Higher Maths Sample 2 P1 Q10

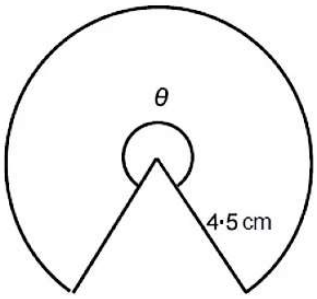

Diagram not drawn to scale

The diagram shows a sector of a circle of radius 4·5 cm. The perimeter of the sector is 34 cm.
Write an expression for angle θ, in terms of π.
Give your answer, in degrees, in its simplest form.

[4]

Higher Maths Sample 1 P2 Q12

The square and the sector of a circle shown below have equal areas.

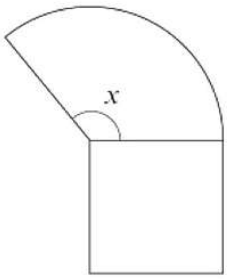

Diagram not drawn to scale

Calculate the size of angle x. [3]

Higher Maths Summer 2018 P2 Q14

A and B are points on a circle with centre O.
Calculate the length of the arc AB shown below. [2]

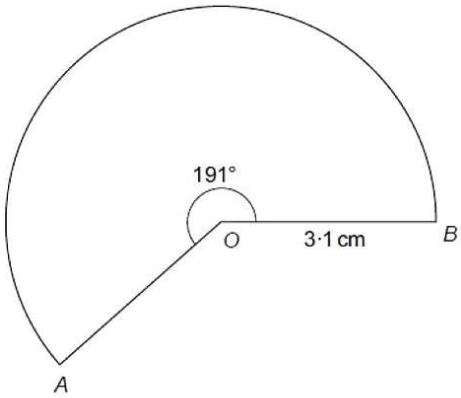

Diagram not drawn to scale

Higher Maths Summer 2019 P2 Q14

The diagram shows a triangle *ABC* and a circle with centre *A*.
The points *B* and *D* lie on the circumference of the circle.

The radius of the circle is 8 cm.
The length of the line *AC* is 19 cm.
The area of triangle *ABC* is 70 cm^2.

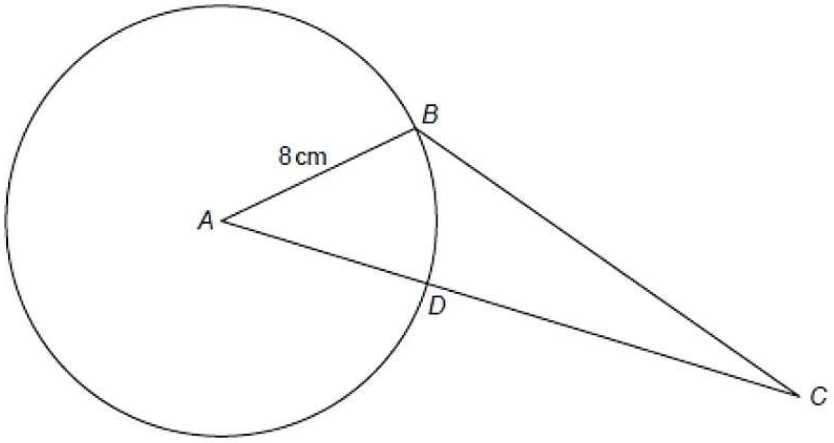

Diagram not drawn to scale

Calculate the area of the sector *ABD*. [5]

Higher Maths Nov 2018 P1 Q14

In the diagram below, *AC* and *BD* are diameters of a circle, centre *O*.

$AO = 30$ cm and $A\hat{O}B = 20°$.

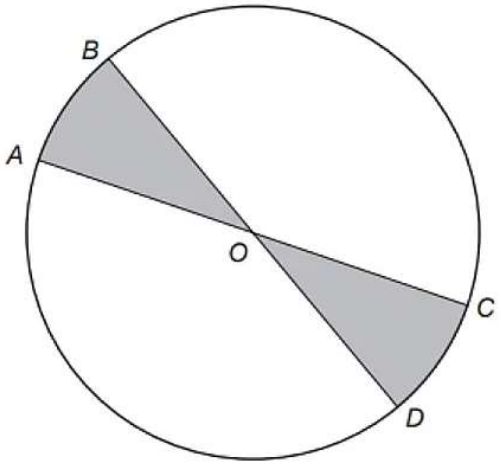

Diagram not drawn to scale

A second circle has an area which equals the total shaded area above.

Calculate the radius of the second circle. [3]

Higher Maths Nov 2016 P2 Q14

Points E and F lie on a circle, centre O.
The radius of the circle is 10 cm.
The area of the shaded sector is 65 cm^2.

