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CBSE Class 9 Maths Notes Chapter 13 Overview

Here are the surface area and volume for the Class 9 notes. This page discusses and provides an explanation for all of the surface area and volume formulas for various three-dimensional shapes.

The surface area of any three-dimensional object can be broadly divided into three categories: total surface area (TSA), lateral surface area (LSA), and curved surface area (CSA). These can be calculated for a variety of 3D shapes, including cylinders, cubes, cuboids, cones, and so forth.

CBSE Class 9 Maths Notes Chapter 13

The surface areas and volumes of several shapes, including cuboids, cubes, circular cylinders, right circular cones, and spheres, will be presented to the students. Let's look at the key points and equations for every shape.

Cuboid

A three-dimensional shape is called a cuboid. Six rectangular faces arranged at right angles make up the cuboid. A cuboid's total surface area is the product of the areas of each of its six rectangular faces.

Consider a cuboid whose length is "*l*" cm, breadth is *b* cm and height *h* cm.

Area of face ABCD = Area of Face EFGH = $(l \times b)\ cm^2$

Area of face AEHD = Area of face BFGC = $(b \times h)\ cm^2$

Area of face ABFE = Area of face DHGC = $(l \times h)\ cm^2$

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

$= 2(l \times b) + 2(b \times h) + 2(l \times h)$

$TSA\ (cuboid) = 2(lb + bh + lh)$

Lateral Surface Area of a Cuboid

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

$= 2(b \times h) + 2(l \times h)$

$LSA\ (cuboid) = 2h(l + b)$

Cube

A **cuboid** whose length, breadth, and height are all **equal** is called a **cube**. It is a three-dimensional shape bounded by **six equal squares**. It has 12 edges and 8 vertices.

Total Surface Area of a Cube

For cube, length = breadth = height

Suppose the length of an edge = a

Total surface area(TSA) of the cube $= 2(a \times a + a \times a + a \times a)$

$TSA(cube) = 2 \times (3a^2) = 6a^2$

Right Circular Cylinder

A right circular cylinder is a closed solid with two parallel circular bases joined by a curved surface where the axis is at a right angle to the base and the bases are exactly over each other.

Curved Surface Area of a Right Circular Cylinder

Consider a cylinder with height h and base radius r in units. When the curved surface of this cylinder is expanded at the circular base's diameter (d = 2r), it forms a rectangle with dimensions of h units for height and 2πr for length. Consequently,

Curved surface area(CSA) of a cylinder of base radius *r* and height *h* = 2π × r × h

Total Surface Area of a Right Circular Cylinder

Total surface area(TSA) of a cylinder of base radius *r* and height *h* = 2π × r × h + area of two circular bases
⇒ TSA = 2π × r × h + 2 × πr square
⇒ TSA = 2πr(h + r)

Right Circular Cone

A right circular cone is a circular cone whose axis is perpendicular to its base.

Relation between Slant Height and Height of a Right Circular Cone

The relationship between slant height(l) and height(h) of a right circular cone is:
$l^2 = h^2 + r^2$ (Using Pythagoras Theorem)
Where *r* is the radius of the base of the cone.

Curved Surface Area of a Right Circular Cone

Think of a right circular cone with radius r and slant length l.
A sector of a circle of radius l is created if a perpendicular cut is performed from a point on the base's circumference to the vertex and the cone is opened up, as seen in the image below:

Label A and B and corresponding b_1, b_2 ...b_n at equal intervals, with O as the common vertex. The Curved surface area(CSA) of the cone will be the sum of the areas of the small triangles: $1/2 \times (b_1 + b_2.....b_n) \times l$
(b1 + b2...bn) is also equal to the circumference of base = 2πr
CSA of right circular cone = $(1/2) \times (2\pi r) \times l = \pi rl$ (On substituting the values)

Total Surface Area of a Right Circular Cone

Total surface area(TSA) = Curved surface area(CSA) + area of base

$= \pi rl + \pi r^2 = \pi r(l + r)$

Sphere

A spherical is a closed, three-dimensional solid object in which every point on its surface is equally spaced from the central, fixed point. The term "radius" refers to the equidistant.

Surface Area of a Sphere

The surface area of a sphere of radius r = 4 times the area of a circle of radius r

