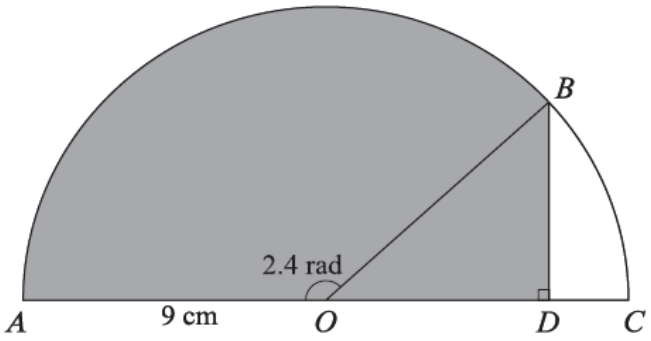
PAST YEAR QUESTIONS
CIRCULAR MEASURE

JUNE 2005



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.

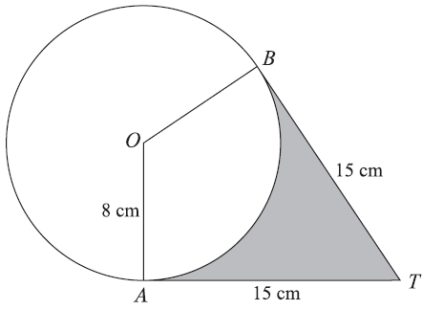
(i) Show that $BD = 6.08$ cm, correct to 3 significant figures. [2]

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

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

ANS :
(i) 6.08 cm
(ii) 43.3 cm
(iii) 117 cm^2

JUNE 2006



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.

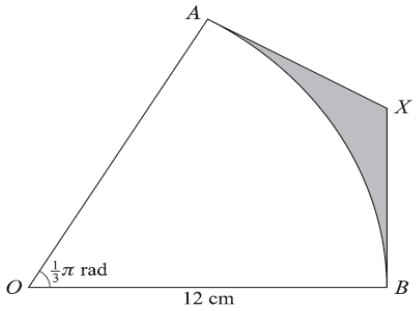
(i) Show that angle AOB is 2.16 radians, correct to 3 significant figures. [3]

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

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

ANS :
(i) 2.16
(ii) 47.3
(iii) 50.8 or 50.9

JUNE 2007



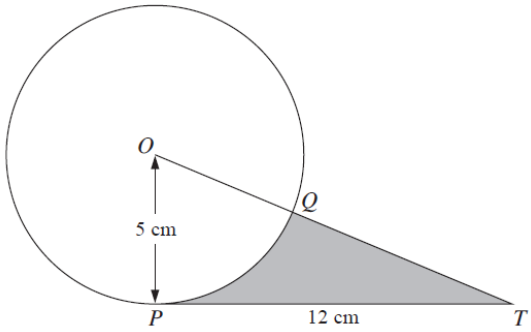
ANS :
(i) $4\sqrt{3}$
(ii) $48\sqrt{3} - 24\pi$

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 π and $\sqrt{3}$. [3]

JUNE 2008



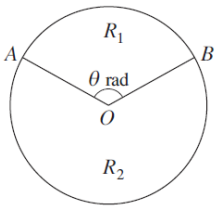
ANS :
(i) 25.9 cm
(ii) 15.3 cm^2

The diagram shows a circle with centre O and radius 5 cm. The point P lies on the circle, PT is a tangent to the circle and $PT = 12$ cm. The line OT cuts the circle at the point Q.

(i) Find the perimeter of the shaded region. [4]

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

JUNE 2009



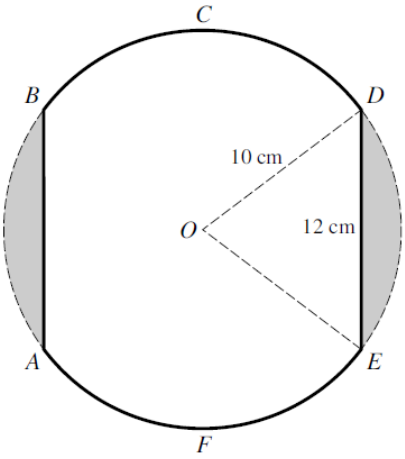
ANS :
(ii) 58.2

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 cm^2, find the area of region R_2, correct to 3 significant figures. [4]

JUNE 2010(3)



