Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Trigonometry

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Pink or Green)	Nil

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

1. (*a*) Show that the equation

$$5\cos^2 x = 3(1 + \sin x)$$

can be written as

$$5\sin^2 x + 3\sin x - 2 = 0.$$

(2)

(*b*) Hence solve, for $0 \leq x < 360°$, the equation

$$5\cos^2 x = 3(1 + \sin x),$$

giving your answers to 1 decimal place where appropriate.

(5)

a) $5(1 - \sin^2 x) = 3(1 + \sin x)$

$5 - 5\sin^2 x = 3 + 3\sin x$

$0 = 5\sin^2 x + 3\sin x - 2$

b) $(5\sin x - 2)(\sin x + 1) = 0$

$\sin x = 2/5 \qquad \sin x = -1$

$x = 23.6°, \qquad x = 270°$

$156.4°$

$\underline{\underline{x = 23.6°, 156.4°, 270°}}$

2. (*a*) Show that the equation

$$3 \sin^2 \theta - 2 \cos^2 \theta = 1$$

can be written as

$$5 \sin^2 \theta = 3.$$

(2)

(*b*) Hence solve, for $0° \leq \theta < 360°$, the equation

$$3 \sin^2 \theta - 2 \cos^2 \theta = 1,$$

giving your answer to 1 decimal place.

(7)

a) $3 \sin^2 \theta - 2(1 - \sin^2 \theta) = 1$

$3 \sin^2 \theta - 2 + 2\sin^2 \theta = 1$

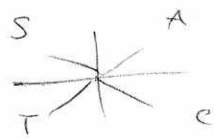
$5\sin^2 \theta - 2 = 1$

$5\sin^2 \theta = 3$

b/ $\sin^2 \theta = \frac{3}{5}$

$\sin \theta = \pm\sqrt{3/5}$

$\theta = 50.8°, 129.2°$ $\quad \theta = -50.8, 230.8, 309.2$



$\underline{\theta = 50.8°, 129.2°, 230.8°, 309.2°}$

3. Find all the solutions, in the interval $0 \leq x < 2\pi$, of the equation

$$2 \cos^2 x + 1 = 5 \sin x,$$

giving each solution in terms of π.

(6)

$2(1 - \sin^2 x) + 1 = 5 \sin x$

$2 - 2\sin^2 x + 1 = 5 \sin x$

$0 = 2\sin^2 x + 5 \sin x - 3$

$(2 \sin x - 1)(\sin x + 3)$

$\sin x = \frac{1}{2}$ $\quad \sin x = -3$

NO SOLUTIONS

$x = \frac{1}{6}\pi, \frac{5}{6}\pi$

4. (*a*) Given that $\sin \theta = 5 \cos \theta$, find the value of $\tan \theta$.

(1)

(*b*) Hence, or otherwise, find the values of θ in the interval $0 \leq \theta < 360°$ for which

$$\sin \theta = 5 \cos \theta,$$

giving your answers to 1 decimal place.

(3)

a/ $\sin \theta = 5 \cos \theta$

$\tan \theta = 5$

b/ $\tan \theta = 5$

$\theta = 78.7°, 258.7°$

5. Solve, for $0 \leq x \leq 180°$, the equation

(*a*) $\sin(x + 10°) = \frac{\sqrt{3}}{2}$,

(4)

(*b*) $\cos 2x = -0.9$, giving your answers to 1 decimal place.

(4)

a) $x + 10 = 60°, 120°$

$\underline{x = 50°, 110°}$

b) ~~co~~ $2x = 154.16, 205.84$

$\underline{x = 77.1°, 102.9°}$

6. (*a*) Show that the equation

$$4\sin^2 x + 9\cos x - 6 = 0$$

can be written as

$$4\cos^2 x - 9\cos x + 2 = 0.$$

(2)

(*b*) Hence solve, for $0 \leq x < 720°$,

$$4\sin^2 x + 9\cos x - 6 = 0,$$

giving your answers to 1 decimal place.

