

1 Here is a rectangle.

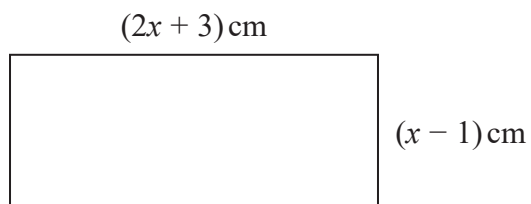


Diagram **NOT**  
accurately drawn

Given that the area of the rectangle is less than  $75 \text{ cm}^2$

find the range of possible values of  $x$

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(Total for Question 1 is 5 marks)

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2 The diagram shows a trapezium.

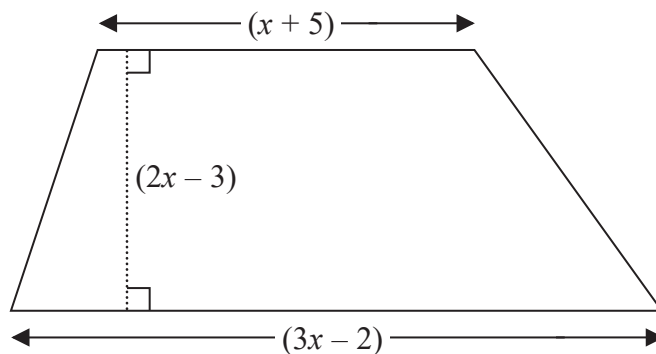


Diagram **NOT**  
accurately drawn

All measurements shown on the diagram are in centimetres.

The area of the trapezium is  $133 \text{ cm}^2$

(a) Show that  $8x^2 - 6x - 275 = 0$

(3)

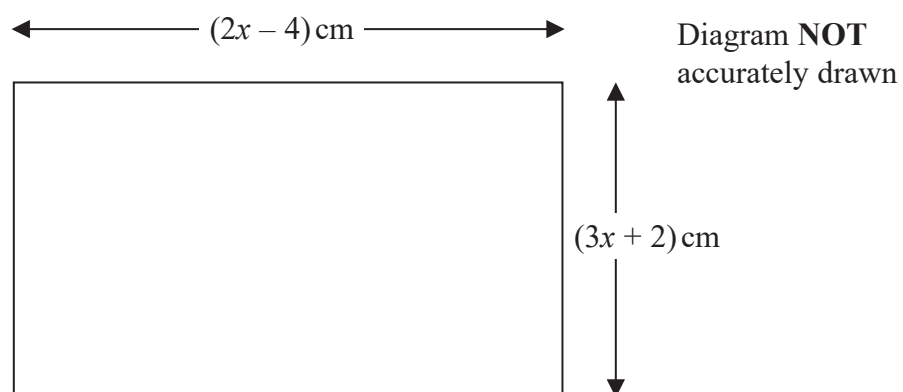
(b) Find the value of  $x$ .  
Show your working clearly.

$x =$

(3)

(Total for Question 2 is 6 marks)

3 The diagram shows a rectangle.



The area of the rectangle is  $A \text{ cm}^2$

Given that  $A < 3x + 27$

find the range of possible values for  $x$ .

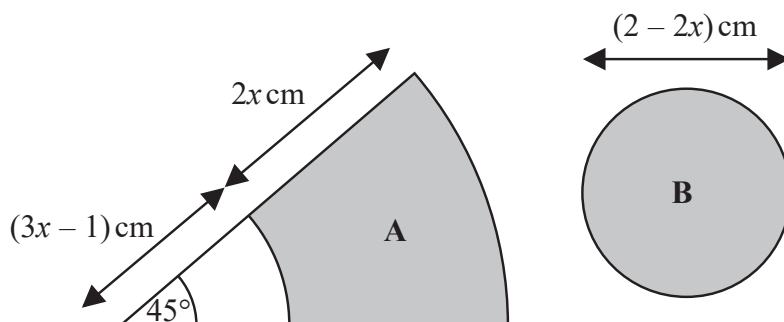
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(Total for Question 3 is 5 marks)

4 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.



