Geometry: Similar Shapes (Area and Volume Scale Factors)

Practice Worksheet (Nov 2020 Paper 1H Style)

I Do

R and **S** are two similar solid shapes.
Shape **R** has surface area 108 cm^2 and volume 135 cm^3.
Shape **S** has surface area 300 cm^2.
Work out the volume of shape **S**.

We Do

A and **B** are two similar solid shapes.
Shape **A** has surface area 80 cm^2 and volume 192 cm^3.
Shape **B** has surface area 180 cm^2.
Work out the volume of shape **B**.

You Do

X and **Y** are two similar solid shapes.
Shape **X** has surface area 45 cm^2 and volume 54 cm^3.
Shape **Y** has surface area 125 cm^2.
Work out the volume of shape **Y**.

Challenge

P and **Q** are two similar solid shapes.
Shape **P** has surface area 160 cm^2 and volume 256 cm^3.
Shape **Q** has volume 500 cm^3.
Work out the surface area of shape **Q**.

Answers

- **I Do:**

$$\text{Area scale factor } (k^2) = \frac{300}{108} = \frac{25}{9}$$

$$\text{Linear scale factor } (k) = \sqrt{\frac{25}{9}} = \frac{5}{3}$$

$$\text{Volume scale factor } (k^3) = \left(\frac{5}{3}\right)^3 = \frac{125}{27}$$

$$\text{Volume of } \mathbf{S} = 135 \times \frac{125}{27} = 5 \times 125 = \mathbf{625} \text{ cm}^\mathbf{3}$$

- **We Do:**

$$\text{Area scale factor } (k^2) = \frac{180}{80} = \frac{9}{4}$$

$$\text{Linear scale factor } (k) = \sqrt{\frac{9}{4}} = \frac{3}{2}$$

$$\text{Volume scale factor } (k^3) = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$$

$$\text{Volume of } \mathbf{B} = 192 \times \frac{27}{8} = 24 \times 27 = \mathbf{648} \text{ cm}^\mathbf{3}$$

- **You Do:**

$$\text{Area scale factor } (k^2) = \frac{125}{45} = \frac{25}{9}$$

$$\text{Linear scale factor } (k) = \sqrt{\frac{25}{9}} = \frac{5}{3}$$

$$\text{Volume scale factor } (k^3) = \left(\frac{5}{3}\right)^3 = \frac{125}{27}$$

$$\text{Volume of } \mathbf{Y} = 54 \times \frac{125}{27} = 2 \times 125 = \mathbf{250} \text{ cm}^\mathbf{3}$$

- **Challenge:**

$$\text{Volume scale factor } (k^3) = \frac{500}{256} = \frac{125}{64}$$

$$\text{Linear scale factor } (k) = \sqrt[3]{\frac{125}{64}} = \frac{5}{4}$$

$$\text{Area scale factor } (k^2) = \left(\frac{5}{4}\right)^2 = \frac{25}{16}$$

$$\text{Surface area of } \mathbf{Q} = 160 \times \frac{25}{16} = 10 \times 25 = \mathbf{250} \text{ cm}^\mathbf{2}$$