(6)

a) $4(1 - \cos^2 x) + 9\cos x - 6 = 0$

$4 - 4\cos^2 x + 9\cos x - 6 = 0$

$-4\cos^2 x + 9\cos x - 2 = 0$

$4\cos^2 x - 9\cos x + 2 = 0$

b/ $(4\cos x - 1)(\cos x - 2) = 0$

$\cos x = 1/4 \quad \cos x = 2$

NO SOLUTIONS

$x = 75.5°, 284.5°, 435.5°, 644.5°$

7. (i) Solve, for $-180° \leq \theta < 180°$,

$$(1 + \tan\theta)(5\sin\theta - 2) = 0.$$

(4)

(ii) Solve, for $0 \leq x < 360°$,

$$4\sin x = 3\tan x.$$

(6)

(i) $\tan\theta = -1$ $\quad \sin\theta = \frac{2}{5}$

$\theta = -45°, 135°$ $\quad \theta = 23.6°, 156.4°$ $\quad$ (1dp)

ii) $4\sin x = \dfrac{3\sin x}{\cos x}$

$4\sin x\cos x = 3\sin x$

$4\sin x\cos x - 3\sin x = 0$

$\sin x(4\cos x - 3) = 0$

$\sin x = 0$ $\quad \cos x = \frac{3}{4}$

$\underline{x = 0, 180°}$ $\quad \underline{x = 41.4°, 318.6°}$

8. (*a*) Find all the values of θ, to 1 decimal place, in the interval $0° \leq \theta < 360°$ for which

$$5 \sin (\theta + 30°) = 3.$$

(4)

(*b*) Find all the values of θ, to 1 decimal place, in the interval $0° \leq \theta < 360°$ for which

$$\tan^2 \theta = 4.$$

(5)

a) $\sin(\theta + 30) = 3/5$

$\theta + 30 = 36.9, 143.1$

$\theta = 6.9°, 113.1°$

b/ $\tan^2 \theta = 4$

$\tan \theta = \pm 2$

$\theta = 63.4°, 243.4°$

$\theta = -63.4$

$= \underline{116.6°, 296.6°}$

θ

$\underline{\theta = 63.4°, 116.6°, 243.4°, 296.6°}$

9. Solve, for $0 \leq x < 360°$,

(*a*) $\sin(x - 20°) = \frac{1}{\sqrt{2}}$,

(4)

(*b*) $\cos 3x = -\frac{1}{2}$.

(6)

a) $x - 20 = 45°, 135°$

$x = 65°, 155°$

b/ $\cos 3x = -\frac{1}{2}$

$3x = 120°, 240°, 480°, 600°, 840°, 960°$

$x = 40°, 80°, 160°, 200°, 280°, 320°$

10. (*a*) Sketch, for $0 \leq x \leq 2\pi$, the graph of $y = \sin\left(x + \frac{\pi}{6}\right)$.

(2)

(*b*) Write down the exact coordinates of the points where the graph meets the coordinate axes.

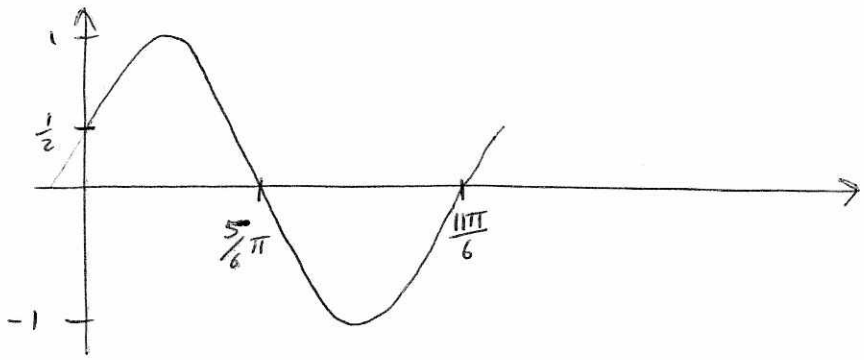
(3)

(*c*) Solve, for $0 \leq x \leq 2\pi$, the equation

$$\sin\left(x + \frac{\pi}{6}\right) = 0.65,$$

giving your answers in radians to 2 decimal places.

(5)



c/ $x + \frac{\pi}{6} = 0.7075844367, \ 2.434008217$

$x = \underline{0.18^c, \ 1.91^c}$