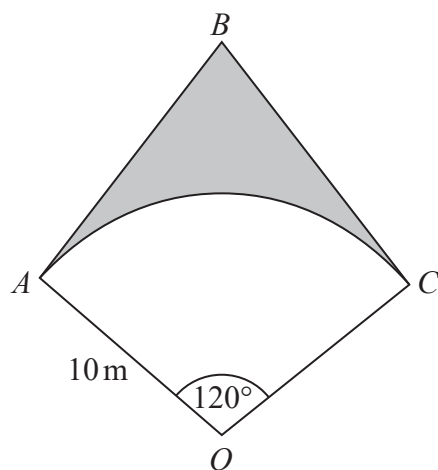
The area of shape **A** is equal to the area of shape **B**.

Find the value of  $x$ .

You must show all your working.

(Total for Question 4 is 5 marks)

5



$OAC$  is a sector of a circle, centre  $O$ , radius  $10\text{ m}$ .

$BA$  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.

..... $\text{m}^2$

(Total for Question 5 is 5 marks)

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

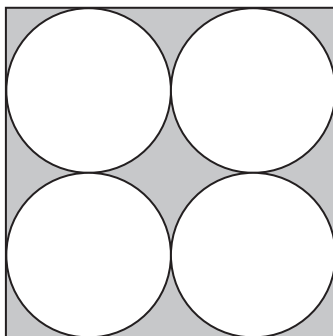


Diagram **NOT**  
accurately drawn

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  $40\text{ cm}^2$

Work out the perimeter of the square.

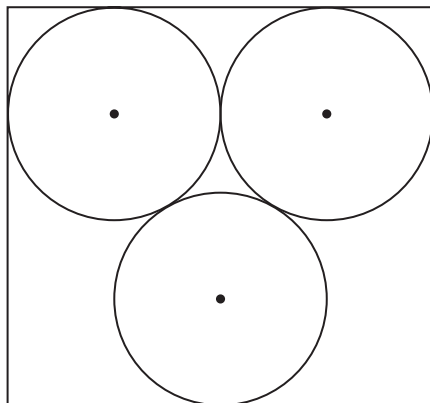
Give your answer correct to 3 significant figures.

..... cm

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(Total for Question 6 is 4 marks)

- 7 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.

..... mm<sup>2</sup>

(Total for Question 7 is 4 marks)

8 The area of a rectangle is  $18\text{ cm}^2$

The length of the rectangle is  $(\sqrt{7} + 1)\text{ cm}$ .

Without using a calculator and showing each stage of your working,

find the width of the rectangle.

Give your answer in the form  $a\sqrt{b} + c$  where  $a$ ,  $b$  and  $c$  are integers.

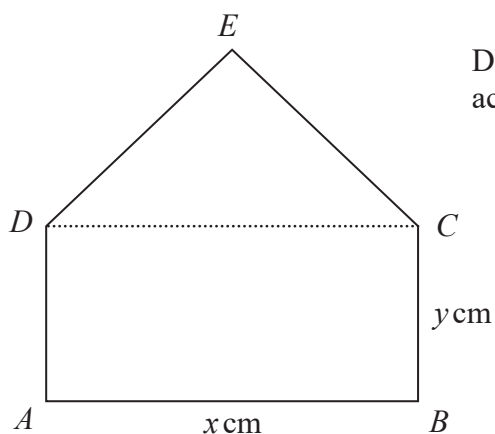
..... cm

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(Total for Question 8 is 3 marks)



9  $ABCED$  is a five-sided shape.



$ABCD$  is a rectangle.

$CED$  is an equilateral triangle.

$$AB = x \text{ cm} \quad BC = y \text{ cm}$$

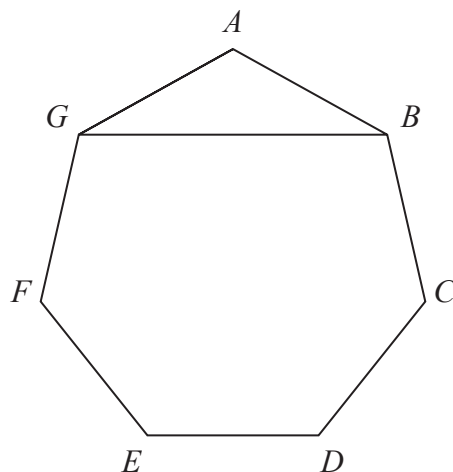
The perimeter of  $ABCED$  is 100 cm.

