

1 Solve, for $0 \leq x < 180^\circ$, the equation,

$$\cos(2x + 15) = 0.3$$

Give your answers to one decimal place.

(Total for question 1 is 5 marks)

2 Solve, for $0 \leq \theta < 180^\circ$, the equation,

$$\sin(3\theta - 15) = 0.7$$

Give your answers to two decimal places.

(Total for question 2 is 5 marks)

3 Solve, for $-180 \leq \theta < 180^\circ$, the equation,

$$\tan(\theta + 30) = -2.5$$

Give your answers to one decimal place.

(Total for question 3 is 4 marks)

4 Solve, for $0 \leq x < 360^\circ$, the equation,

$$5 \cos(x - 40) = 2$$

Give your answers to two decimal places.

(Total for question 4 is 4 marks)

5 Solve, for $0 \leq x < 360^\circ$, the equation,

$$\tan^2(x) = 3$$

(Total for question 5 is 5 marks)

6

- (a) Show that the equation

$$2 \sin^2 x = 7 \cos x + 5$$

Can be written in the form

$$2 \cos^2 x + 7 \cos x + 3 = 0$$

(3)

- (b) Hence solve, for $0 \leq x < 360^\circ$, the equation,

$$2 \sin^2 x = 7 \cos x + 5$$

(5)

(Total for question 6 is 8 marks)

7

- (a) Show that the equation $6 \cos^2 x = 4 - \sin x$ can be written in the form $6 \sin^2 x - \sin x - 2 = 0$

(3)

- (b) Hence solve, for $0 \leq x < 360^\circ$, the equation, $6 \cos^2 x = 4 - \sin x$. Give your answers to one decimal place where appropriate.

(6)

(Total for question 7 is 9 marks)

- 8** Find all values for x in the interval $0 \leq x < 360^\circ$, for which $2 \cos^2 x - 3 \sin^2 x = 14 \cos x$. Give your answers to one decimal place.

(Total for question 8 is 8 marks)

9

- (a) Sketch the graph of $y = \sin(x - 30)$ for x in the interval $0 \leq x < 360^\circ$

(2)

- (b) Find all values for x in the interval $0 \leq x < 360^\circ$, for which $\sin(x - 30) = 0.3$. Give your answers to one decimal place.

(4)

(Total for question 9 is 6 marks)

- 10** Find all values for x in the interval $0 \leq x < 360^\circ$, for which $3 \tan x = 4 \sin x$. Give your answers to one decimal place where appropriate.

(Total for question 10 is 7 marks)

11

- (a) Show that the equation $3 \sin 2x \tan 2x = \cos 2x + 2$ can be written in the form $4 \cos^2 2x + 2 \cos 2x - 3 = 0$

(4)

- (b) Find all values for x in the interval $0 \leq x < 180^\circ$, for which $3 \sin 2x \tan 2x = \cos 2x + 2$.
Give your answers to two decimal places.

(6)

(Total for question 11 is 10 marks)

12

- (a) Show that the equation $1 + \cos x = 3 \tan x \sin x$ can be written in the form $4 \cos^2 x + \cos x - 3 = 0$

(4)

- (b) Hence solve, for $0 \leq x < 360^\circ$, the equation, $1 + \cos x = 3 \tan x \sin x$. Give your answers to one decimal place where appropriate.

(5)

(Total for question 12 is 9 marks)

13

(a) Show that $\frac{6 \cos^2 \theta + 7 \sin \theta - 8}{1 - 2 \sin \theta} \equiv 3 \sin \theta - 2$

(4)

(b) Hence solve, for $0 \leq \theta < 360^\circ$, the equation, $\frac{6 \cos^2 \theta + 7 \sin \theta - 8}{1 - 2 \sin \theta} = 2 \cos \theta - 2$

(3)

(Total for question 13 is 7 marks)

14

- (a) Solve, for $360 \leq \theta < 720^\circ$, the equation, $3 \cos \theta = 8 \tan \theta$

(5)

- (b) The first four positive solutions, in order of size, of the equation $\cos(2a + 50) = 0.7$ are a_1 , a_2 , a_3 and a_4 . To the nearest degree find the value of a_4 .

