CORE MATHEMATICS 2
CHAPTER 6 – RADIAN MEASURE AND ITS APPLICATIONS
EXTRA PRACTICE

1.

Figure 1

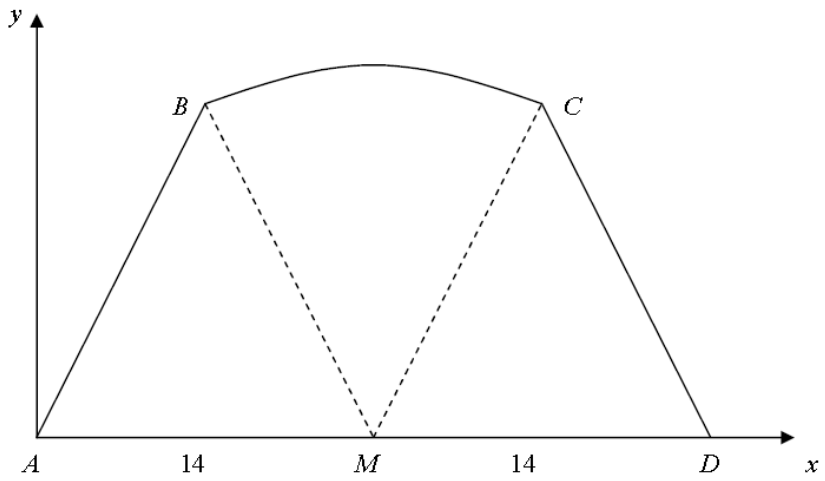


Fig. 1 shows the cross-section $ABCD$ of a chocolate bar, where AB, CD and AD are straight lines and M is the mid-point of AD. The length AD is 28 mm, and BC is an arc of a circle with centre M.

Taking A as the origin, B, C and D have coordinates (7, 24), (21, 24) and (28, 0) respectively.

(a) Show that the length of BM is 25 mm.

(b) Show that, to 3 significant figures, $\angle BMC = 0.568$ radians.

(c) Hence calculate, in mm^2, the area of the cross-section of the chocolate bar.

Given that this chocolate bar has length 85 mm,

(d) calculate, to the nearest cm^3, the volume of the bar.

2.

Figure 1

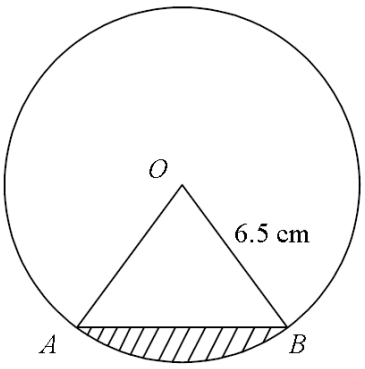


Fig. 1 shows the sector AOB of a circle, with centre O and radius 6.5 cm, and $\angle AOB = 0.8$ radians.

(a) Calculate, in cm^2, the area of the sector AOB.

(b) Show that the length of the chord AB is 5.06 cm, to 3 significant figures.

The segment R, shaded in Fig. 1, is enclosed by the arc AB and the straight line AB.

(c) Calculate, in cm, the perimeter of R.

3.

Figure 2

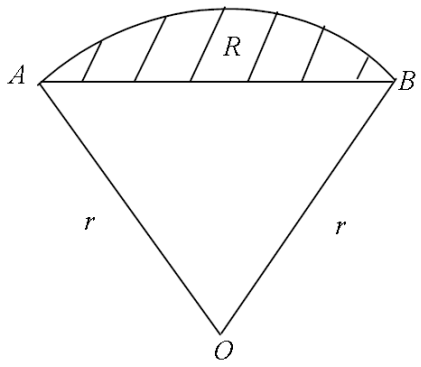


Fig. 2 shows the sector OAB of a circle of radius r cm. The area of the sector is 15 cm^2 and $\angle AOB = 1.5$ radians.

(a) Prove that $r = 2\sqrt{5}$.

(b) Find, in cm, the perimeter of the sector OAB.

The segment R, shaded in Fig 1, is enclosed by the arc AB and the straight line AB.

(c) Calculate, to 3 decimal places, the area of R.

4.

