6.

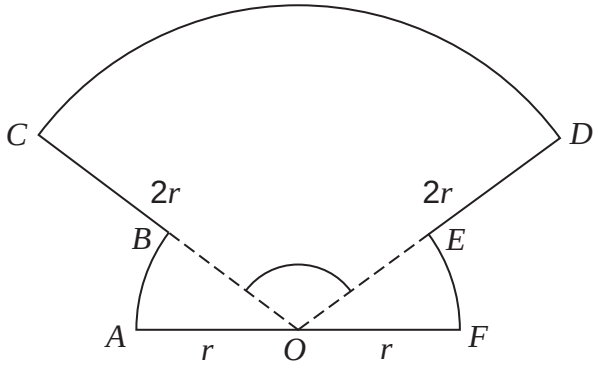

Figure 1

The shape $OABCDEFO$ shown in Figure 1 is a design for a logo.

In the design

- OAB is a sector of a circle centre O and radius r
- sector OFE is congruent to sector OAB
- ODC is a sector of a circle centre O and radius $2r$
- AOF is a straight line

Given that the size of angle COD is θ radians,

(a) write down, in terms of θ, the size of angle AOB

(1)

(b) Show that the area of the logo is

$$r^2(3 + \theta)$$

(2)

(c) Find the perimeter of the logo, giving your answer in simplest form in terms of r, and θ.

(2)

3.

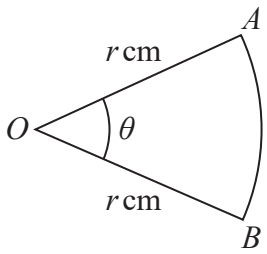

Figure 1

Figure 1 shows a sector AOB of a circle with centre O and radius r 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)

3.

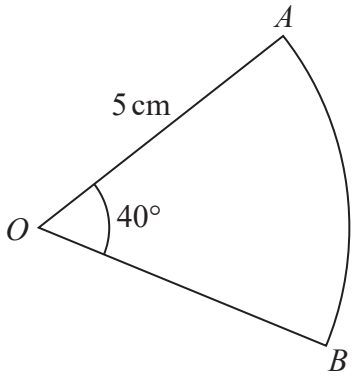

Figure 1

Figure 1 shows a sector AOB of a circle with centre O, radius 5 cm and angle $AOB = 40°$

The attempt of a student to find the area of the sector is shown below.

$$\text{Area of sector} = \frac{1}{2} r^2\theta$$

$$= \frac{1}{2} \times 5^2 \times 40$$

$$= 500\,\text{cm}^2$$

(a) Explain the error made by this student.

(1)

(b) Write out a correct solution.

(2)

11.

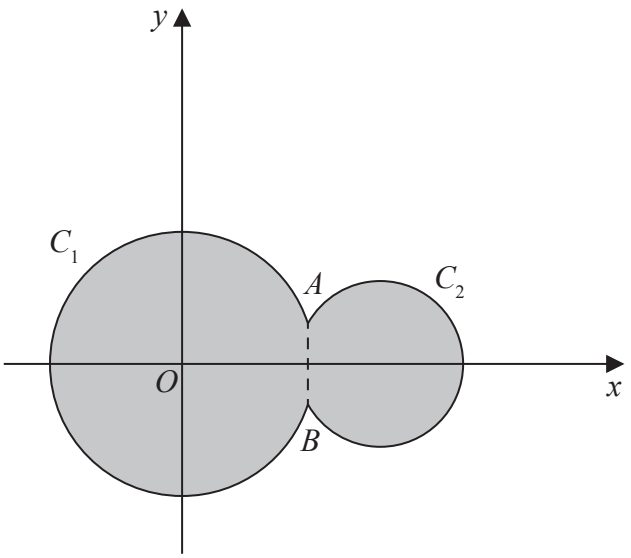

Figure 3

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)

Leave blank

12.

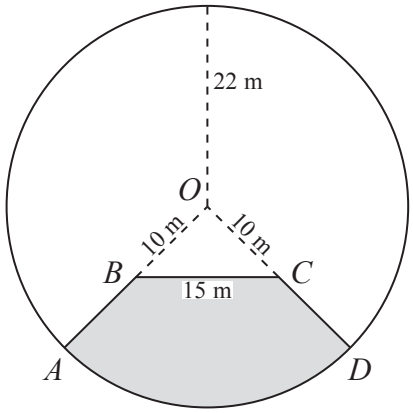

Diagram **NOT** drawn to scale

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)

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11.

