Cones Spheres Pyramids

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

A cone has radius 3 cm and vertical height 4 cm. Find its volume and total surface area in terms of π.

Step 1 · Volume

$\frac{1}{3} \times \pi \times 9 \times 4 = 12\pi \text{ cm}^3$

Step 2 · Slant height

$l = \sqrt{(3^2 + 4^2)} = 5 \text{ cm}$

Step 3 · Surface area

$\pi \times 3 \times 5 + \pi \times 9 = 15\pi + 9\pi = 24\pi \text{ cm}^2$

Answer: $V = 12\pi \text{ cm}^3$ (≈ 37.7), $SA = 24\pi \text{ cm}^2$ (≈ 75.4)

Check: The vertical height is used for volume, the slant height for the curved surface ✓

2. Now try one with the steps

Find the volume and surface area of a sphere of radius 6 cm, in terms of π.

Step 1 · Volume

Step 2 · Surface area

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. A cone has radius 5 cm and vertical height 12 cm. Find its volume in terms of π. [2]

2. Find the slant height of the cone in question 1. [1]

3. Find the curved surface area of the cone in question 1, in terms of π. [2]

4. Find the total surface area of the cone in question 1, in terms of π. [1]

5. Find the volume of a sphere of radius 3 cm, in terms of π. [2]

6. Find the surface area of a sphere of radius 3 cm, in terms of π. [1]

7. Find the volume of a hemisphere of radius 4 cm, to 1 decimal place. [2]

8. Find the total surface area of a solid hemisphere of radius 4 cm, in terms of π. [2]

9. A square-based pyramid has base 5 cm by 5 cm and vertical height 9 cm. Find its volume. [2]

10. A pyramid has a rectangular base 4 cm by 6 cm and vertical height 7 cm. Find its volume. [2]

11. A sphere has volume 972π cm^3. Find its radius, in cm. [3]

12. A cone has volume 96π cm^3 and radius 6 cm. Find its vertical height, in cm. [3]

13. An ice cream is a cone of radius 3 cm and height 4 cm topped by a hemisphere of radius 3 cm. Find the total volume, to 1 decimal place. [3]

14. A cone of radius 10 cm and height 24 cm has a cone of radius 5 cm and height 12 cm cut from its top. Find the volume of the frustum, to 1 decimal place. [4]

15. A solid metal sphere of radius 6 cm is melted and recast cylinder of radius 4 cm. Find the height of the cylinder, in cm. [3]

4. Before you hand it in

Curved surface of a cone with r = 3, h = 4: π × 3 × 4
πrl uses the SLANT height: l = $\sqrt{(3^2 + 4^2)} = 5$, so 15π.

Volume of a cone = $\pi r^2 h$
A cone fills a third of the cylinder around it: $\frac{1}{3}\pi r^2 h$.

Hemisphere surface area = $2\pi r^2$ for a solid hemisphere
A solid hemisphere has a curved surface $2\pi r^2$ AND a circular base πr^2: $3\pi r^2$.

Sphere with diameter 12 cm: $V = 4/3\ \pi \times 12^3$
r = 6 cm, so V = 4/3 π × 216 = 288π.