1 The diagram shows one face of a wall.
This face is in the shape of a pentagon with exactly one line of symmetry.

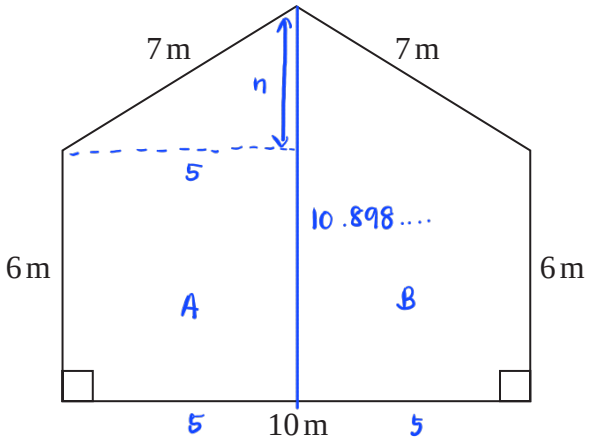


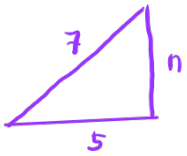
Diagram **NOT** accurately drawn

Omondi is going to paint this face of the wall once.
He has to buy all the paint that he needs to use.

The paint in each tin of paint Omondi is going to buy will cover $16\,m^2$ of the face of the wall.

Work out the least number of tins of paint Omondi will need to buy.
Show your working clearly.

By using Pythagoras' Theorem, finding n :



$n = \sqrt{7^2 - 5^2}$

$= \sqrt{24}$ (1)

$= 4.898....$ (1)

Area of trapezium A and B :

$\frac{1}{2} \times (6 + 10.898...) \times (5) \times 2$ ← 2 trapeziums

$= 84.494..\ m^2$ (1)

$\frac{84.494...}{16} = 5.28$ (1) ← 5 tins of paint is not enough to cover the whole wall

∴ Omondi needs 6 tins of paint. (1)

6

(Total for Question 1 is 5 marks)

2 The region, shown shaded in the diagram, is a path.

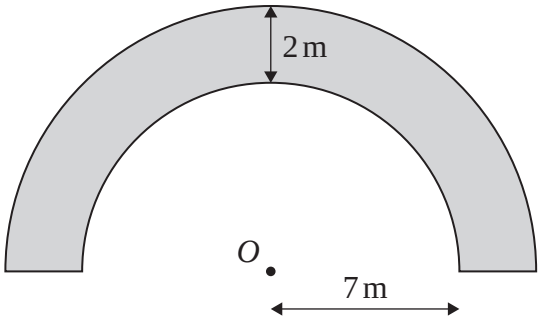


Diagram **NOT** accurately drawn

The boundary of the path is formed by two semicircles, with the same centre O, and two straight lines.

The inner semicircle has a radius of 7 metres.
The path has a width of 2 metres.

Work out the perimeter of the path.
Give your answer correct to one decimal place.

Inner semicircle $= \frac{1}{2} \times 2\pi r$

$= \pi(7)$

$= 7\pi$ (1)

Outer semicircle $= \frac{1}{2} \times 2\pi r$

$= \pi(9)$

$= 9\pi$

Perimeter $= 9\pi + 7\pi + 2(2)$ (1)

$= 16\pi + 4$

$= 54.3$ (1dp)

(1)
54.3 ..... m

(Total for Question 2 is 3 marks)

3 The diagram shows a sector OBC of a circle with centre O and radius $(6 + x)$ cm.

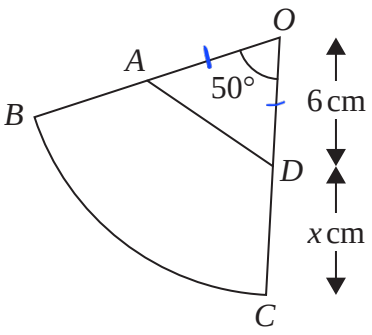


Diagram **NOT** accurately drawn

A is the point on OB and D is the point on OC such that $OA = OD = 6$ cm

Angle $BOC = 50°$

Given that

the perimeter of sector $OBC = 2 \times$ the perimeter of triangle OAD

find the value of x.
Give your answer correct to 3 significant figures.

