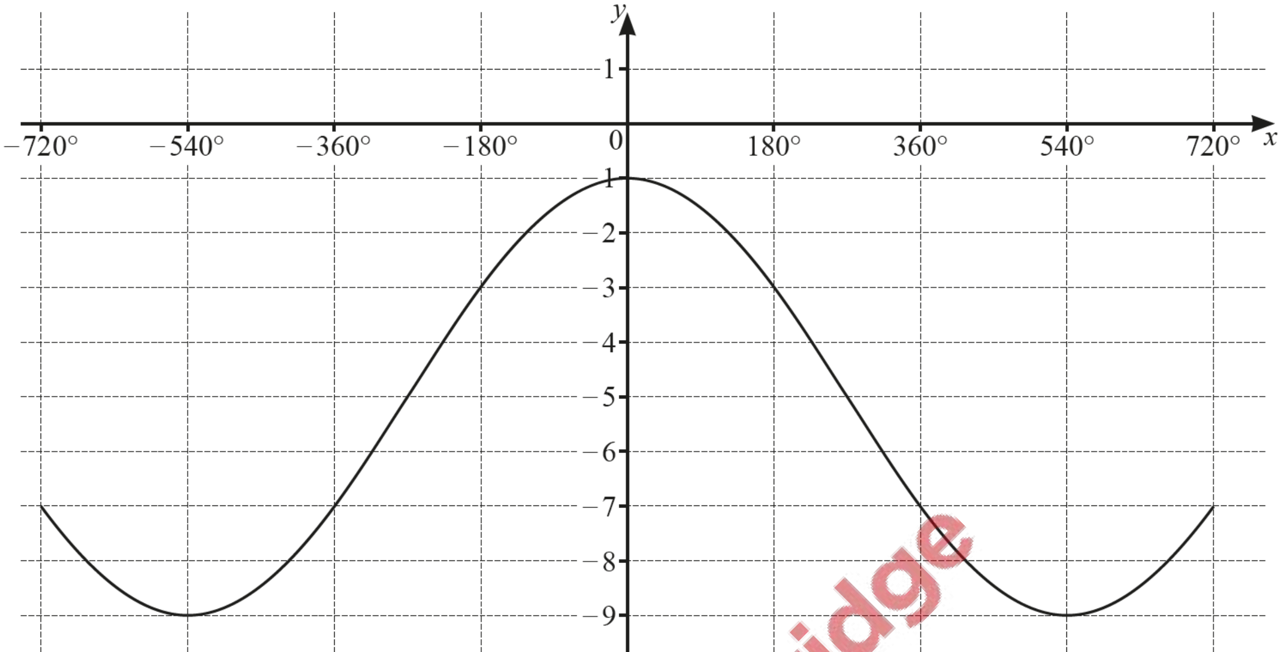
Trigonometry – 2023 Additional Math 0606

1. Nov/2023/Paper_0606/11/No.1



The diagram shows part of the graph of $y = a\cos\left(\frac{x}{b}\right) + c$, where a, b and c are integers. Find the values of a, b and c. [3]

