

GCSE Maths: Trigonometric graphs (Higher): answers

GCSE Maths - Functions and Advanced Graphs - Higher - Lesson 25.5

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch25-functions-advanced-graphs/higher/trigonometric-graphs/

Exercise 25E Trigonometric graphs Calculator allowed

- 1 Use your calculator (in degree mode) to complete the table of values for $y = \cos x$. Give each value to 1 decimal place.

x	0°	60°	90°	120°	180°	270°	360°
$\cos x$							

Answer: 1.0, 0.5, 0.0, -0.5, -1.0, 0.0, 1.0

- 2 For each graph, write down the maximum value, the minimum value and the period.

(a) $y = \sin x$

Answer: maximum 1, minimum -1, period 360°

(b) $y = \cos x$

Answer: maximum 1, minimum -1, period 360°

(c) $y = \tan x$

Answer: no maximum or minimum, period 180°

- 3 Given that $\sin 30^\circ = 0.5$, write down the value of

(a) $\sin 150^\circ$

Answer: 0.5

(b) $\sin 210^\circ$

Answer: -0.5

(c) $\sin 330^\circ$

Answer: -0.5

- 4 Given that $\cos 60^\circ = 0.5$, write down the value of

(a) $\cos 120^\circ$

Answer: -0.5

(b) $\cos 240^\circ$

Answer: -0.5

(c) $\cos 300^\circ$

Answer: 0.5

- 5 Given that $\tan 45^\circ = 1$, write down the value of

(a) $\tan 135^\circ$

Answer: -1

(b) $\tan 225^\circ$

Answer: 1

(c) $\tan 315^\circ$

Answer: -1

6 Solve each equation for $0^\circ \leq x \leq 360^\circ$. Give your answers to 1 decimal place.