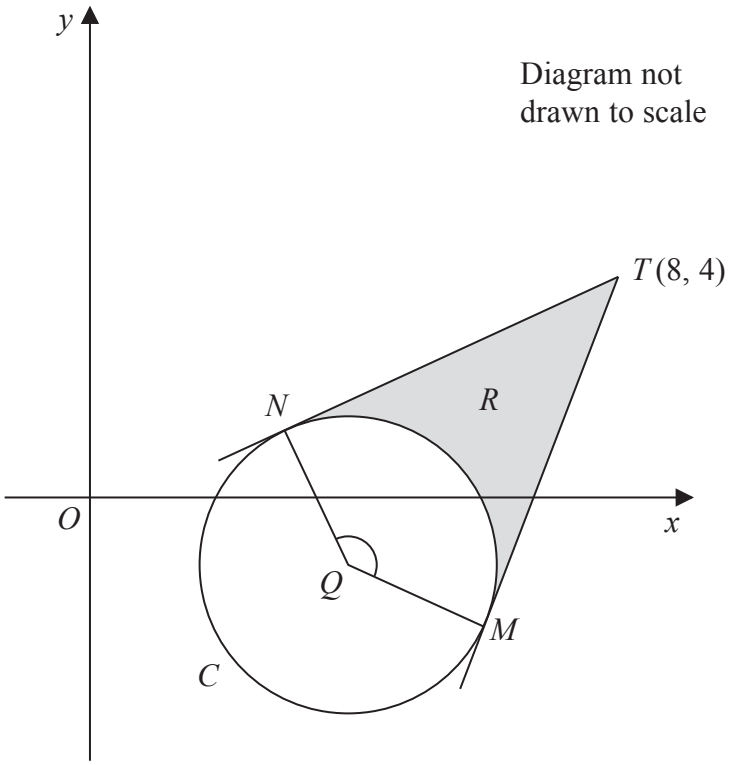

Figure 4

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)

Leave blank

9.

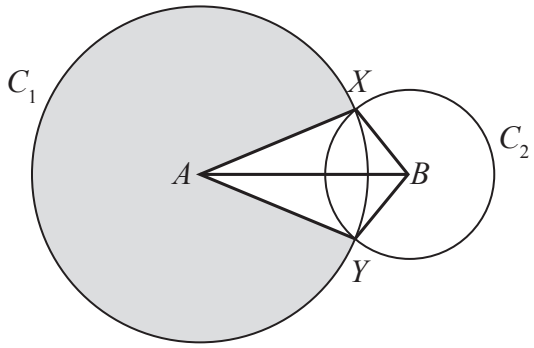

Figure 3

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)

Leave blank

11.

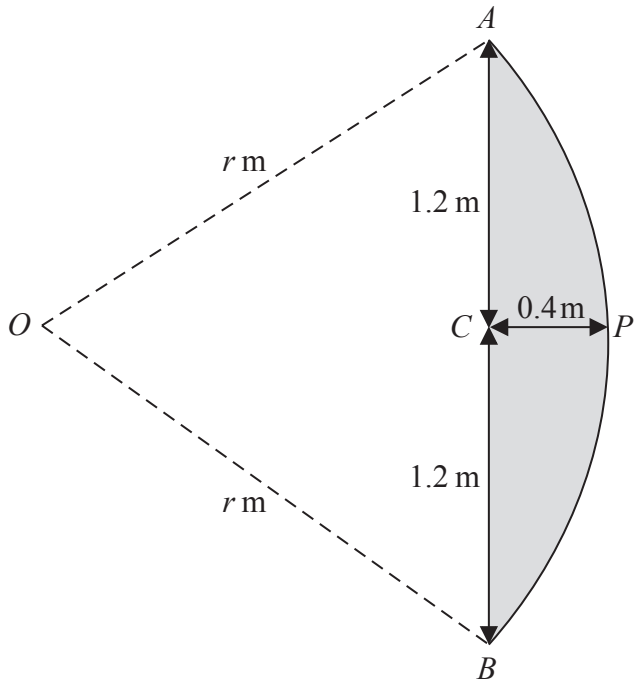

Diagram not drawn to scale

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.

