

Trigonometry

Question Paper 4

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Trigonometry
Sub Topic	
Booklet	Question Paper 4

Time Allowed: **62 minutes**

Score: **/51**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 (i) Sketch, on the same diagram, the graphs of $y = \sin x$ and $y = \cos 2x$ for $0^\circ \leq x \leq 180^\circ$. [3]

(ii) Verify that $x = 30^\circ$ is a root of the equation $\sin x = \cos 2x$, and state the other root of this equation for which $0^\circ \leq x \leq 180^\circ$. [2]

(iii) Hence state the set of values of x , for $0^\circ \leq x \leq 180^\circ$, for which $\sin x < \cos 2x$. [2]

2 (i) Given that

$$3 \sin^2 x - 8 \cos x - 7 = 0,$$

show that, for real values of x ,

$$\cos x = -\frac{2}{3}. \quad [3]$$

(ii) Hence solve the equation

$$3 \sin^2(\theta + 70^\circ) - 8 \cos(\theta + 70^\circ) - 7 = 0$$

for $0^\circ \leq \theta \leq 180^\circ$. [4]

3 (i) Show that the equation $2 \tan^2 \theta \sin^2 \theta = 1$ can be written in the form

$$2 \sin^4 \theta + \sin^2 \theta - 1 = 0. \quad [2]$$

(ii) Hence solve the equation $2 \tan^2 \theta \sin^2 \theta = 1$ for $0^\circ \leq \theta \leq 360^\circ$. [4]

4 (i) Prove the identity $\frac{\cos \theta}{\tan \theta(1 - \sin \theta)} \equiv 1 + \frac{1}{\sin \theta}$. [3]

(ii) Hence solve the equation $\frac{\cos \theta}{\tan \theta(1 - \sin \theta)} = 4$, for $0^\circ \leq \theta \leq 360^\circ$. [3]

5 (i) Prove the identity $\left(\frac{1}{\sin \theta} - \frac{1}{\tan \theta}\right)^2 \equiv \frac{1 - \cos \theta}{1 + \cos \theta}$. [3]

(ii) Hence solve the equation $\left(\frac{1}{\sin \theta} - \frac{1}{\tan \theta}\right)^2 = \frac{2}{5}$, for $0^\circ \leq \theta \leq 360^\circ$. [4]

6 (i) Prove the identity $\frac{\sin x \tan x}{1 - \cos x} \equiv 1 + \frac{1}{\cos x}$. [3]

(ii) Hence solve the equation $\frac{\sin x \tan x}{1 - \cos x} + 2 = 0$, for $0^\circ \leq x \leq 360^\circ$. [3]

7 Prove the identity

$$\tan^2 x - \sin^2 x \equiv \tan^2 x \sin^2 x. \quad [4]$$

8 Solve the equation $15 \sin^2 x = 13 + \cos x$ for $0^\circ \leq x \leq 180^\circ$. [4]

9 The acute angle x radians is such that $\tan x = k$, where k is a positive constant. Express, in terms of k ,

(i) $\tan(\pi - x)$, [1]

(ii) $\tan\left(\frac{1}{2}\pi - x\right)$, [1]

(iii) $\sin x$. [2]