

Question 2.

- (a) Solve the equation $\sqrt{3} \tan(x) - 3 = 0$ for $0 \leq x \leq 2\pi$.

(8 marks)
(3 marks)

$$\begin{aligned} \sqrt{3} \tan x &= 3 \\ \tan x &= \frac{3}{\sqrt{3}} \quad \checkmark \text{ (1)} \\ \tan x &= \frac{3\sqrt{3}}{3} > \frac{180}{\pi} \quad X \end{aligned}$$

- (b) A function has a period of k and is defined by $f(x) = 4 \cos(2x)$.

- (i) State the value of k . (1 mark)

$$2 \checkmark$$

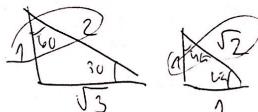
- (ii) State the amplitude of $f(x)$. (1 mark)

$$4 \checkmark$$

- (c) Determine an exact value for $\cos 105^\circ$.

(3 marks)

$$\cos 105^\circ = \cos(60 + 45^\circ)$$



$$\cos(60 + 45^\circ) = \cos 60 \cos 45^\circ - \sin 60 \sin 45^\circ$$

$$\cos(60 + 45^\circ) = \frac{1}{2} \times \frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}}$$

$$\cos(60 + 45^\circ) = \frac{1}{2} \times \frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2}$$

$$\cos(60 + 45^\circ) = \frac{\sqrt{2}}{4} - \frac{\sqrt{6}}{4}$$

$$\cos(60 + 45^\circ) = \frac{\sqrt{2} - \sqrt{6}}{4} \quad \checkmark$$

Question 4

(a) State the exact value of

$$(i) \cos(-\frac{\pi}{3}) = -\frac{\pi}{3} \times \frac{180}{\pi} = -\frac{180}{3} = -60 \quad (1 \text{ mark})$$

$$(ii) \cos 15^\circ = \cos(45^\circ - 30^\circ) = \cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4} \quad (3 \text{ marks})$$

(b) Solve for θ ,

$$(i) \sin(\theta + 90^\circ) = 0 \quad 0^\circ \leq \theta \leq 360^\circ \quad (2 \text{ marks})$$

$$(ii) 3 \tan^2 \theta - 1 = 0 \quad -\pi \leq \theta \leq \pi \quad (3 \text{ marks})$$

$$\gamma \tan^2 \theta = 1$$

$$\tan^2 \theta = \frac{1}{3}$$

$$\tan \theta = \pm \frac{1}{\sqrt{3}}$$

$$\tan \theta = 30^\circ$$

$$\tan \theta = \frac{\pi}{6}$$

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Given that,
Question 5

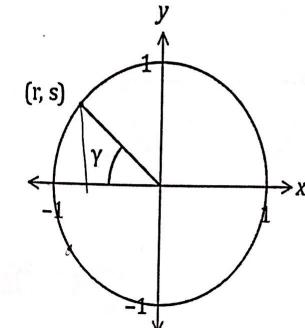
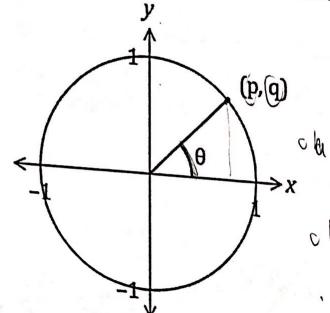


Given that,

Question 5

Question 12

(7 marks)
Consider the points with coordinates (p, q) and (r, s) that lie in the first and second quadrants respectively of the unit circles shown below, where θ and γ are acute angles.



Determine the following in terms of p, q, r and s , simplifying your answers where possible.

$$(a) \tan \theta = \frac{q}{p} \quad (1 \text{ mark})$$

$$(b) \sin(180 - \theta) = -\frac{q}{1} \quad (1 \text{ mark})$$

$$(c) \cos \gamma = \frac{r}{1} \quad (1 \text{ mark})$$

$$(d) \sin(\pi + \gamma) = -\frac{s}{1} \quad (1 \text{ mark})$$

$$(e) \cos(\gamma - \theta) = \frac{rs - qr}{1} \quad (3 \text{ marks})$$

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(6 marks)

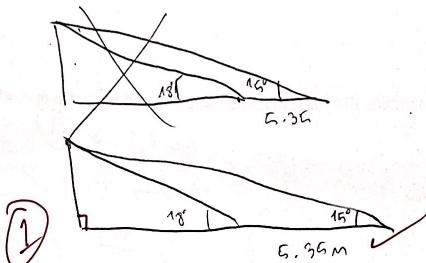
Question 10

A thin pole stands vertically in the middle of a level playing ground. From point *A* on the ground, the angle of elevation to the top of the pole, *T*, is 18° .

