



Volume of cones, cylinders and spheres

Three formulas, one family

- Today: the formulas, and how they relate to each other.

Write $r =$ first. Every time.

- Questions give DIAMETERS. Cans and balls are described by their width.
- Halve it, write it down, then reach for the formula.

This one habit prevents the most common error in the topic.

Cylinder

- $V = \pi r^2 h$.
- Base area times height — like any prism.

Cone: a third of its cylinder

- $V = \frac{1}{3}\pi r^2 h$.
- Same base, same height, one third the volume.

Not a separate formula. The cylinder's, divided by 3.

Sphere: two thirds of its cylinder

- $V = \frac{4}{3}\pi r^3$.
- Put a sphere in the tightest cylinder: height = $2r$.
- Cylinder 54π , sphere 36π .

Cylinder : sphere : cone = 3 : 2 : 1 on the same base.

Why the diameter error is so big

- Radius 3, diameter 6. Use 6 by mistake:
- Cylinder: 4× too big. Sphere: 8× too big.

r is squared or cubed, so the mistake gets squared or cubed too.

The size of the error tells you the cause

- Exactly 8 times too big on a sphere?
- That is a doubled radius, not a slip.

Wrong by a factor of 4 or 8 is a diagnosis, not bad luck.

Your turn

- A can has diameter 8 and height 10. Volume?
- Then a cone with the same base and height.

What did you write on your first line?