



- 1** Two shapes are mathematically similar. The smaller has area 12 cm^2 and the larger has area 27 cm^2 . A side of the smaller shape is 4 cm long.

Work out the length of the matching side of the larger shape.

(2 marks)

$$\begin{aligned}\text{area scale factor} &= \{27\}/\{12\} = \{9\}/\{4\} \\ \text{length scale factor} &= \sqrt{\frac{9}{4}} = \{3\}/\{2\} \\ 4 \times \{3\}/\{2\} &= 6\end{aligned}$$

$$\boxed{6 \text{ cm}}$$

- 2** Triangle P and triangle Q are mathematically similar. Triangle P has area 20 cm^2 and base $x \text{ cm}$. Triangle Q has area 45 cm^2 and the matching base is $(x + 3) \text{ cm}$.

Work out the value of x .

(4 marks)

$$\begin{array}{lcl} \text{area scale factor} & = & \{45\}/\{20\} = \{9\}/\{4\} \\ \text{length scale factor} & = & \{3\}/\{2\} \\ x + 3 & = & \{3\}/\{2\}x \\ \times 2 & & \\ 2x + 6 & = & 3x \\ & & \times 2 \\ x & = & 6 \end{array}$$

$$\boxed{x = 6}$$

- 3** Two solid shapes are mathematically similar. The smaller has volume 54 cm^3 and height 6 cm. The larger has volume 250 cm^3 and height $(2x + 4) \text{ cm}$.

Work out the value of x .

(4 marks)

$$\begin{array}{lcl} \text{volume scale factor} & = & \{250\}/\{54\} = \{125\}/\{27\} \\ \text{length scale factor} & = & \sqrt[3]{\frac{125}{27}} = \{5\}/\{3\} \\ 2x + 4 & = & 6 \times \{5\}/\{3\} = 10 \\ -4 & & \\ 2x & = & 6 \\ \div 2 & & \\ x & = & 3 \end{array}$$

$$\boxed{x = 3}$$

4

In triangle ABC, D lies on AB and E lies on AC so that DE is parallel to BC.

$AD : DB = 2 : 1$.

The area of triangle ADE is 24 cm^2 .

Work out the area of the trapezium DBCE.

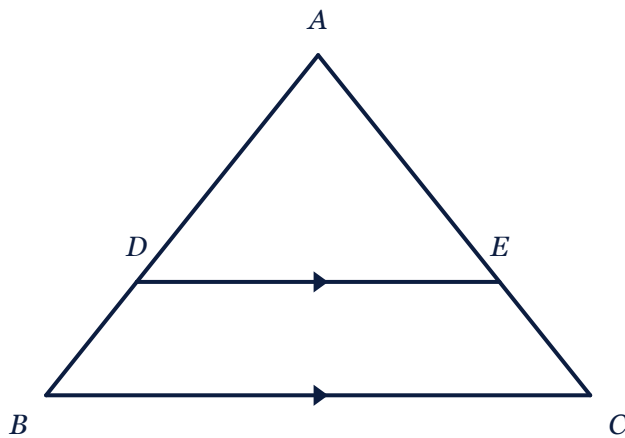


Diagram NOT accurately drawn

(4 marks)

DE is parallel to BC, so triangles ADE and ABC are similar

AO

$AB = 2 : 3$, so the length scale factor from
ADE to ABC is $\frac{3}{2}$

$$\text{Area scale factor} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$\text{Area of ABC} = 24 \times \frac{9}{4} = 54 \text{ cm}^2$$

$$\text{Area of trapezium DBCE} = 54 - 24 = 30 \text{ cm}^2$$

$$\boxed{30 \text{ cm}^2}$$

- 5 Two rectangles are mathematically similar. The smaller has area 36 cm^2 and the larger has area 100 cm^2 . The length of the smaller is $(x + 1) \text{ cm}$ and the matching length of the larger is $2x \text{ cm}$. Work out the value of x and the two lengths.

(4 marks)

$$\begin{array}{rcl} \text{length scale factor} & = & \sqrt{\frac{100}{36}} = \{10\}/\{6\} = \\ & & \{5\}/\{3\} \\ 2x & = & \{5\}/\{3\}(x + 1) \\ \times 3 & & \\ 6x & = & 5x + 5 \\ -5x & & \times 3 \\ x & = & 5 \end{array}$$

$$x + 1 = 6 \text{ and } 2x = 10$$

$$x = 5; 6 \text{ cm and } 10 \text{ cm}$$

- 6 In triangle ABC, the point D is on AB and the point E is on AC so that DE is parallel to BC. $AD = x \text{ cm}$ and $AB = 3x \text{ cm}$.

The area of triangle ADE is $A \text{ cm}^2$.

Show that the area of the trapezium DBCE is $8A \text{ cm}^2$.

(4 marks)

DE $\parallel$ BC so ADE and ABC are similar

$$\text{length scale factor} = \{3x\}/\{x\} = 3$$

$$\text{area scale factor} = 3^2 = 9$$

$$\text{area ABC} = 9A$$

$$\text{DBCE} = 9A - A$$

$$\text{DBCE} = 8A$$

- 7 Two mathematically similar containers, A and B, have volumes 400 cm^3 and 1350 cm^3 .

- Container A has height 12 cm . Work out the height of container B.
- Container B has surface area 468 cm^2 . Work out the surface area of container A.

(5 marks)

Volume ratio A

$$B = 400 : 1350 = 8 : 27$$

$$\text{Length ratio} = \sqrt[3]{8} : \sqrt[3]{27} = 2 : 3$$

$$\text{a) Height of B} = 12 \times 3 \div 2 = 18 \text{ cm}$$

$$\text{Area ratio} = 2^2 : 3^2 = 4 : 9$$

$$\text{b) Surface area of A} = 468 \times 4 \div 9 = 208 \text{ cm}^2$$

8

Two solid shapes, S and T, are mathematically similar. Their volumes are in the ratio 8 : 27.

The height of S is x cm and the height of T is $(x + 4)$ cm. The surface area of S is 96 cm^2 .

a. Work out the value of x .

b. Work out the surface area of T.

(5 marks)

a)

$$\text{length ratio} = \sqrt[3]{8} : \sqrt[3]{27} = 2 : 3$$

$$x + 4 = \frac{3}{2}x$$

$\times 2$

$$2x + 8 = 3x$$

$\times 2$

$$x = 8$$

b)

$$\text{area ratio} = 2^2 : 3^2 = 4 : 9$$

$$96 \times \frac{9}{4} = 216$$

$$\boxed{\text{a) } x = 8 \text{ b) } 216 \text{ cm}^2}$$