From point *B*, also on the ground but 5.35 metres further from the foot of the pole than *A*, the angle of elevation to the top of the pole is 15° .

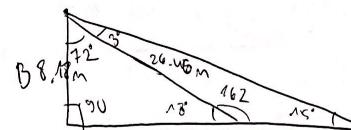
(a) Draw a diagram to represent this information.

(1 marks)



(b) Showing use of trigonometry, determine the height of the post.

(5 marks)



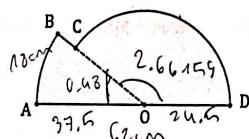
$$\frac{5.35}{\sin 15} = \frac{x}{\sin 18} \quad \text{(1)}$$

$$\frac{26.46}{\sin 18} = \frac{8.18}{\sin 15} \quad \text{(1)}$$

Question 7

(5 marks)

Shape ABCDOA below consists of sector AOB of circle centre O joined to sector COD of a different circle, also centre O. AD is a straight line of length 62 cm, arc AB is 18 cm long and $\angle AOB = 0.48$ radians.



- (a) Determine the length OA.

(2 marks)

$$\begin{aligned} l &= r\theta \\ 18 &= r \cdot 0.48 \quad \text{①} \\ \frac{18}{0.48} &= r \\ r &= 37.5 \quad \text{②} \end{aligned}$$

- (b) Determine the area of the shape.

(3 marks)

$$\begin{aligned} \text{Area of sector small} &= \frac{180 \cdot \frac{\pi}{180}}{360} \cdot \pi \\ &= \frac{1}{2} \cdot 37.5^2 \cdot 0.48 \quad \text{Area big} \\ &= \frac{1}{2} \cdot 24^2 \cdot (\pi - 0.48) \\ \cancel{A = 937.5}^2 &= 798.81 \text{ cm}^2 \quad \text{③} \\ \boxed{A_{\text{total}}} &= 1134.3 \text{ cm}^2 \quad \text{④} \end{aligned}$$

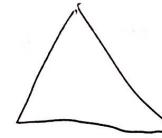
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Question 8

(8 marks)

- (a) Determine the area of triangle PQR when $\angle PQR = 26^\circ$, $\angle PRQ = 122^\circ$ and $PQ = 57$ cm.

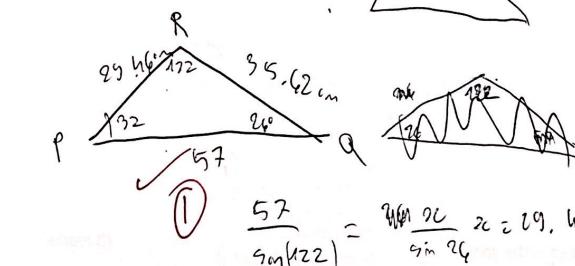
(4 marks)



$$\frac{a+b+c}{2} = \frac{122 \cdot 1}{2} = 61.04 \quad \text{①}$$

$$s = 61.04 \quad \text{②}$$

$$A = \sqrt{61.04} \quad \text{③}$$

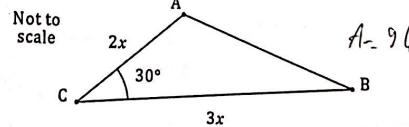


$$A = \sqrt{61.04(61.04 - 29.46)} \quad \text{④}$$

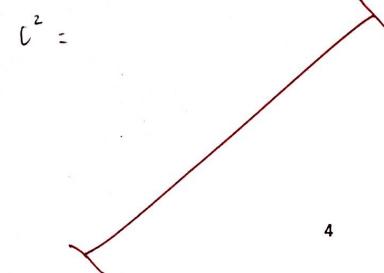
$$A = 1134.3 \text{ cm}^2 \quad \text{⑤}$$

The area of triangle ABC is 96 cm²; $\angle ACB = 30^\circ$ and $2BC = 3AC$ as shown in the diagram. Determine the length of AB.

(4 marks)



$$\begin{aligned} 2BC &= 3AC \\ 2(2x) &= 3(3x) \quad X \\ 6x &= 6x \end{aligned}$$



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