

MATHEMATICS

Chapter 13: Surface Areas and Volumes



PRIME NOTES

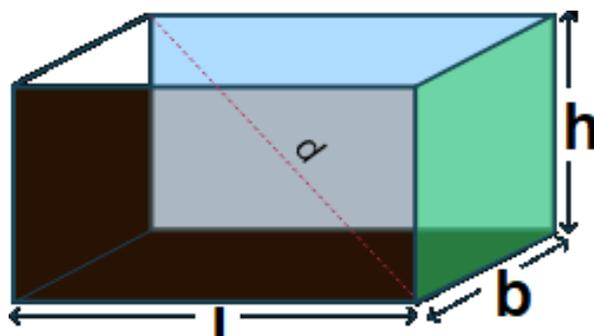
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Surface Areas and Volumes

1. **Surface area** of a solid is the sum of the areas of all its faces.
2. The space occupied by a solid object is the **volume** of that object.
3. If l, b, h denote respectively the length, breadth and height of a **cuboid**, then: Lateral surface area or Area of four walls = $2(l + b)h$

Total surface area = $2(lb + bh + hl)$ Volume = $l \times b \times h$

Diagonal of a cuboid =

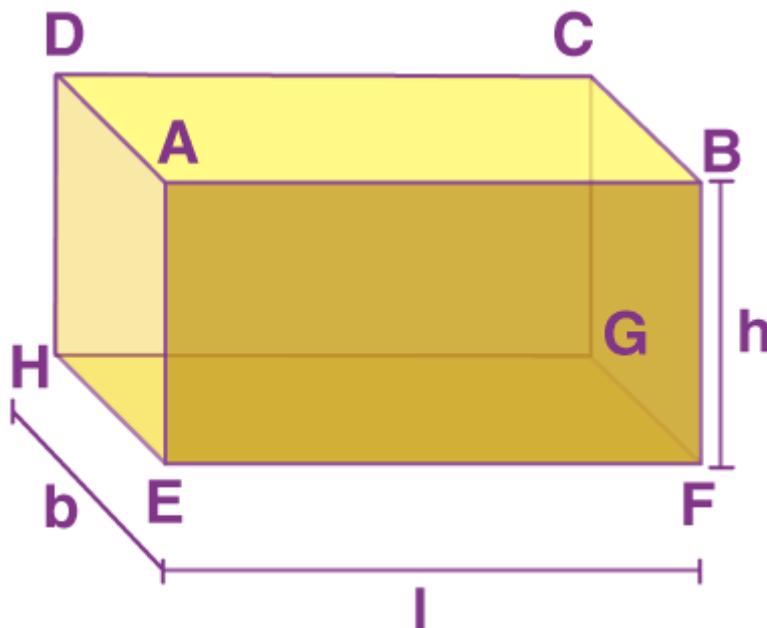


Surface Area and Volume of Cuboid

A cuboid is the region covered by its six rectangular faces. The surface area of a cuboid is equal to the sum of the areas of its six rectangular faces.

Surface area of the cuboid

Consider a cuboid whose dimensions are $l \times b \times h$, respectively.



Cuboid with length l , breadth b and height h

The total surface area of the cuboid (TSA) = Sum of the areas of all its six faces

$$TSA \text{ (cuboid)} = 2(l \times b) + 2(b \times h) + 2(l \times h) = 2(lb + bh + lh)$$

Lateral surface area (LSA) is the area of all the sides apart from the top and bottom faces.



The lateral surface area of the cuboid = Area of face AEHD + Area of face BFGC + Area of face ABFE + Area of face DHGC

$$\text{LSA (cuboid)} = 2(b \times h) + 2(l \times h) = 2h(l + b)$$

$$\text{Length of diagonal of a cuboid} = \sqrt{l^2 + b^2 + h^2}$$

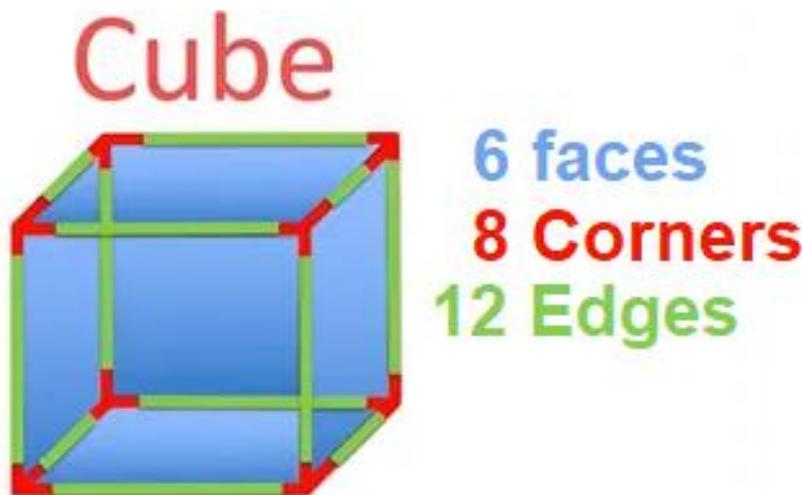
4. If the length of each edge of a **cube** is 'a' units, then:

$$\text{Lateral surface area} = 4 \times (\text{edge})^2$$

$$\text{Total surface area} = 6 \times (\text{edge})^2$$

$$\text{Volume} = (\text{edge})^3$$

$$\text{Diagonal of a cube} = \sqrt{3} \times \text{edge}$$

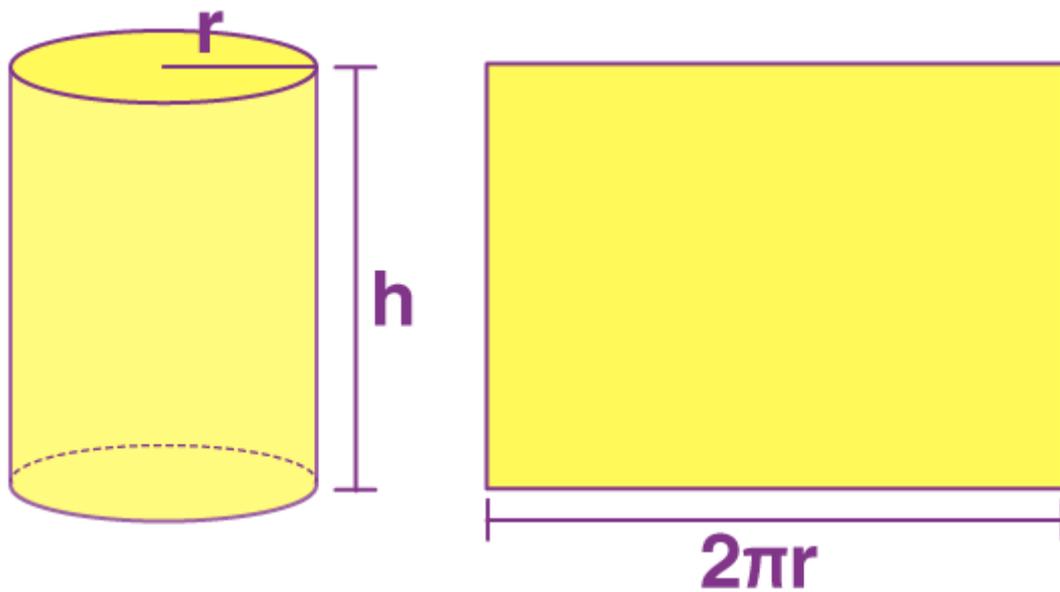


Surface Area and Volume of Cylinder

A cylinder is a solid shape that has two circular bases, connected with each other, through a lateral surface. Thus, there are three faces, two circular and one lateral, of a cylinder. Based on these dimensions, we can find the surface area and volume of a cylinder.

Surface Area of Cylinder

Take a cylinder of base radius r and height h units. The curved surface of this cylinder, if opened along the diameter (d = 2r) of the circular base can be transformed into a rectangle of length 2πr and height h units. Thus,



Transformation of a Cylinder into a rectangle.

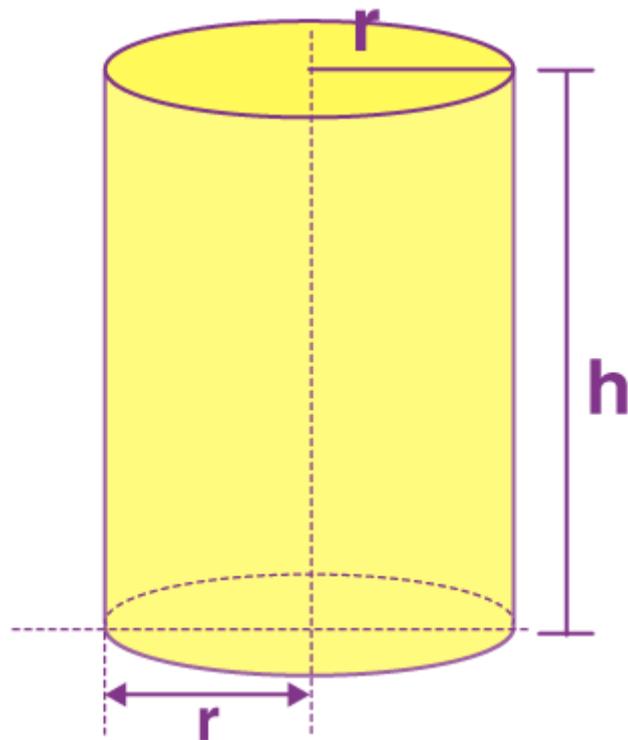
CSA of a cylinder of base radius r and height $h = 2\pi \times r \times h$

TSA of a cylinder of base radius r and height $h = 2\pi \times r \times h + \text{area of two circular bases}$
 $= 2\pi \times r \times h + 2\pi r^2$

$= 2\pi r (h + r)$

Volume of a Cylinder

Volume of a cylinder = Base area \times height = $(\pi r^2) \times h = \pi r^2 h$



Cylinder with height h and base radius r

5. If r and h respectively denote the radius of the base and the height of a **right circular cylinder**, then: Area of each end or Base area = πr^2