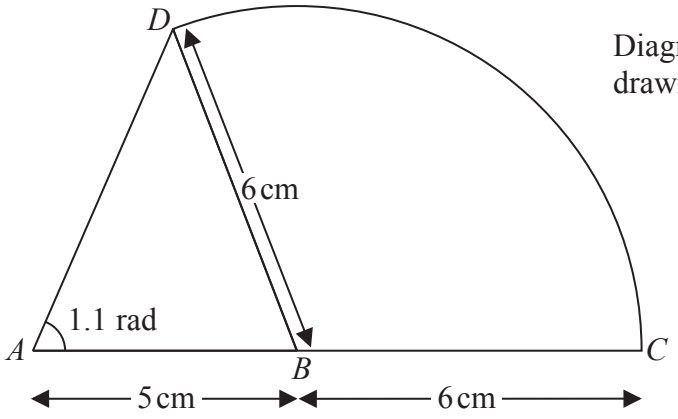

Figure 1

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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15.

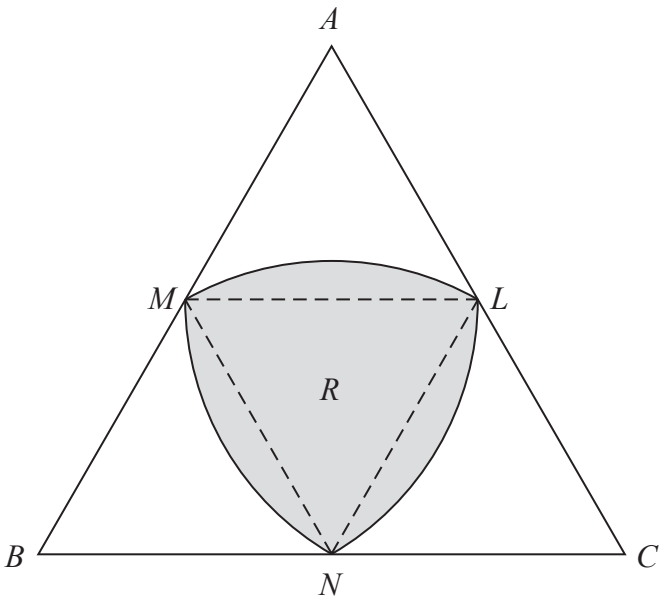

Figure 5

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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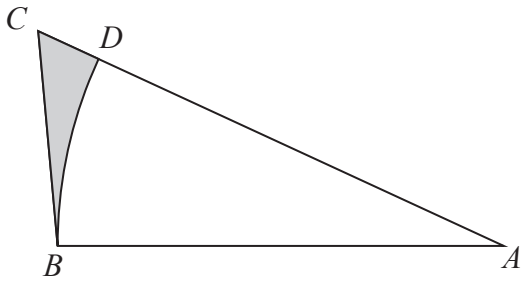

Figure 2

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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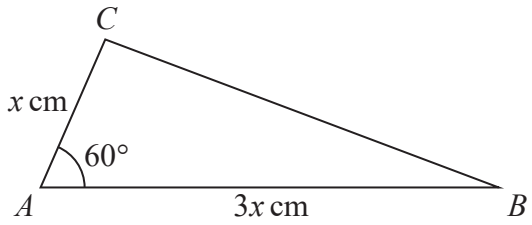

Figure 1

Figure 1 shows a sketch of a triangle ABC with $AB = 3x$ cm, $AC = x$ cm and angle $CAB = 60°$

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)

Leave blank

4.

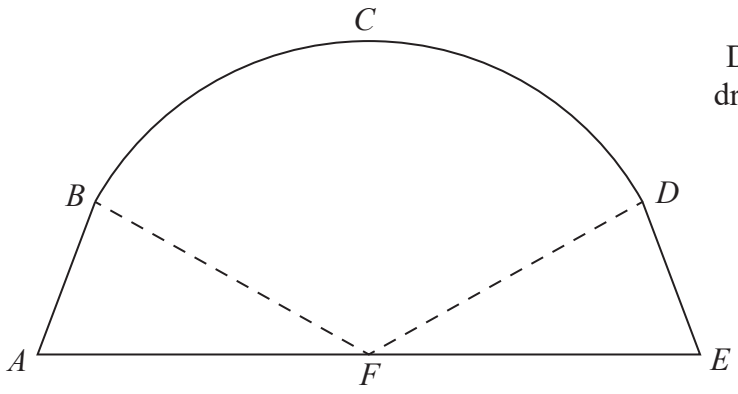

Diagram not drawn to scale

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

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

Find

(a) the length of the arc *BCD* in metres to 2 decimal places,

(2)

(b) the area of the sector *FBCD* in m^2 to 2 decimal places,

(2)

(c) the total area of the cross-section of the tent in m^2 to 2 decimal places.

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA