

**Class 9**  
**Important Formulas**

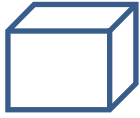
**Chapter 13 - Surface Area and Volume**

S.no	Term	Description
1	Mensuration	It is branch of mathematics which is concerned about the measurement of length ,area and Volume of plane and Solid figure
2	Perimeter	a)The perimeter of plane figure is defined as the length of the boundary b)It units is same as that of length i.e. m ,cm,km
3	Area	a)The area of the plane figure is the surface enclosed by its boundary b) It unit is square of length unit. i.e. $m^2$ , $km^2$
4	Volume	Volume is the measure of the amount of space inside of a solid figure, like a cube, ball, cylinder or pyramid. Its units are always "cubic", that is, the number of little element cubes that fit inside the figure.

**Volume Unit conversion**

<b>1 cm<sup>3</sup></b>	<b>1mL</b>	<b>1000 mm<sup>3</sup></b>
<b>1 Litre</b>	1000ml	1000 cm <sup>3</sup>
<b>1 m<sup>3</sup></b>	10 <sup>6</sup> cm <sup>3</sup>	1000 L
<b>1 dm<sup>3</sup></b>	1000 cm <sup>3</sup>	1 L

## Surface Area and Volume of Cube and Cuboid



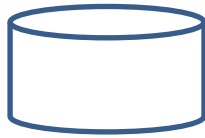
Cube



Cuboid

Type	Measurement
<b>Surface Area of Cuboid of Length L, Breadth B and Height H</b>	$2(LB + BH + LH).$
<b>Lateral surface area of the cuboids</b>	$2( L + B ) H$
<b>Diagonal of the cuboids</b>	$\sqrt{L^2 + B^2 + H^2}$
<b>Volume of a cuboids</b>	LBH
<b>Length of all 12 edges of the cuboids</b>	$4 (L+B+H).$
<b>Surface Area of Cube of side L</b>	$6L^2$
<b>Lateral surface area of the cube</b>	$4L^2$
<b>Diagonal of the cube</b>	$L\sqrt{3}$
<b>Volume of a cube</b>	$L^3$

## Surface Area and Volume of Right circular cylinder



<b>Radius</b>	The radius ( $r$ ) of the circular base is called the radius of the cylinder
<b>Height</b>	The length of the axis of the cylinder is called the height ( $h$ ) of the cylinder
<b>Lateral Surface</b>	The curved surface joining the two base of a right circular cylinder is called Lateral Surface.

Type	Measurement
<b>Curved or lateral Surface Area of cylinder</b>	$2\pi rh$
<b>Total surface area of cylinder</b>	$2\pi r (h+r)$
<b>Volume of Cylinder</b>	$\pi r^2h$

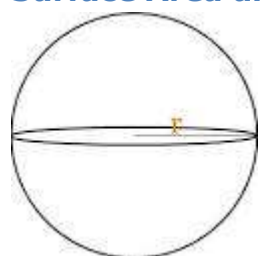
## Surface Area and Volume of Right circular cone



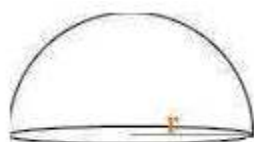
<b>Radius</b>	The radius ( $r$ ) of the circular base is called the radius of the cone
<b>Height</b>	The length of the line segment joining the vertex to the center of base is called the height ( $h$ ) of the cone.
<b>Slant Height</b>	The length of the segment joining the vertex to any point on the circular edge of the base is called the slant height ( $L$ ) of the cone.
<b>Lateral surface Area</b>	The curved surface joining the base and uppermost point of a right circular cone is called Lateral Surface

Type	Measurement
<b>Curved or lateral Surface Area of cone</b>	$\pi rL$
<b>Total surface area of cone</b>	$\pi r (L+r)$
<b>Volume of Cone</b>	$\frac{1}{3}\pi r^2 h$

### Surface Area and Volume of sphere and hemisphere



Sphere



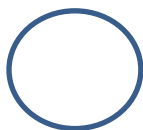
Hemisphere

<b>Sphere</b>	<b>A sphere can also be considered as a solid obtained on rotating a circle About its diameter</b>
<b>Hemisphere</b>	A plane through the centre of the sphere divides the sphere into two equal parts, each of which is called a hemisphere
<b>radius</b>	The radius of the circle by which it is formed
<b>Spherical Shell</b>	The difference of two solid concentric spheres is called a spherical shell
<b>Lateral Surface Area for Sphere</b>	Total surface area of the sphere
<b>Lateral Surface area of Hemisphere</b>	It is the curved surface area leaving the circular base

Type	Measurement
Surface area of Sphere	$4\pi r^2$
Volume of Sphere	$\frac{4}{3}\pi r^3$
Curved Surface area of hemisphere	$2\pi r^2$
Total Surface area of hemisphere	$3\pi r^2$
Volume of hemisphere	$\frac{2}{3}\pi r^3$
Volume of the spherical shell whose outer and inner radii and 'R' and 'r' respectively	$\frac{4}{3}\pi (R^3 - r^3)$

### How the Surface area and Volume are determined

#### Area of Circle



The circumference of a circle is  $2\pi r$ . This is the definition of  $\pi$  (pi). Divide the circle into many triangular segments. The area of the triangles is  $1/2$  times the sum of their bases,  $2\pi r$  (the circumference), times their height,  $r$ .

$$A = \frac{1}{2} \times 2\pi r r = \pi r^2$$

#### Surface Area of cylinder

This can be imagined as unwrapping the surface into a rectangle.



### **Surface area of cone**

This can be achieved by divide the surface of the cone into its triangles, or the surface of the cone into many thin triangles. The area of the triangles is  $1/2$  times the sum of their bases,  $p$ , times their height,

$$A = \frac{1}{2} \times 2\pi rs = \pi rs$$