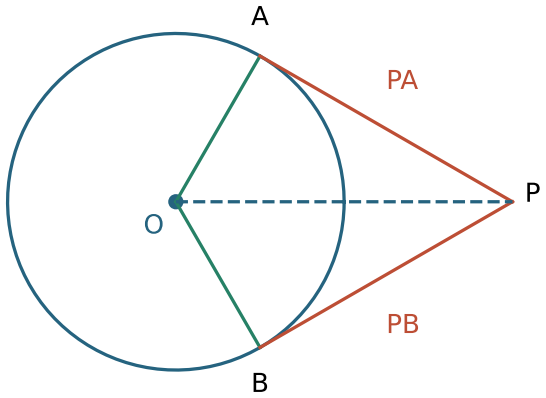
Exercise walk-through

4.2.3
Plane Area

AQA · GCSE · Mathematics

Figure: Congruence, similarity and circles (4)

Shared OP and equal radii → RHS → PA = PB



- Equal radii, shared OP and right angles give congruent triangles (RHS), so PA = PB
- Match each part of the diagram to the text.

Perimeter, area and volume

- Triangle: $\frac{1}{2} \times b \times h$, where h is the **perpendicular height** .
- Parallelogram: $b \times h$.
- Trapezium: $\frac{1}{2}(a+b)h$, where a and b are the parallel sides.
- Circle: $A = \pi r^2$, and the **circumference** is $C = 2\pi r = \pi d$.

$$\text{arc length} = \frac{\theta}{360} \times 2\pi r \qquad \text{sector area} = \frac{\theta}{360} \times \pi r^2$$

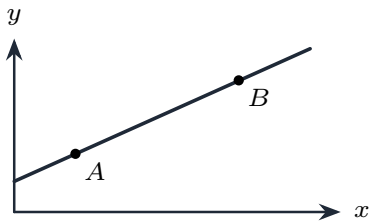
Pythagoras and trigonometry

- **Pythagoras' theorem.** In a right-angled triangle, $a^2 + b^2 = c^2$, where c is the **hypotenuse**, the longest side, opposite the right angle.
- A ladder whose foot is 3 m from a wall and whose top is 4 m up the wall is $\sqrt{9+16} = 5$ m long.
- **Trigonometric ratios.** Label the sides from the angle θ: opposite, **adjacent** (next to the angle) and **hypotenuse**.
- **Worked example 12.** In a right-angled triangle the hypotenuse is 23.7 cm and x is the side **adjacent** to an angle of $52°$.

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

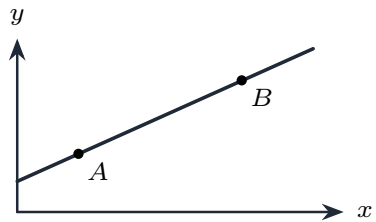
Exercise 2.1

2.1 Work out the area of a triangle with base 9 cm and perpendicular height 6 cm. [2]



Exercise 2.1

2.1 Work out the area of a triangle with base 9 cm and perpendicular height 6 cm. [2]



2.1

- $A = \frac{1}{2}bh = \frac{1}{2} \times 9 \times 6 = \mathbf{27}$ cm^2

Setup for exercise 2.2

2.2 A parallelogram has base 12 cm, slanted side 7 cm and perpendicular height 5 cm. Work out its area. [2]



2.3 A rectangle has area 56 cm^2 and length 8 cm. Work out its perimeter. [2]



Exercise 2.2

2.4 Work out the area of a trapezium with parallel sides 5 m and 9 m and height 3 m. [2]



2.5 Convert 3.5 m^2 to cm^2. [1]



Exercise 2.2

2.4 Work out the area of a trapezium with parallel sides 5 m and 9 m and height 3 m. [2]



2.5 Convert 3.5 m^2 to cm^2. [1]



2.2

- using the perpendicular height: $A = bh = 12 \times 5 = \mathbf{60}$ cm^2

2.3

- width $= 56 \div 8 = 7$ cm

Full solution on next slide

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Full solution 2.2

2.2

- using the perpendicular height: $A = bh = 12 \times 5 = \mathbf{60}$ cm^2

2.3

- width $= 56 \div 8 = 7$ cm
- perimeter $= 2(8 + 7) = \mathbf{30}$ cm

2.4

- $A = \frac{1}{2}(a + b)h = \frac{1}{2} \times (5 + 9) \times 3 = \mathbf{21}$ m^2

2.5

- $3.5 \times 10\,000 = \mathbf{35\,000}$ cm^2

Exercise 3.1

3.1 Sam works out the area of the parallelogram in **2.2** as $12 \times 7 = 84$ cm^2. Explain his mistake. [1]



Exercise 3.1

3.1 Sam works out the area of the parallelogram in **2.2** as $12 \times 7 = 84$ cm^2. Explain his mistake. [1]



3.1

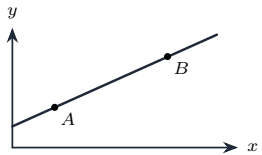
- he used the slanted side, 7 cm; the height must be perpendicular to the base, 5 cm

Setup for exercise 3.2

3.2 An L-shaped floor is a 10 m by 8 m rectangle with a 4 m by 3 m rectangle cut from one corner. Work out its area and its perimeter. [4]



3.3 A triangle has area 42 cm^2 and base 12 cm. Work out its perpendicular height. [2]



3.4 A trapezium has area 60 cm^2, height 6 cm and one parallel side 8 cm. Work out the other parallel side. [3]



Exercise 3.2

3.5 Floor tiles are squares of side 40 cm and cost ¥12 each. Work out the cost of tiling a 4.8 m by 3.2 m floor. [3]



Exercise 3.2

3.5 Floor tiles are squares of side 40 cm and cost ¥12 each. Work out the cost of tiling a 4.8 m by 3.2 m floor. [3]



3.2

- area $= 10 \times 8 - 4 \times 3 = 80 - 12 =$ **68** m^2
- the cut corner does not change the perimeter: its two new edges equal the two removed ones
- perimeter $= 2(10 + 8) =$ **36** m

3.3

- $42 = \frac{1}{2} \times 12 \times h = 6h$
- $h =$ **7** cm

Full solution on next slide

Full solution 3.2

3.2

- area $= 10 \times 8 - 4 \times 3 = 80 - 12 =$ **68** m^2
- the cut corner does not change the perimeter: its two new edges equal the two removed ones
- perimeter $= 2(10 + 8) =$ **36** m

3.3

- $42 = \frac{1}{2} \times 12 \times h = 6h$
- $h =$ **7** cm

3.4

- $60 = \frac{1}{2}(8 + b) \times 6 = 3(8 + b)$
- $8 + b = 20$
- $b =$ **12** cm

3.5

- tiles along each side: $480 \div 40 = 12$ and $320 \div 40 = 8$
- $12 \times 8 = 96$ tiles
- $96 \times 12 =$ **¥1152**