



1 The curve C has equation $y = \cos x^\circ$ for $0 \leq x \leq 360$

- Write down the coordinates of the points where C crosses the x -axis.
- Write down the coordinates of the maximum points of C .
- Write down the coordinates of the point where C crosses the y -axis.

(3 marks)

a) $\cos x = 0$

$(90, 0)$ and $(270, 0)$

b) the greatest value of $\cos x$ is 1

$(0, 1)$ and $(360, 1)$

c) $x = 0$ gives $y = \cos 0^\circ = 1$

$(0, 1)$

2 a. Write down the period of the graph of $y = \cos x^\circ$.

b. Write down the period of the graph of $y = \tan x^\circ$.

c. Write down the maximum value and the minimum value of $y = 4 \sin x^\circ$.

(3 marks)

a) $\cos x$ repeats every 360°

360°

b) $\tan x$ repeats every 180°

180°

c) $\sin x$ is between -1 and 1 , so multiply by 4

maximum 4, minimum -4

3 The curve C has equation $y = \cos x^\circ$ for $0 \leq x \leq 360$.

Write down the coordinates of the minimum point of C .

(2 marks)

The cosine curve starts at $(0, 1)$, falls to its lowest value of -1 at $x = 180$, and returns to 1 at $x = 360$

So the minimum point is $(180, -1)$

$(180, -1)$

- 4 You are given that $\sin 20^\circ = 0.342$, correct to 3 decimal places.
Use the graph of $y = \sin x^\circ$ to write down the value of

- a. $\sin 160^\circ$
- b. $\sin 200^\circ$
- c. $\sin 340^\circ$
- d. $\cos 70^\circ$

(4 marks)

a) $160^\circ = 180^\circ - 20^\circ$

$$\sin 160^\circ = 0.342$$

b) $200^\circ = 180^\circ + 20^\circ$, below the axis

$$\sin 200^\circ = -0.342$$

c) $340^\circ = 360^\circ - 20^\circ$, below the axis

$$\sin 340^\circ = -0.342$$

d) $\cos 70^\circ = \sin(90^\circ - 70^\circ) = \sin 20^\circ$

$$\cos 70^\circ = 0.342$$

- 5 You are given that $\tan 35^\circ = 0.700$, correct to 3 decimal places.

- a. Find all the solutions of $\tan x^\circ = 0.700$ for $0 \leq x \leq 360$
- b. Find all the solutions of $\tan x^\circ = -0.700$ for $0 \leq x \leq 360$

(3 marks)

a) period of $\tan$ is 180°

$$35 + 180 = 215$$

$$x = 35 \text{ and } 215$$

b) $\tan x = -0.700$: use $180 - 35$

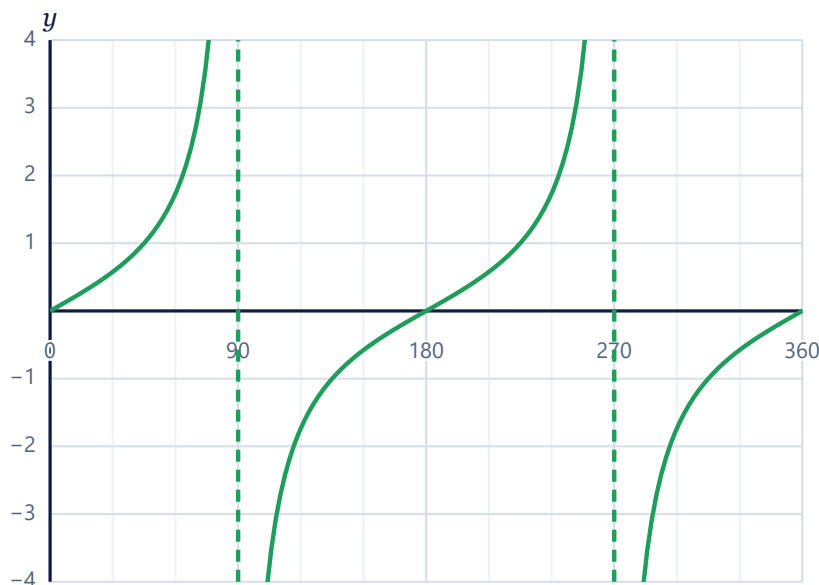
$$180 - 35 = 145$$

$$145 + 180 = 325$$

$$x = 145 \text{ and } 325$$

6 Sketch the graph of $y = \tan x^\circ$ for $0 \leq x \leq 360$.

Show clearly where the graph crosses the x -axis and mark the values of x where the graph has asymptotes.



