Guide to:
Spheres, cones and cylinders

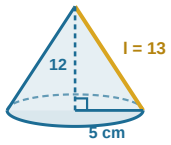
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Explanation:

Key 3D curved solid formulas: **Cylinder** volume = $\pi r^2 h$, curved surface area = $2\pi rh$; **Sphere** volume = $\frac{4}{3}\pi r^3$, surface area = $4\pi r^2$; **Cone** volume = $\frac{1}{3}\pi r^2 h$, curved surface area = πrl (where slant height $l = \sqrt{(r^2 + h^2)}$).

For a **solid hemisphere** or **solid cone**, remember to include the flat circular base ($+\pi r^2$), so the total surface area of a solid hemisphere is $2\pi r^2 + \pi r^2 = 3\pi r^2$. When melting and recasting shapes, equate their exact volumes in terms of π so π cancels cleanly.

Example 1: Find the exact total surface area of a solid cone with base radius 5 cm and vertical height 12 cm.

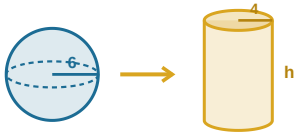


Solution:

$l = \sqrt{(5^2 + 12^2)} =$ **13 cm**

CSA + Base $= \pi(5)(13) + \pi(5)^2 = 65\pi + 25\pi =$ **90π cm^2**

Example 2: A metal sphere of radius 6 cm is melted down to form a cylinder of radius 4 cm. Find the height h of the cylinder.



Solution:

$V_{sphere} = \frac{4}{3}\pi(6)^3 =$ **288π**; $V_{cyl} = \pi(4)^2 h =$ **$16\pi h$**

$16\pi h = 288\pi \Rightarrow h = 288 \div 16 =$ **18 cm**

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