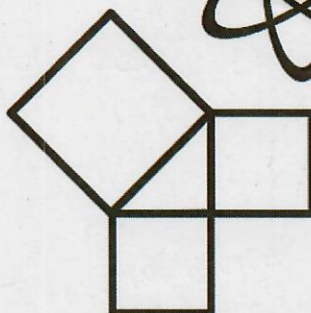
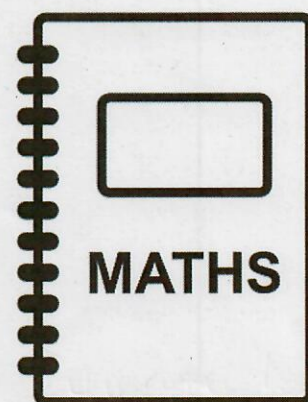
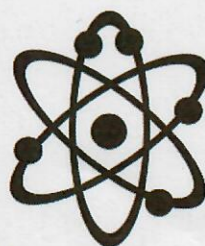


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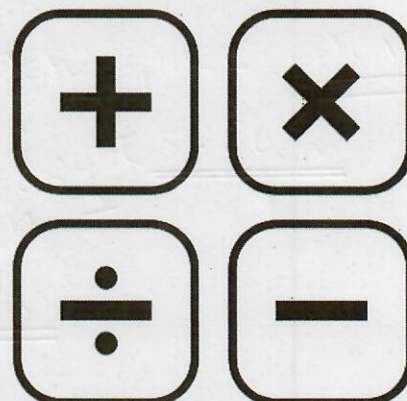
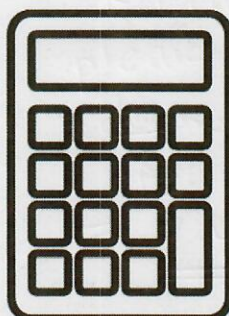
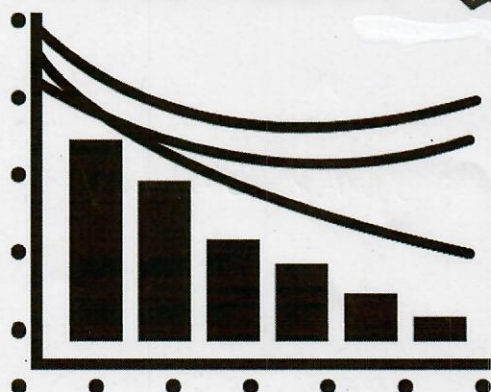
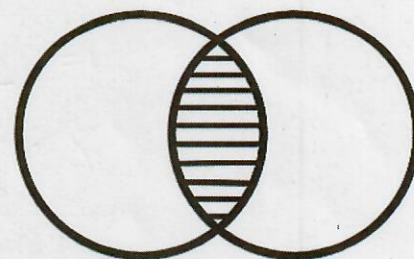
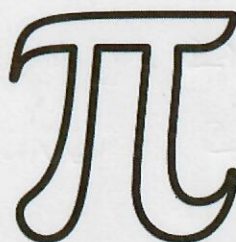
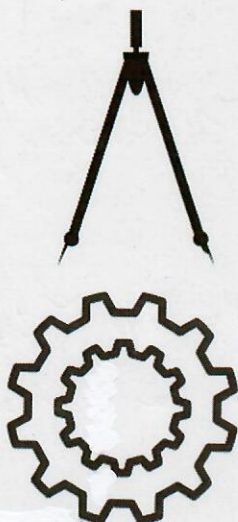
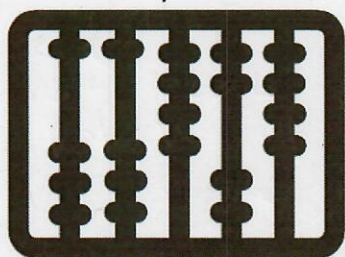
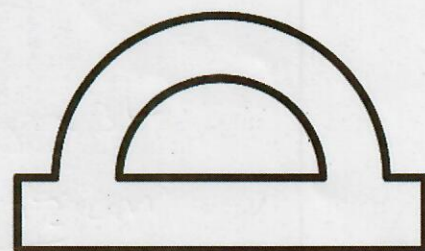
GCSE TOPIC BOOKLET VOLUME OF A SPHERE & HEMISPHERE

