

Trigonometric ratios beyond 90°

About 50 minutes Calculator allowed 43 marks

Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-trigonometric-ratios-beyond-90/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** Last lesson [2 marks]
- In a right-angled triangle, angle $\theta = 30^\circ$ and the side opposite θ is 3 cm. Find the length of the hypotenuse.
- Triangle ABC has $AB = 7$ cm, angle $BAC = 30^\circ$ and an area of 14 cm^2 . Find the length AC . ($\sin 30^\circ = 0.5$)

Answer

Answer

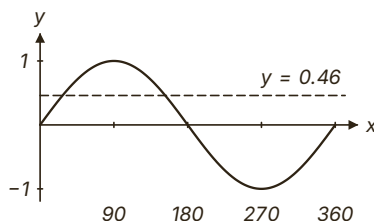
- A3** From chapter 19 [2 marks] **A4** From chapter 21 [2 marks]
- Of 38 students, 12 study French, 18 study German and 4 study both. A student who studies at least one of the two languages is picked at random. Find the probability that they study both.
- y is inversely proportional to x^2 . When $x = 9$, $y = 5$. Find y when $x = 3$.

Answer

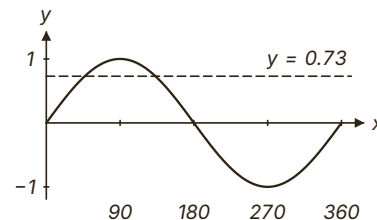
Answer

B Example, then your turn

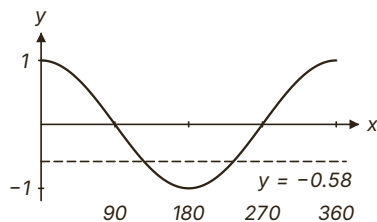
Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1Solve $\sin x = 0.46$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p.**Hint** The sine curve is symmetric about $x = 90^\circ$.

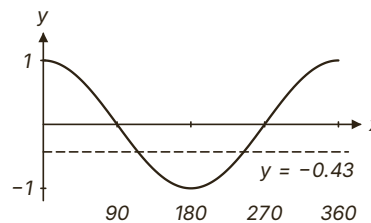
- B1** Solve $\sin x = 0.73$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p. [3 marks]



Answer

EXAMPLE 2Solve $\cos x = -0.58$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p.**Hint** The cosine curve is symmetric about $x = 180^\circ$.**B2** Solve $\cos x = -0.43$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p.

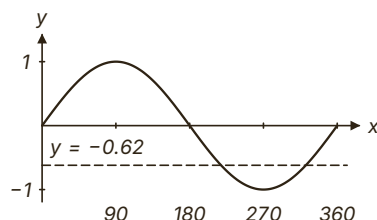
[3 marks]



Answer

c Practice**C1** Solve $\sin x = -0.62$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p.

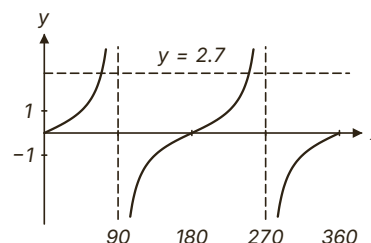
[3 marks]



Answer

C2 Solve $\tan x = 2.7$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p.

[2 marks]



Answer

C3 Write down the coordinates of the minimum point of $y = 4 \sin x$ for $0^\circ \leq x \leq 360^\circ$.

[2 marks]

Answer

C4 Solve $5 \cos x + 2 = 0$ for $0^\circ \leq x \leq 360^\circ$, to 1 d.p.

[3 marks]

Answer

C5 How many solutions does $\cos x = 0.8$ have for $0^\circ \leq x \leq 720^\circ$?

[1 mark]

Answer

C6 $\sin 38^\circ = 0.616$ to 3 d.p. Without a calculator, write down the value of $\sin 142^\circ$ and the value of $\sin 218^\circ$.

[2 marks]

Answer

D Exam-style questions

- D1** Sara solves $\tan x = 3.2$ for $0^\circ \leq x \leq 360^\circ$. She writes, " $x = 72.6^\circ$ or $x = 180 - 72.6 = 107.4^\circ$." [3 marks]

Explain what Sara has done wrong, and give the correct solutions to 1 d.p.

Answer

- D2** The height, h metres, of a seat on a big wheel t seconds after the ride starts is $h = 13 - 11 \cos(6t)^\circ$, for $0 \leq t \leq 60$.
- (a) Work out the height of the seat when $t = 10$. [1 mark]

Answer

- (b) Write down the greatest height of the seat. [1 mark]

Answer

- (c) Find the two times when the seat is 20 m high. Give your answers to 1 d.p. [4 marks]

Answer

Total for D2: 6 marks

- D3** The line $y = k$ meets the curve $y = \sin x$, for $0^\circ \leq x \leq 360^\circ$, at exactly two points. [3 marks]
One of them has $x = 23^\circ$. Find the x -coordinate of the other point, and the value of k to 3 d.p.

Answer

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** Solve $\cos 2x = -0.6$ for $0^\circ \leq x \leq 360^\circ$. Give every solution to 1 d.p. [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Let $y = 2x$. If x goes from 0° to 360° , y goes from 0° to 720° .
- Hint 2** $\cos^{-1}(-0.6) = 126.9^\circ$, so $y = 126.9, 233.1, 486.9, 593.1$.
- Hint 3** Halve each value of y : there are four solutions.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can find both solutions of a trig equation between 0° and 360° . ☐ ☐ ☐

I can use the symmetry of the sine, cosine and tangent graphs. ☐ ☐ ☐

I can use a trig model to answer a question in context. ☐ ☐ ☐