

Circular Measure

Question Paper 3

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Circular Measure
Sub Topic	
Booklet	Question Paper 3

Time Allowed: 64 minutes

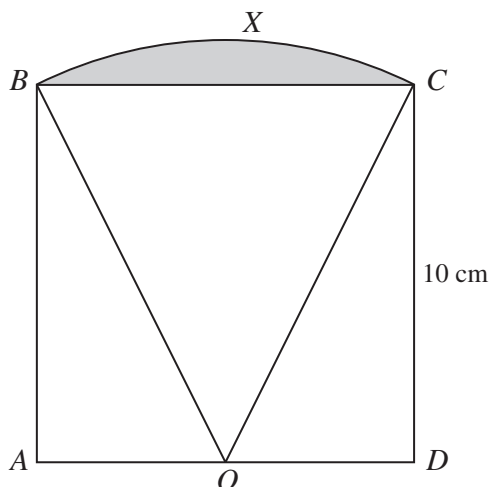
Score: /53

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 square $ABCD$ of side 10 cm. The mid-point of AD is O and BXC is an arc of a circle with centre O .

- (i) Show that angle BOC is 0.9273 radians, correct to 4 decimal places. [2]
- (ii) Find the perimeter of the shaded region. [3]
- (iii) Find the area of the shaded region. [2]

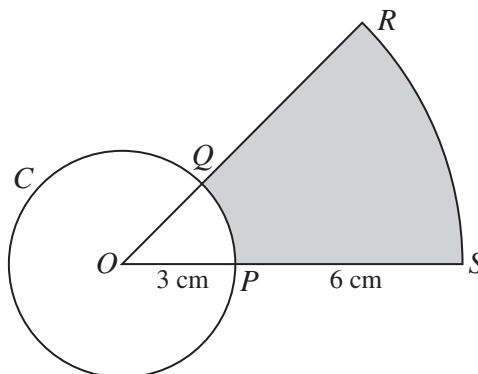
2 The volume of a solid circular cylinder of radius r cm is 250π cm³.

- (i) Show that the total surface area, S cm², of the cylinder is given by

$$S = 2\pi r^2 + \frac{500\pi}{r}. \quad [2]$$

- (ii) Given that r can vary, find the stationary value of S . [4]
- (iii) Determine the nature of this stationary value. [2]

3



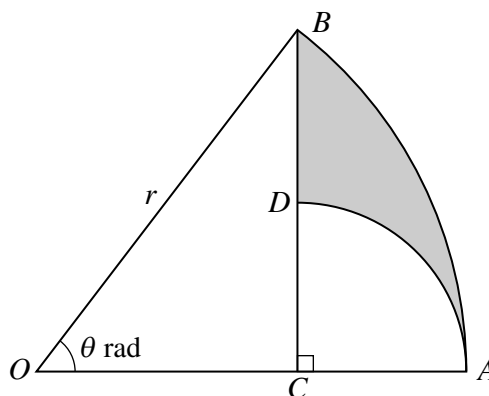
The diagram shows a circle C with centre O and radius 3 cm. The radii OP and OQ are extended to S and R respectively so that ORS is a sector of a circle with centre O . Given that $PS = 6$ cm and that the area of the shaded region is equal to the area of circle C ,

(i) show that angle $POQ = \frac{1}{4}\pi$ radians, [3]

(ii) find the perimeter of the shaded region. [2]

4 An oil pipeline under the sea is leaking oil and a circular patch of oil has formed on the surface of the sea. At midday the radius of the patch of oil is 50 m and is increasing at a rate of 3 metres per hour. Find the rate at which the area of the oil is increasing at midday. [4]