Figure 1

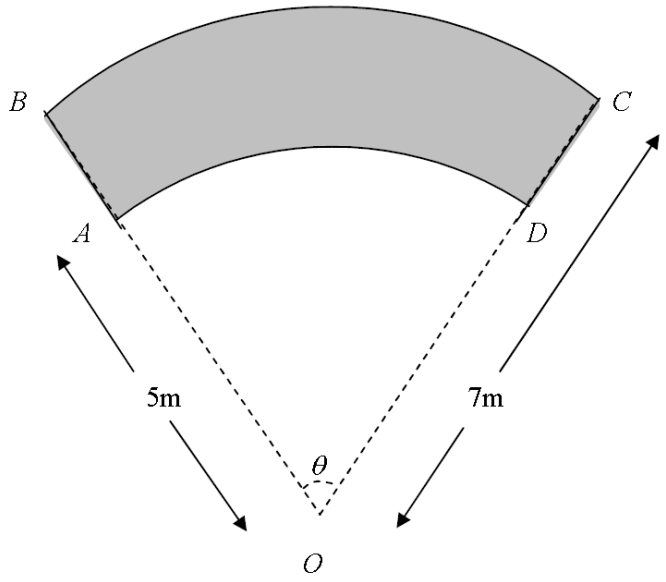


Fig. 1 shows a gardener's design for the shape of a flower bed with perimeter $ABCD$. AD is an arc of a circle with centre O and radius 5 m. BC is an arc of a circle with centre O and radius 7 m. OAB and ODC are straight lines and the size of $\angle AOD$ is θ radians.

(a) Find, in terms of θ, an expression for the area of the flower bed.

Given that the area of the flower bed is 15 m^2,

(b) show that $\theta = 1.25$,

(c) calculate, in m, the perimeter of the flower bed.

The gardener now decides to replace arc AD with the straight line AD.

(d) Find, to the nearest cm, the reduction in the perimeter of the flower bed.

5.

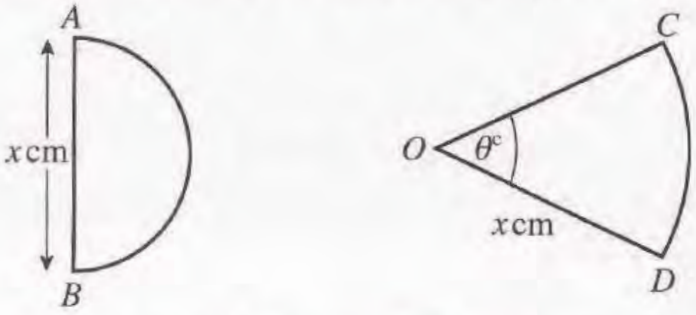
A sector of a circle, of radius r cm, contains an angle of 0.8 radians at the centre of the circle. The sector has perimeter P cm and area A cm^2, where $A + P = 31.2$.

(a) Show that r satisfies the equation $r^2 + 7r - 78 = 0$.

(b) Calculate the values of A and P.

6.

The diagrams below show the cross-sections of two biscuits.



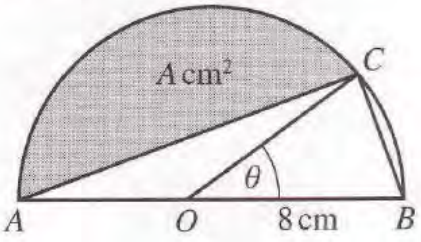
One is semi-circular with diameter $AB = x$ cm, the other is a circular sector DOC, with radius x cm and angle θ radians, as shown. The two cross-sections have the same perimeter.

(a) Show that $\theta = \frac{\pi}{2} - 1$.

(b) Given that $x = 6$, find in terms of π, the difference in the areas of the shapes.

7.

In the diagram AB is the diameter of a circle, with centre O and radius 8 cm, and $\angle BOC = \theta$ radians. The shaded segment has area A cm^2 and the area of triangle $BOC = B$ cm^2. Given that $A = 2B$, show that $\pi = \theta + 3 \sin \theta$.



8.

In the diagram, AB is the arc of a circle, centre O and radius 10 cm. The points C and D are such that $OC = 5$ cm, $OD = 4$ cm. Angle $AOB = 0.75$ radians. Calculate, giving your answer to 3 significant figures:

(a) the area of the shaded region,

(b) the perimeter of the shaded region.