

Name

Class

MATHS TEACHER HUB

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Circles

(9 – 1) Topic booklet

HIGHER

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1F** question you are not allowed to use a calculator.
- If the question is a **2F** or a **3F** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

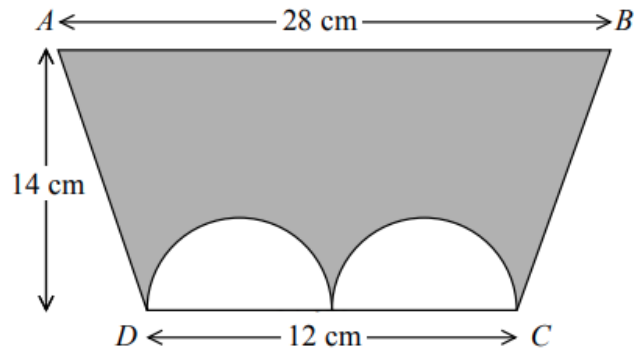
Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions

**Write your answers in the space provided.
You must write down all the stages in your working.**

- 1** The diagram shows a trapezium $ABCD$ and two identical semicircles.



The centre of each semicircle is on DC .

Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

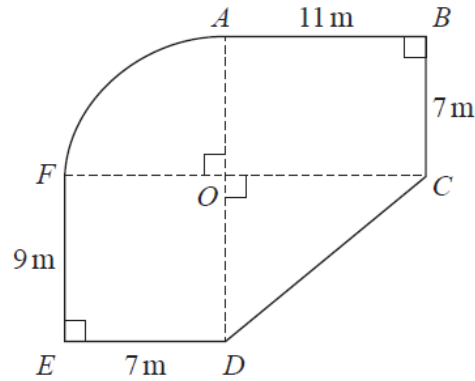
..... cm^2

4 The diagram shows a plan of Jason's garden.

$ABCO$ and $DEFO$ are rectangles.

CDO is a right-angled triangle.

AFO is a sector of a circle with centre O and angle $AOF = 90^\circ$



Jason is going to cover his garden with grass seed.

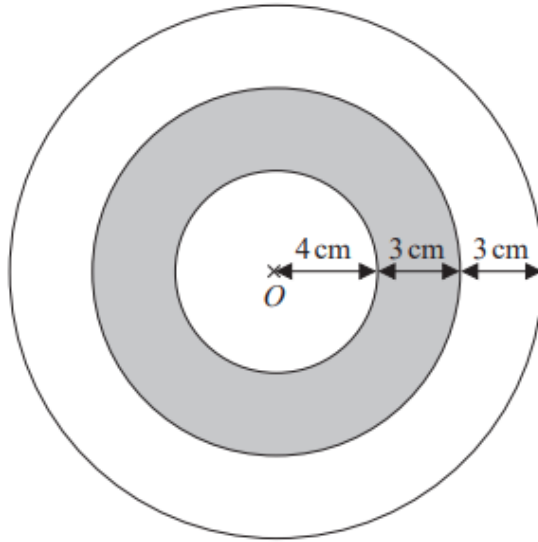
Each bag of grass seed covers 14 m^2 of garden.

Each bag of grass seed costs £10.95

Work out how much it will cost Jason to buy all the bags of grass seed he needs.

£.....

4 The diagram shows a logo made from three circles.



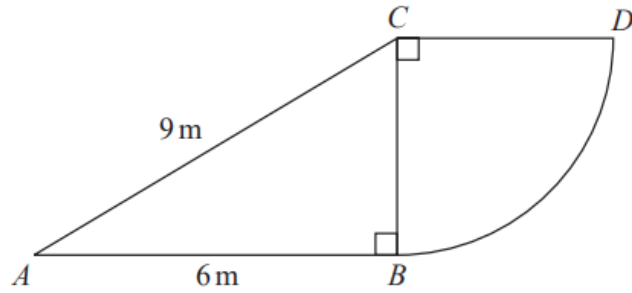
Each circle has centre O .

Daisy says that exactly $\frac{1}{3}$ of the logo is shaded.

Is Daisy correct?

You must show all your working.

