# Form a Cuboid & Find the Formula For Its Surface Area

## Objective

To form a cuboid and find the formula for its surface area experimentally.

## Materials Required

1. Cardboard
2. Cutter/Scissors
3. Ruler
4. Adhesive tape
5. Pen/Pencil
6. Sketch pens

## Prerequisite Knowledge

1. Basic knowledge about cuboid.
2. Total surface area, lateral surface area and diagonal of a cuboid.

## Theory

1. For knowledge about cuboid refer to Activity 7.
2. Let the length of the cuboid be l units, breadth b units and height h units, then
    - **Total Surface Area:** Surface area (SA) or total surface area (TSA) of the cuboid
      = Sum of all faces of the cuboid
      = lb + lb + bh + bh + lh + lh
      ⇒ SA or TSA = 2 (lb+bh+hl) sq.units
      i.e. SA or TSA =2 (Length x Breadth + Breadth x Height + Height x Length)

    - **Lateral Surface:** Area If out of the six faces of a cuboid, we leave the bottom and top faces and find the area of the four faces, then the area of these four faces is called the lateral surface area of the cuboid.
      So, lateral surface area of a cuboid = 2(l + b)h
    - **Diagonal of a Cuboid**
      Diagonal of a cuboid = $\sqrt{(l^2 + b^2 + h^2)}$

## Procedure

1. Take a cardboard of a suitable size and cut two identical rectangles of dimensions x units * y units (see Fig. 27.1), two identical rectangles of dimensions y units * z

units (see Fig. 27.2) and two identical rectangles of dimensions z units * x units, (see Fig. 27.3) Flere, x > y > z.

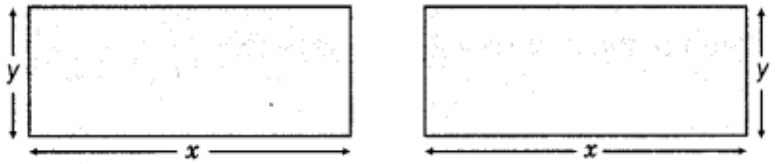


Fig. 27.1

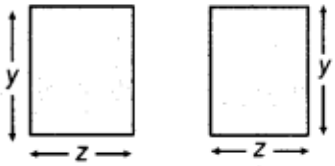


Fig. 27.2

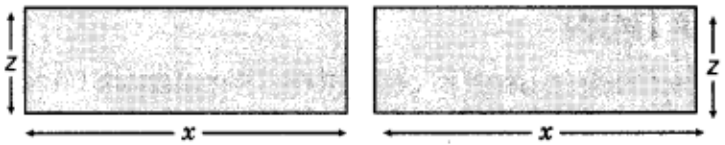


Fig. 27.3

2. Now, arrange all the cut out rectangles and join all of them with the help of adhesive tape, (see Fig. 27.4)

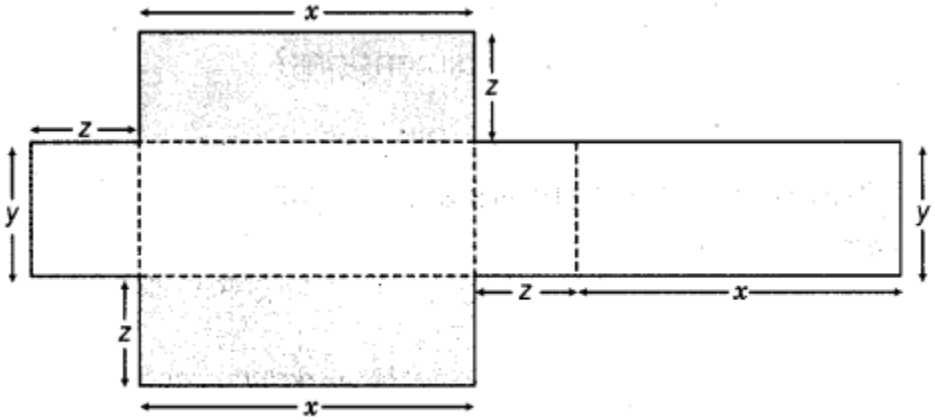


Fig. 27.4

3. Fold the rectangles along the dotted markings (or along with adhesive tape) and form a cuboid by using adhesive tape, (see Fig. 27.5)

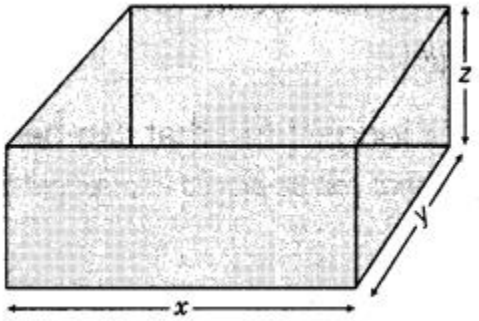


Fig. 27.5

**Note:** Instead of making six rectangles separately, a net of a cuboid be directly prepared on the cardboard itself.

## Demonstration

Surface area of cuboid so formed = 2 x [Area of rectangle of dimensions (x units * y units)
+ Area of rectangle of dimensions (y units * z units) + Area of rectangle of dimensions (z units * x units)]
= 2(xy + yz +zx) sq units

## Observation

By actual measurement,
x = ……
y = ……
z = ……
xy = …….
yz = ……
zx = ……
2xy= ……..
2yz = …….
2zx = ……..
Sum of the areas of all rectangles = ……
Hence, surface area of the cuboid = 2(xy + yz + zx)

## Result

We have verified the formula for calculating surface area of a cuboid.

## Application

The result is used in estimation of materials necessary in the production of cuboidal boxes/almirahs, etc.

## Viva-Voce

**Question 1.**
How many edges a cuboid has?
**Answer:**
12

**Question 2.**
Are all the edges of cuboid equal in dimensions?
**Answer:**
No

**Question 3.**
In a cuboid, how many edges are equal to length?
**Answer:**
4 edges are equal to length.

**Question 4.**
What do you mean by a cuboid?
**Answer:**
Cuboid is a three dimensional solid bounded by six rectangular faces

**Question 5.**
In a cuboid, how many edges are equal to breadth?
**Answer:**
4 edges are equal to breadth.

**Question 6.**
In a cuboid, how many edges are equal to height?
**Answer:**
4 edges are equal to height.

**Question 7.**
What will be the length of longest rod that can be placed inside a cuboid?
**Answer:**
The length of longest rod that can be placed in a cuboid is equal to diagonal of a cuboid.

## Suggested Activity

By using this activity, find the area of cuboid which is 13m long, 10m broad and 7m high.