$=4\times(\pi r^2)$

For a sphere Curved surface area (CSA) = Total Surface area(TSA) = $4\pi r^2$

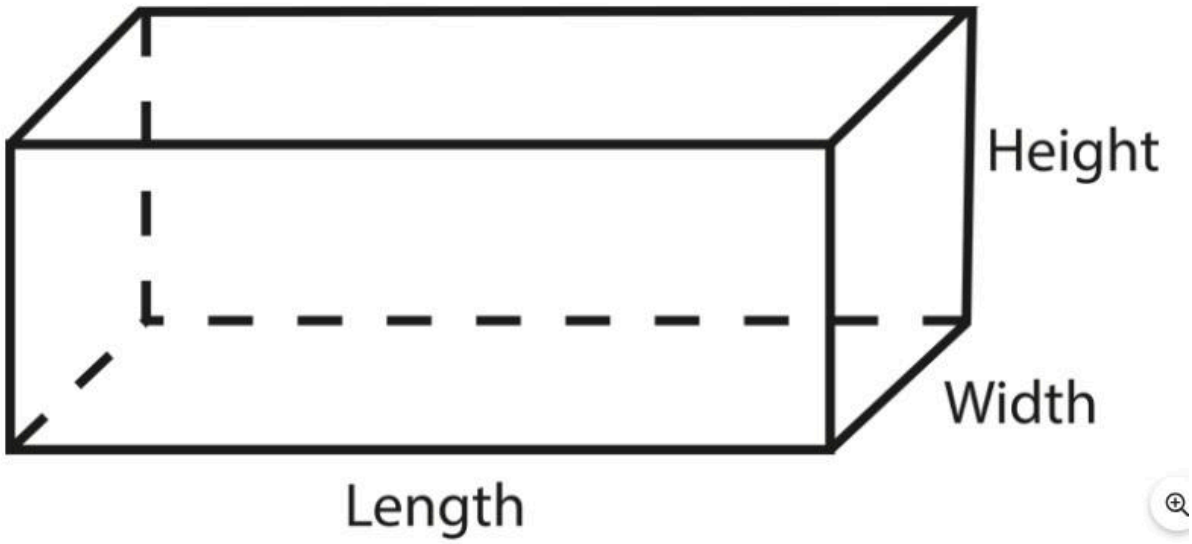
Surface Area Formulas

Shapes	Surface Areas
Cuboid	2(lb + bh + hl)
Cube	6a2
Right Circular Cylinder	2πr(r + h)
Right Circular Cone	πr(l + r), (l2 = h2 + r2)
Sphere	4 π r2

Volume and Capacity

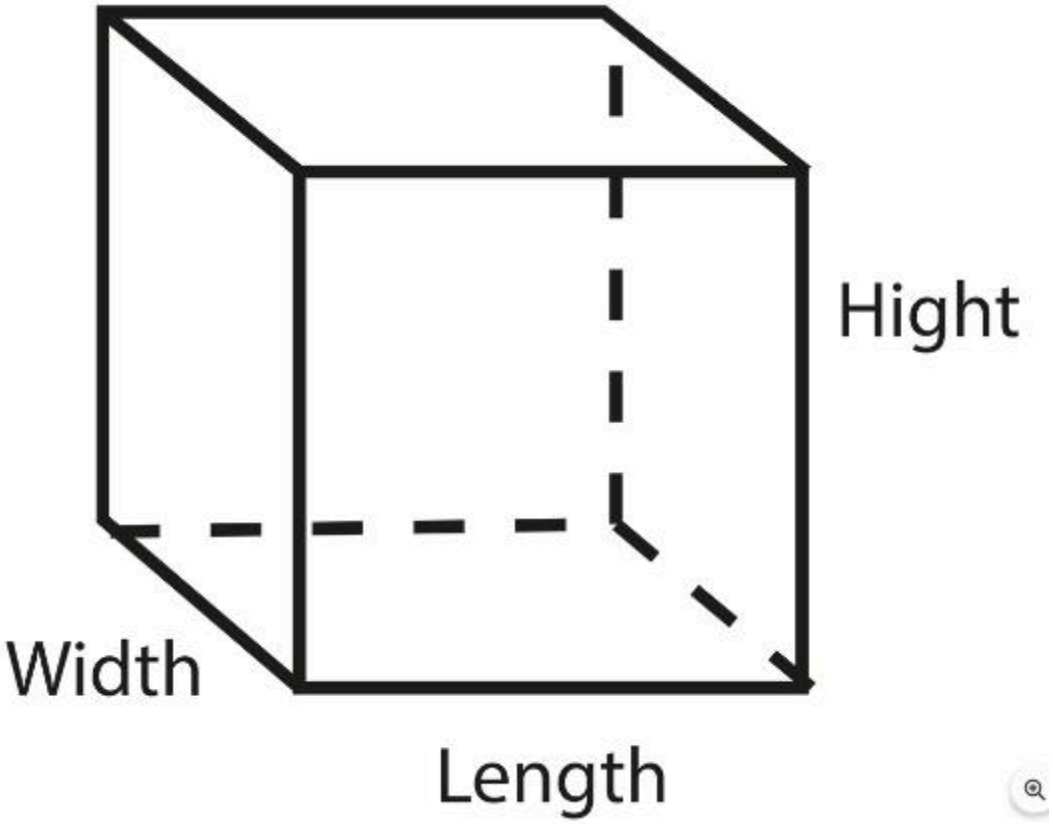
An object's capacity is the maximum amount of substance it can hold inside of it, whereas its volume is the amount of space it takes up. The cubic unit is used to measure both capacity and volume.

Volume of a Cuboid



The volume of a cuboid is the product of its dimensions.
Volume of a cuboid = length × breadth × height= lbh
Where *l* is the length of the cuboid, *b* is the breadth, and *h* is the height of the cuboid.

Volume of a Cube



The volume of a cube = base area × height.

Since all dimensions are identical, the volume of the cube = a^3

Where a is the length of the edge of the cube.

Volume of a Right Circular Cylinder

The volume of a right circular cylinder is equal to base area × its height.

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

Where r is the radius of the base of the cylinder and h is the height of the cylinder.

Volume of a Right Circular Cone

The volume of a Right circular cone is 1/3 times the volume of a cylinder with the same radius and height. In other words, three cones make one cylinder of the same height and base.

The volume of right circular cone = $(1/3)\pi r^2 h$

Where r is the radius of the base of the cone and h is the height of the cone.

Volume of a Sphere

The volume of a sphere of radius $r = (4/3)\pi r^3$

Volume Formulas for Class 9

Shapes	Volumes
Cuboid	length × breadth × height
Cube	a3
Right Circular Cylinder	πr2h
Right Circular Cone	⅓ πr2h
Sphere	4/3 π r3

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