SOLUTIONS

Volume of sphere = $\frac{4}{3} \pi r^3$



$$a^2 = b^2 + c^2$$



1. Find the volume of a sphere with a radius 6.4 cm.

$$V = \frac{4}{3} \pi r^3$$

$$V = \frac{4}{3} \times \pi \times 6.4^3$$

$$V = 1098.066219 = \underline{1098.1 \text{ cm}^3} \text{ (1dp)} \quad [2]$$

2. Calculate the volume of a sphere with radius 2.8 cm.

$$V = \frac{4}{3} \pi r^3$$

$$V = \frac{4}{3} \times \pi \times 2.8^3$$

$$V = 91.95232258$$

$$\underline{V = 92.0 \text{ cm}^3} \text{ (1dp)} \quad [2]$$

3. The volume of a sphere is 45.9 litres. Calculate the radius of the sphere stating the units of your answer.

$$V = 45.9 \text{ litres}$$

$$1 \text{ litre} = 1000 \text{ cm}^3$$

$$V = 45.9 \times 1000 = \underline{45,900 \text{ cm}^3}$$

$$V = \frac{4}{3} \pi r^3$$

$$45,900 = \frac{4}{3} \times \pi \times r^3$$

$$45,900 = 4.188790205 r^3$$

$$\frac{45,900}{4.188790205} = r^3$$

$$10957.81783 = r^3$$

$$r = \sqrt[3]{10957.81783}, \quad r = 22.21133652$$

$$\underline{r = 22.2 \text{ cm}} \text{ (1dp)} \quad [5]$$

4.

The volume of a hemisphere is 34.2 cm^3 . Calculate the radius of the hemisphere.

$$\text{Volume sphere} = \frac{4}{3} \pi r^3 \Rightarrow \text{Volume hemisphere} = \frac{2}{3} \pi r^3$$

$$34.2 = \frac{2}{3} \times \pi r^3$$

$$34.2 = 2.094395102 r^3$$

$$16.32929716 = r^3$$

$$r = \sqrt[3]{16.32929716} = 2.53701186$$

$$\underline{\underline{r = 2.5 \text{ cm (1dp)}}}$$

[3]

5.

The volume of a hemisphere is 41 cm^3 . Calculate the radius of the hemisphere.

$$\text{Volume sphere} = \frac{4}{3} \pi r^3 \Rightarrow \text{Volume hemisphere} = \frac{2}{3} \pi r^3$$

$$41 = \frac{2}{3} \pi r^3$$

$$41 = 2.094395102 r^3$$

$$41 \div 2.094395102 = r^3$$

$$19.576058 = r^3$$

$$r = \sqrt[3]{19.576058}$$

$$r = 2.695101222$$

$$\underline{\underline{r = 2.7 \text{ cm (1dp)}}}$$

[4]

6. The volume of a hemisphere is 48.5 cm^3 . Calculate the radius of the hemisphere.

$$\text{Volume sphere} = \frac{4}{3} \pi r^3 \Rightarrow \text{Volume Hemisphere} = \frac{2}{3} \pi r^3$$

$$48.5 = \frac{2}{3} \pi r^3$$

$$48.5 = 2.094395102 r^3$$

$$48.5 \div 2.094395102 = r^3$$

$$23.15704422 = r^3$$

$$r = \sqrt[3]{23.15704422}$$

$$r = 2.850324954$$

$$\underline{\underline{r = 2.9 \text{ cm (1dp)}}}$$

[4]

7. The volume of a hemisphere is 34 cm^3 . Find the volume of a sphere with a radius of twice that of the hemisphere.

$$\text{Volume sphere} = \frac{4}{3} \pi r^3 \Rightarrow \text{Volume Hemisphere} = \frac{2}{3} \pi r^3$$

$$34 = \frac{2}{3} \pi r^3$$

$$34 = 2.094395102 r^3$$

$$34 \div 2.094395102 = r^3$$

$$r = \sqrt[3]{16.2338042}, \quad r = 2.532056746$$

$$\underline{\underline{r = 2.53 \text{ cm (1dp)}}}$$

[4]

Radius of new sphere

$$\begin{aligned} \text{Volume sphere} &= \frac{4}{3} \pi r^3 = \frac{4}{3} \times \pi \times 5.06^3 = \underline{\underline{5.06 \text{ cm}}} \\ &= \underline{\underline{542.7 \text{ cm}^3}} \quad (542 - 544) \end{aligned}$$

This question could also be attempted by considering similar volumes

radius hemisphere
'1'

radius new
hemisphere
= '2r'

$\therefore$ scale factor for length = 2
scale factor for volume = $2^3 = 8$

$\therefore$ volume of new hemisphere = 8×34
= 272 cm³

Volume of new sphere = $2 \times 272 =$ 544 cm³