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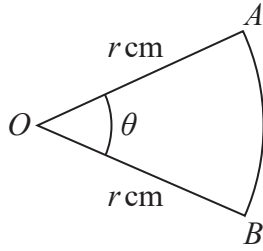


Figure 1

Figure 1 shows a sector AOB of a circle with centre O and radius $r \text{ cm}$.

The angle AOB is θ radians.

The area of the sector AOB is 11 cm^2

Given that the perimeter of the sector is 4 times the length of the arc AB , find the exact value of r .

(4)

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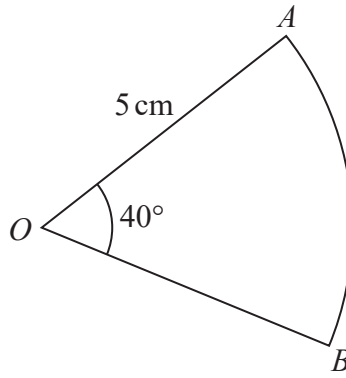


Figure 1

Figure 1 shows a sector AOB of a circle with centre O , radius 5 cm and angle $AOB = 40^\circ$
 The attempt of a student to find the area of the sector is shown below.

$$\begin{aligned}
 \text{Area of sector} &= \frac{1}{2} r^2 \theta \\
 &= \frac{1}{2} \times 5^2 \times 40 \\
 &= 500 \text{ cm}^2
 \end{aligned}$$

(a) Explain the error made by this student. (1)

(b) Write out a correct solution. (2)



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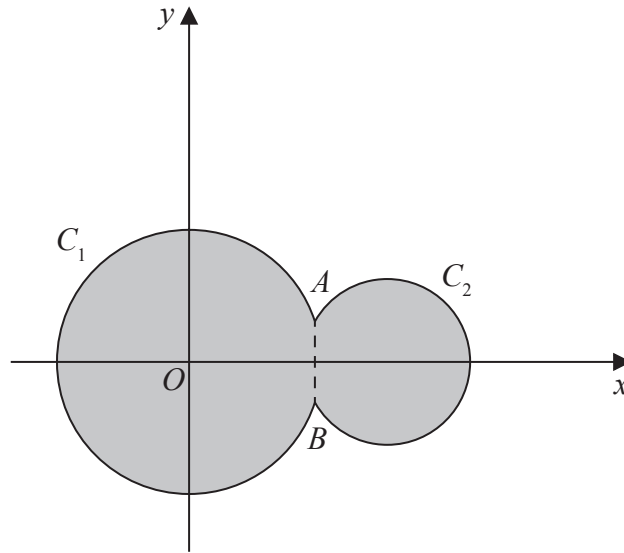


Figure 3

Circle C_1 has equation $x^2 + y^2 = 100$

Circle C_2 has equation $(x - 15)^2 + y^2 = 40$

The circles meet at points A and B as shown in Figure 3.

- (a) Show that angle $AOB = 0.635$ radians to 3 significant figures, where O is the origin. (4)

The region shown shaded in Figure 3 is bounded by C_1 and C_2

- (b) Find the perimeter of the shaded region, giving your answer to one decimal place. (4)

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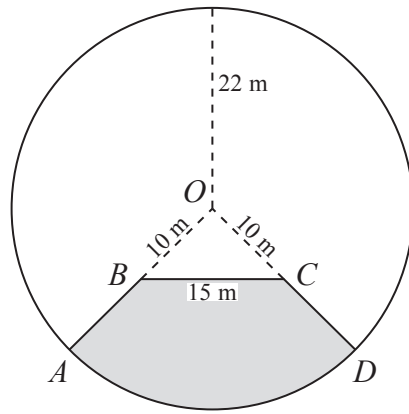


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Figure 1

Figure 1 shows the plan for a pond and platform. The platform is shown shaded in the figure and is labelled $ABCD$.

The pond and platform together form a circle of radius 22 m with centre O .

OA and OD are radii of the circle. Point B lies on OA such that the length of OB is 10 m and point C lies on OD such that the length of OC is 10 m. The length of BC is 15 m.

The platform is bounded by the arc AD of the circle, and the straight lines AB , BC and CD .

Find

- (a) the size of the angle BOC , giving your answer in radians to 3 decimal places, (3)
- (b) the perimeter of the platform to 3 significant figures, (4)
- (c) the area of the platform to 3 significant figures. (4)



11.

