

9.

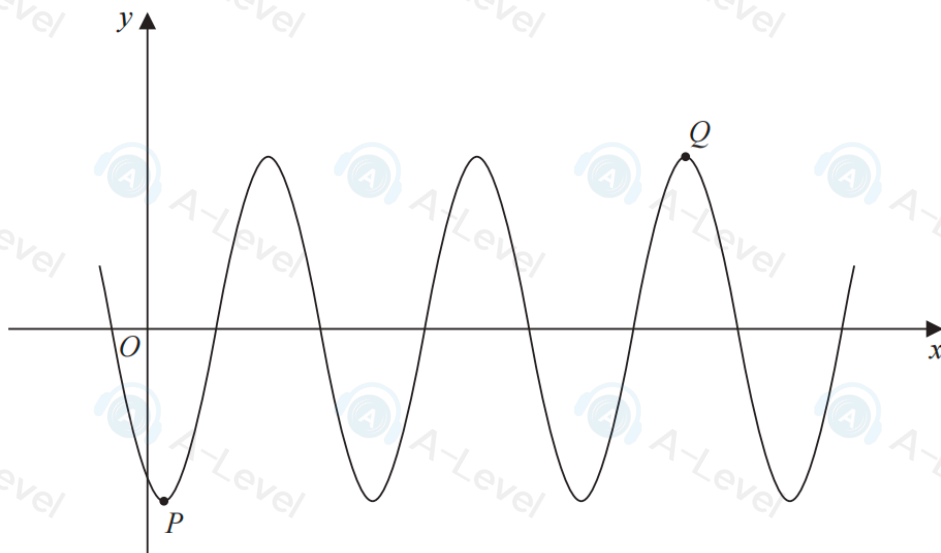


Figure 4

Figure 4 shows part of the curve with equation

$$y = A \cos(x - 30)^\circ$$

where A is a constant.

The point P is a minimum point on the curve and has coordinates $(30, -3)$ as shown in Figure 4.

(a) Write down the value of A .

(1)

The point Q is shown in Figure 4 and is a maximum point.

(b) Find the coordinates of Q .

(3)

4. A parallelogram $ABCD$ has area 40 cm^2

Given that AB has length 10 cm , BC has length 6 cm and angle DAB is obtuse, find

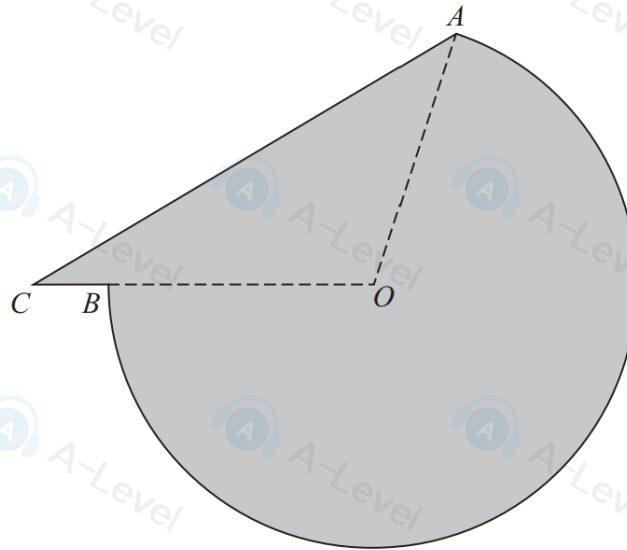
(a) the size of angle DAB , in degrees, to 2 decimal places,

(3)

(b) the length of diagonal BD , in cm, to one decimal place.

(2)

6.



Not to scale

Figure 2

The shaded area in Figure 2 shows the plan view of a helicopter landing pad.

The area consists of the major sector AOB of a circle centre O joined to a triangle AOC .

Given that

- $AO = OB = 15$ m
- $BC = 2$ m
- CBO is a straight line
- angle $ACO = 0.6$ radians

(a) show that angle COA is 1.847 radians to 3 decimal places.

(3)

(b) Find the total area of the helicopter landing pad.
Give your answer in m^2 to 3 significant figures.

(3)

(c) Find the perimeter of the helicopter landing pad.
Give your answer in metres to 3 significant figures.

(3)

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9.

