

# Circular Measure

## Question Paper 6

<b>Level</b>	International A Level
<b>Subject</b>	Maths
<b>Exam Board</b>	CIE
<b>Topic</b>	Circular Measure
<b>Sub Topic</b>	
<b>Booklet</b>	Question Paper 6

**Time Allowed:** 56 minutes

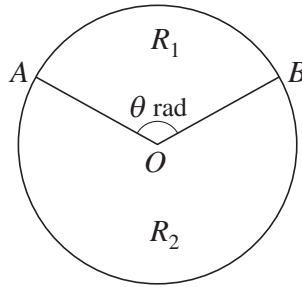
**Score:** /46

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

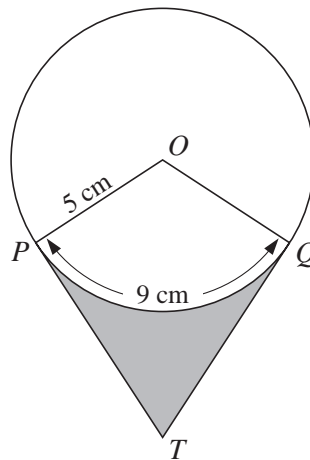
1



The diagram shows a circle with centre  $O$ . The circle is divided into two regions,  $R_1$  and  $R_2$ , by the radii  $OA$  and  $OB$ , where angle  $AOB = \theta$  radians. The perimeter of the region  $R_1$  is equal to the length of the major arc  $AB$ .

- (i) Show that  $\theta = \pi - 1$ . [3]
- (ii) Given that the area of region  $R_1$  is  $30 \text{ cm}^2$ , find the area of region  $R_2$ , correct to 3 significant figures. [4]

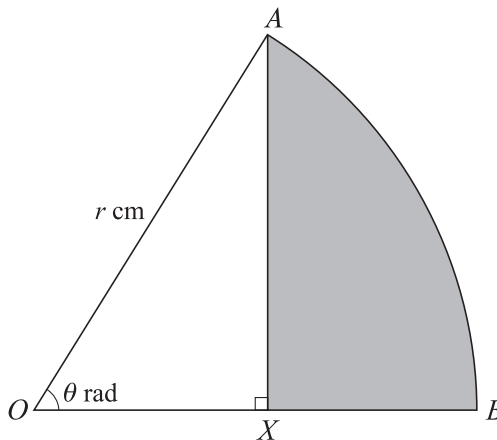
2



In the diagram, the circle has centre  $O$  and radius  $5 \text{ cm}$ . The points  $P$  and  $Q$  lie on the circle, and the arc length  $PQ$  is  $9 \text{ cm}$ . The tangents to the circle at  $P$  and  $Q$  meet at the point  $T$ . Calculate

- (i) angle  $POQ$  in radians, [2]
- (ii) the length of  $PT$ , [3]
- (iii) the area of the shaded region. [3]

3



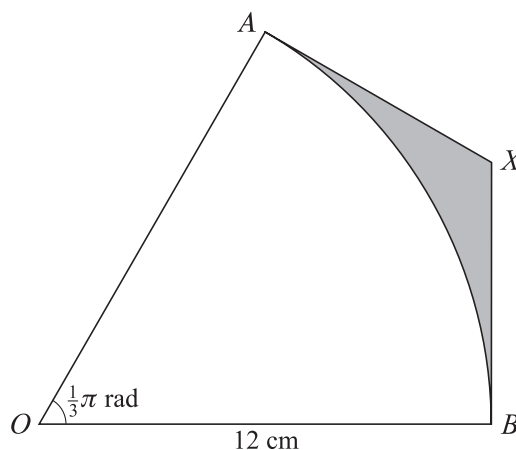
In the diagram,  $AB$  is an arc of a circle, centre  $O$  and radius  $r$  cm, and angle  $AOB = \theta$  radians. The point  $X$  lies on  $OB$  and  $AX$  is perpendicular to  $OB$ .