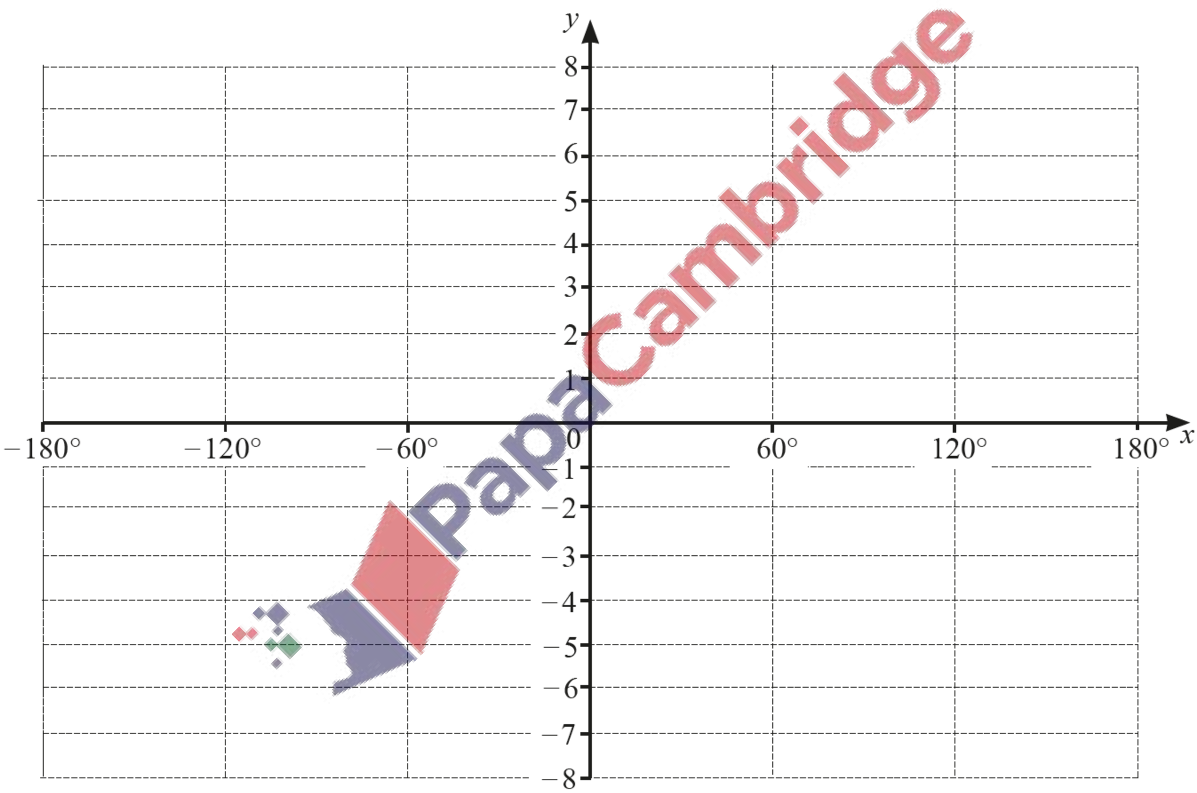
2. Nov/2023/Paper_0606/12/No.2

The function g is defined by $g(x) = 5\sin\frac{3x}{4} - 2$ for all values of x.

(a) Write down the amplitude of g. [1]

(b) Write down the period of g in degrees. [1]

(c) On the axes, sketch the graph of $y = g(x)$, for $-180° \leqslant x \leqslant 180°$. [3]