Diagram NOT to scale

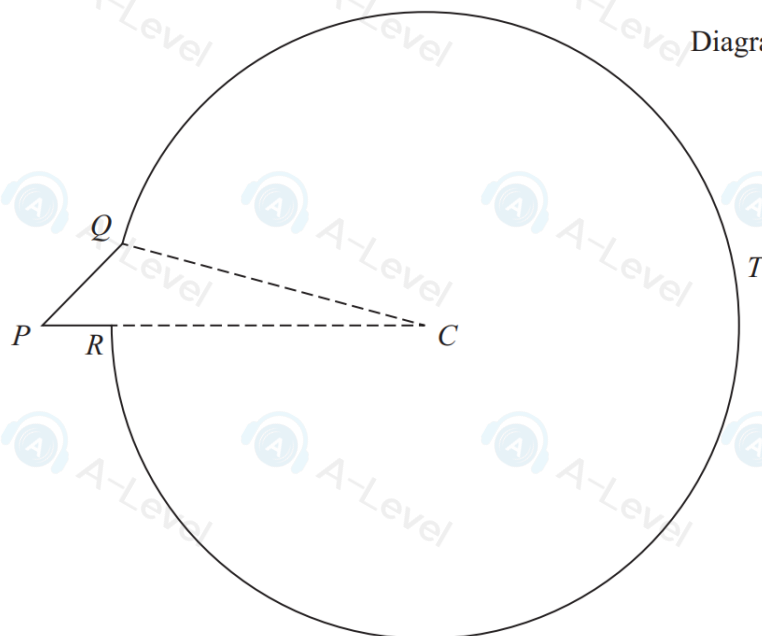


Figure 4

Figure 4 shows the outline of a sign that is used to advertise a bird sanctuary.

The sign is composed of a triangle CPQ joined to a sector $QCRTQ$ of a circle, centre C .

Given that

- angle $QPR = 0.8$ radians
- $PQ = 0.5$ m
- $PC = 1.84$ m
- PRC is a straight line

(a) find the radius, CQ , of the sector, in metres to 3 decimal places.

(2)

(b) Hence show that angle PCQ is 0.236 radians to 3 decimal places.

(2)

(c) Find the total area of the sign, giving your answer in m^2 to one decimal place.

(3)

(d) Find the total perimeter of the sign, giving your answer in metres to one decimal place.

(2)

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9. (i)

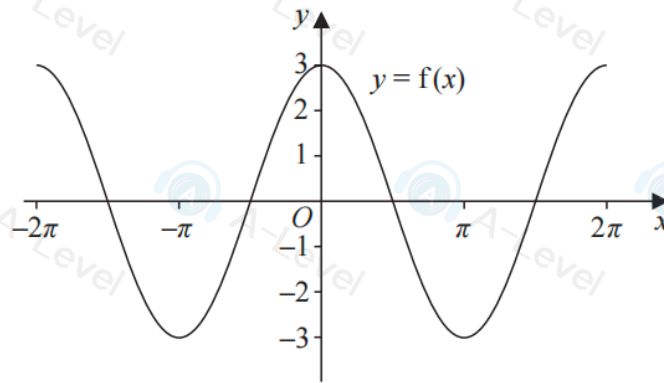


Figure 3

Figure 3 shows part of the graph of the trigonometric function with equation $y = f(x)$

(a) Write down an expression for $f(x)$ (2)

On a separate diagram,

(b) sketch, for $-2\pi < x < 2\pi$, the graph of the curve with equation $y = f\left(x + \frac{\pi}{4}\right)$

Show clearly the coordinates of all the points where the curve intersects the coordinate axes. (3)

(ii)

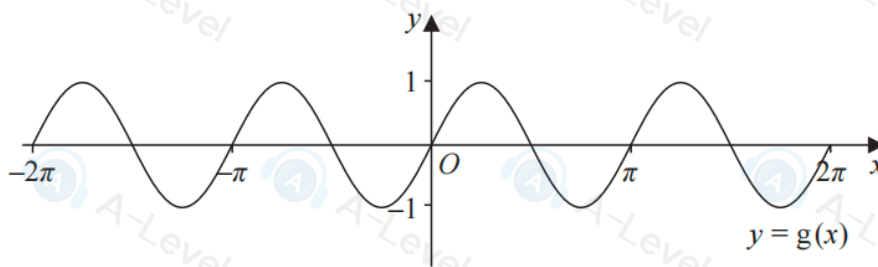


Figure 4

Figure 4 shows part of the graph of the trigonometric function with equation $y = g(x)$

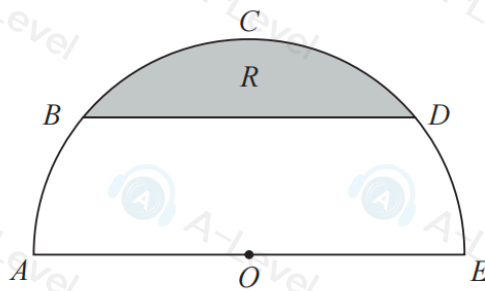
(a) Write down an expression for $g(x)$ (2)

On a separate diagram,

(b) sketch, for $-2\pi < x < 2\pi$, the graph of the curve with equation $y = g(x) - 2$

Show clearly the coordinates of the y intercept. (2)

5.