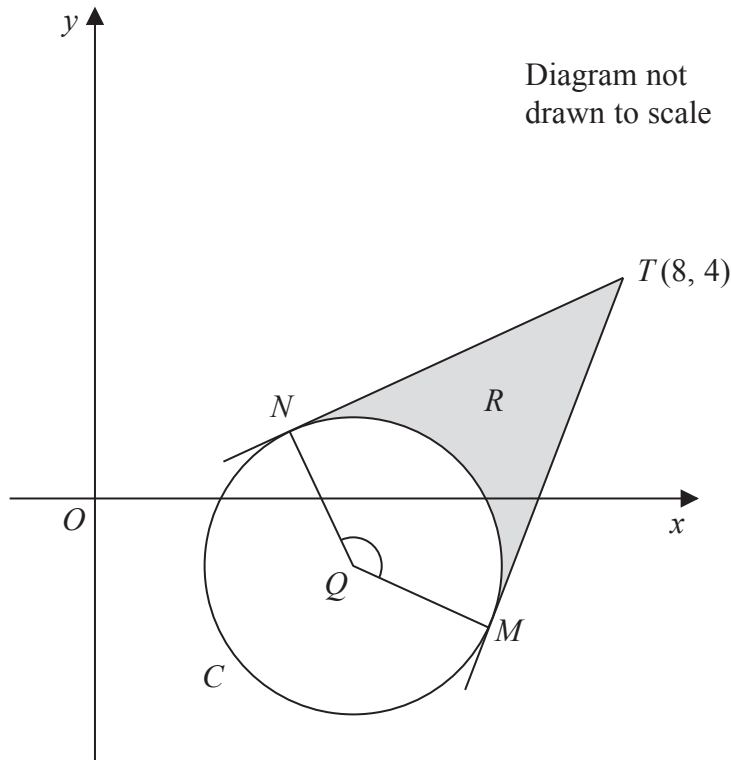


Figure 4

Figure 4 shows a sketch of the circle C with centre Q and equation

$$x^2 + y^2 - 6x + 2y + 5 = 0$$

(a) Find

- (i) the coordinates of Q ,
- (ii) the exact value of the radius of C .

(5)

The tangents to C from the point $T(8, 4)$ meet C at the points M and N , as shown in Figure 4.

(b) Show that the obtuse angle MQN is 2.498 radians to 3 decimal places.

(5)

The region R , shown shaded in Figure 4, is bounded by the tangent TN , the minor arc NM , and the tangent MT .

(c) Find the area of region R .

(5)



9.

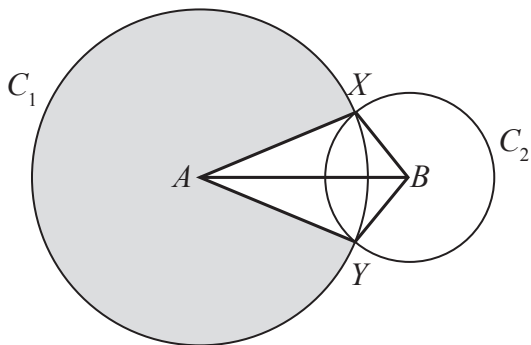


Figure 3

In Figure 3, the points A and B are the centres of the circles C_1 and C_2 respectively. The circle C_1 has radius 10 cm and the circle C_2 has radius 5 cm. The circles intersect at the points X and Y , as shown in the figure.

Given that the distance between the centres of the circles is 12 cm,

- (a) calculate the size of the acute angle XAB , giving your answer in radians to 3 significant figures, (2)

- (b) find the area of the major sector of circle C_1 , shown shaded in Figure 3, (3)

- (c) find the area of the kite $AYBX$. (3)



11.

