Circular Measure
Question Paper 7

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Circular Measure
Sub Topic	
Booklet	Question Paper 7

Time Allowed: **60 minutes**

Score: **/50**

Percentage: **/100**

Grade Boundaries:

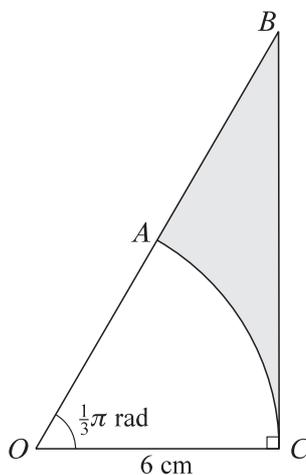| A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1
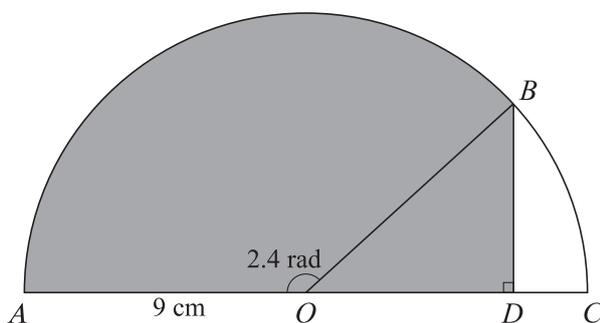
In the diagram, ABC is a semicircle, centre O and radius 9 cm. The line BD is perpendicular to the diameter AC and angle $AOB = 2.4$ radians.
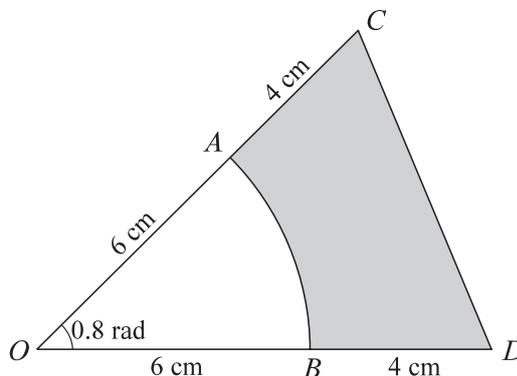
   (i) Show that $BD = 6.08$ cm, correct to 3 significant figures.   [2]

  (ii) Find the perimeter of the shaded region.   [3]

 (iii) Find the area of the shaded region.   [3]

2

In the diagram, AC is an arc of a circle, centre O and radius 6 cm. The line BC is perpendicular to OC and OAB is a straight line. Angle $AOC = \frac{1}{3}\pi$ radians. Find the area of the shaded region, giving your answer in terms of π and $\sqrt{3}$.   [5]
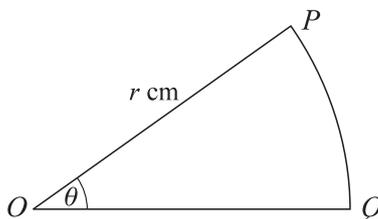
3

In the diagram, OCD is an isosceles triangle with $OC = OD = 10$ cm and angle $COD = 0.8$ radians. The points A and B, on OC and OD respectively, are joined by an arc of a circle with centre O and radius 6 cm. Find

    (i) the area of the shaded region,   [3]
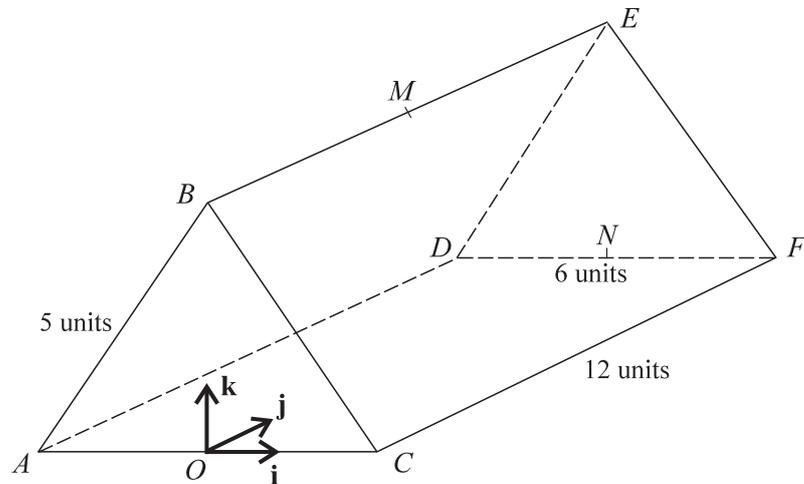
    (ii) the perimeter of the shaded region.   [4]

4

The diagram shows the sector OPQ of a circle with centre O and radius r cm. The angle POQ is θ radians and the perimeter of the sector is 20 cm.

    (i) Show that $\theta = \dfrac{20}{r} - 2$.   [2]

    (ii) Hence express the area of the sector in terms of r.   [2]

    (iii) In the case where $r = 8$, find the length of the chord PQ.   [3]

5

The diagram shows a triangular prism with a horizontal rectangular base $ADFC$, where $CF = 12$ units and $DF = 6$ units. The vertical ends ABC and DEF are isosceles triangles with $AB = BC = 5$ units. The mid-points of BE and DF are M and N respectively. The origin O is at the mid-point of AC.

Unit vectors **i**, **j** and **k** are parallel to OC, ON and OB respectively.

  (i) Find the length of OB.   [1]

 (ii) Express each of the vectors $\overrightarrow{MC}$ and $\overrightarrow{MN}$ in terms of **i**, **j** and **k**.   [3]

(iii) Evaluate $\overrightarrow{MC}.\overrightarrow{MN}$ and hence find angle CMN, giving your answer correct to the nearest degree.
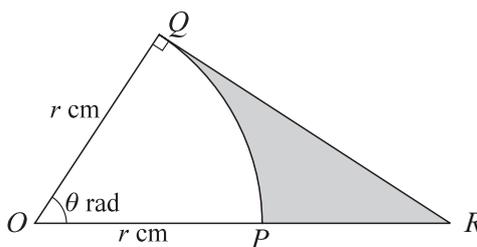   [4]

6
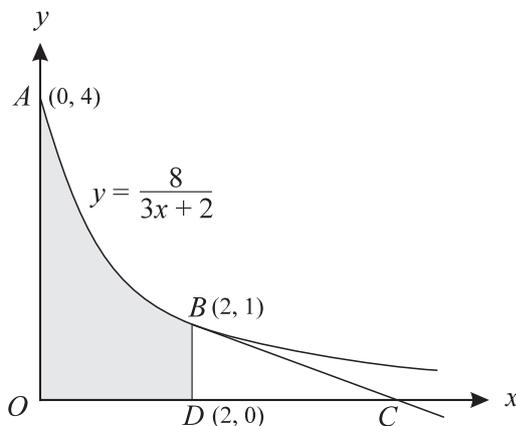
The diagram shows points A (0, 4) and B (2, 1) on the curve $y = \dfrac{8}{3x + 2}$. The tangent to the curve at B crosses the x-axis at C. The point D has coordinates (2, 0).

(i) Find the equation of the tangent to the curve at B and hence show that the area of triangle BDC is $\frac{4}{3}$. [6]

(ii) Show that the volume of the solid formed when the shaded region $ODBA$ is rotated completely about the x-axis is 8π. [5]

7

In the diagram, OPQ is a sector of a circle, centre O and radius r cm. Angle $QOP = \theta$ radians. The tangent to the circle at Q meets OP extended at R.

(i) Show that the area, A cm^2, of the shaded region is given by $A = \frac{1}{2}r^2(\tan \theta - \theta)$. [2]

(ii) In the case where $\theta = 0.8$ and $r = 15$, evaluate the length of the perimeter of the shaded region. [4]