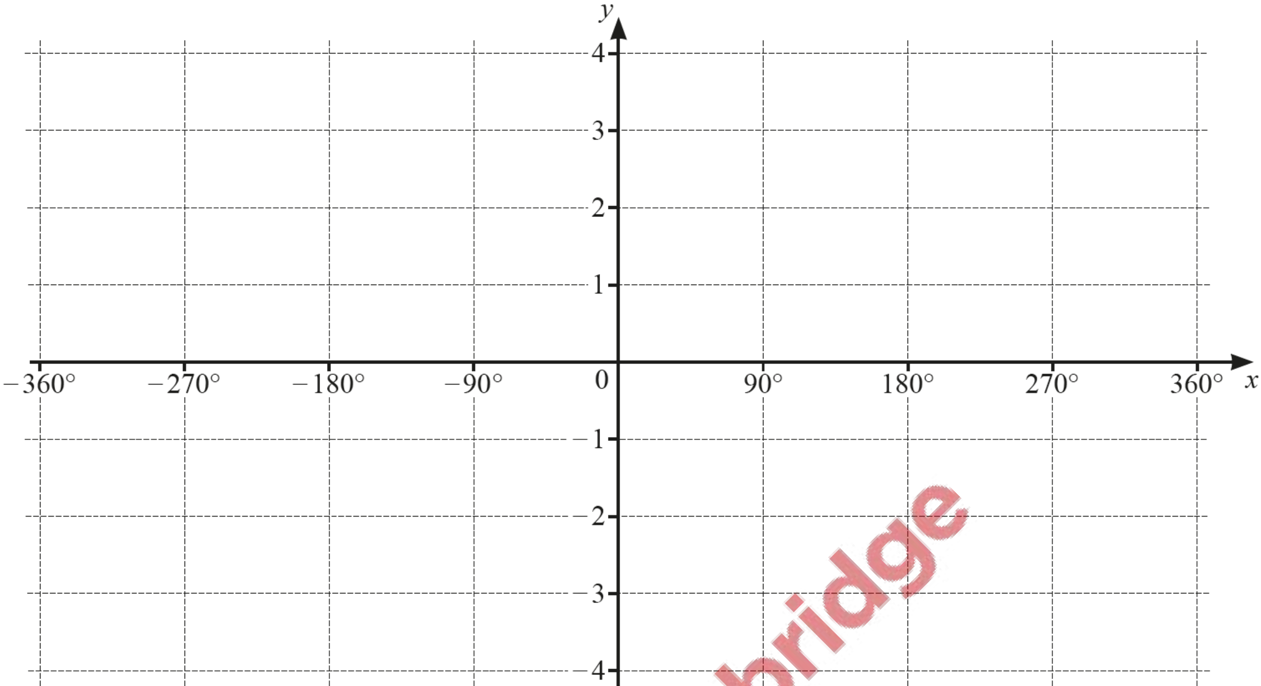


3. Nov/2023/Paper_0606/12/No.5

Solve the equation $3\sec^2\left(2\theta+\frac{\pi}{6}\right)=4$ for $-\frac{\pi}{2}<\theta<\frac{\pi}{2}$, giving your answers in terms of π. [5]

4. Nov/2023/Paper_0606/13/No.3

On the axes, draw the graph of $y = 2\sin\frac{x}{3} - 1$ for $-360° \leqslant x \leqslant 360°$. [4]



5. Nov/2023/Paper_0606/13/No.12

Solve the equation $3\,\mathrm{cosec}^2\left(\frac{2x}{3}-\frac{\pi}{3}\right)=4$, for $0 < x \leqslant 3\pi$. Give your answers in terms of π. [5]

6. Nov/2023/Paper_0606/21/No.11

(a) Show that $\dfrac{1}{\sec x - \operatorname{cosec} x} + \dfrac{1}{\sec x + \operatorname{cosec} x} = \dfrac{2\cos x}{1 - \cot^2 x}$. [5]

(b) Solve the equation $3\tan^2(y+\frac{\pi}{4}) = 1$ for $-2\pi < y < 0$. [4]

7. Nov/2023/Paper_0606/22/No.10

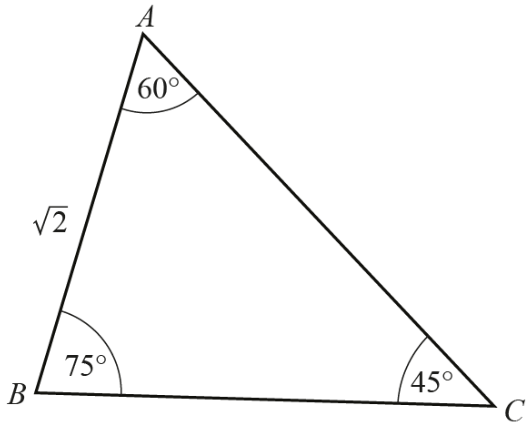
(a) By writing $\cot x$ and $\tan x$ in terms of $\cos x$ and $\sin x$, show that

$$\frac{\sin x}{1-\cot x}+\frac{\cos x}{1-\tan x}=\sin x+\cos x.$$ [5]

(b) Solve the equation $9\cot x + 3\operatorname{cosec} x = \tan x$, for $0° < x < 360°$. [5]

8. Nov/2023/Paper_0606/23/No.7

DO NOT USE A CALCULATOR IN THIS QUESTION.