- (i) Show that the area,  $A$  cm<sup>2</sup>, of the shaded region  $AXB$  is given by

$$A = \frac{1}{2}r^2(\theta - \sin \theta \cos \theta). \quad [3]$$

- (ii) In the case where  $r = 12$  and  $\theta = \frac{1}{6}\pi$ , find the perimeter of the shaded region  $AXB$ , leaving your answer in terms of  $\sqrt{3}$  and  $\pi$ . [4]

4

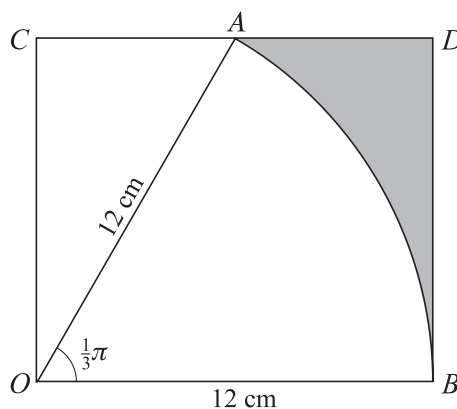


In the diagram,  $OAB$  is a sector of a circle with centre  $O$  and radius 12 cm. The lines  $AX$  and  $BX$  are tangents to the circle at  $A$  and  $B$  respectively. Angle  $AOB = \frac{1}{3}\pi$  radians.

- (i) Find the exact length of  $AX$ , giving your answer in terms of  $\sqrt{3}$ . [2]

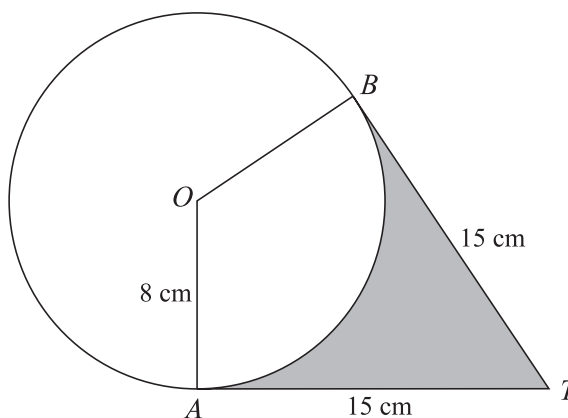
- (ii) Find the area of the shaded region, giving your answer in terms of  $\pi$  and  $\sqrt{3}$ . [3]

5



In the diagram,  $AOB$  is a sector of a circle with centre  $O$  and radius 12 cm. The point  $A$  lies on the side  $CD$  of the rectangle  $OCDB$ . Angle  $AOB = \frac{1}{3}\pi$  radians. Express the area of the shaded region in the form  $a(\sqrt{3}) - b\pi$ , stating the values of the integers  $a$  and  $b$ . [6]

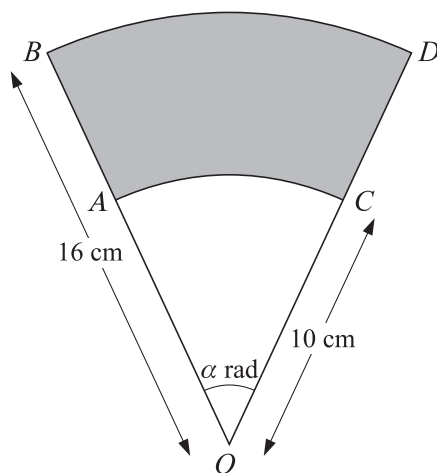
6



The diagram shows a circle with centre  $O$  and radius 8 cm. Points  $A$  and  $B$  lie on the circle. The tangents at  $A$  and  $B$  meet at the point  $T$ , and  $AT = BT = 15$  cm.

- (i) Show that angle  $AOB$  is 2.16 radians, correct to 3 significant figures. [3]
- (ii) Find the perimeter of the shaded region. [2]
- (iii) Find the area of the shaded region. [3]

7



In the diagram,  $OAB$  and  $OCD$  are radii of a circle, centre  $O$  and radius 16 cm. Angle  $AOC = \alpha$  radians.  $AC$  and  $BD$  are arcs of circles, centre  $O$  and radii 10 cm and 16 cm respectively.

(i) In the case where  $\alpha = 0.8$ , find the area of the shaded region. [2]

(ii) Find the value of  $\alpha$  for which the perimeter of the shaded region is 28.9 cm. [3]