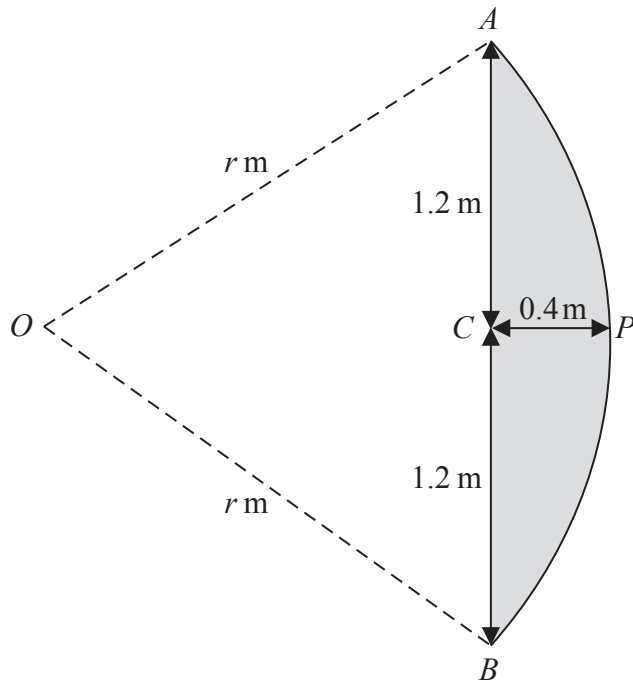


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Figure 2

Figure 2 shows the design for a sail $APBCA$.

The curved edge APB of the sail is an arc of a circle centre O and radius r m.

The straight edge ACB is a chord of the circle.

The height AB of the sail is 2.4 m.

The maximum width CP of the sail is 0.4 m.

- (a) Show that $r = 2$ (2)
- (b) Show, to 4 decimal places, that angle $AOB = 1.2870$ radians. (2)
- (c) Hence calculate the area of the sail, giving your answer, in m^2 , to 3 decimal places. (4)

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8.

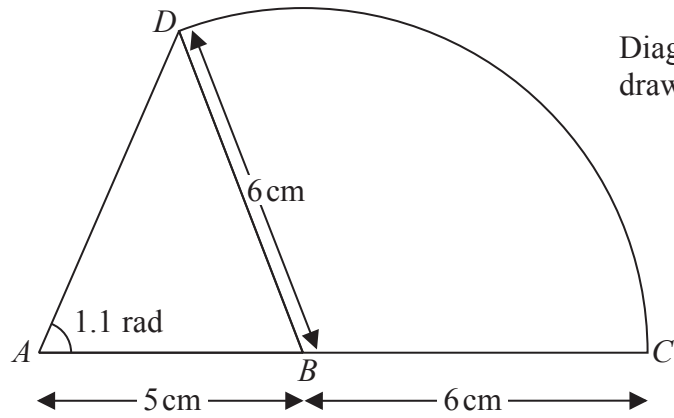


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Figure 1

The compound shape $ABCDA$, shown in Figure 1, consists of a triangle ABD joined along its edge BD to a sector DBC of a circle with centre B and radius 6 cm. The points A , B and C lie on a straight line with $AB = 5$ cm and $BC = 6$ cm. Angle $DAB = 1.1$ radians.

- (a) Show that angle $ABD = 1.20$ radians to 3 significant figures. (4)

- (b) Find the area of the compound shape, giving your answer to 3 significant figures. (4)

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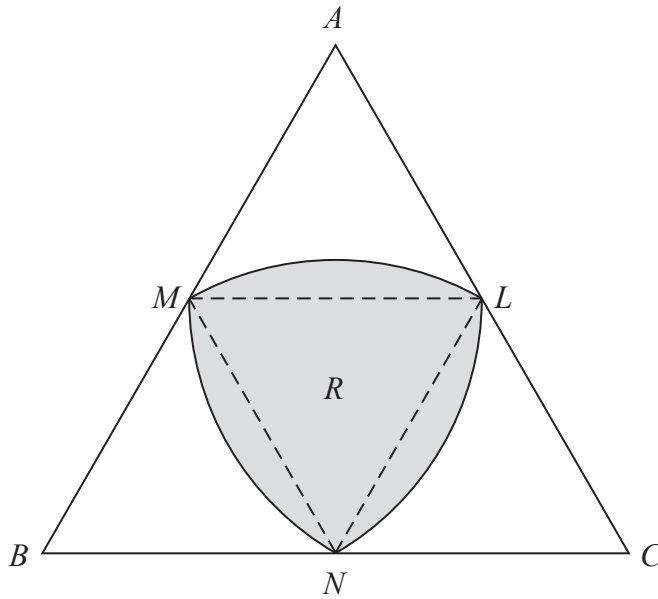


Figure 5

Figure 5 shows the design for a logo.