(a) $\sin x = 0.5$

Answer: $30, 150$

(b) $\sin x = 0.8$

Answer: $53.1, 126.9$

(c) $\sin x = -0.5$

Answer: $210, 330$

(d) $\sin x = -0.9$

Answer: $244.2, 295.8$

7 Solve each equation for $0^\circ \leq x \leq 360^\circ$. Give your answers to 1 decimal place.

(a) $\cos x = 0.5$

Answer: $60, 300$

(b) $\cos x = -0.5$

Answer: $120, 240$

(c) $\cos x = 0.2$

Answer: $78.5, 281.5$

(d) $\cos x = -0.7$

Answer: $134.4, 225.6$

8 Solve each equation for $0^\circ \leq x \leq 360^\circ$. Give your answers to 1 decimal place.

(a) $\tan x = 1$

Answer: $45, 225$

(b) $\tan x = -1$

Answer: $135, 315$

(c) $\tan x = 3$

Answer: $71.6, 251.6$

(d) $\tan x = -0.5$

Answer: $153.4, 333.4$

9 Solve each equation for $-180^\circ \leq x \leq 180^\circ$. Give your answers to 1 decimal place.

(a) $\sin x = 0.5$

Answer: 30, 150

(b) $\cos x = 0.5$

Answer: -60, 60

(c) $\tan x = 1$

Answer: -135, 45

(d) $\sin x = -0.4$

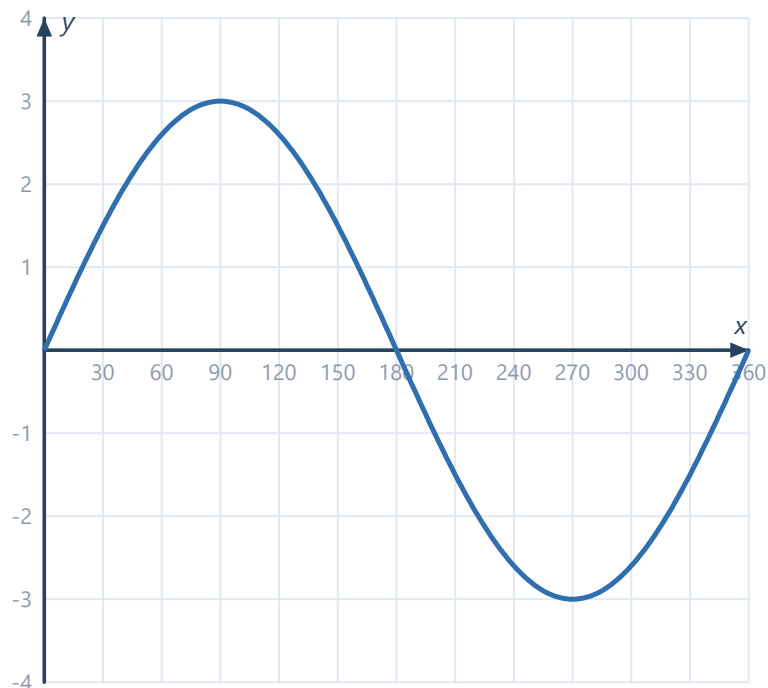
Answer: -156.4, -23.6

10 Solve $\sin x = 0.3$ for $0^\circ \leq x \leq 720^\circ$. Give your answers to 1 decimal place. How many solutions are there?

Answer: 17.5, 162.5, 377.5, 522.5 (4 solutions)

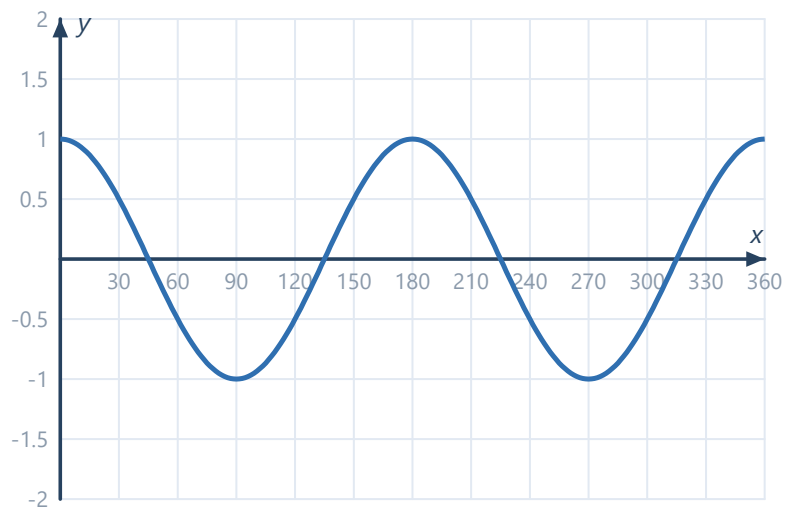
11 Each graph is of the form $y = a \sin(bx) + d$ or $y = a \cos(bx) + d$. Write down the equation of each graph.

(a)