5

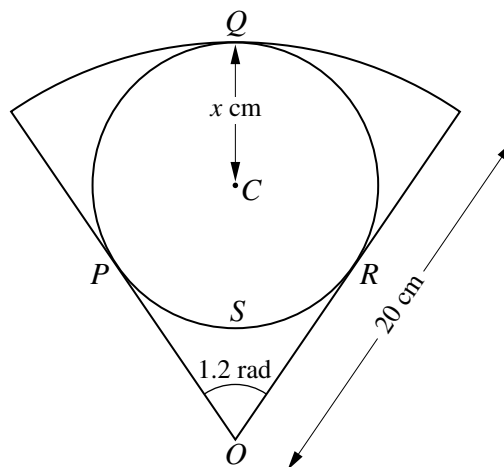


The diagram shows a sector OAB of a circle with centre O and radius r . Angle AOB is θ radians. The point C on OA is such that BC is perpendicular to OA . The point D is on BC and the circular arc AD has centre C .

(i) Find AC in terms of r and θ . [1]

(ii) Find the perimeter of the shaded region ABD when $\theta = \frac{1}{3}\pi$ and $r = 4$, giving your answer as an exact value. [6]

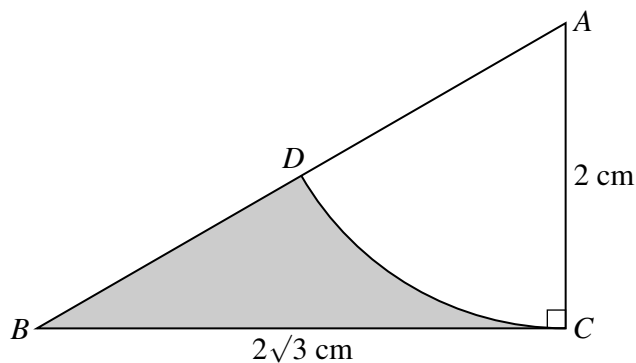
6



The diagram shows a sector of a circle with centre O and radius 20 cm. A circle with centre C and radius x cm lies within the sector and touches it at P , Q and R . Angle $POR = 1.2$ radians.

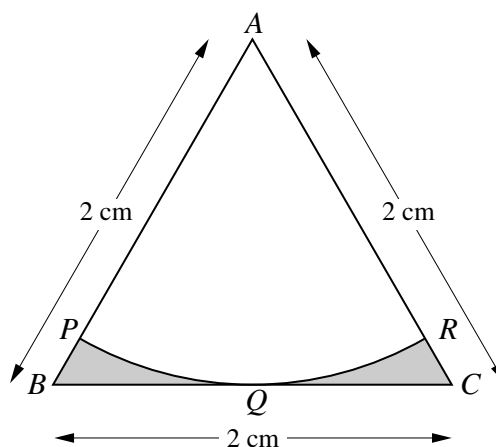
- (i) Show that $x = 7.218$, correct to 3 decimal places. [4]
- (ii) Find the total area of the three parts of the sector lying outside the circle with centre C . [2]
- (iii) Find the perimeter of the region $OPSR$ bounded by the arc PSR and the lines OP and OR . [4]

7



In the diagram, D lies on the side AB of triangle ABC and CD is an arc of a circle with centre A and radius 2 cm. The line BC is of length $2\sqrt{3}$ cm and is perpendicular to AC . Find the area of the shaded region BDC , giving your answer in terms of π and $\sqrt{3}$. [4]

8



In the diagram, ABC is an equilateral triangle of side 2 cm . The mid-point of BC is Q . An arc of a circle with centre A touches BC at Q , and meets AB at P and AC at R . Find the total area of the shaded regions, giving your answer in terms of π and $\sqrt{3}$. [5]

9 A watermelon is assumed to be spherical in shape while it is growing. Its mass, M kg, and radius, r cm, are related by the formula $M = kr^3$, where k is a constant. It is also assumed that the radius is increasing at a constant rate of 0.1 centimetres per day. On a particular day the radius is 10 cm and the mass is 3.2 kg. Find the value of k and the rate at which the mass is increasing on this day. [5]