x (degrees)

(2 marks)

The tangent graph crosses the x -axis at $x = 0, 180$ and 360

It has vertical asymptotes at $x = 90$ and $x = 270$

Each branch increases from bottom left to top right, repeating every 180

A vertical asymptote is a line that the graph approaches while its values grow without bound. Here $\tan x = \sin x \div \cos x$ is undefined at 90° and 270° because $\cos x = 0$. Do not join the branches across those lines

7 Solve $5 \sin x^\circ = 2$ for $0 \leq x \leq 360$

Give your answers correct to 1 decimal place.

(3 marks)

$$\begin{array}{rcl} 5 \sin x^\circ & = & 2 \\ \div 5 & & \\ \sin x^\circ & = & 0.4 \\ & & \div 5 \\ x & = & \sin^{-1}(0.4) = 23.6^\circ \end{array}$$

Second solution by symmetry: $180 - 23.6$

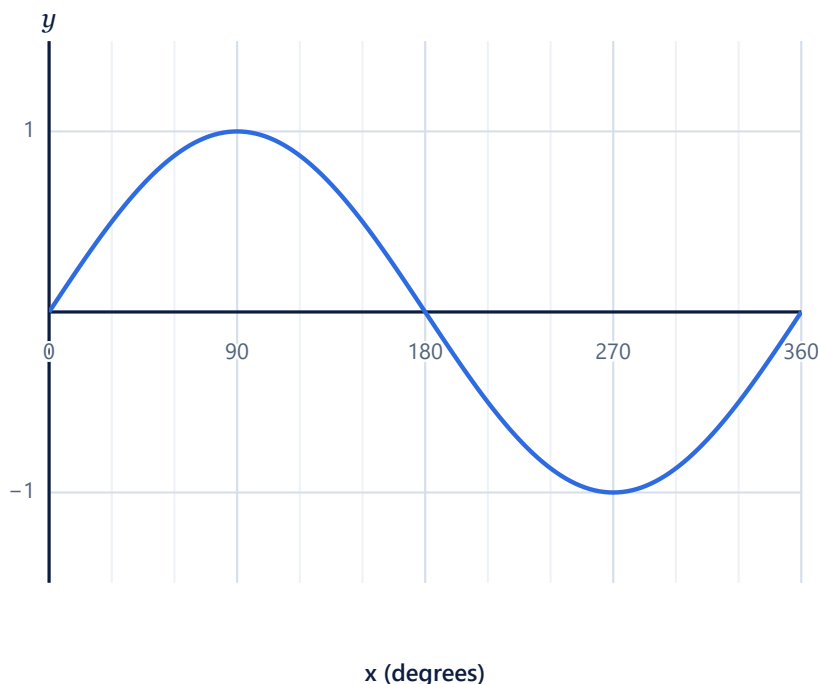
$$\boxed{x = 23.6 \text{ and } 156.4}$$

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You are given that $\sin 40^\circ = 0.643$ correct to 3 decimal places.

Using the symmetry of the graph of $y = \sin x^\circ$, write down the two solutions of $\sin x^\circ = 0.643$ for $0 \leq x \leq 360$

Give the angle solutions to the nearest whole degree, using the supplied approximation.



(2 marks)

One solution is $x = 40$

The sine graph is symmetric about $x = 90$, so the second solution is $180 - 40 = 140$

$$x = 40 \text{ and } x = 140$$

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Solve $\cos x^\circ = -0.3$ for $0 \leq x \leq 360$

Give your answers correct to 1 decimal place.

