

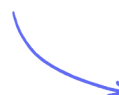
## Non-Calculator Questions

# Circles, Arcs & Sectors

Area &amp; Circumference of Circles / Arc Lengths &amp; Sector Areas

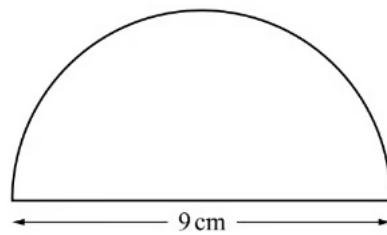
|                         |            |
|-------------------------|------------|
| Medium (5 questions)    | /14        |
| Hard (4 questions)      | /15        |
| Very Hard (5 questions) | /28        |
| <b>Total Marks</b>      | <b>/57</b> |

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# Medium Questions

1



NOT TO  
SCALE

The diagram shows a semicircle with diameter 9 cm.

Calculate the total perimeter of this semicircle.

Give your answer in exact form.

(3 marks)

2

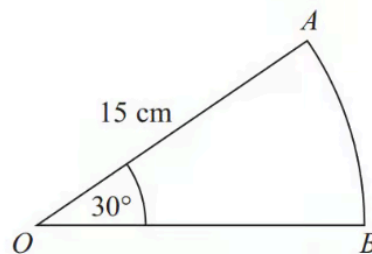


Diagram **NOT**  
accurately drawn

$OAB$  is a sector of a circle, centre  $O$ .

The radius of the circle is 15 cm.

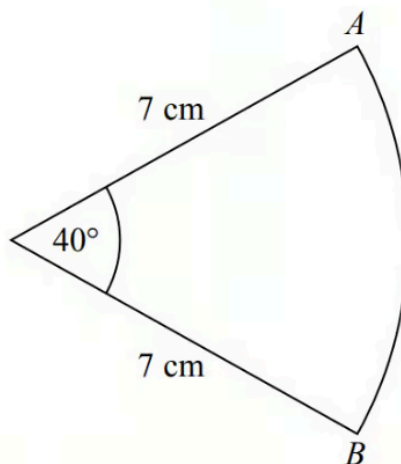
The angle of the sector is  $30^\circ$ .

Calculate the area of sector  $OAB$ .

Give your answer as a simplified expression in terms of  $\pi$ .

(2 marks)

- 3 The diagram shows a sector of a circle of radius 7 cm.



Work out the length of arc  $AB$ .

Give your answer as a simplified expression in terms of  $\pi$ .

(2 marks)

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

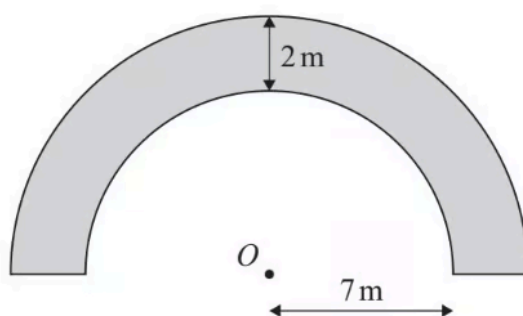


Diagram **NOT**  
accurately drawn

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 as a simplified expression in terms of  $\pi$ .

..... m

(3 marks)

- 5 A circle centre  $O$  has radius 9 cm.

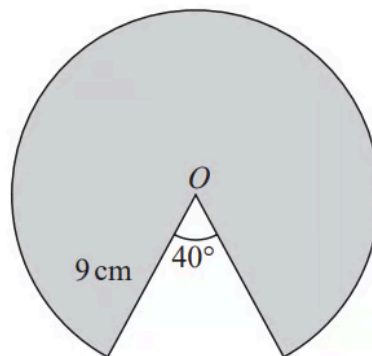


Diagram NOT  
accurately drawn

Calculate the perimeter of the shaded sector of the circle.