(3)

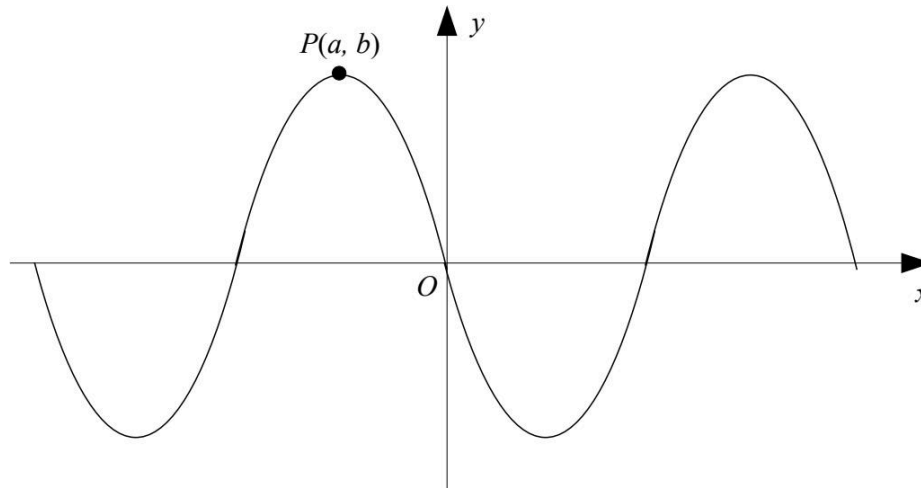
(Total for question 14 is 8 marks)

- 15** Solve the equation $\tan^2 2x - 3 = 0$ giving all the solutions for the interval $0 \leq x < 360^\circ$

(Total for question 15 is 4 marks)

- 16** Given $\cos(75^\circ) = \frac{\sqrt{6}-\sqrt{2}}{4}$ and $\sin(75^\circ) = \frac{\sqrt{6}+\sqrt{2}}{4}$. Show that $\tan^2(75^\circ)$ can be written in the form $a + b\sqrt{3}$. Fully justify your answer.

(Total for question 16 is 3 marks)



The graph shows part of the curve with equation $y = 4 \sin x^\circ$. The point P is a maximum point on the curve with a being the smallest negative value of x that a maximum occurs.

- (a) State the value of a and the value of b .

(1)

- (b) State the coordinates of the point to which P is mapped by the transformation which transforms the curve with equation $y = 4 \sin x^\circ$ to the curve with equation (i) $y = 4 \sin(x + 28)$ (ii) $y = 4 \sin(3x)$

(2)

- (c) Solve, for $360 \leq \theta < 720^\circ$, $4 \sin \theta = \tan \theta$. Give your answers to one decimal place where appropriate.

(5)

(Total for question 17 is 8 marks)

- 18** Solve $\tan 2\theta - 1 = 0$ giving all the solutions for the interval $0 \leq \theta < 360^\circ$

(Total for question 18 is 3 marks)

19

- (a) Solve $6 \sin^2 \theta = \cos \theta + 4$ giving all the solutions for the interval $0 \leq \theta < 360^\circ$

(4)

- (b) Hence, solve $6 \sin^2 2\theta = \cos 2\theta + 4$ giving all the solutions for the interval $0 \leq \theta < 360^\circ$

(2)

(Total for question 19 is 6 marks)

- 20** At 12 noon the temperature in Harry's house is 22°C . At 6 pm the temperature in Harry's house is 25°C . Harry models the temperature in his house, T , by the formula

$$T = A + B \sin(15h)$$

where h is the number of hours after 12 noon.

- (a) State the value that Harry should use for A .

(1)

- (b) State the value that Harry should use for B .

(1)

- (c) Using this model, calculate the temperature in Harry's house at 9 pm.

(1)

- (d) Using the model find the number of hours in a day that the temperature will be above 23.5°C

(4)

(Total for question 20 is 7 marks)

- 21** It is given that $\sin y = -0.2$ and $180^{\circ} < y < 270^{\circ}$
Find the exact value of $\cos y$

(Total for question 21 is 2 marks)

22 Jacob has to solve the equation

$$3 - \sin x = 1 + 2 \cos^2 x$$

where $-180^\circ \leq x < 180^\circ$

Jacob's working is as follows:

$$3 - \sin x = 1 + 2 \cos^2 x$$

$$2 - \sin x = 2 \cos^2 x$$

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

$$2 - \sin x = 2 - 2 \sin^2 x$$

$$-\sin x = -2 \sin^2 x$$

$$1 = 2 \sin x$$

$$\sin x = 0.5$$

$$x = 30^\circ$$

(a) Explain the two errors that Jacob has made.