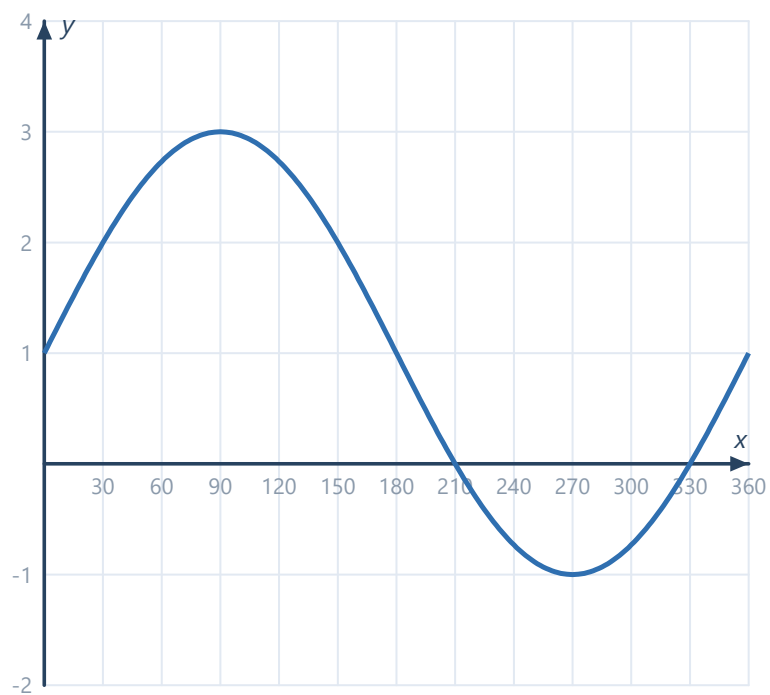
Answer: $y = 3 \sin x$

(b)



Answer: $y = \cos 2x$

(c)



Answer: $y = 2 \sin x + 1$

12 For each graph, write down the maximum, the minimum, the period and the y-intercept.

(a) $y = 2 \cos x$

Answer: max 2, min -2, period 360° , y-intercept 2

(b) $y = \sin 3x + 1$

Answer: max 2, min 0, period 120° , y-intercept 1

(c) $y = 4 \cos 2x - 1$

Answer: max 3, min -5, period 180° , y-intercept 3

- 13 The depth of water in a harbour, in metres, is modelled by $h = 5 + 3 \sin(30t)^\circ$, where t is the time in hours after midnight, for $0 \leq t \leq 12$.

- (a) Work out the depth at 3 a.m. and at 9 a.m.

Answer: 3 a.m.: 8 m; 9 a.m.: 2 m

- (b) Write down the greatest and the least depth.

Answer: greatest 8 m, least 2 m

- (c) At what times is the depth 6.5 m?

Answer: 1 a.m. and 5 a.m.

- 14 The graph of $y = \cos(x - 90^\circ)$ is a translation of the graph of $y = \cos x$. Describe the translation and show that $\cos(x - 90^\circ) = \sin x$ by completing a table for $x = 0^\circ, 30^\circ, 90^\circ$ and 150° .

Answer: Translation 90° to the right; the values match $\sin x$

- 15 Explain why the equation $\sin x = 2$ has no solutions, but the equation $\tan x = 2000$ does have solutions.

Answer: $\sin x$ never exceeds 1, but $\tan x$ takes every value

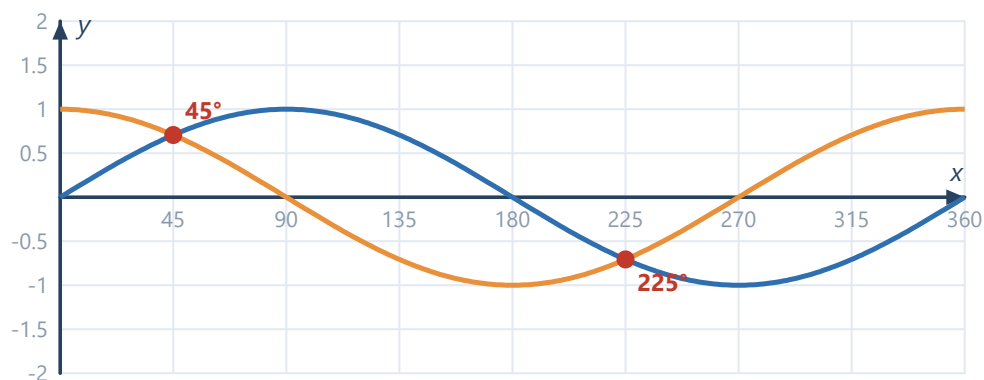
- 16 Solve $2 \sin x + 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

Answer: $210, 330$

- 17 Solve $2 \cos x + 1 = 0.2$ for $0^\circ \leq x \leq 360^\circ$. Give your answers to 1 decimal place.

Answer: $113.6, 246.4$

- 18 The graphs of $y = \sin x$ (blue) and $y = \cos x$ (orange) are shown. They cross at two points between 0° and 360° . Show that at these points $\tan x = 1$, and find the two values of x .



Answer: $x = 45^\circ$ and $x = 225^\circ$