7 The diagram shows a right-angled triangle and a quarter circle.

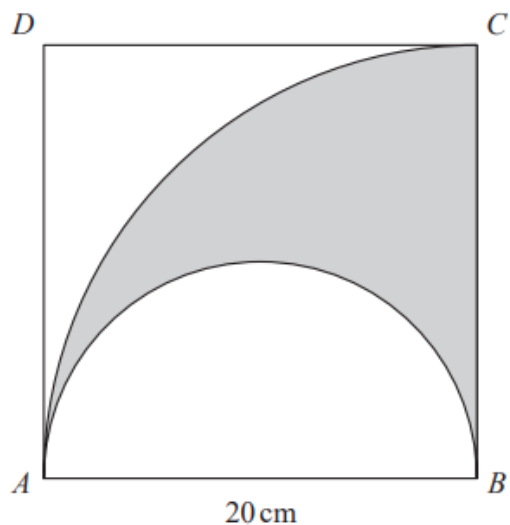


The right-angled triangle ABC has angle $ABC = 90^\circ$
The quarter circle has centre C and radius CB .

Work out the area of the quarter circle.
Give your answer correct to 3 significant figures.
You must show all your working.

..... m^2

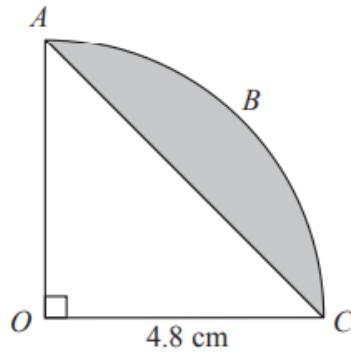
- 7 The diagram shows a square $ABCD$ with sides of length 20 cm. It also shows a semicircle and an arc of a circle.



AB is the diameter of the semicircle.
 AC is an arc of a circle with centre B .

Show that $\frac{\text{area of shaded region}}{\text{area of square}} = \frac{\pi}{8}$

7

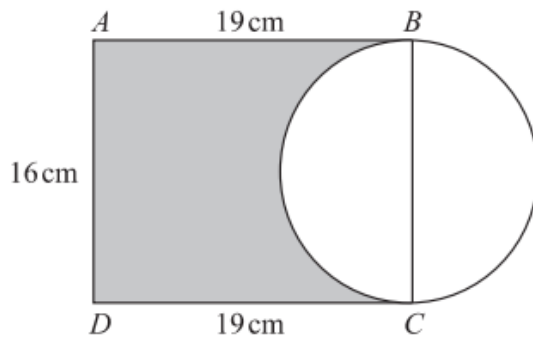


The arc ABC is a quarter of a circle with centre O and radius 4.8 cm.
 AC is a chord of the circle.

Work out the area of the shaded segment.
Give your answer correct to 3 significant figures.

..... cm^2

8 Here is a diagram showing a rectangle, $ABCD$, and a circle.



BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.
Give your answer correct to 1 decimal place.

..... %

9 The circumference of circle **B** is 90% of the circumference of circle **A**.

(a) Find the ratio of the area of circle **A** to the area of circle **B**.

.....
(2)

Square **E** has sides of length e cm.

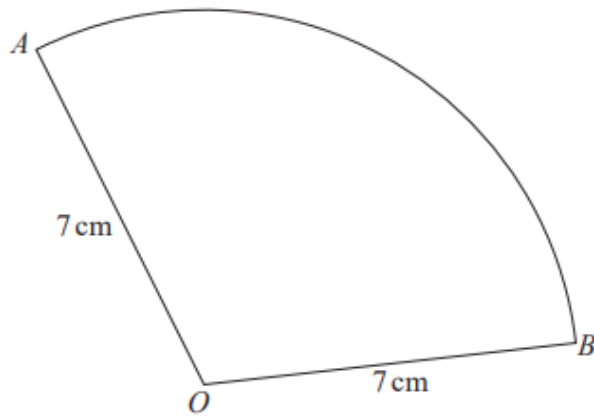
Square **F** has sides of length f cm.

The area of square **E** is 44% greater than the area of square **F**.

(b) Work out the ratio $e:f$

.....
(2)

12 OAB is a sector of a circle with centre O and radius 7 cm.



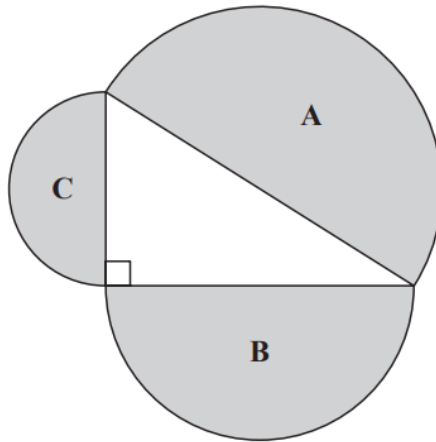
The area of the sector is 40 cm^2

Calculate the perimeter of the sector.

Give your answer correct to 3 significant figures.

..... cm

- 13** A right-angled triangle is formed by the diameters of three semicircular regions, **A**, **B** and **C** as shown in the diagram.