(2)

(b) Write down all the values of x that satisfy the equation

$$3 - \sin x = 1 + 2 \cos^2 x$$

where $-180^\circ \leq x < 180^\circ$

(2)

(Total for question 22 is 4 marks)

23 Find all solutions of

$$6 \cos^2 x + 5 \sin x - 7 = 0$$

where $0^\circ \leq x < 360^\circ$

Give your solutions to the nearest degree.

(Total for question 23 is 4 marks)

24

- (a) Show that the equation

$$2 \sin^2 x = 4 \cos^2 x - \cos x$$

can be expressed in the form

$$6 \cos^2 x - \cos x - 2 = 0$$

(3)

- (b) Hence, solve the equation

$$2 \sin^2 2\theta = 4 \cos^2 2\theta - \cos 2\theta$$

giving all values of θ between 0° and 180° , correct to 1 decimal place.

(5)

(Total for question 24 is 8 marks)

25

(a) Solve the equation $\sin^2 x = 0.25$ for $0^\circ \leq x < 360^\circ$

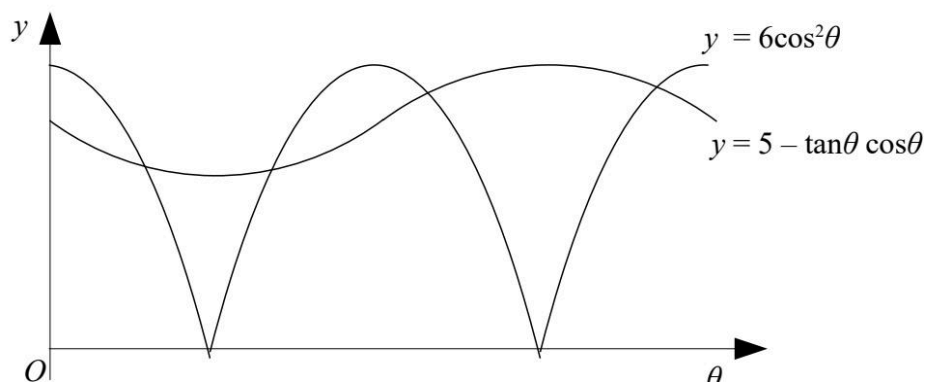
(3)

(b) Solve the equation $\tan 3x = 1$ for $0^\circ \leq x < 180^\circ$

(3)

(Total for question 25 is 6 marks)

- 26 The diagram shows parts of the curves $y = 6 \cos^2 \theta$ and $y = 5 - \tan \theta \cos \theta$, where θ is in degrees.



- (a) Show that the equation $5 - \tan \theta \cos \theta = 6 \cos^2 \theta$ can be expressed in the form $6 \sin^2 x - \sin x - 1 = 0$

(2)

- (b) Solve the inequality $5 - \tan \theta \cos \theta > 6 \cos^2 \theta$ for $0^\circ \leq \theta < 360^\circ$

(5)

(Total for question 26 is 7 marks)

27

(a) Solve the equation $\sin^2 x = \tan^2 x$ for $0^\circ \leq x \leq 180^\circ$

(5)

(b) Prove that $\frac{2\sin x - \cos^2 x + 1}{2 + \sin x} \equiv \sin x$

(3)

(Total for question 27 is 8 marks)

28

- (a) Sketch the graphs of $y = 3 \cos x$ and $y = \sin x$ for $0^\circ \leq x \leq 180^\circ$ on the same axes.

(2)

- (b) Find the exact coordinates of the point of intersection of these graphs, giving the answer in the form $(\arctan a, k\sqrt{b})$, where a and b are integers and k is rational.

(4)

(Total for question 28 is 6 marks)

29 Solve the equation $5 \sin x = 3 \cos x$ for $0^\circ \leq x \leq 360^\circ$

(Total for question 29 is 3 marks)

30 Solve the equation $24 \tan x + 5 \cos x = 0$ for $0^\circ \leq x \leq 360^\circ$, giving your answers to the nearest degree

(Total for question 30 is 6 marks)
