

Surface Area and Volume

CBSE Class 9 Maths · Knowledge organiser

KEY DEFINITIONS

Surface area

The total area of all the faces or curved surfaces of a solid.

Volume

The space a solid takes up, in cubic units.

Slant height

The distance from the vertex of a cone to a point on the edge of its base.

KEY FORMULAS

Cuboid; cube $2(lb + bh + hl)$, lbh ; $6a^2$, a^3

Cylinder $CSA = 2\pi rh$, $TSA = 2\pi r(r + h)$,
 $V = \pi r^2 h$

Cone,
 $l = \sqrt{r^2 + h^2}$ $CSA = \pi rl$, $TSA = \pi r(l + r)$, $V = \frac{1}{3}\pi r^2 h$

Sphere;
hemisphere $4\pi r^2$, $\frac{4}{3}\pi r^3$; $2\pi r^2$ ($3\pi r^2$ total), $\frac{2}{3}\pi r^3$

$1 \text{ m}^3 = 1000 \text{ litres}$; scale factor k : areas $\times k^2$, volumes $\times k^3$

YOU SHOULD BE ABLE TO...

- Use the surface area and volume formulas for cuboids, cylinders, cones and spheres in one step.
- Find a missing dimension, convert units and answer costing questions.
- Answer multi-part questions on tents, tanks and domes, choosing the right area each time.
- Work backwards from an area or a volume and use 'the volume stays the same' when a solid is recast.

WORKED EXAMPLE

Find the curved surface area of a cylinder with radius 7 cm and height 10 cm (take $\pi = \frac{22}{7}$).

$$2 \times \frac{22}{7} \times 7 \times 10 = 440 \text{ cm}^2.$$

COMMON MISTAKES

- ✗ Using the height h instead of the slant height l in πrl , or l instead of h in the cone's volume.
- ✗ Using the diameter as the radius.
- ✗ Forgetting the flat face in the total surface area of a hemisphere ($3\pi r^2$, not $2\pi r^2$).
- ✗ Mixing m and cm, or cm^3 and litres.