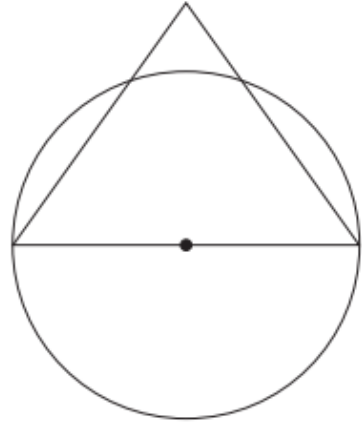
Show that

$$\text{area of region A} = \text{area of region B} + \text{area of region C}$$

13 The diagram shows a circle and an equilateral triangle.

One side of the equilateral triangle is a diameter of the circle.
The circle has a circumference of 44 cm.

Work out the area of the triangle.
Give your answer correct to 3 significant figures.

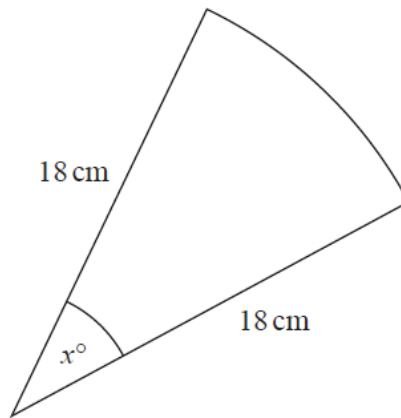


.....cm²

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(Total for Question 13 is 3 marks)

15 The diagram shows a sector of a circle of radius 18 cm.

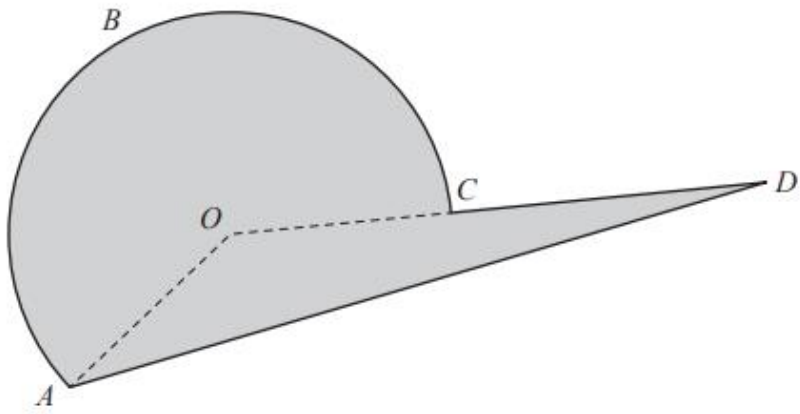


The length of the arc is 4π cm.

Work out the value of x .

$x = \dots\dots\dots$

16 Here is a shaded shape $ABCD$.



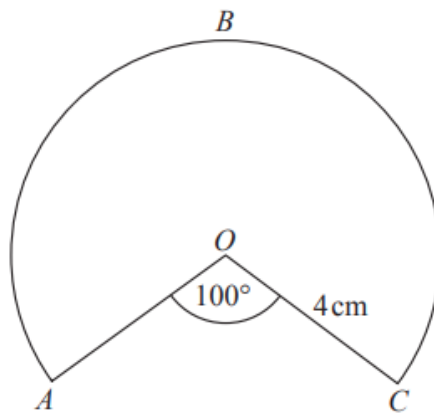
The shape is made from a triangle and a sector of a circle, centre O and radius 6 cm.
 OCD is a straight line.

- $AD = 14$ cm
- Angle $AOD = 140^\circ$
- Angle $OAD = 24^\circ$

Calculate the perimeter of the shape.
Give your answer correct to 3 significant figures.

.....cm

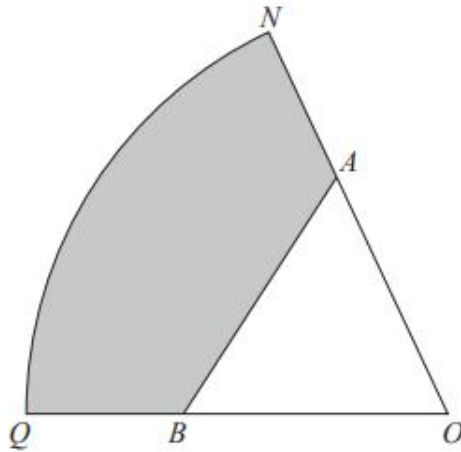
16 The diagram shows a sector of a circle of radius 4 cm.



Work out the length of the arc ABC .
Give your answer correct to 3 significant figures.