ANS :
(i) 1.287 rad
(ii) 61.1
(iii) 281 or 282

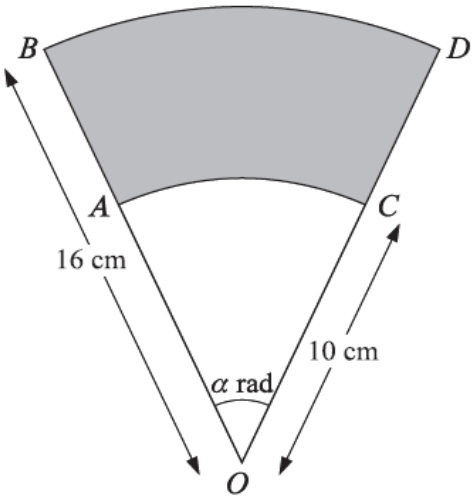
The diagram shows a metal plate $ABCDEF$ which has been made by removing the two shaded regions from a circle of radius 10 cm and centre O. The parallel edges AB and ED are both of length 12 cm.

(i) Show that angle DOE is 1.287 radians, correct to 4 significant figures. [2]

(ii) Find the perimeter of the metal plate. [3]

(iii) Find the area of the metal plate. [3]

NOV 2005



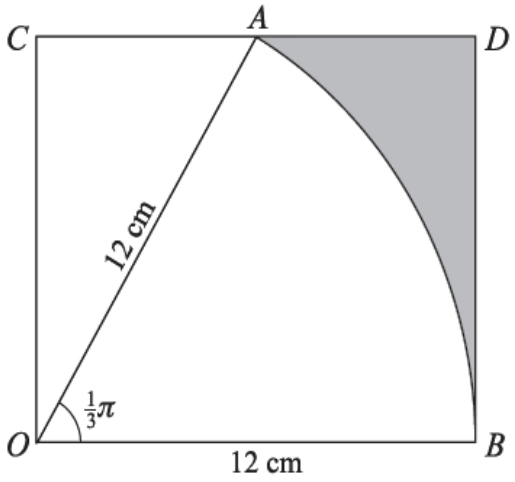
ANS :
(i) 62.4 cm^2
(ii) 0.65

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 α for which the perimeter of the shaded region is 28.9 cm. [3]

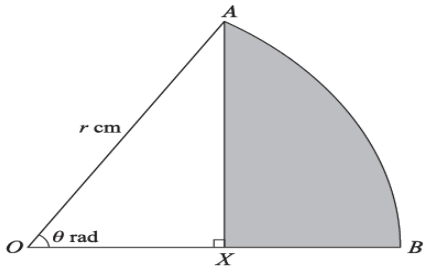
NOV 2006



ANS :
$54\sqrt{3} - 24\pi$

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]

NOV 2007



ANS :
(ii) $18 - 6\sqrt{3} + 2\pi$

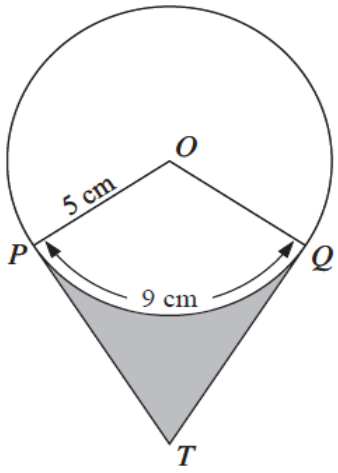
In the diagram, AB is an arc of a circle, centre O and radius r cm, and angle $AOB = \theta$ radians. The point X lies on OB and AX is perpendicular to OB.

(i) Show that the area, A cm^2, of the shaded region AXB is given by

$$A = \tfrac{1}{2}r^2(\theta - \sin\theta\cos\theta).$$ [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 π. [4]

NOV 2008



ANS :
(i) 1.8
(ii) 6.30cm
(iii) 9.00

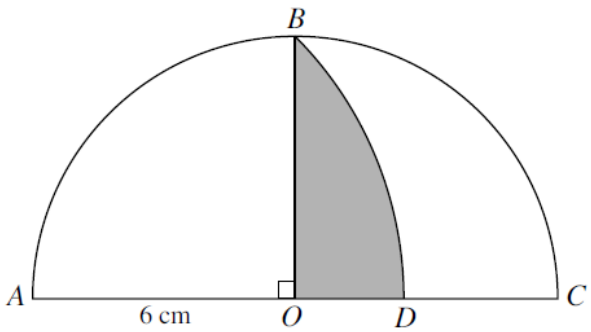
In the diagram, the circle has centre O and radius 5 cm. The points P and Q lie on the circle, and the arc length PQ is 9 cm. The tangents to the circle at P and Q meet at the point T. Calculate

(i) angle POQ in radians, [2]

(ii) the length of PT, [3]

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

NOV 2009(1)



