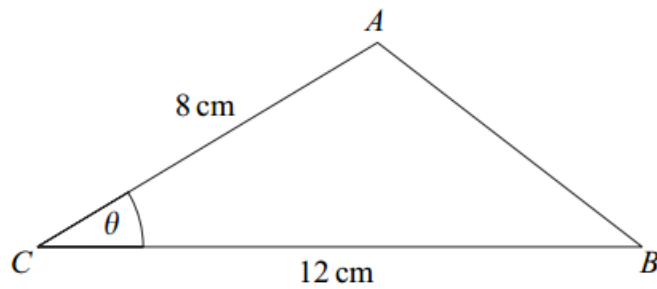# Core 2: Sectors and Arcs

Past Paper Questions
2006 - 2013

Name:

Trigonometry – the Cosine rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

4 The triangle ABC, shown in the diagram, is such that $AC = 8\,\text{cm}$, $CB = 12\,\text{cm}$ and angle $ACB = \theta$ radians.

The area of triangle $ABC = 20\,\text{cm}^2$.

(a) Show that $\theta = 0.430$ correct to three significant figures. *(3 marks)*

(b) Use the cosine rule to calculate the length of AB, giving your answer to two significant figures. *(3 marks)*

(c) The point D lies on CB such that AD is an arc of a circle centre C and radius $8\,\text{cm}$. The region bounded by the arc AD and the straight lines DB and AB is shaded in the diagram.
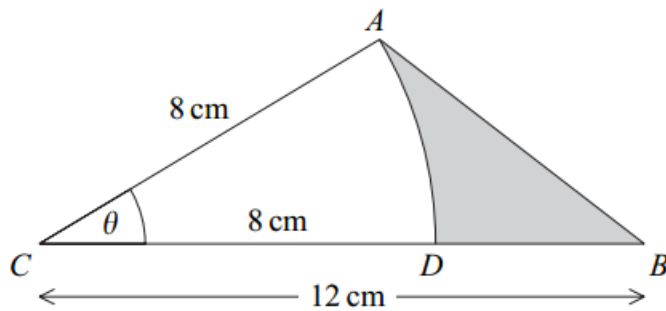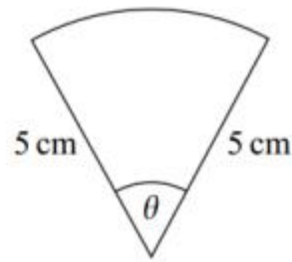

Calculate, to two significant figures:

(i) the length of the arc AD; *(2 marks)*

(ii) the area of the shaded region. *(3 marks)*

June 2006

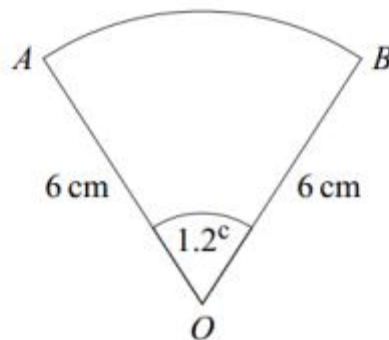1 The diagram shows a sector of a circle of radius 5 cm and angle θ radians.

5 cm   5 cm

θ

The area of the sector is $8.1\,\text{cm}^2$.

(a) Show that $\theta = 0.648$. *(2 marks)*

(b) Find the perimeter of the sector. *(3 marks)*

January 2007

1 The diagram shows a sector OAB of a circle with centre O.

A   B

6 cm   6 cm

1.2^c

O

The radius of the circle is 6 cm and the angle AOB is 1.2 radians.

(a) Find the area of the sector OAB. *(2 marks)*

(b) Find the perimeter of the sector OAB. *(3 marks)*

3 The diagram shows a sector OAB of a circle with centre O and radius 20 cm. The angle between the radii OA and OB is θ radians.
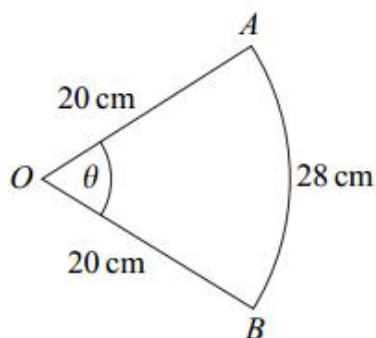
The length of the arc AB is 28 cm.

(a) Show that $\theta = 1.4$. *(2 marks)*

(b) Find the area of the sector OAB. *(2 marks)*

(c) The point D lies on OA. The region bounded by the line BD, the line DA and the arc AB is shaded.
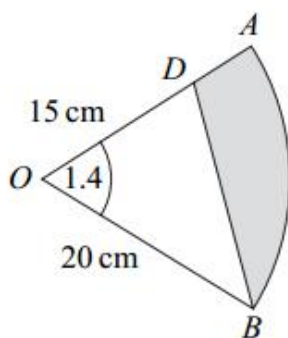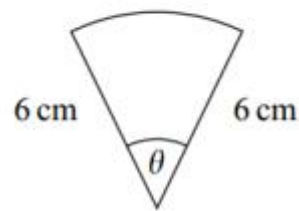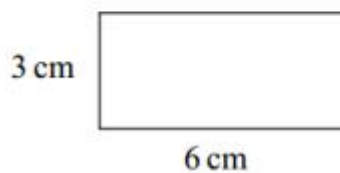

The length of OD is 15 cm.