.....cm

17



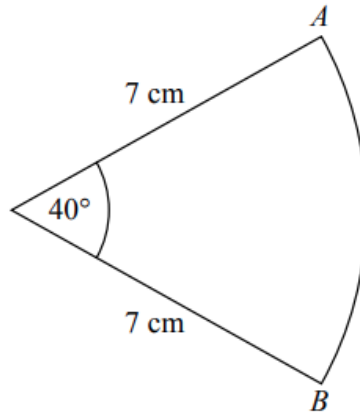
ONQ is a sector of a circle with centre O and radius 11 cm.

A is the point on ON and B is the point on OQ such that AOB is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector ONQ .
Give your answer correct to 1 decimal place.

.....%

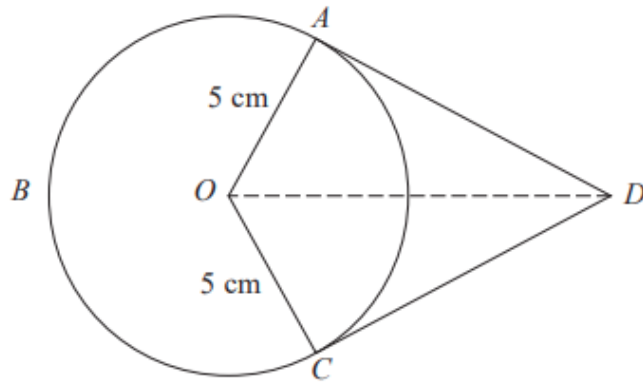
17 The diagram shows a sector of a circle of radius 7 cm.



Work out the length of arc AB .
Give your answer correct to 3 significant figures.

..... cm

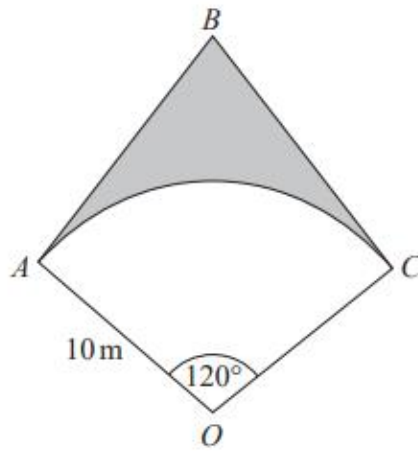
18



A , B and C are points on a circle of radius 5 cm, centre O .
 DA and DC are tangents to the circle.
 $DO = 9$ cm

Work out the length of arc ABC .
Give your answer correct to 3 significant figures.

..... cm



OAC is a sector of a circle, centre O , radius 10 m .

BA is the tangent to the circle at point A .

BC is the tangent to the circle at point C .

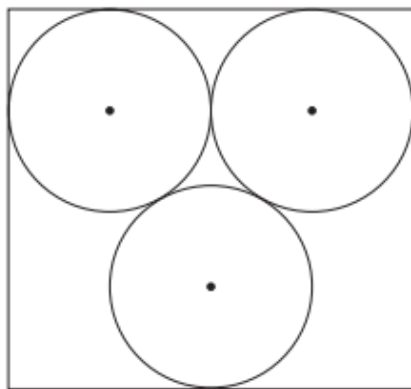
Angle $AOC = 120^\circ$

Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

..... m^2

- 21** The diagram shows 3 identical circles inside a rectangle.
Each circle touches the other two circles and the sides of the rectangle, as shown in the diagram.



The radius of each circle is 24 mm.

Work out the area of the rectangle.

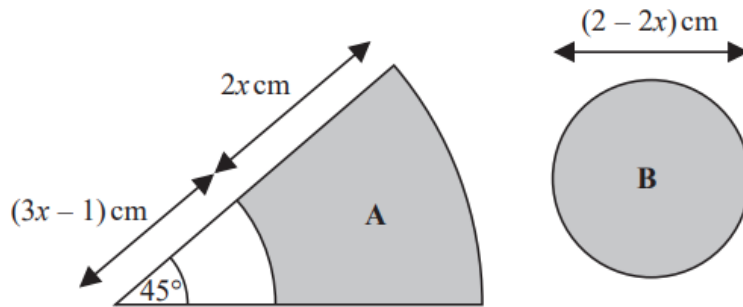
Give your answer correct to 3 significant figures.

..... mm²

22 The diagram shows two shaded shapes, **A** and **B**.

Shape **A** is formed by removing a sector of a circle with radius $(3x - 1)$ cm from a sector of the circle with radius $(5x - 1)$ cm.

Shape **B** is a circle of diameter $(2 - 2x)$ cm.



The area of shape **A** is equal to the area of shape **B**.

Find the value of x .

You must show all your working.