You may use the following trigonometrical ratios.

$\sin 60° = \frac{\sqrt{3}}{2}$, $\sin 45° = \frac{\sqrt{2}}{2}$

$\cos 60° = \frac{1}{2}$, $\cos 45° = \frac{\sqrt{2}}{2}$

$\tan 60° = \sqrt{3}$, $\tan 45° = 1$

(a) Given that the area of triangle ABC is $\frac{3+\sqrt{3}}{4}$, show that $\sin 75° = \frac{\sqrt{6}+\sqrt{2}}{4}$. [5]

(b) Hence find the exact length of AC. [2]

9. Nov/2023/Paper_0606/23/No.8

(a) Show that $\dfrac{\sin x}{\tan x - 1} - \dfrac{\cos x}{\tan x + 1} = \dfrac{\cos x}{\sin^2 x - \cos^2 x}$. [5]

(b) Hence solve the equation $\dfrac{\sin x}{\tan x - 1} - \dfrac{\cos x}{\tan x + 1} = 1$ for $0° < x < 360°$. [5]

10. March/2023/Paper_0606/12/No.10

(a) It is given that $2+\cos\theta = x$ for $1 < x < 3$ and $2\,\text{cosec}\,\theta = y$ for $y > 2$. Find y in terms of x. [4]

(b) Solve the equation $3\cos\frac{\phi}{2} = \sqrt{3}\sin\frac{\phi}{2}$ for $-4\pi < \phi < 4\pi$. [5]

11. June/2023/Paper_0606/11/No.5

DO NOT USE A CALCULATOR IN THIS QUESTION.

In this question, all lengths are in centimetres.

(a) You are given that $\cos 120° = -\frac{1}{2}$, $\sin 120° = \frac{\sqrt{3}}{2}$ and $\tan 120° = -\sqrt{3}$.

In the triangle ABC, $AB = 5\sqrt{3} - 6$, $BC = 5\sqrt{3} + 6$ and angle $ABC = 120°$. Find AC, giving your answer in the form $a\sqrt{b}$ where a and b are integers greater than 1. [4]

(b) You are given that $\cos 30° = \frac{\sqrt{3}}{2}$, $\sin 30° = \frac{1}{2}$ and $\tan 30° = \frac{1}{\sqrt{3}}$.

In the triangle PQR, $PQ = 3 + 2\sqrt{5}$ and angle $PQR = 30°$. Given that the area of this triangle is $\frac{2 + 5\sqrt{5}}{4}$, find QR, giving your answer in the form $c + d\sqrt{5}$, where c and d are integers. [4]

