

# Class 10 Maths

## Chapter 12: Surface Areas and Volumes

### 1. Essential Formulas for Basic Solids

Before finding the surface areas and volumes of combinations of solids, you must memorize the formulas for basic 3D shapes:

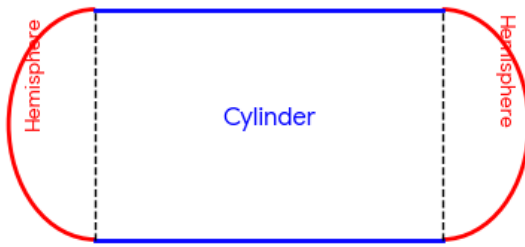
| Shape      | Curved/Lateral Surface Area (CSA/LSA)       | Total Surface Area (TSA) | Volume (V)            |
|------------|---------------------------------------------|--------------------------|-----------------------|
| Cuboid     | $2h(l + b)$                                 | $2(lb + bh + hl)$        | $l \times b \times h$ |
| Cube       | $4a^2$                                      | $6a^2$                   | $a^3$                 |
| Cylinder   | $2\pi rh$                                   | $2\pi r(r + h)$          | $\pi r^2 h$           |
| Cone       | $\pi rl$<br>(where $l = \sqrt{r^2 + h^2}$ ) | $\pi r(l + r)$           | $(1/3)\pi r^2 h$      |
| Sphere     | $4\pi r^2$                                  | $4\pi r^2$               | $(4/3)\pi r^3$        |
| Hemisphere | $2\pi r^2$                                  | $3\pi r^2$               | $(2/3)\pi r^3$        |

### 2. Surface Area of a Combination of Solids

When two or more solids are joined together, the total surface area of the new solid is the sum of the curved surface areas (CSA) of the individual parts that are visible.

**Important Rule:** TSA of combined solid  $\neq$  Sum of TSA of individual solids. We only add the areas of the visible surfaces.

Combination: Capsule



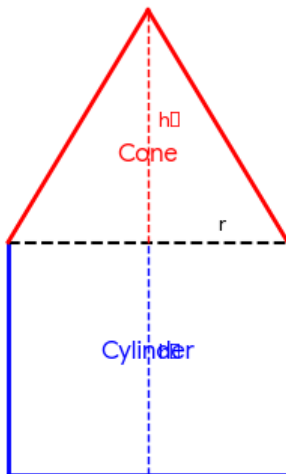
Example (Capsule): Made of a cylinder and two hemispheres at the ends.

TSA of Capsule = CSA of Cylinder + CSA of left Hemisphere + CSA of right Hemisphere

### 3. Volume of a Combination of Solids

Unlike surface area, the volume of a combination of solids is simply the exact sum of the volumes of the individual components.

Combination: Tent



Example (Tent): Made of a cylindrical base surmounted by a conical top.

Total Volume of Tent = Volume of Cylinder + Volume of Cone

Total Volume =  $(\pi r^2 h_2) + (1/3 \times \pi r^2 h_1)$