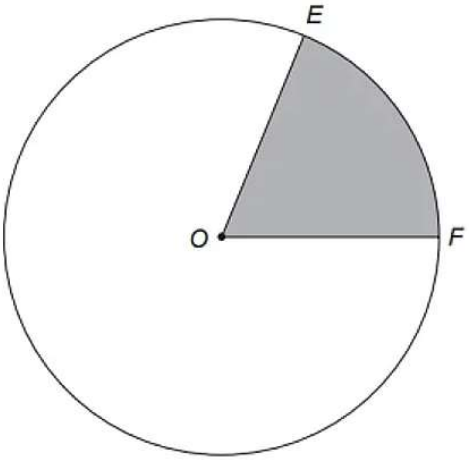

Diagram not drawn to scale

(a) Calculate the size of $E\hat{O}F$. [3]

(b) Hence, calculate the length of the arc EF. [2]

Higher Numeracy Nov 2016 P1 Q10

The shaded part of the diagram below shows the top surface of an engine part.

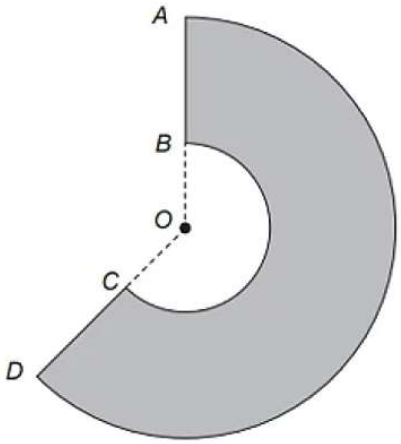

Diagram not drawn to scale

The measurements taken by a motor engineer are:

- reflex angle $B\hat{O}C = 240°$,
- $AO = OD = 6$ cm,
- $BO = OC = 3$ cm.

(a) The length of the major arc AD is to be sealed by attaching a flexible anti-rust strip.
Each flexible anti-rust strip is of length 35 cm.
What length of the anti-rust strip will be left over after sealing the length of the major arc AD?
Give your answer in terms of π, in its simplest form. [3]

(b) The top surface of the engine part is to be painted.
The paint costs 15p per cm^2.

(i) Calculate the cost of the paint to be used.
Give your answer in terms of π, in its simplest form. [4]

(ii) Using $\pi = 3$, calculate how much it costs to paint the top surface of 20 engine parts.
Give your answer in pounds. [1]

Higher Numeracy Nov 2017 P1 Q11

A company is building a new headquarters.
The diagram below shows the ground plan of the new headquarters.

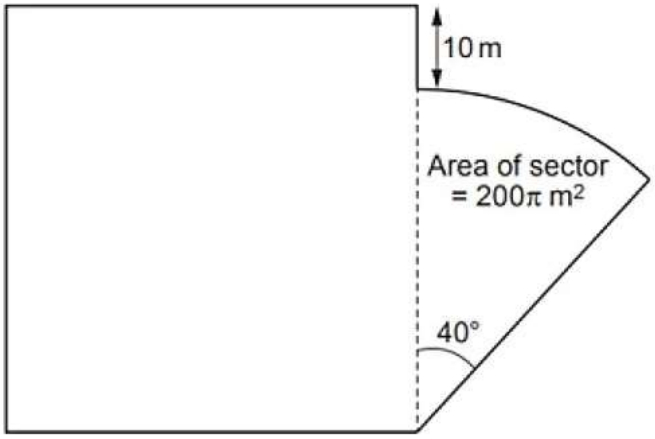

Diagram not drawn to scale

The plan consists of a square and a sector of a circle.

(a) Using the information given in the diagram, calculate the radius of the sector of the circle.

Give your answer in the form $a\sqrt{b}$, where a is an integer and b is a prime number. [5]

(b) The square is to be covered in concrete.

Calculate the area of the square.
Expand any brackets, and simplify your answer. [3]

Higher Numeracy Sample 2 P2 Q10

10. Ceri is a jewellery designer and is making a brooch.

The brooch is in the shape of a sector of a circle of radius 2·8 cm, as shown in the diagram.

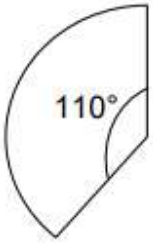

Diagram not drawn to scale

(a) Ceri is planning to cover the brooch in gold leaf.

Ceri buys gold leaf in square sheets of side length 80 mm. The cost of one sheet of gold leaf is £48.00.

Assuming that no gold leaf is wasted, find the cost of the gold leaf that is required to cover the brooch.

[5]

(b) (i) The cost of the metal Ceri uses for the base of her first brooch should be £2.28.

