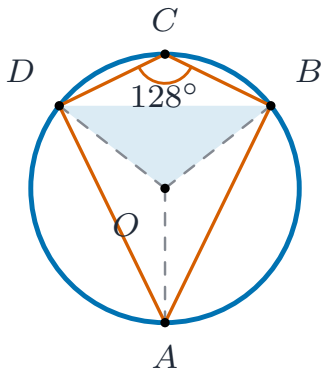
Exercise walk-through

4.8
Similarity ratios and mixed practice

Pearson Edexcel · International GCSE · Mathematics A

Figure: Circle geometry with reasons (2)



cyclic quad: $\angle BAD = 52°$
centre $= 2\times$ rim: $\angle BOD = 104°$
$OB = OD$ (radii): isosceles
$\angle OBD = \frac{180-104}{2} = 38°$

every numerical step names its reason

- Worked example 2: a circle centre O with **cyclic quadrilateral** ABCD, angle BCD = 128°, and the chain BAD = 52°, BOD = 104°, OBD = 38°.
- Match each part of the diagram to the text.

Pythagoras and trigonometry in 2D

- $\tan 62° = \frac{h}{50}$, so $h = 50 \tan 62° = 94.0$ m (3 s.f.).
- The **sine rule** , $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$, works when you know a side and its opposite angle.
- The **cosine rule** , $a^2 = b^2 + c^2 - 2bc\cos A$, works when you know two sides and the angle between them, or all three sides.

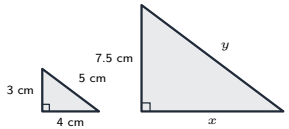
$$\sin\theta = \frac{\text{opp}}{\text{hyp}}, \quad \cos\theta = \frac{\text{adj}}{\text{hyp}}, \quad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

Pythagoras and trigonometry in 2D (2)

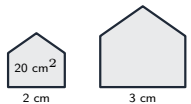
- The area of a triangle is $\frac{1}{2}ab\sin C$. It also works backwards: if the area is 15, $a = 6$ and $b = 10$, then $30\sin C = 15$, so $\sin C = 0.5$ and $C = 30°$ (or $150°$ if the angle is obtuse).
- $BC = a$ is opposite A, and $AC = b$ is opposite B. By the **sine rule**, $$\frac{b}{\sin 65°} = \frac{8}{\sin 40°}.$$
- $b = \dfrac{8\sin 65°}{\sin 40°} = 11.3$ cm (3 s.f.).

Exercises 2.1·2.2

2.1 The two triangles are similar. Find the lengths x and y. [2]

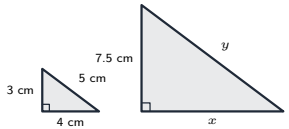


2.2 Two shapes are similar. Their widths are 2 cm and 3 cm. The small shape has area 20 cm^2. Find the area of the large shape. [2]



Exercises 2.1·2.2

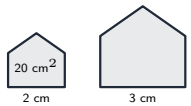
2.1 The two triangles are similar. Find the lengths x and y. [2]



2.1

- $k = 7.5 \div 3 = 2.5$
- $x =$ **10** cm, $y =$ **12.5** cm

2.2 Two shapes are similar. Their widths are 2 cm and 3 cm. The small shape has area 20 cm^2. Find the area of the large shape. [2]



2.2

- area factor $= 1.5^2 = 2.25$
- **45** cm^2

Exercise 2.3

2.3 Are the two triangles congruent? Give the condition. [2]



Exercise 2.3

2.3 Are the two triangles congruent? Give the condition. [2]

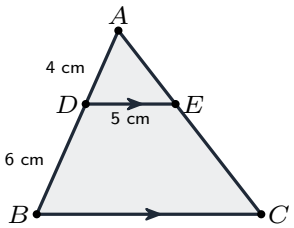


2.3

- yes, they are congruent
- SAS: two sides and the angle between them are equal

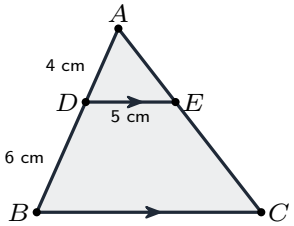
Exercise 3.1

3.1 In triangle ABC, D is on AB and E is on AC. DE is parallel to BC. $AD = 4$ cm, $DB = 6$ cm and $DE = 5$ cm. Find the length BC. [3]