(i) Find the area of the shaded region, giving your answer to three significant figures. *(3 marks)*

(ii) Use the cosine rule to calculate the length of BD, giving your answer to three significant figures. *(3 marks)*

1 The diagrams show a rectangle of length 6 cm and width 3 cm, and a sector of a circle of radius 6 cm and angle θ radians.

3 cm

6 cm

6 cm   6 cm

θ
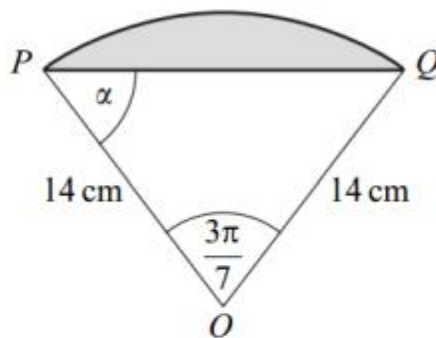
The area of the rectangle is twice the area of the sector.

(a) Show that $\theta = 0.5$. *(3 marks)*
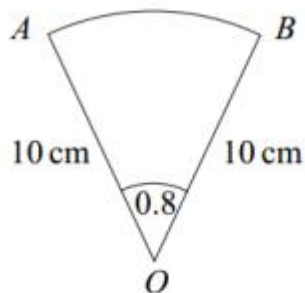
(b) Find the perimeter of the sector. *(3 marks)*

2 The diagram shows a shaded segment of a circle with centre O and radius 14 cm, where PQ is a chord of the circle.

P α Q

14 cm   14 cm

$\dfrac{3\pi}{7}$

O

In triangle OPQ, angle $POQ = \dfrac{3\pi}{7}$ radians and angle $OPQ = \alpha$ radians.

(a) Find the length of the arc PQ, giving your answer as a multiple of π. *(2 marks)*

(b) Find α in terms of π. *(2 marks)*

(c) Find the **perimeter** of the shaded segment, giving your answer to three significant figures. *(2 marks)*
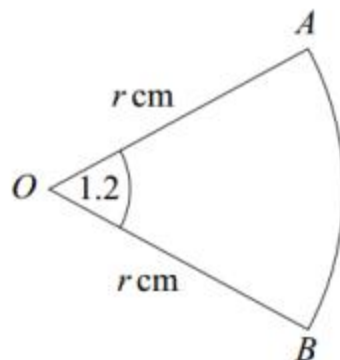
1 The diagram shows a sector OAB of a circle with centre O and radius 10 cm.

The angle AOB is 0.8 radians.

(a) Find the area of the sector. *(2 marks)*

(b) (i) Find the perimeter of the sector OAB. *(3 marks)*

(ii) The perimeter of the sector OAB is equal to the perimeter of a square. Find the area of the square. *(2 marks)*
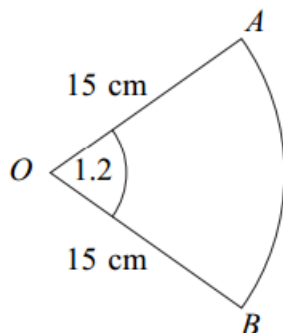
6 The diagram shows a sector OAB of a circle with centre O and radius r cm.

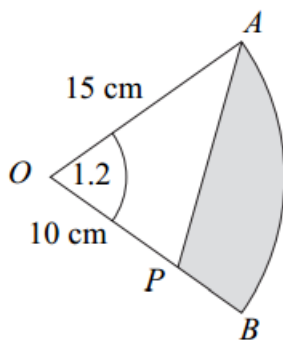The angle AOB is 1.2 radians. The area of the sector is 33.75 cm^2.

Find the perimeter of the sector. *(6 marks)*

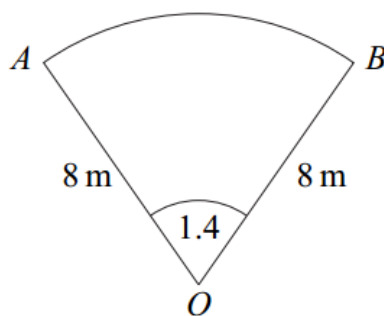**1** The diagram shows a sector OAB of a circle with centre O.

The radius of the circle is 15 cm and angle $AOB = 1.2$ radians.

(a) (i) Show that the area of the sector is 135 cm². *(2 marks)*

   (ii) Calculate the length of the arc AB. *(2 marks)*

(b) The point P lies on the radius OB such that $OP = 10$ cm, as shown in the diagram below.

