

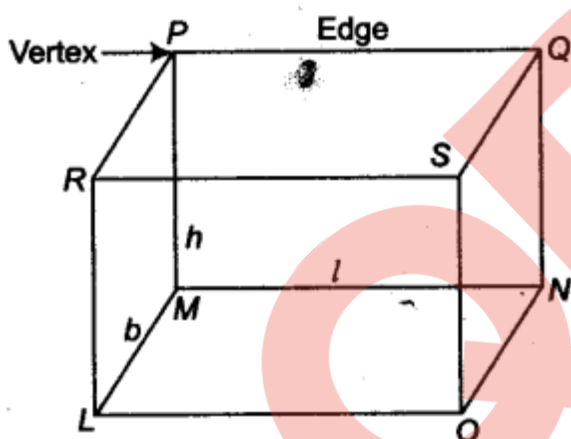
9th Standard-Maths

Surface Areas and Volumes

1. **Cuboid:** A figure which is surrounded by six rectangular surfaces is called cuboid.

The opposite surface of a cuboid is equal and parallel.

A cuboid has 12 edges and 8 corners. Each corner of a cuboid is called the vertex of a cuboid. The line segment joining the opposite vertices is called the diagonal of a cuboid. There are four diagonals in a cuboid.



Volume of cuboid = Length \times Breadth \times Height = $l \times b \times h$

Lateral surface area = $2 (\text{Length} + \text{Breadth}) \times \text{Height} = 2 (l + b) \times h$

Total surface area = $2 (\text{Length} \times \text{Breadth} + \text{Breadth} \times \text{Height} + \text{Height} \times \text{Length}) = 2 (lb + bh + hl)$

Total length of cuboid = $4 (l + b + h)$

$$\begin{aligned} \text{Diagonal of cuboid} &= \sqrt{(\text{Length})^2 + (\text{Breadth})^2 + (\text{Height})^2} \\ &= \sqrt{l^2 + b^2 + h^2} \end{aligned}$$

2. **Cube:** A cuboid, whose length, breadth and height are same is called a cube. A cube has six surfaces, twelve edges, eight corners and four diagonals.

$$\text{Volume of cube} = (\text{Side})^3 = l^3$$

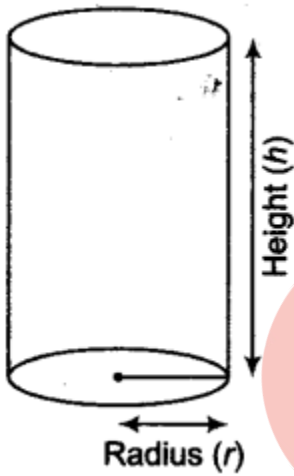
$$\text{Lateral surface area} = 4 \times (\text{Side})^2 = 4l^2$$

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

$$\text{Total length of cube} = 12l$$

$$\text{Diagonal of cube} = \sqrt{3} l$$

3. **Right Circular Cylinder:** A right circular cylinder is considered as a solid generated by the revolution of a rectangle about one of its sides.

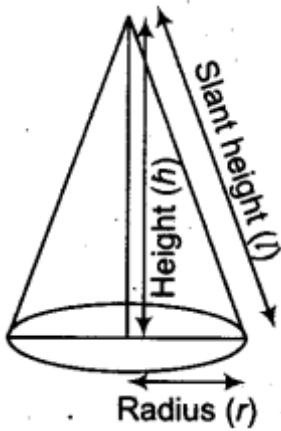


$$\text{The volume of a cylinder} = \pi r^2 h$$

$$\text{Curved surface area or lateral surface area} = 2\pi r h$$

$$\text{Total surface area} = \text{Curved surface} + 2 \times \text{Base area} = 2\pi r h + 2\pi r^2 = 2\pi r(h + r)$$

4. **Cone:** A right circular cone is a solid generated by revolving of a triangle about one of its sides (other than hypotenuse).



Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area or lateral surface area = $\pi r l$

Total surface area = Curved surface area + Base area

$$= \pi r l + \pi r^2$$

$$= \pi r (l + r)$$

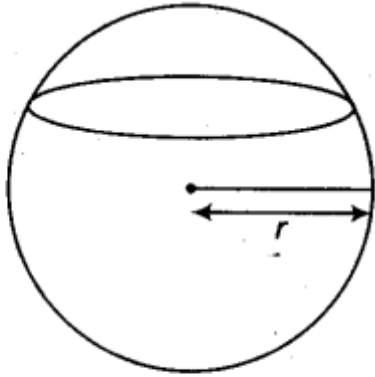
$$l = \sqrt{h^2 + r^2}$$

$$h = \sqrt{l^2 - r^2}$$

$$r = \sqrt{l^2 - h^2}$$

5. **Sphere:** A solid which is surrounded by a curved surface and each point of the surface is the same distance from a fixed point. The fixed point is called the centre of the sphere. The line segment joining from the centre of the

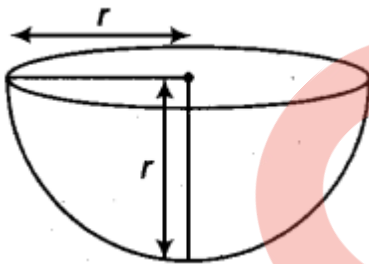
sphere to any point of the surface is called the radius of the sphere.



$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

$$\text{Surface area of sphere} = 4\pi r^2$$

6. **Hemisphere:** A plane passing through the centre of a sphere divides the sphere into two equal parts. Each part is called a hemisphere.



$$\text{Volume of hemisphere} = \frac{2}{3} \pi r^3$$

$$\text{The curved surface area of hemisphere} = 2\pi r^2$$

$$\text{Total surface area of hemisphere} = 2\pi r^2 + \pi r^2 = 3\pi r^2$$