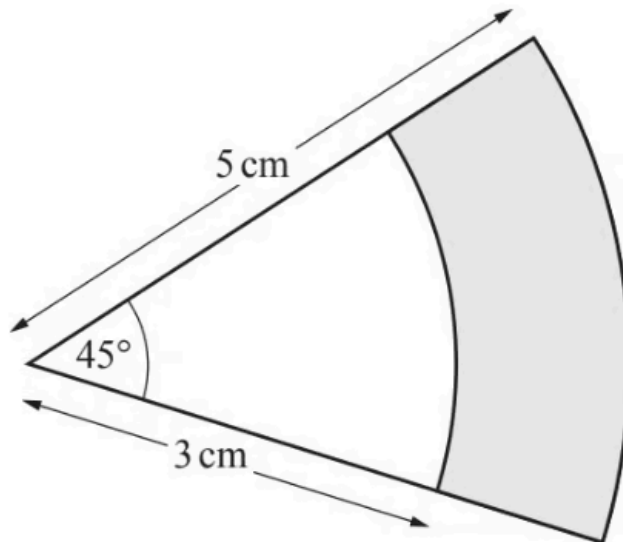
Give your answer as a simplified expression in terms of  $\pi$ .

..... cm

(4 marks)

# Hard Questions

1



NOT TO  
SCALE

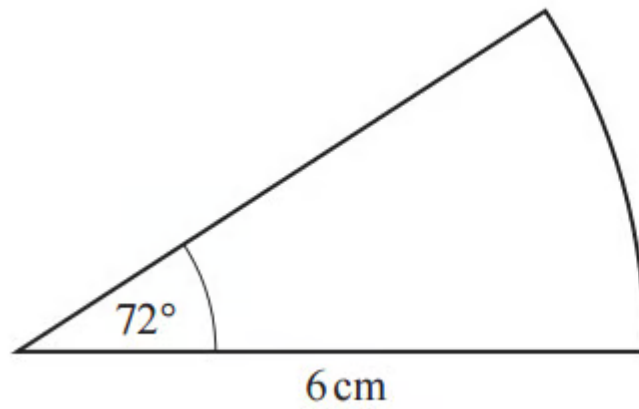
The diagram shows two sectors of circles with the same centre. Calculate the shaded area.

Give your answer in terms of  $\pi$ .

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

(3 marks)

2



NOT TO  
SCALE

The diagram shows a sector of a circle with radius 6 cm and sector angle  $72^\circ$ .

The perimeter of this sector is  $(p + q\pi)$  cm. Find the value of  $p$  and the value of  $q$ .

$p = \dots\dots\dots$

$q = \dots\dots\dots$

(3 marks)

- 3 The diagram shows a square  $ABCD$  inside a circle.

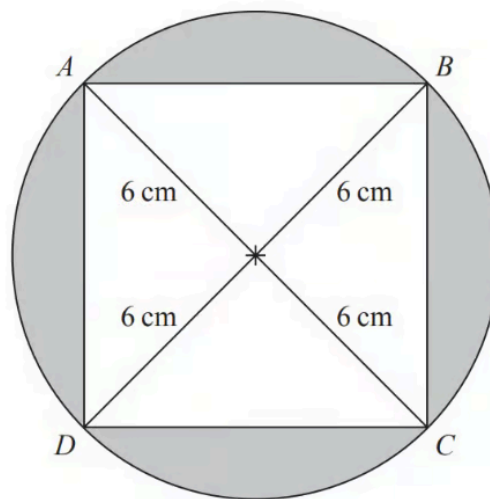


Diagram **NOT**  
accurately drawn

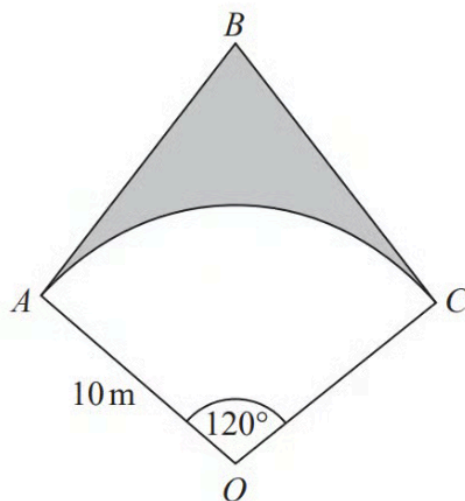
The points  $A$ ,  $B$ ,  $C$  and  $D$  lie on the circle.

The radius of the circle is 6 cm.

Work out the total area of the shaded regions.

Give your answer in terms of  $\pi$ .