The area of  $ABCED$  is  $R \text{ cm}^2$

(a) Show that  $R = \frac{x}{4} \left( 200 - [6 - \sqrt{3}]x \right)$

(Total for Question 9 is 3 marks)

10  $ABCDEFG$  is a regular heptagon.



The area of triangle  $ABG$  is  $30 \text{ cm}^2$

Calculate the length of  $GB$ .

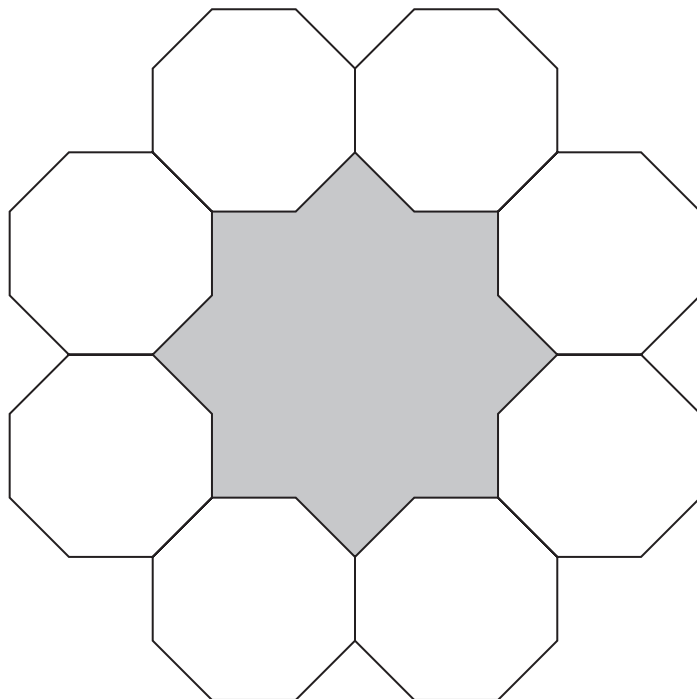
Give your answer correct to 3 significant figures.

You must show all your working.

..... cm

(Total for Question 10 is 5 marks)

- 11 The diagram shows 8 identical regular octagons joined to enclose a shaded shape.



Each octagon has sides of length  $a$ .

Find, in terms of  $a$ , an expression for the area of the shaded shape.

Give your answer in the form  $p(2 + \sqrt{2})a^2$  where  $p$  is an integer.  
You must show all your working.

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**(Total for Question 11 is 5 marks)**

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12  $A$ ,  $B$  and  $C$  are points on a circle with centre  $O$ .

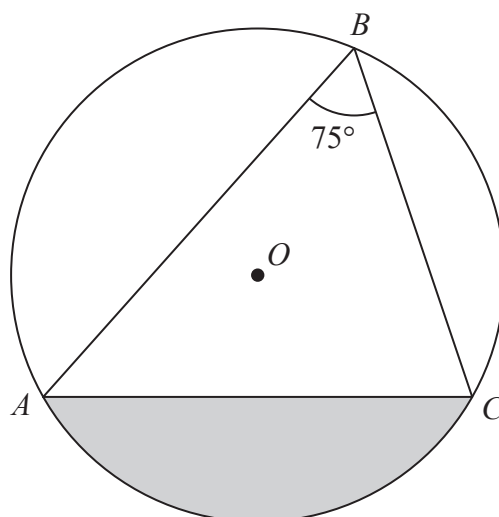


Diagram **NOT**  
accurately drawn

Angle  $ABC = 75^\circ$

The area of the shaded segment is  $200 \text{ cm}^2$

Calculate the radius of the circle.

Give your answer correct to 3 significant figures.

..... cm

(Total for Question 12 is 5 marks)

- 14 The diagram shows equilateral triangle  $ABC$  with sides of length 10 cm.  
A circle is drawn inside the triangle.