(3 marks)

$$\cos x^\circ = -0.3$$

$$x = \cos^{-1}(-0.3) = 107.5^\circ$$

The cosine graph is symmetrical about 180° , so the other solution is $360 - 107.5$

$$x = 107.5 \text{ and } 252.5$$

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You are given that $\cos 60^\circ = 0.5$

- Find all the solutions of $\cos x^\circ = 0.5$ for $0 \leq x \leq 360$
- Find all the solutions of $\cos x^\circ = -0.5$ for $0 \leq x \leq 360$

(3 marks)

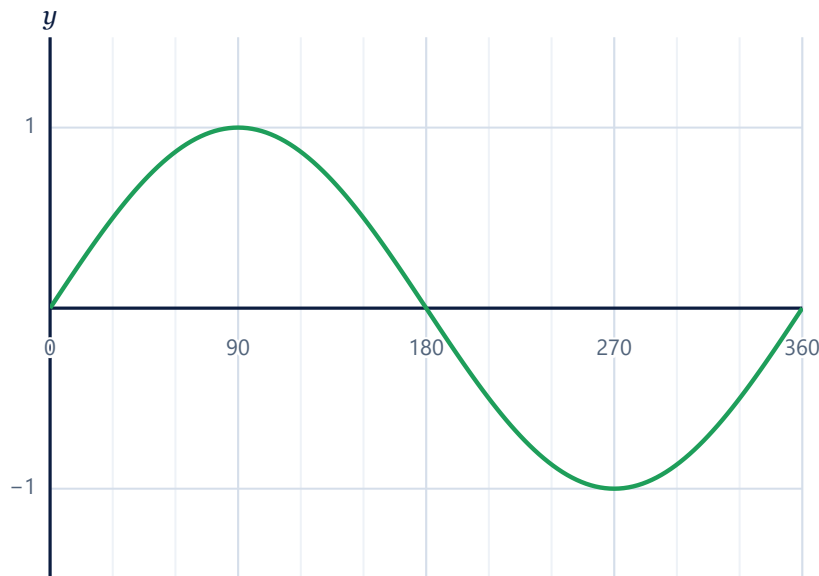
a) One solution is $x = 60$. The cosine graph is symmetric about $x = 180$, so the other is $360 - 60 = 300$

b) $\cos x = -0.5$ when $x = 180 - 60 = 120$ and $x = 180 + 60 = 240$

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- Sketch the graph of $y = \sin x^\circ$ for $0 \leq x \leq 360$, marking the values where the graph meets the x -axis.
- You are given that $\sin 35^\circ = 0.574$ correct to 3 decimal places.
Find all the solutions of $\sin x^\circ = -0.574$ for $0 \leq x \leq 360$

Give the angle solutions to the nearest whole degree, using the supplied approximation.



x (degrees)

(4 marks)

a) The sine curve passes through $(0, 0)$, rises to $(90, 1)$, falls through $(180, 0)$ to $(270, -1)$, then returns to $(360, 0)$

b) $\sin x$ is negative between 180 and 360

b) The solutions are $x = 180 + 35 = 215$ and $x = 360 - 35 = 325$

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The curve C has equation $y = 2 \sin x^\circ + 1$ for $0 \leq x \leq 360$

- Write down the coordinates of the maximum point of C .
- Write down the coordinates of the minimum point of C .
- Write down the coordinates of the point where C crosses the y -axis.
- Solve $2 \sin x^\circ + 1 = 0$ for $0 \leq x \leq 360$

(5 marks)

a) $\sin x = 1$ at $x = 90$

$$y = 2 \times 1 + 1 = 3$$

$$(90, 3)$$

b) $\sin x = -1$ at $x = 270$

$$y = 2 \times (-1) + 1 = -1$$

$$(270, -1)$$

c) $x = 0$ gives $y = 2 \times 0 + 1$

$$(0, 1)$$

d)

$$\begin{array}{rcl} 2 \sin x^\circ + 1 & = & 0 \\ -1, \div 2 & & \sin x^\circ = -\frac{1}{2} \quad -1, \div 2 \end{array}$$

$\sin 30^\circ = \frac{1}{2}$; sine is negative between 180° and 360°

$$180 + 30 = 210$$

$$360 - 30 = 330$$

$$x = 210 \text{ and } 330$$