She decides to produce a larger brooch in a similar shape, but with a base of the same thickness. The radius of the sector of the circle she uses this time is 4·2 cm.

The cost of the metal needed for the base of the second brooch should be

£3.19 £3.42 £4.47 £5.13 £9.58

[1]

(ii) Ceri finds that when she makes the base of a brooch, she wastes $\frac{1}{4}$ of the metal that she buys.
Including the waste, the actual cost of the metal for the base of the smaller brooch is

£0.57 £1.71 £2.85 £3.04 £9.12

[1]

Higher Numeracy Summer 2017 P2 Q11

A company produces metal badges to be worn by its employees.
The badge is made up of two parts.
One part is in the shape of a sector of a circle as shown in the diagram.

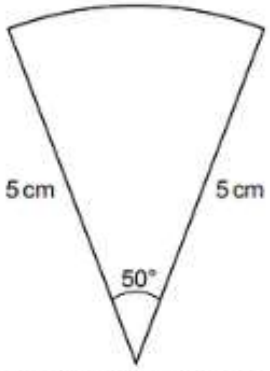

Diagram not drawn to scale

(a) The perimeter of the sector is decorated with a coloured edging strip.
Calculate the length of edging strip needed to decorate the sector. [3]

(b) The other part is in the shape of a quarter-circle of radius 3 cm.

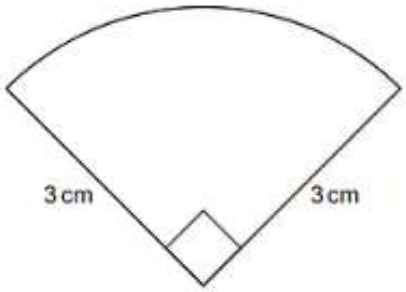

Diagram not drawn to scale

To make the badge, the two pieces are joined together with the sector in front of the quarter-circle, as shown in the diagram.
The badge has a vertical line of symmetry.

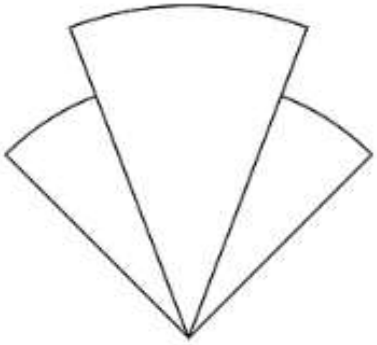

Diagram not drawn to scale

The visible surface of the front of the badge is painted.
Calculate the area that is painted. [5]

Higher Numeracy Summer 2019 P1 Q12b

A new running track is to be built at the stadium.

Athletes in a 200-metre race run in lanes.
The inside line of one of the lanes is shown below.

The inside line consists of:

- a straight section of length 90 m,
- an arc of a circle with radius 36 m.

The length of this inside line is 200 m.

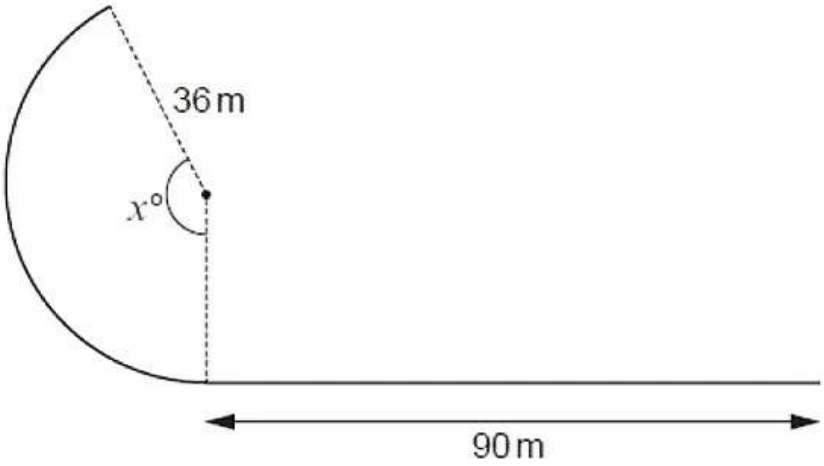

Diagram not drawn to scale

Show that the value of x is $\frac{550}{\pi}$. [5]

Higher Numeracy Nov 2018 P1 Q13

Taryn made a birthday cake for her brother Carwyn, and placed it on a cake stand.
She made a cylindrical cake of radius 12 cm and height 10 cm.
To make the birthday cake look like the letter 'C' for Carwyn, she cut out a large slice.

The cake she has left has a uniform cross-section in the shape of a sector of a circle with sector angle 300°.

