



Name: _____ **Date:** _____ **Score:** _____ / 66

- 1** a. Write 135° in radians, giving your answer as an exact multiple of π .
 b. Convert 2.4 radians to degrees, giving your answer to 1 decimal place.
 c. Find the exact value of $\sin \frac{5\pi}{6}$ (3 marks)

Answer _____

- 2** A sector of a circle has radius 8 cm and angle 0.9 radians.
 Find
 a. the length of the arc,
 b. the perimeter of the sector,
 c. the area of the sector. (4 marks)

Answer _____

- 3** Given that θ is small and measured in radians, use the small angle approximations to show that

$$3 \sin 2\theta + \cos 4\theta \approx a + b\theta + c\theta^2$$
 where a , b and c are integers to be found. (3 marks)

Answer _____

4

A sector of a circle has radius r cm and angle θ radians. The area of the sector is 20 cm^2 and its perimeter is 18 cm.

Find the two possible pairs of values of r and θ .

(5 marks)

Answer

5

The diagram shows a circle with centre O and radius 10 cm . The points A and B lie on the circle and angle $AOB = 1.2\text{ radians}$. The shaded region is the segment cut off by the chord AB .

- Find the area of the shaded segment.
- Find the perimeter of the shaded segment.

Give each answer to 3 significant figures.

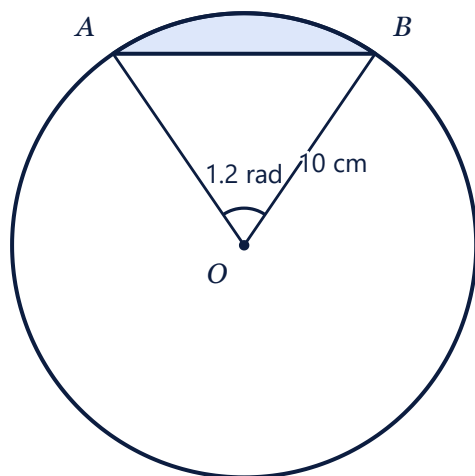


Diagram NOT accurately drawn

(6 marks)

Answer

6 Solve, for $0 \leq x < 2\pi$, the equation

$$2 \cos^2 x + 3 \sin x = 3$$

giving your answers as exact multiples of π .

(5 marks)

Answer _____

7 Solve, for $0 \leq \theta < \pi$, the equation

$$3 \cos(2\theta + 0.5) = 2$$

giving your answers in radians to 3 significant figures.

(5 marks)

Answer _____

8 The equation $\sin \theta + \cos \theta = 1.1$ has a small positive root, $\theta = \alpha$, where θ is measured in radians.

- Use the small angle approximations to show that α is approximately a root of $\theta^2 - 2\theta + 0.2 = 0$
- Hence find an approximate value for α , giving your answer to 4 decimal places and explaining your choice of root.
- Given that the true value of α is 0.10579 to 5 decimal places, find the percentage error in using $1 - \sqrt{0.8}$ as an approximation for α .

(6 marks)

Answer _____

9

The diagram shows a sector OAB of a circle with centre O and radius 6 cm. Angle $AOB = 0.8$ radians. The tangent to the circle at A meets the line OB extended at the point C . The shaded region is bounded by AC , CB and the arc AB .

- Find the length of AC .
- Find the area of the shaded region.
- Find the perimeter of the shaded region.

Give each answer to 3 significant figures.

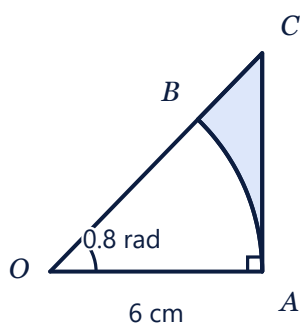


Diagram NOT accurately drawn

(7 marks)

Answer _____

10

The points A and B lie on a circle with centre O and radius 5 cm, and angle $AOB = \theta$ radians, where $0 < \theta < \pi$. The chord AB divides the sector OAB into the triangle OAB and a segment. The area of the segment is equal to the area of the triangle OAB.

- Show that $\theta = 2 \sin \theta$
- Show that this equation has a root between 1.8 and 2.0
- Given that the root is $\theta = 1.8955$ to 4 decimal places, find the area of the segment, giving your answer to 3 significant figures.

(7 marks)

Answer _____

11

A flower bed is in the shape of the region between two arcs of circles with the same centre O , as shown in the diagram. The inner arc has radius r metres and the outer arc has radius $2r$ metres. Both arcs subtend an angle of θ radians at O , and $\theta > 1$

The perimeter of the flower bed is 26 m and its area is 36 m^2 .

- Show that $r^2\theta = 24$
- Show that $r^2 - 13r + 36 = 0$
- Find the value of r and the value of θ , explaining why you reject one solution.

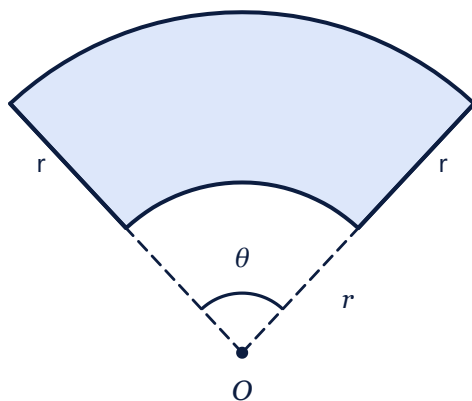


Diagram NOT accurately drawn

(7 marks)

Answer _____

12

A pendulum consists of a small bob on a light string of length L metres. When the string makes an angle θ radians with the vertical, the bob has moved a distance s metres along its circular path from the lowest point, and it is h metres above the lowest point, where

$$h = L(1 - \cos \theta)$$

a. Write down s in terms of L and θ .

b. Show that, when θ is small, $h \approx \frac{s^2}{2L}$

A pendulum with $L = 2$ is pulled back until the string makes an angle of 8° with the vertical.

c. Use the approximation in part (b) to estimate h , and find the percentage error compared with the exact value of h . Give your answers to 2 significant figures.

d. Explain why the approximation becomes less accurate as the angle increases.

(8 marks)

Answer _____

End of questions | Total 66 marks