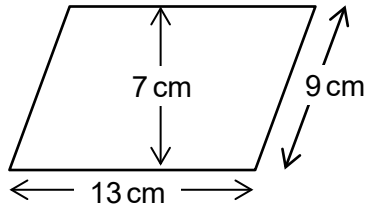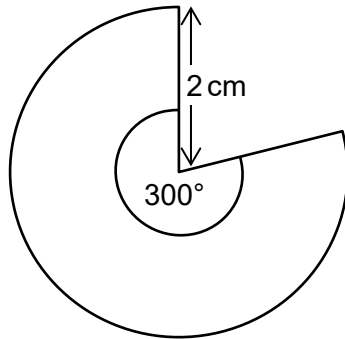## Foundation Check In - 10.03 Area calculations

1. Calculate the area of this parallelogram.
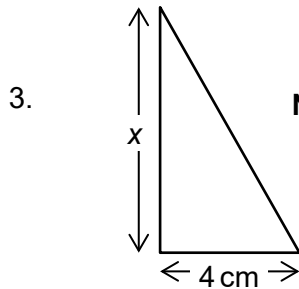
   7 cm    9 cm    **Not to scale**

   13 cm

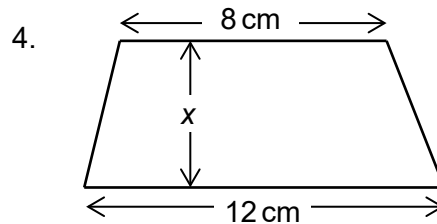2. Calculate the area of the sector below.

   2 cm

   300°    **Not to scale**

The shapes in questions 3 and 4 each have an area of 10 cm$^2$.
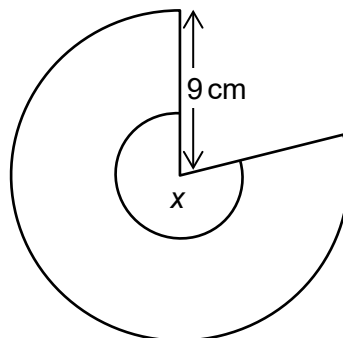Find the missing length $x$ in each diagram.

3.    $x$    **Not to scale**

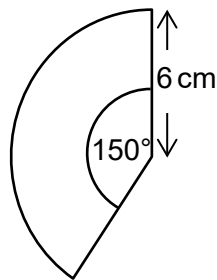   4 cm

4.    8 cm    **Not to scale**

   $x$

   12 cm

5. The area of the sector below is 230 cm$^2$. Find angle $x$.
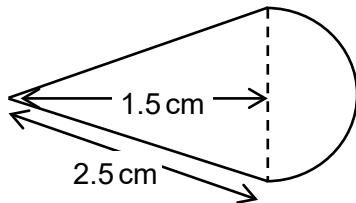
   9 cm

   $x$    **Not to scale**

6. Show that the area of the sector below is $15\pi \, \text{cm}^2$.

6 cm

150°

**Not to scale**

7. Show that the total area of the shape below is $(3 + 2\pi) \, \text{cm}^2$.

1.5 cm

2.5 cm

**Not to scale**

8. Show that the shaded region is $\dfrac{3}{4}$ of the area of the total sector.

18 cm

120°

9 cm
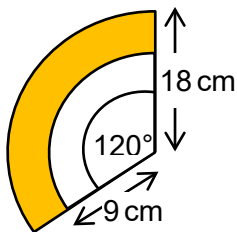
**Not to scale**

9. Calculate the shaded area.

5 cm
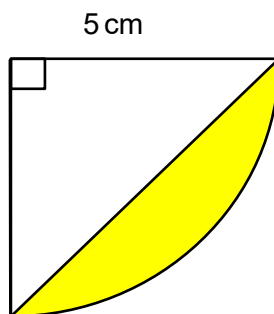
**Not to scale**

10. Toby has a 9 m by 12 m lawn that he wants to water. He has two sprinklers, each of which can water grass within a 7.5 m radius. Toby sets up the two sprinklers so that they are on opposite corners of the lawn. Work out what percentage of the lawn he will be able to water with the sprinklers.