Not to scale

Figure 2

Figure 2 shows a plan view of a semicircular garden $ABCDEOA$

The semicircle has

- centre O
- diameter AOE
- radius 3 m

The straight line BD is parallel to AE and angle BOA is 0.7 radians.

(a) Show that, to 4 significant figures, angle BOD is 1.742 radians.

(1)

The flowerbed R , shown shaded in Figure 2, is bounded by BD and the arc BCD .

(b) Find the area of the flowerbed, giving your answer in square metres to one decimal place.

(3)

(c) Find the perimeter of the flowerbed, giving your answer in metres to one decimal place.

(3)

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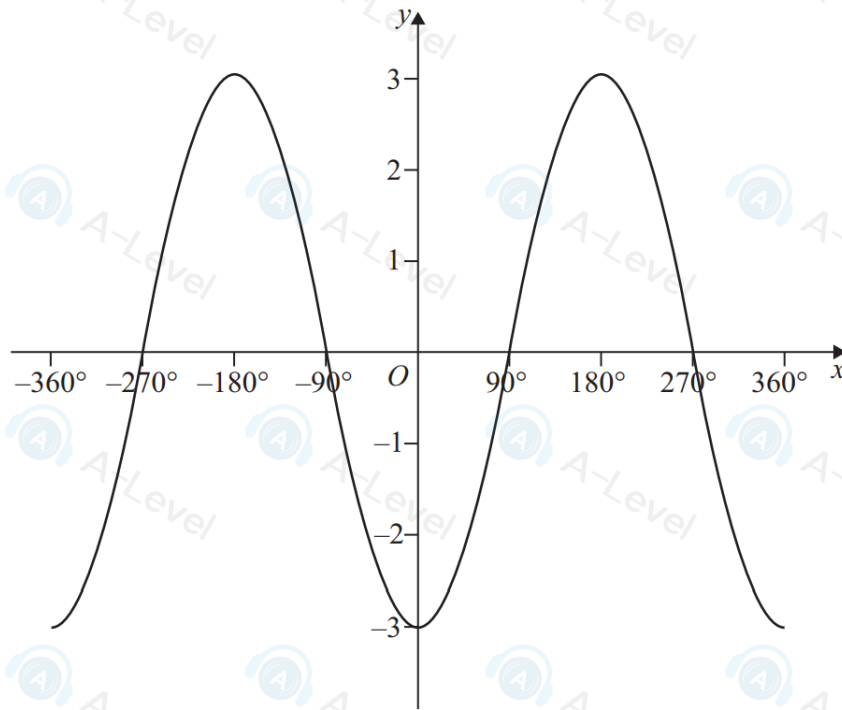


Figure 2

Figure 2 shows part of the graph of the trigonometric function with equation $y = f(x)$, where x is measured in degrees.

(a) Write down an expression for $f(x)$.

(2)

(b) State the number of solutions of the equation

(i) $f(x) = 2$ in the interval $-720^\circ \leq x \leq 720^\circ$

(ii) $f(x) = -3$ in the interval $-720^\circ \leq x \leq 720^\circ$

(2)

7.