The logo is in the shape of an equilateral triangle ABC of side length $2r$ cm, where r is a constant.

The points L , M and N are the midpoints of sides AC , AB and BC respectively.

The shaded section R , of the logo, is bounded by three curves MN , NL and LM .

The curve MN is the arc of a circle centre L , radius r cm.

The curve NL is the arc of a circle centre M , radius r cm.

The curve LM is the arc of a circle centre N , radius r cm.

Find, in cm^2 , the area of R . Give your answer in the form kr^2 , where k is an exact constant to be determined.

(5)

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6.

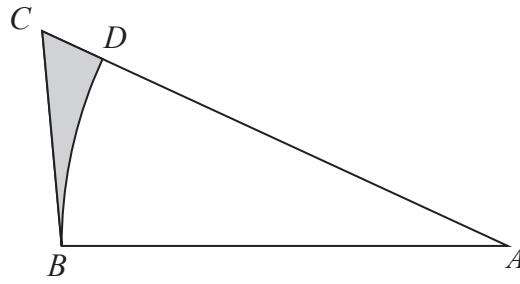


Figure 2

Figure 2 shows a sketch of a design for a triangular garden ABC .

The garden has sides BA with length 10 m, BC with length 6 m and CA with length 12 m.

The point D lies on AC such that BD is an arc of the circle centre A , radius 10 m.

A flowerbed BCD is shown shaded in Figure 2.

- (a) Find the size of angle BAC , in radians, to 4 decimal places. (2)
- (b) Find the perimeter of the flowerbed BCD , in m, to 2 decimal places. (3)
- (c) Find the area of the flowerbed BCD , in m^2 , to 2 decimal places. (4)

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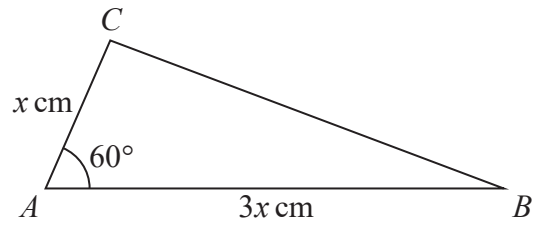


Figure 1

Figure 1 shows a sketch of a triangle ABC with $AB = 3x \text{ cm}$, $AC = x \text{ cm}$ and angle $CAB = 60^\circ$

Given that the area of triangle $ABC = 24\sqrt{3}$

(a) show that $x = 4\sqrt{2}$ (3)

(b) Hence find the exact length of BC , giving your answer as a simplified surd. (3)

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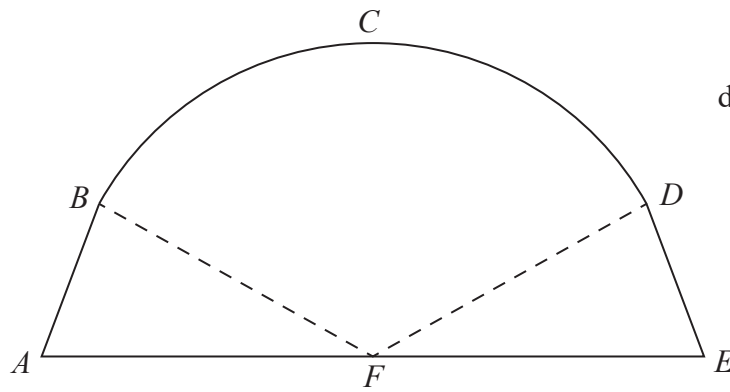


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Figure 1

Figure 1 is a sketch representing the cross-section of a large tent *ABCDEF*.
AB and *DE* are line segments of equal length.
 Angle *FAB* and angle *DEF* are equal.
F is the midpoint of the straight line *AE* and *FC* is perpendicular to *AE*.
BCD is an arc of a circle of radius 3.5 m with centre at *F*.
 It is given that

$$\begin{aligned} AF = FE &= 3.7\text{m} \\ BF = FD &= 3.5\text{m} \\ \text{angle } BFD &= 1.77 \text{ radians} \end{aligned}$$

Find

- (a) the length of the arc *BCD* in metres to 2 decimal places, (2)
- (b) the area of the sector *FBCD* in m² to 2 decimal places, (2)
- (c) the total area of the cross-section of the tent in m² to 2 decimal places. (4)

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