(4 marks)



$OAC$  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  $AOC = 120^\circ$

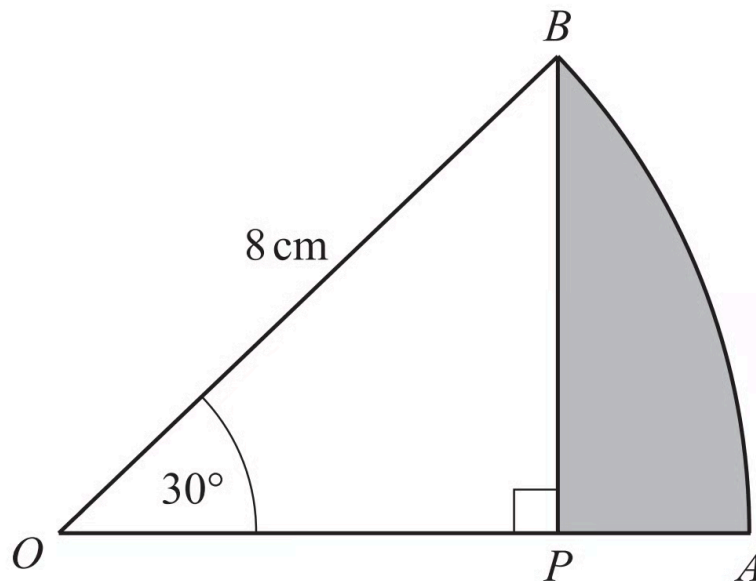
Calculate the area of the shaded region. Give your answer as an exact value in terms of  $\pi$ .

(5 marks)



# Very Hard Questions

1 (a)



NOT TO  
SCALE

$OAB$  is the sector of a circle, centre  $O$ .

$OB = 8$  cm and angle  $AOB = 30^\circ$ .

$BP$  is perpendicular to  $OA$ .

Calculate  $AP$ .

Give your answer as an exact value.

$AP = \dots\dots\dots$  cm

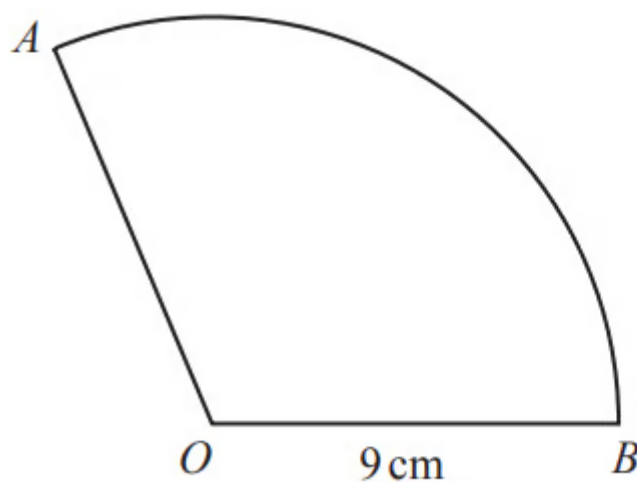
(3 marks)

(b) Work out the area of the shaded region  $APB$ . Give your answer as an exact value in terms of  $\pi$ .

$\dots\dots\dots$  cm<sup>2</sup>

(3 marks)

- 2  $AB$  is an arc of a circle, centre  $O$ , radius 9 cm.



NOT TO  
SCALE

The length of the arc  $AB$  is  $6\pi$  cm.

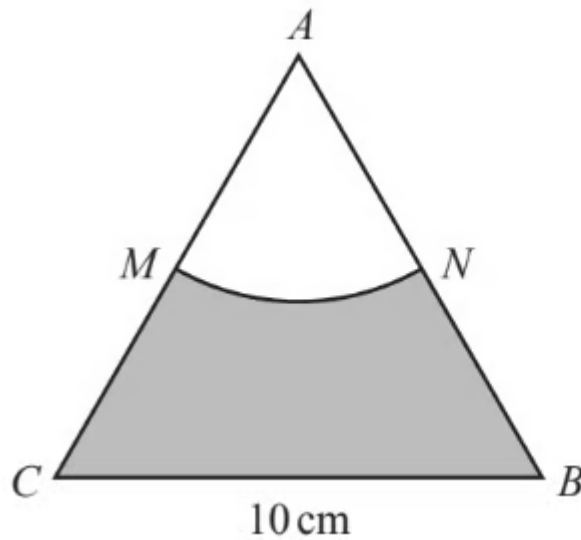
The area of sector  $AOB$  is  $k\pi$  cm<sup>2</sup>.

Find the value of  $k$ .

$k = \dots\dots\dots$

(3 marks)

3



NOT TO  
SCALE

The diagram shows an equilateral triangle  $ABC$  with sides of length  $10\text{ cm}$ .

$AMN$  is a sector of a circle, centre  $A$ .

$M$  is the mid-point of  $AC$ .

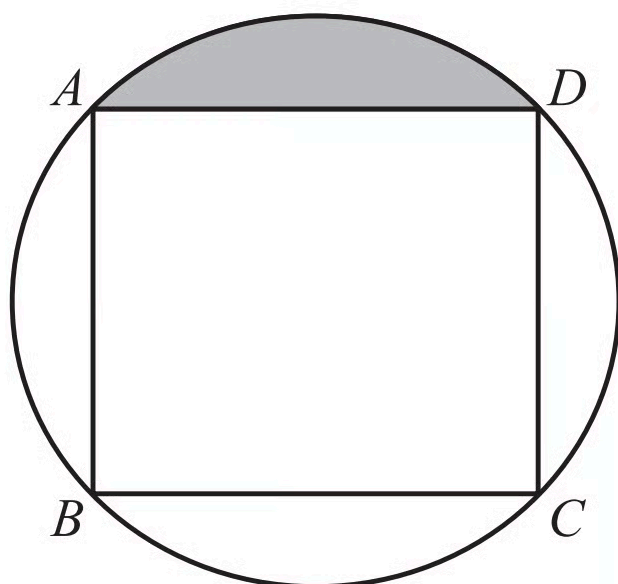
Work out the area of the shaded region.

Give your answer as an exact value in terms of  $\pi$ .

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

(4 marks)

4 (a)



NOT TO  
SCALE

The vertices of a square  $ABCD$  lie on the circumference of a circle, radius 8 cm. Calculate the area of the square.

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

(2 marks)

- (b) i) Calculate the area of the shaded segment. Give your answer as a simplified expression in terms of  $\pi$ .

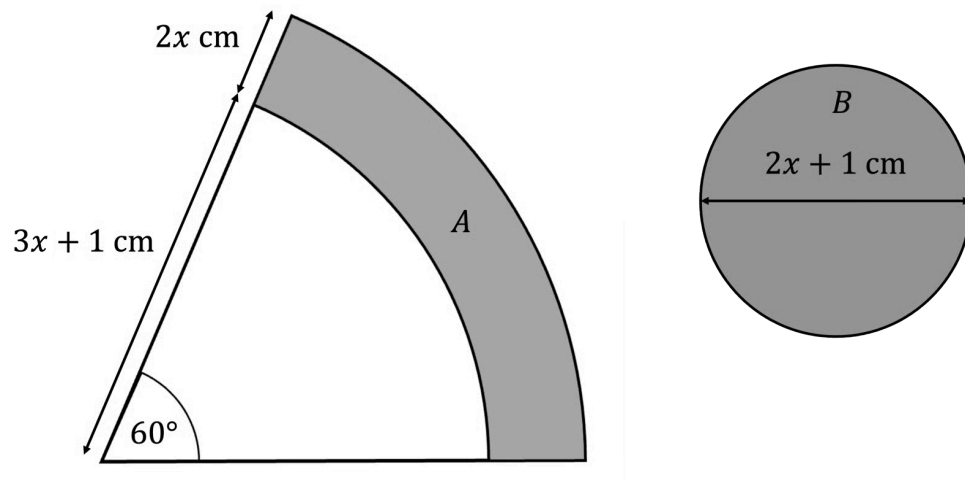
.....  $\text{cm}^2$  [3]

- ii) Calculate the perimeter of the shaded segment. Give your answer as a simplified expression in terms of  $\pi$ .

..... cm [4]

(7 marks)

5



The diagram above shows two shaded shapes,  $A$  and  $B$ .

Shape  $A$  is formed by removing a sector with radius  $(3x + 1)$  cm from a sector with radius  $(5x + 1)$  cm.

Shape  $B$  is a circle with diameter  $(2x + 1)$  cm.

The two shaded sections have equal areas.

Find the value of  $x$ .

(6 marks)