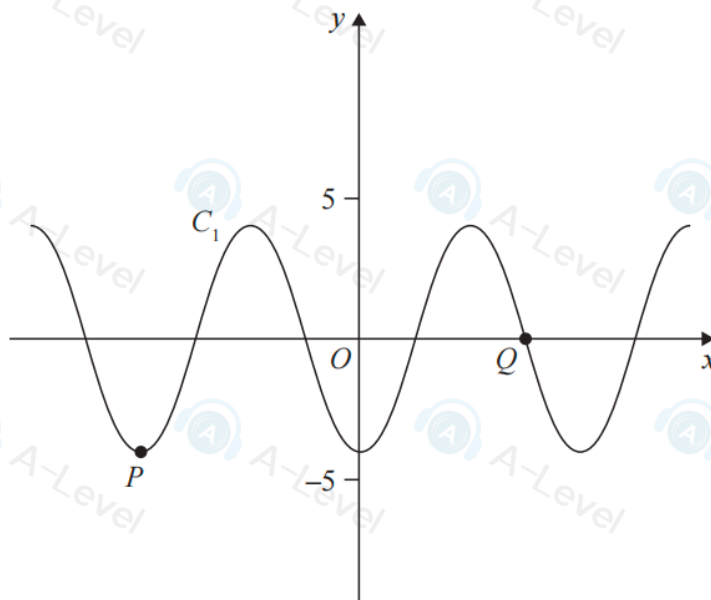


Figure 3

Figure 3 shows a plot of part of the curve C_1 with equation

$$y = -4 \cos x$$

where x is measured in radians.

Points P and Q lie on the curve and are shown in Figure 3.

(a) State

(i) the coordinates of P

(ii) the coordinates of Q

(3)

The curve C_2 has equation $y = -4 \cos x + k$ where x is measured in radians and k is a constant.

Given that C_2 has a maximum y value of 11

(b) (i) state the value of k

(ii) state the coordinates of the minimum point on C_2 with the smallest positive x coordinate.

(3)

On the opposite page there is a copy of Figure 3 labelled Diagram 1.

(c) Using Diagram 1, state the number of solutions of the equation

$$-4 \cos x = 5 - \frac{10}{\pi} x$$

giving a reason for your answer.

(2)

5.

Diagram **NOT**
accurately drawn

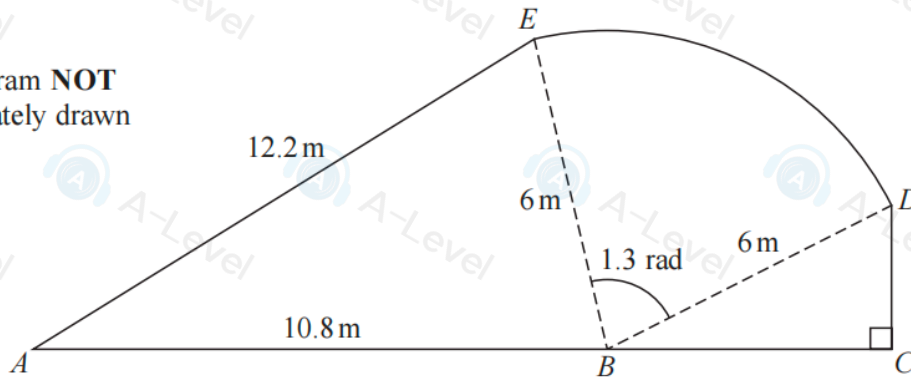


Figure 2

Figure 2 shows the plan view of a garden.

The shape of the garden $ABCDEA$ consists of a triangle ABE and a right-angled triangle BCD joined to a sector BDE of a circle with radius 6 m and centre B .

The points A , B and C lie on a straight line with $AB = 10.8$ m

Angle $BCD = \frac{\pi}{2}$ radians, angle $EBD = 1.3$ radians and $AE = 12.2$ m

- (a) Find the area of the sector BDE , giving your answer in m^2 (2)
- (b) Find the size of angle ABE , giving your answer in radians to 2 decimal places. (2)
- (c) Find the area of the garden, giving your answer in m^2 to 3 significant figures. (3)

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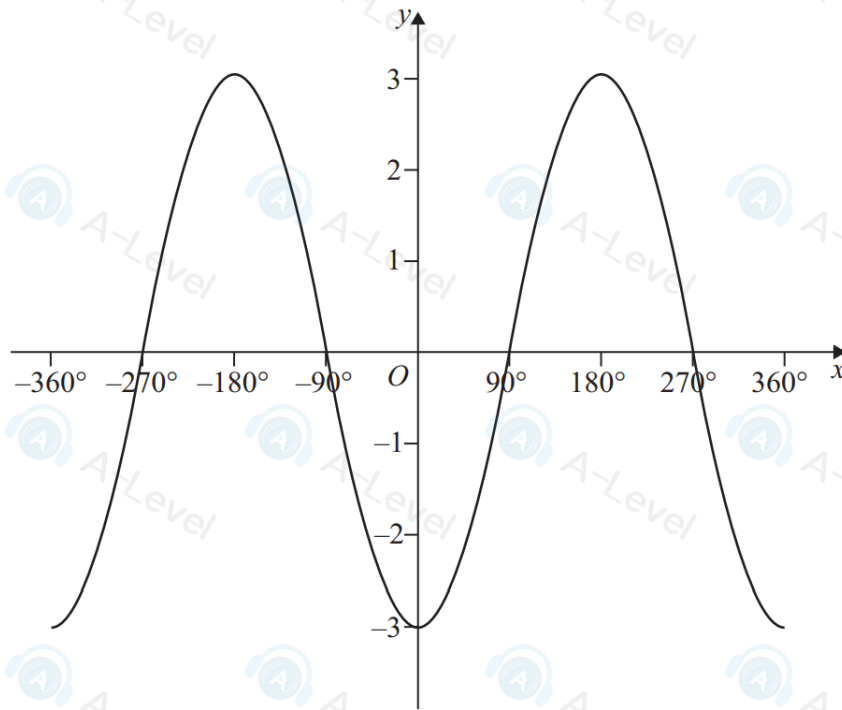