Calculate the perimeter of the shaded region bounded by AP, PB and the arc AB, giving your answer to three significant figures. *(5 marks)*
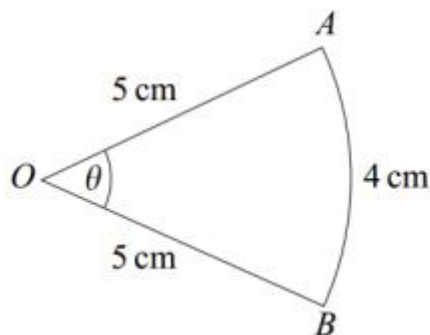
1   The diagram shows a sector OAB of a circle with centre O.

The radius of the circle is 8 m and the angle AOB is 1.4 radians.

(a)   Find the area of the sector OAB.   *(2 marks)*

(b) (i)   Find the perimeter of the sector OAB.   *(3 marks)*

(ii)   The perimeter of the sector OAB is equal to the circumference of a circle of radius x m. Calculate the value of x to three significant figures.   *(2 marks)*

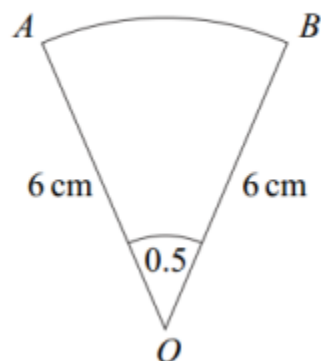**1**   The diagram shows a sector OAB of a circle with centre O and radius 5 cm.

The angle between the radii OA and OB is θ radians.

The length of the arc AB is 4 cm.

(a)   Find the value of θ.   *(2 marks)*

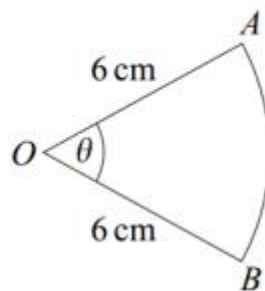**(b)**   Find the area of the sector OAB.   *(2 marks)*

2   The diagram shows a sector OAB of a circle with centre O.

The radius of the circle is 6 cm and the angle $AOB = 0.5$ radians.

(a)   Find the area of the sector OAB.   *(2 marks)*

(b) (i)   Find the length of the arc AB.   *(2 marks)*

(ii)   Hence show that

the perimeter of the sector $OAB = k \times$ the length of the arc AB

where k is an integer.   *(2 marks)*

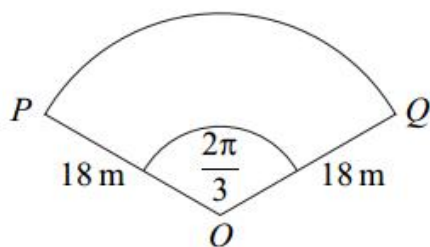**1**   The diagram shows a sector OAB of a circle with centre O and radius 6 cm.

The angle between the radii OA and OB is θ radians.
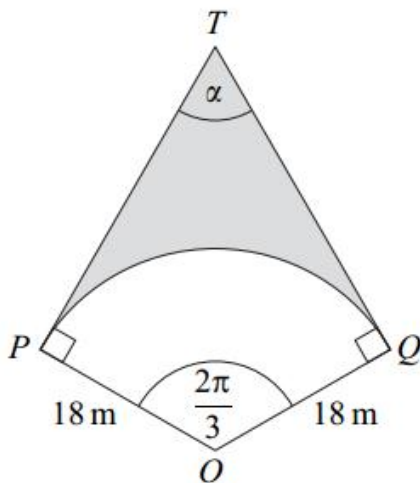
The area of the sector OAB is 21.6 cm^2.

(a)   Find the value of θ.   *(2 marks)*

(b)   Find the length of the arc AB.   *(2 marks)*

**5**   The diagram shows a sector *OPQ* of a circle with centre *O*.

The radius of the circle is 18 m and the angle *POQ* is $\dfrac{2\pi}{3}$ radians.

(a)   Find the length of the arc *PQ*, giving your answer as a multiple of π.   *(2 marks)*

(b)   The tangents to the circle at the points *P* and *Q* meet at the point *T*, and the angles *TPO* and *TQO* are both right angles, as shown in the diagram below.

(i)   Angle $PTQ = \alpha$ radians. Find α in terms of π.   *(1 mark)*

(ii)   Find the area of the shaded region bounded by the arc *PQ* and the tangents *TP* and *TQ*, giving your answer to three significant figures.   *(6 marks)*

1   The diagram shows a sector OAB of a circle with centre O and radius r cm.
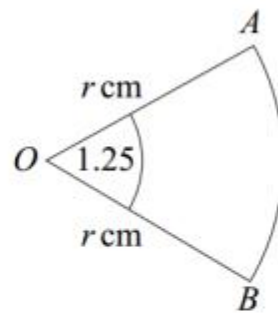
The angle AOB is 1.25 radians. The perimeter of the sector is 39 cm.

(a)   Show that $r = 12$.   *(3 marks)*

(b)   Calculate the area of the sector OAB.   *(2 marks)*