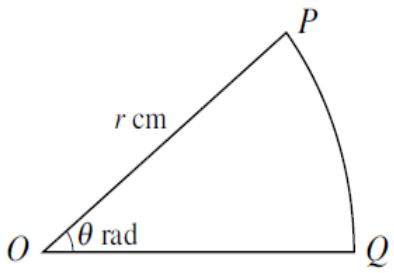
ANS :
(i) 6.66(7)
(ii) 10.3

The diagram shows a semicircle ABC with centre O and radius 6 cm. The point B is such that angle BOA is 90° and BD is an arc of a circle with centre A. Find

(i) the length of the arc BD, [4]

(ii) the area of the shaded region. [3]

NOV 2009(2)



ANS :
(ii) 156.25

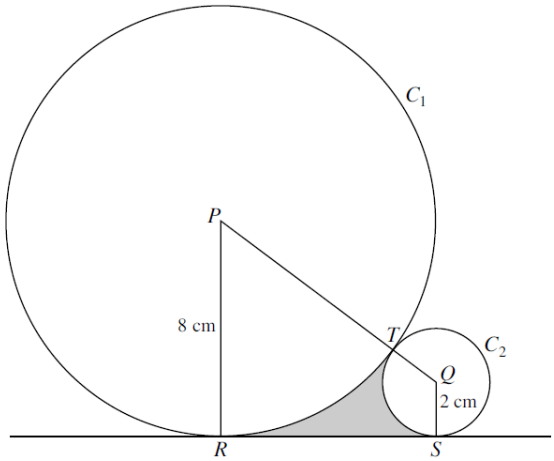
A piece of wire of length 50 cm is bent to form the perimeter of a sector POQ of a circle. The radius of the circle is r cm and the angle POQ is θ radians (see diagram).

(i) Express θ in terms of r and show that the area, A cm^2, of the sector is given by

$$A = 25r - r^2.$$ [4]

(ii) Given that r can vary, find the stationary value of A and determine its nature. [4]

NOV 2010(1)



ANS :
(ii) 0.9273 rad
(iii) 5.90 cm²

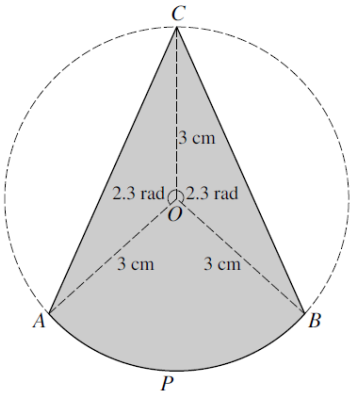
The diagram shows two circles, C_1 and C_2, touching at the point T. Circle C_1 has centre P and radius 8 cm; circle C_2 has centre Q and radius 2 cm. Points R and S lie on C_1 and C_2 respectively, and RS is a tangent to both circles.

(i) Show that $RS = 8$ cm. [2]

(ii) Find angle RPQ in radians correct to 4 significant figures. [2]

(iii) Find the area of the shaded region. [4]

NOV 2010(2)



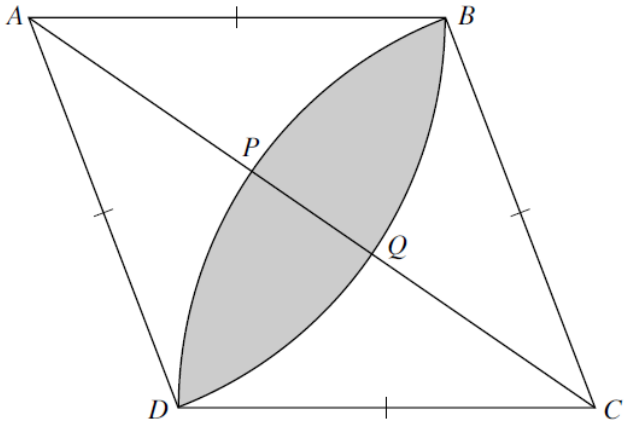
ANS :
(i) 1.683
(ii) 14.3

The diagram shows points A, C, B, P on the circumference of a circle with centre O and radius 3 cm. Angle AOC = angle BOC = 2.3 radians.

(i) Find angle AOB in radians, correct to 4 significant figures. [1]

(ii) Find the area of the shaded region $ACBP$, correct to 3 significant figures. [4]

NOV 2010(3)



ANS :
(i) 6.70
(ii) 1.75

The diagram shows a rhombus $ABCD$. Points P and Q lie on the diagonal AC such that BPD is an arc of a circle with centre C and BQD is an arc of a circle with centre A. Each side of the rhombus has length 5 cm and angle BAD = 1.2 radians.

(i) Find the area of the shaded region $BPDQ$. [4]

(ii) Find the length of PQ. [4]