Figure 2

Figure 2 shows part of the graph of the trigonometric function with equation $y = f(x)$, where x is measured in degrees.

(a) Write down an expression for $f(x)$.

(2)

(b) State the number of solutions of the equation

(i) $f(x) = 2$ in the interval $-720^\circ \leq x \leq 720^\circ$

(ii) $f(x) = -3$ in the interval $-720^\circ \leq x \leq 720^\circ$

(2)

8.

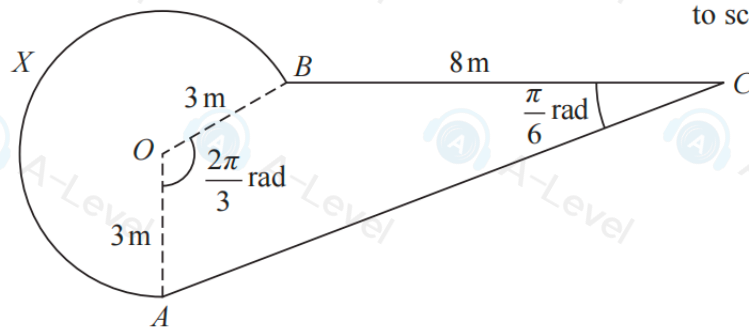


Figure 2

Figure 2 shows the plan view of a design for a pond.

The design consists of a sector $AOBX$ of a circle centre O joined to a quadrilateral $AOBC$.

- $BC = 8$ m
- $OA = OB = 3$ m
- angle AOB is $\frac{2\pi}{3}$ radians
- angle BCA is $\frac{\pi}{6}$ radians

- (a) Calculate (i) the exact area of the sector $AOBX$,
(ii) the exact perimeter of the sector $AOBX$.

(5)

- (b) Calculate the exact area of the triangle AOB .

(2)

- (c) Show that the length AB is $3\sqrt{3}$ m.

(2)

- (d) Find the total surface area of the pond. Give your answer in m^2 correct to 2 significant figures.

(5)

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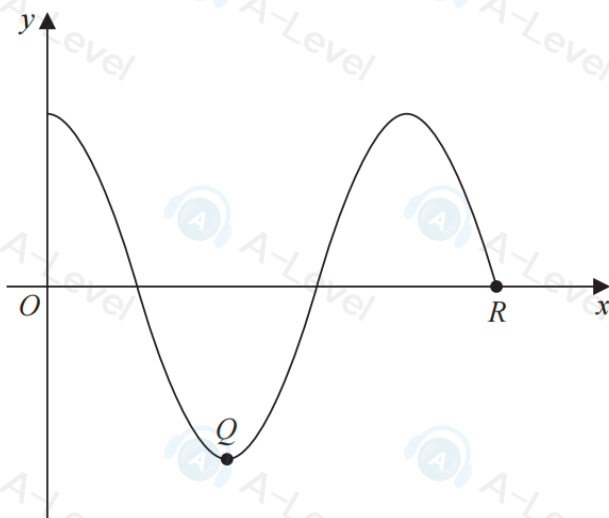


Figure 2

Figure 2 shows a sketch of the curve with equation $y = f(x)$, where

$$f(x) = \cos 2x^\circ \quad 0 \leq x \leq k$$

The point Q and the point $R(k, 0)$ lie on the curve and are shown in Figure 2.

(a) State

- (i) the coordinates of Q ,
- (ii) the value of k .

(3)

(b) Given that there are exactly two solutions to the equation

$$\cos 2x^\circ = p \quad \text{in the region } 0 \leq x \leq k$$

find the range of possible values for p .

(2)