$a^2 = b^2 + c^2 - 2bc \cos A$

$AD^2 = 6^2 + 6^2 - 2(6)(6) \cos 50°$

$= 25.719\ldots$

$AD = \sqrt{25.719\ldots}$

$= 5.0714\ldots$ (1)

perimeter of triangle $OAD = 12 + 5.0714\ldots$

$= 17.0714\ldots$ (1)

arc $BC = \frac{50°}{360°} \times 2\pi(6+x)$

$= \frac{5\pi}{18}(6+x)$ (1)

perimeter of sector $OBC = \frac{5\pi}{18}(6+x) + 2(6+x)$

$= \frac{5\pi}{18}(6+x) + 12 + 2x$

perimeter of sector OBC = 2x perimeter of triangle OAD

$\frac{5\pi}{18}(6+x) + 12 + 2x = 2 \times 17.0714..$ (1)

$\frac{5}{3}\pi + \frac{5\pi}{18}x + 12 + 2x = 34.1428$

$\frac{5\pi}{18}x + 2x = 34.1428 - 12 - \frac{5}{3}\pi$ (1)

$x\left(\frac{5\pi}{18} + 2\right) = 16.9068...$

$x = 5.89$ (3sf) (1)

$x =$ 5.89

(Total for Question 3 is 6 marks)

4 Here is a parallelogram *PQRS*, in which angle *SPQ* is acute.

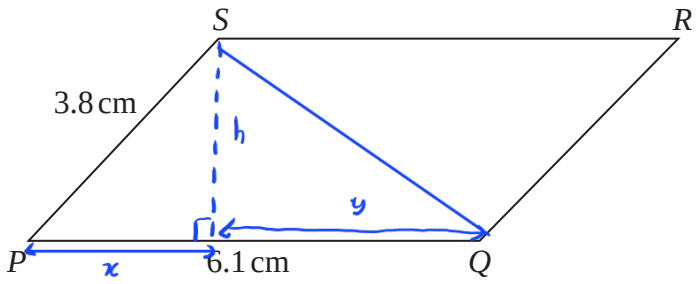


Diagram **NOT** accurately drawn

PQ = 6.1 cm *PS* = 3.8 cm

Area of parallelogram = base × height

The area of the parallelogram is 18 cm^2

Work out the length of *QS*
Give your answer correct to 3 significant figures.

Area of parallelogram = $18 = 6.1 \times h$

$h = \frac{18}{6.1} = 2.95\ldots$ (1)

Finding length x by Pythagoras' theorem:

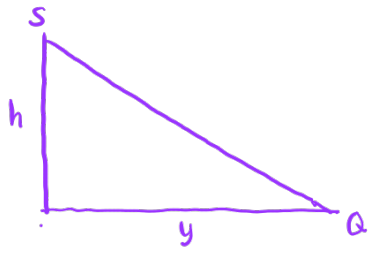
$x = \sqrt{3.8^2 - 2.95^2\ldots}$

$= 2.394\ldots$ (1)

length $y = 6.1 - 2.394$

$= 3.7057\ldots$ (1)

Finding length QS:



$QS = \sqrt{h^2 + y^2}$

$= \sqrt{(2.95)^2 + (3.7057\ldots)^2}$ (1)

$= 4.74$ (1)

4.74 ..... cm

(Total for Question 4 is 5 marks)

5 The diagram shows four identical circles drawn inside a square.

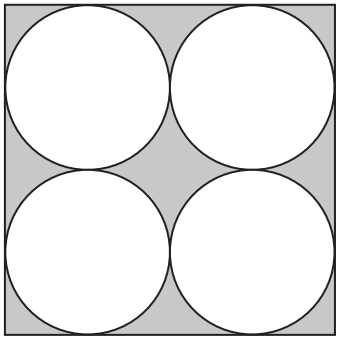


Diagram **NOT** accurately drawn

Each circle touches two other circles and two sides of the square.

The region inside the square that is outside the circles, shown shaded in the diagram, has a total area of 40 cm^2

Work out the perimeter of the square.
Give your answer correct to 3 significant figures.

Area of square $= 4r \times 4r = 16r^2$ (1)

Area of 4 circles $= 4 \times \pi \times r^2 = 4\pi r^2$

$16r^2 - 4\pi r^2 = 40$

$r^2 = \dfrac{40}{16 - 4\pi}$

$r = \sqrt{\dfrac{40}{16 - 4\pi}} = 3.413\ldots$ (1)

Perimeter $= 16 \times 3.413\ldots$ (1)

$= 54.6$ (1)

54.6 ..... cm

(Total for Question 5 is 4 marks)

6 Here is a rectangle.

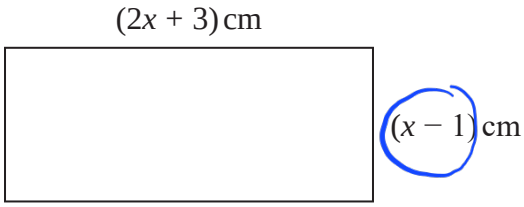


Diagram **NOT** accurately drawn

Given that the area of the rectangle is less than $75\,cm^2$

find the range of possible values of x

$(2x+3)(x-1) < 75$ (1)

$2x^2 - 2x + 3x - 3 - 75 < 0$

$2x^2 + x - 78 < 0$ (1)

$(x-6)(2x+13) < 0$ (1)

$x = 6$, $x = -\frac{13}{2}$ is not a solution (1)

$x > 1$ since length cannot be 0 or less.

Hence, $1 < x < 6$ (1)

$1 < x < 6$

(Total for Question 6 is 5 marks)