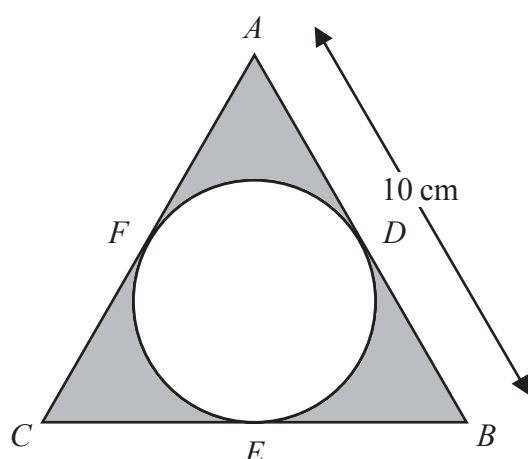


Diagram **NOT**  
accurately drawn

$D$ ,  $E$  and  $F$  are points on the circle.

$ADB$ ,  $BEC$  and  $CFA$  are tangents to the circle.

Calculate the total area of the regions shown shaded in the diagram.  
Give your answer correct to 3 significant figures.

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

(Total for Question 14 is 4 marks)

- 14 The diagram shows two circles such that the region **R**, shown shaded in the diagram, is the region common to both circles.

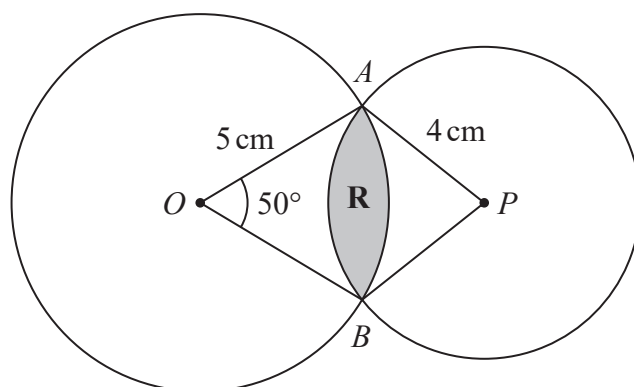


Diagram **NOT**  
accurately drawn

One of the circles has centre  $O$  and radius  $5\text{ cm}$ .  
The other circle has centre  $P$  and radius  $4\text{ cm}$ .  
Angle  $AOB = 50^\circ$

Calculate the area of region **R**.  
Give your answer correct to 3 significant figures.

..... cm<sup>2</sup>

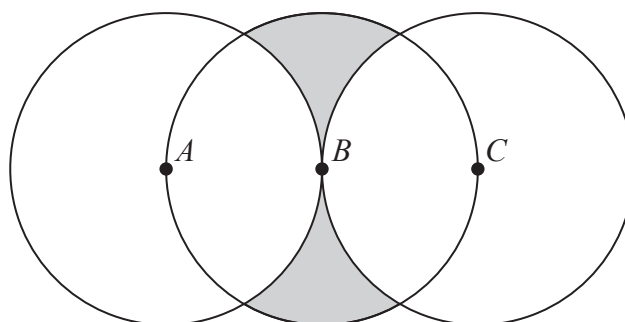
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**(Total for Question 14 is 6 marks)**



**15** The diagram shows three circles, each of radius 4 cm.

The centres of the circles are  $A$ ,  $B$  and  $C$  such that  $ABC$  is a straight line and  $AB = BC = 4$  cm.



Work out the total area of the two shaded regions.  
Give your answer in terms of  $\pi$

..... cm<sup>2</sup>

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(Total for Question 15 is 5 marks)

16 The diagram shows two circles with centre  $O$  and a regular pentagon  $ABCDE$

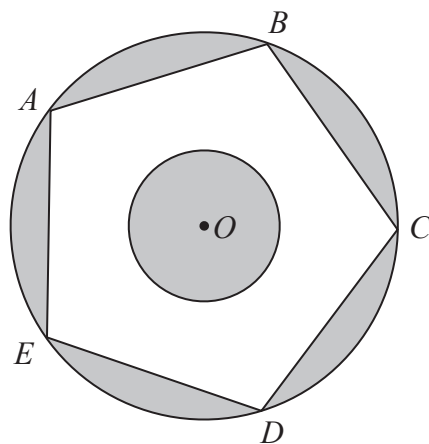


Diagram **NOT**  
accurately drawn

$A$ ,  $B$ ,  $C$ ,  $D$  and  $E$  are points on the larger circle.  
The pentagon has sides of length 8 cm.

The diagram is shaded such that

$$\text{shaded area} = \text{unshaded area}$$

Work out the radius of the smaller circle.  
Give your answer correct to 3 significant figures.

..... cm

**(Total for Question 16 is 6 marks)**

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