

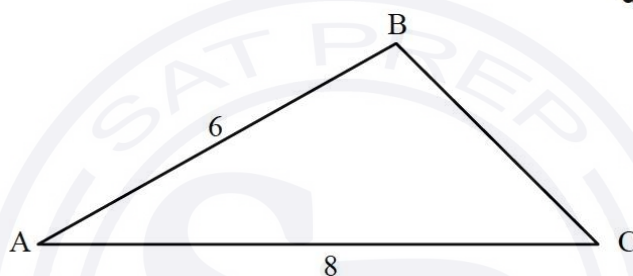
Subject – Math AA(Standard Level)
Topic - Geometry and Trigonometry
Year - May 2021 – Nov 2022
Paper -1
Questions

Question 1

[Maximum mark: 5]

The following diagram shows triangle ABC, with $AB = 6$ and $AC = 8$.

diagram not to scale



- (a) Given that $\cos \hat{A} = \frac{5}{6}$, find the value of $\sin \hat{A}$. [3]
- (b) Find the area of triangle ABC. [2]

Question 2

[Maximum mark: 8]

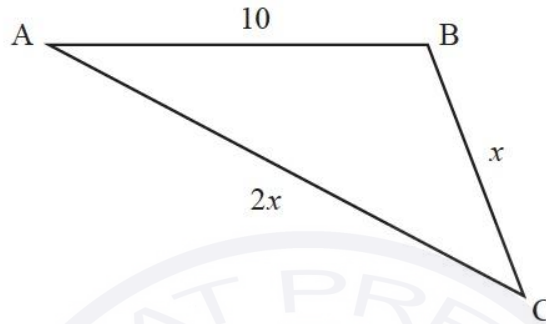
- (a) Show that $\sin 2x + \cos 2x - 1 = 2 \sin x (\cos x - \sin x)$. [2]
- (b) Hence or otherwise, solve $\sin 2x + \cos 2x - 1 + \cos x - \sin x = 0$ for $0 < x < 2\pi$. [6]

Question 3

[Maximum mark: 7]

The following diagram shows triangle ABC, with $AB = 10$, $BC = x$ and $AC = 2x$.

diagram not to scale



Given that $\cos \hat{C} = \frac{3}{4}$, find the area of the triangle.

Give your answer in the form $\frac{p\sqrt{q}}{2}$ where $p, q \in \mathbb{Z}^+$.

Question 4

[Maximum mark: 6]

(a) Show that the equation $2 \cos^2 x + 5 \sin x = 4$ may be written in the form $2 \sin^2 x - 5 \sin x + 2 = 0$.

[1]

(b) Hence, solve the equation $2 \cos^2 x + 5 \sin x = 4$, $0 \leq x \leq 2\pi$.

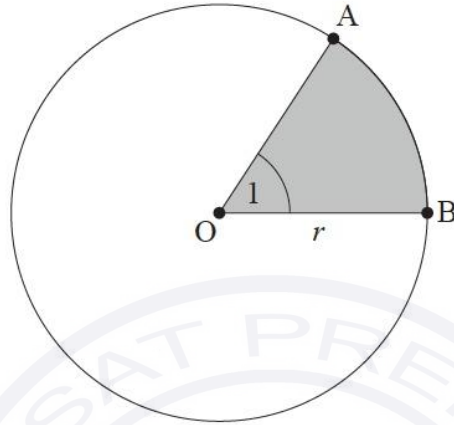
[5]

Question 5

[Maximum mark: 6]

The following diagram shows a circle with centre O and radius r .

diagram not to scale



Points A and B lie on the circumference of the circle, and $\widehat{AOB} = 1$ radian.

The perimeter of the shaded region is 12.

- (a) Find the value of r . [3]
- (b) Hence, find the exact area of the **non-shaded** region. [3]

Question 6

[Maximum mark: 7]

- (a) Show that $2x - 3 - \frac{6}{x-1} = \frac{2x^2 - 5x - 3}{x-1}$, $x \in \mathbb{R}$, $x \neq 1$. [2]
- (b) Hence or otherwise, solve the equation $2\sin 2\theta - 3 - \frac{6}{\sin 2\theta - 1} = 0$ for $0 \leq \theta \leq \pi$, $\theta \neq \frac{\pi}{4}$. [5]

Question 7

[Maximum mark: 7]

Consider the functions $f(x) = \sqrt{3} \sin x + \cos x$ where $0 \leq x \leq \pi$ and $g(x) = 2x$ where $x \in \mathbb{R}$.

- (a) Find $(f \circ g)(x)$. [2]
- (b) Solve the equation $(f \circ g)(x) = 2 \cos 2x$ where $0 \leq x \leq \pi$. [5]

Question 8

[Maximum mark: 5]

Consider the points $A(-2, 20)$, $B(4, 6)$ and $C(-14, 12)$. The line L passes through the point A and is perpendicular to $[BC]$.

(a) Find the equation of L . [3]

The line L passes through the point $(k, 2)$.

(b) Find the value of k . [2]

Question 9

[Maximum mark: 5]

Find the least positive value of x for which $\cos\left(\frac{x}{2} + \frac{\pi}{3}\right) = \frac{1}{\sqrt{2}}$.

Question 10

[Maximum mark: 5]

Let a be a constant, where $a > 1$.

(a) Show that $a^2 + \left(\frac{a^2 - 1}{2}\right)^2 = \left(\frac{a^2 + 1}{2}\right)^2$. [3]

Consider a right-angled triangle with sides of length a , $\left(\frac{a^2 - 1}{2}\right)$ and $\left(\frac{a^2 + 1}{2}\right)$.

(b) Find an expression for the area of the triangle in terms of a . [2]

Question 11

[Maximum mark: 7]

Consider a circle with a diameter AB , where A has coordinates $(1, 4, 0)$ and B has coordinates $(-3, 2, -4)$.

(a) Find

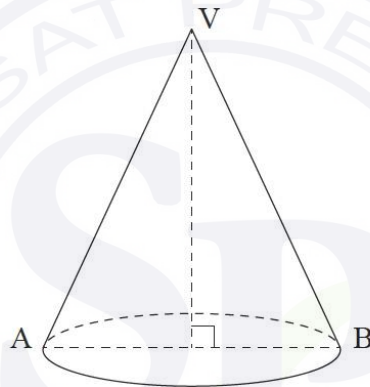
(i) the coordinates of the centre of the circle;

(ii) the radius of the circle.

[4]

The circle forms the base of a right cone whose vertex V has coordinates $(-1, -1, 0)$.

diagram not to scale



(b) Find the exact volume of the cone.

[3]