

the flat faced solids and the round ones, and reading which of the two a question wants

Two quantities, two sets of units

- volume is the space a solid fills, measured in cubic units such as cm^3
- surface area is the skin of the solid, measured in square units such as cm^2
- lateral or curved surface area leaves out the top and bottom faces and counts only the sides
- total surface area counts every face the solid actually has
- the wording decides which: painting, covering or wrapping wants area, while filling, holding or capacity wants volume
- a solid open at the top, such as a tank or a box without a lid, does not count that face

The flat faced solids

cuboid, volume

$$V = lbh$$

cuboid, total surface then lateral

$$2(lb + bh + hl), 2h(l + b)$$

cube of edge a , volume then surface

$$a^3, 6a^2$$

diagonal of a cuboid

$$d = \sqrt{l^2 + b^2 + h^2}$$

diagonal of a cube

$$d = a\sqrt{3}$$

the lateral surface of a cuboid is the four walls only, which is what a question about painting the walls of a room wants. Adding the ceiling but not the floor is a common variation, so read carefully

The round solids

cylinder, curved then total surface

$$2\pi rh, 2\pi r(h + r)$$

cylinder, volume

$$V = \pi r^2 h$$

cone, curved then total surface

$$\pi rl, \pi r(l + r)$$

cone, volume

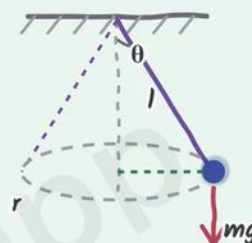
$$V = \frac{1}{3} \pi r^2 h$$

sphere, surface then volume

$$4\pi r^2, \frac{4}{3} \pi r^3$$

the cone's three lengths

$$l^2 = r^2 + h^2$$



a cone and a cylinder of the same radius and the same height standing together: the cone holds exactly one third of what the cylinder holds, which is where the factor of a third in its volume formula comes from

the last line is the one that catches people out: the cone's area formulas use the slant l while its volume uses the vertical height h , so a question giving r and h needs a Pythagoras step before any area can be found