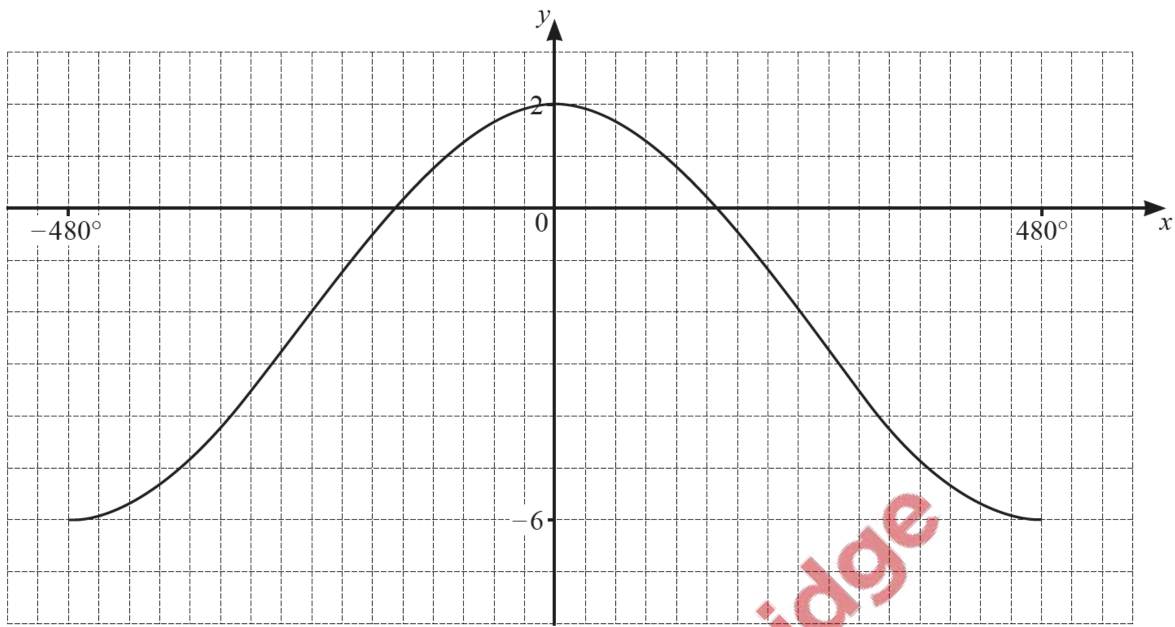
12. June/2023/Paper_0606/11/No.6

(a) Show that $\frac{\cot\theta + \tan\theta}{\sec\theta} = \operatorname{cosec}\theta$. [4]

(b) Hence solve the equation $\left(\dfrac{\cot\dfrac{\phi}{3}+\tan\dfrac{\phi}{3}}{\sec\dfrac{\phi}{3}}\right)^2 = 2$, for $-540° < \phi < 540°$. [6]

13. June/2023/Paper_0606/12/No.1

The diagram shows the graph of $y = a\cos bx + c$. Find the values of the constants a, b and c. [3]



14. June/2023/Paper_0606/12/No.6

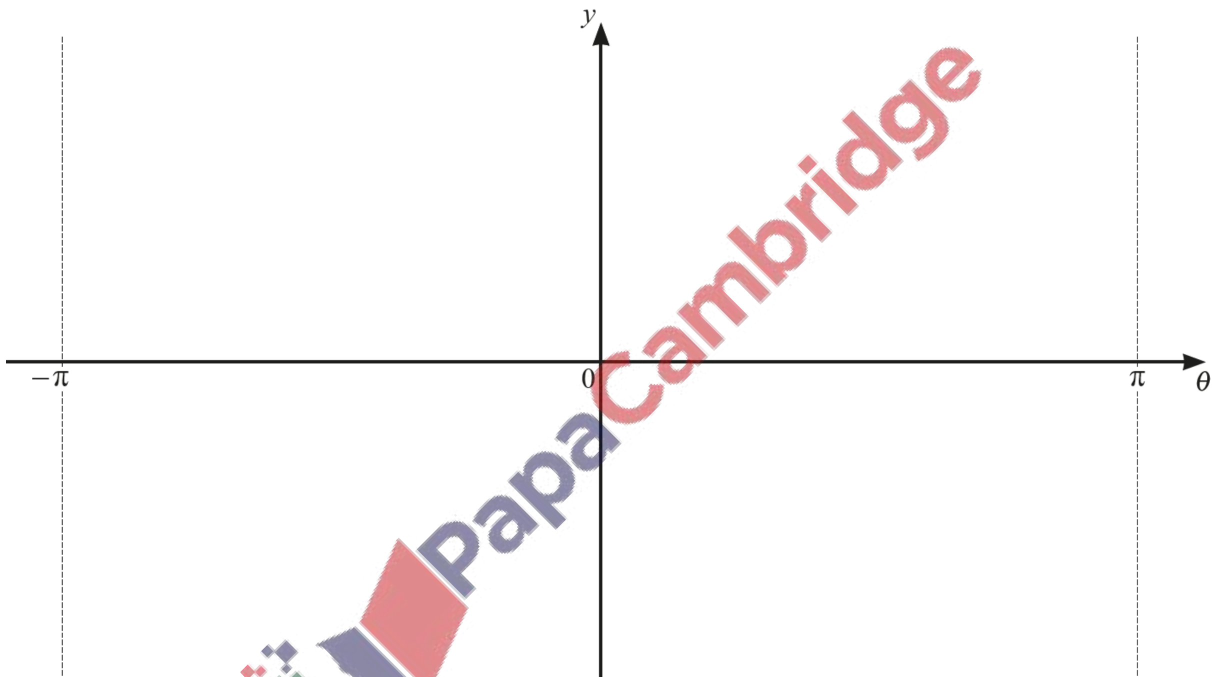
(a) Given that $\cot^2\theta = \frac{1}{y+2}$ and $\sec\theta = x - 4$, find y in terms of x. [2]