**Extension**

A square tile has an area of 64 cm$^2$ and is sold in packs of 20 for £8.50.
The manager of an exclusive spa is going to tile every wall in three identical treatment rooms (see plan view below).

3.5 m

2.5 m
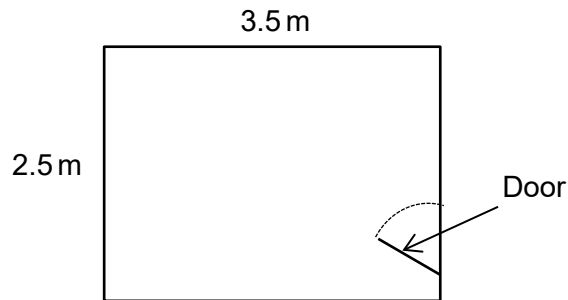
Door

Each wall is 2.5 m high and the door occupies a space of 1.28 m$^2$ which does not require tiles.

How much money should the manager budget for the cost of the tiles to the nearest £100?

## Answers

1. $91\,\text{cm}^2$

2. $10.5\,\text{cm}^2$

3. $5\,\text{cm}$

4. $1\,\text{cm}$

5. $325°$

6. $\dfrac{150}{360} \times \pi \times 6^2 = \dfrac{5}{12} \times 36\pi = 5 \times 3\pi = 15\pi\,\text{cm}^2$

7. Base of triangle $= 2\sqrt{2.5^2 - 1.5^2} = 4$

   Area of triangle $= \dfrac{1}{2} \times 4 \times 1.5 = 3$ and area of semi-circle $= \dfrac{1}{2} \times \pi \times 2^2 = 2\pi$

   Total area $= (3 + 2\pi)\,\text{cm}^2$

8. Fraction $= \dfrac{\text{shaded area}}{\text{total area}} = \dfrac{\dfrac{120}{360}\pi \times 18^2 - \dfrac{120}{360}\pi \times 9^2}{\dfrac{120}{360}\pi \times 18^2} = \dfrac{\dfrac{1}{3}\pi(324 - 81)}{\dfrac{1}{3}\pi \times 324} = \dfrac{243}{324} = \dfrac{3}{4}$

9. $7.13\,\text{cm}^2$

10. Length of the diagonal of the lawn is $\sqrt{12^2 + 9^2} = \sqrt{225} = 15\,\text{m}$, so the midpoint is 7.5 m. As the maximum reach of the sprinkler is 7.5 m, the sprinklers will not overlap.

    Area covered with water $= \dfrac{1}{2} \times \pi \times 7.5^2 = 88.357\,\text{m}^2$

    Percentage covered with water $= \dfrac{88.357}{108} \times 100 = 81.8\%$

**Extension**

Each tile has sides of length $\sqrt{64} = 8$ cm
$350 \div 8 = 43.75$, so 44 tiles needed
$250 \div 8 = 31.25$, so 32 tiles needed

The total number of tiles needed per room is:
$2 \times 44 \times 32 = 2816$
$2 \times 32 \times 32 = 2048$
$12800 \div 64 = 200$
$2816 + 2048 - 200 = 4664$ tiles

The total number of tiles for all three rooms is $4664 \times 3 = 13992$ tiles

Total number of packs required: $13992 \div 20 = 699.6$, rounded to 700 complete packs

Cost $= 700 \times £8.50 = £5950$ so the manager should budget £6000 for the tiles.

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| Assessment Objective | Qu. | Topic | R | A | G |
|---|---|---|---|---|---|
| AO1 | 1 | Find the area of a parallelogram | | | |
| AO1 | 2 | Find the area of a sector | | | |
| AO1 | 3 | Use the area formula for a triangle | | | |
| AO1 | 4 | Use the area formula for a trapezium | | | |
| AO1 | 5 | Find the angle of a sector given the area and the radius | | | |
| AO2 | 6 | Find the area of a sector in terms of pi | | | |
| AO2 | 7 | Find the area of a composite shape | | | |
| AO2 | 8 | Find the difference between two sector areas | | | |
| AO3 | 9 | Solve a problem using area formulae | | | |
| AO3 | 10 | Solve a problem using area formulae | | | |

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