Exercise 3.1

3.1 In triangle ABC, D is on AB and E is on AC. DE is parallel to BC. $AD = 4$ cm, $DB = 6$ cm and $DE = 5$ cm. Find the length BC. [3]

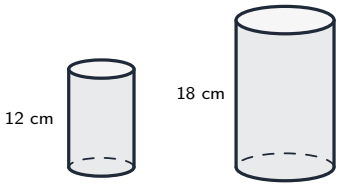


3.1

- triangles ADE and ABC are similar because DE is parallel to BC
- $k = 10 \div 4 = 2.5$
- $BC = \mathbf{12.5}$ cm

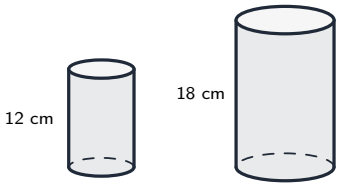
Exercise 3.2

3.2 Two jugs are similar. Their heights are 12 cm and 18 cm. The large jug holds 1350 cm^3. Find what the small jug holds. [3]



Exercise 3.2

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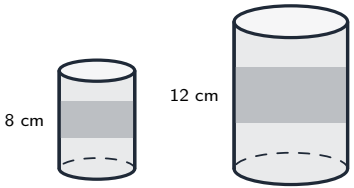
3.2

- $k = 18 \div 12 = 1.5$
- volume factor $= 1.5^3 = 3.375$
- $1350 \div 3.375 = \mathbf{400}\ \text{cm}^3$

Exercise 3.3 (a)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

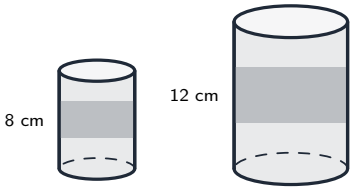
(a) The label on the small can has area 120 cm^2. Find the area of the label on the large can. [3]



Exercise 3.3 (a)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(a) The label on the small can has area 120 cm^2. Find the area of the label on the large can. [3]



(a) $k = 1.5$; area factor $= 2.25$; **270** cm^2

Exercise 3.3 (b)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(b) The large can holds 810 cm^3. Find the volume of the small can. [3]

Exercise 3.3 (b)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(b) The large can holds 810 cm^3. Find the volume of the small can. [3]

(b) volume factor $= 3.375$; $810 \div 3.375 = \mathbf{240}$ cm^3

Exercise 3.3 (c)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(c) Find the radius of the small can and the radius of the large can. [4]

Exercise 3.3 (c)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(c) Find the radius of the small can and the radius of the large can. [4]

(c) $\pi r^2 \times 8 = 240$; $r = \mathbf{3.09}$ cm; $3.09 \times 1.5 = \mathbf{4.63}$ cm

Exercise 3.3 (d)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(d) The small can costs ¥6 and the large can costs ¥18. Which can is better value? A medium can, similar to both, holds 500 cm^3. Find its height. [5]

Exercise 3.3 (d)

3.3 A small can and a large can are similar cylinders. The small can is 8 cm tall and the large can is 12 cm tall.

(d) The small can costs ¥6 and the large can costs ¥18. Which can is better value? A medium can, similar to both, holds 500 cm^3. Find its height. [5]

(d) small: $6 \div 240 = ¥0.025$ per cm^3; large: $18 \div 810 = ¥0.0222$ per cm^3; the **large** can is better value; $k^3 = 500 \div 240 = 2.083$, $k = 1.277$; height $= 8 \times 1.277 = \mathbf{10.2}$ cm