(b) Solve the equation $\sqrt{3}\,\text{cosec}\left(2\phi + \frac{3\pi}{4}\right) = 2$, for $-\pi < \phi < \pi$, giving your answers in terms of π. [5]

15. June/2023/Paper_0606/13/No.1

(a) Write down the period, in radians, of $3\tan\frac{\theta}{2} - 3$. [1]

(b) On the axes, sketch the graph of $y = 3\tan\frac{\theta}{2} - 3$ for $-\pi \leqslant \theta \leqslant \pi$, stating the coordinates of the points where the graph meets the axes. [3]



16. June/2023/Paper_0606/13/No.10

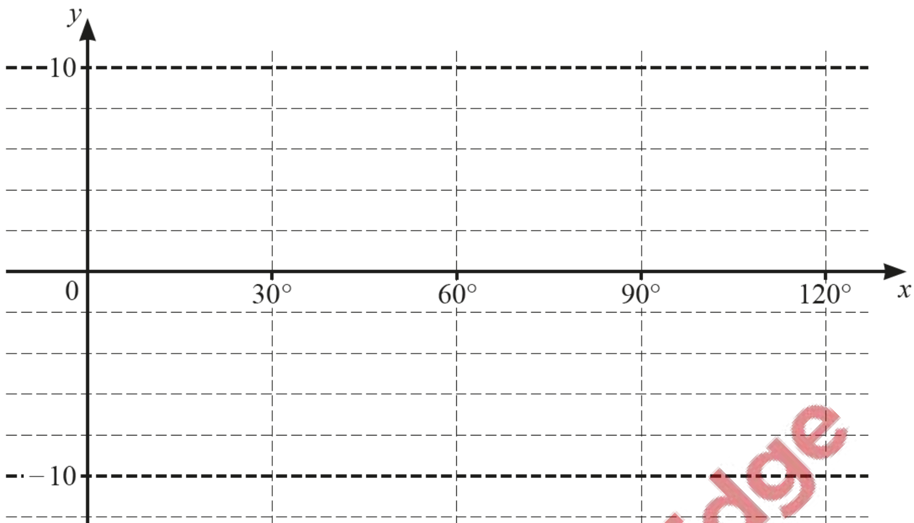
(a) Show that $\cos^4\theta - \sin^4\theta + 1 = 2\cos^2\theta$. [3]

(b) Solve the equation $\cos^4\frac{\phi}{3} - \sin^4\frac{\phi}{3} + 1 = \frac{1}{2}$, for $-3\pi < \phi < 3\pi$, giving your answers in terms of π. [5]

17. June/2023/Paper_0606/21/No.2

The function g is defined for $0° \leqslant x \leqslant 120°$ by $g(x) = 2 + 4\cos 6x$.

(a) On the axes, sketch the graph of $y = g(x)$. [3]



(b) State the amplitude of g. [1]

(c) State the period of g. [1]