

We see that a cone one curved surface that it can roll on and the one flat surface that it can be placed upright.

Hence, we can say that a cone has two faces, the edge and one vertex.





FACES (F) = 2
EDGES (E)= 1
VERTICES (V) = 1