

Circular Measure

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Circular Measure
Sub Topic	
Booklet	Question Paper 1

Time Allowed: 57 minutes

Score: /47

Percentage: /100

Grade Boundaries:

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

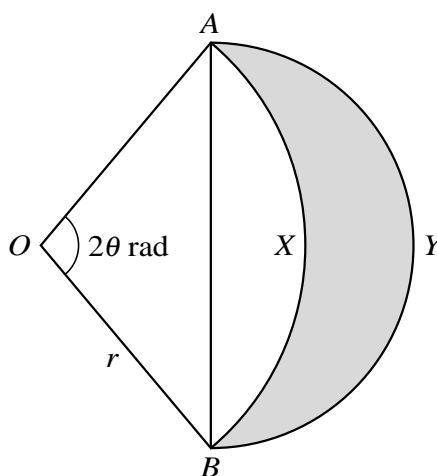
1 A piece of wire of length 24 cm is bent to form the perimeter of a sector of a circle of radius r cm.

(i) Show that the area of the sector, A cm², is given by $A = 12r - r^2$. [3]

(ii) Express A in the form $a - (r - b)^2$, where a and b are constants. [2]

(iii) Given that r can vary, state the greatest value of A and find the corresponding angle of the sector. [2]

2



In the diagram, AYB is a semicircle with AB as diameter and $OAXB$ is a sector of a circle with centre O and radius r . Angle $AOB = 2\theta$ radians. Find an expression, in terms of r and θ , for the area of the shaded region. [4]

3 A tourist attraction in a city centre is a big vertical wheel on which passengers can ride. The wheel turns in such a way that the height, h m, of a passenger above the ground is given by the formula $h = 60(1 - \cos kt)$. In this formula, k is a constant, t is the time in minutes that has elapsed since the passenger started the ride at ground level and kt is measured in radians.

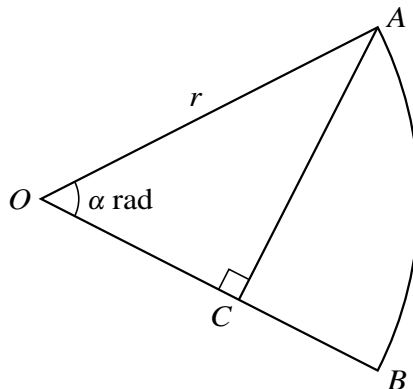
(i) Find the greatest height of the passenger above the ground. [1]

One complete revolution of the wheel takes 30 minutes.

(ii) Show that $k = \frac{1}{15}\pi$. [2]

(iii) Find the time for which the passenger is above a height of 90 m. [3]

4



In the diagram, OAB is a sector of a circle with centre O and radius r . The point C on OB is such that angle ACO is a right angle. Angle AOB is α radians and is such that AC divides the sector into two regions of equal area.

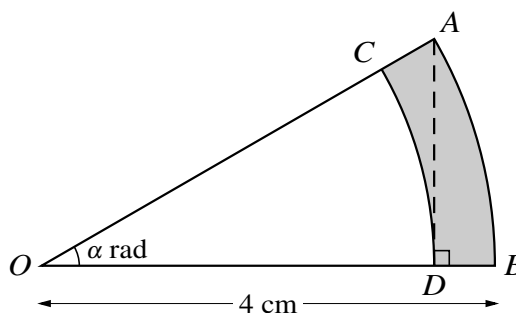
(i) Show that $\sin \alpha \cos \alpha = \frac{1}{2}\alpha$. [4]

It is given that the solution of the equation in part (i) is $\alpha = 0.9477$, correct to 4 decimal places.

(ii) Find the ratio
 perimeter of region OAC : perimeter of region ACB ,
 giving your answer in the form $k : 1$, where k is given correct to 1 decimal place. [5]

(iii) Find angle AOB in degrees. [1]

5

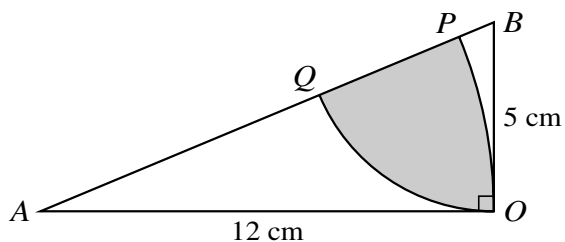


In the diagram, AB is an arc of a circle with centre O and radius 4 cm. Angle AOB is α radians. The point D on OB is such that AD is perpendicular to OB . The arc DC , with centre O , meets OA at C .

(i) Find an expression in terms of α for the perimeter of the shaded region $ABDC$. [4]

(ii) For the case where $\alpha = \frac{1}{6}\pi$, find the area of the shaded region $ABDC$, giving your answer in the form $k\pi$, where k is a constant to be determined. [4]

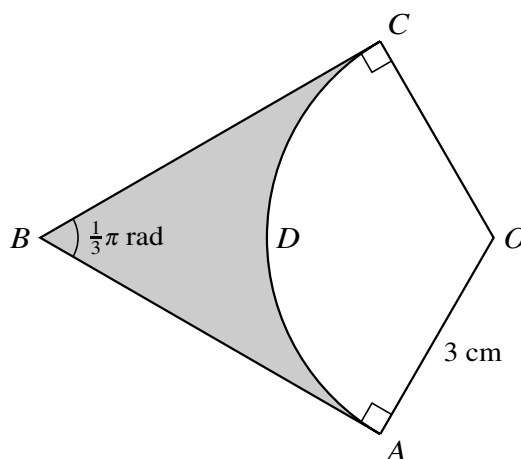
6



The diagram shows a triangle AOB in which OA is 12 cm, OB is 5 cm and angle AOB is a right angle. Point P lies on AB and OP is an arc of a circle with centre A . Point Q lies on AB and OQ is an arc of a circle with centre B .

- (i) Show that angle BAO is 0.3948 radians, correct to 4 decimal places. [1]
- (ii) Calculate the area of the shaded region. [5]

7



In the diagram, $OADC$ is a sector of a circle with centre O and radius 3 cm. AB and CB are tangents to the circle and angle $ABC = \frac{1}{3}\pi$ radians. Find, giving your answer in terms of $\sqrt{3}$ and π ,

- (i) the perimeter of the shaded region, [3]
- (ii) the area of the shaded region. [3]