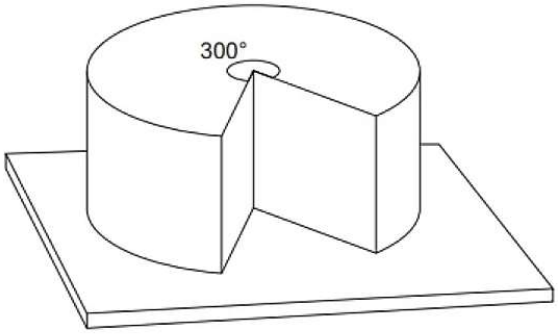

Diagram not drawn to scale

Taryn wants to put icing on all the visible surfaces of the cake.
Calculate the surface area that needs to be covered with icing.
Give your answer, **in its simplest form**, in terms of π. [5]

Higher Numeracy Summer 2018 P1 Q14

The diagram shows the simplified model of part of an engine.
It shows a belt which runs around three circular cogs.
The engine rotates Cog 1.
Cog 1 rotates the belt, which then makes Cogs 2 and 3 rotate.

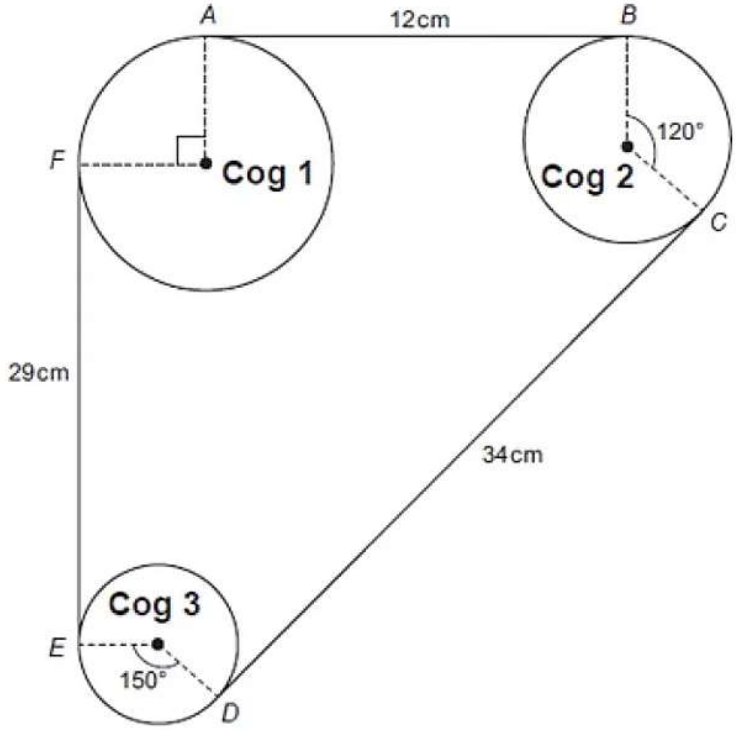

Diagram not drawn to scale

AB, *CD* and *EF* are straight sections of the belt.
AB = 12 cm, *CD* = 34 cm and *EF* = 29 cm.
The belt bends around the outer edges of the circular cogs, represented by the arcs *BC*, *DE* and *AF*.
The dimensions of the cogs are:

- radius of Cog 1 = 6 cm
- radius of Cog 2 = 4·5 cm
- radius of Cog 3 = 3 cm

(a) What is the length of arc *AF* in terms of π?
Circle your answer. [1]

2π 3π 6π 4π $\frac{3\pi}{2}$

(b) Calculate the total length of the belt.
Give your answer in terms of π in its simplest form. [4]

(c) Elen notices that when Cog 3 makes two revolutions, Cog 1 makes only one revolution, because the radius of Cog 3 is half the radius of Cog 1.

In one minute, Cog 3 makes 2400 revolutions.
Calculate the number of revolutions Cog **2** will make in one minute. [3]

Higher Maths Nov 2017 P2 Q17

ABC represents the **sector** of a circle with radius 7 cm and centre *A*, as shown below.
$B\hat{A}C = x°$, *AD* = 3 cm and *BD* = 6 cm.

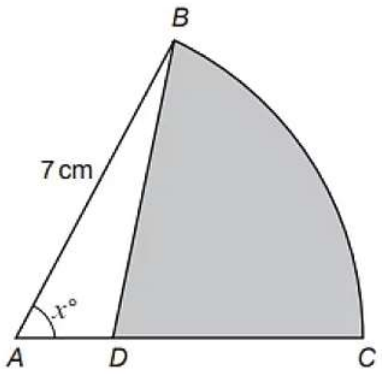

Diagram not drawn to scale

Find the area of the shaded region *BCD*. [8]