

Exercise walk-through

Sine and Cosine Function Graphs ■ 3.4

eXercise

You must be able to

- state the period, amplitude, midline, and range of $y = \sin x$ and $y = \cos x$
- relate $\cos x$ to a shifted $\sin x$

Method — The basic graphs

$y = \sin x$ and $y = \cos x$ each have:

- period 2π , amplitude 1, midline $y = 0$, range $[-1, 1]$.

They are shifts of each other: $\cos x = \sin\left(x + \frac{\pi}{2}\right)$.

Method — Reading a transformed graph

For $y = 3 \sin x$ the amplitude is 3, so the range is $[-3, 3]$; the period (2π) and midline ($y = 0$) are unchanged. Multiplying the whole function stretches it vertically – it does not change how often the wave repeats.

Practice 2.1 ■ 1 mark

State the period of $y = \sin x$.

Solution 2.1

Worked steps

$$2\pi \text{ B1}.$$

Practice 2.2 ■ 1 mark

State the range of $y = \cos x$.

Solution 2.2

Worked steps

 $[-1, 1]$ **B1**.

Practice 2.3 ■ 2 marks

State the amplitude and midline of $y = \sin x$.

Solution 2.3

Worked steps

amplitude 1; midline $y = 0$ **B1** **B1**.

Exam-style 3.1 ■ 1 mark

The period of $y = \sin x$ is

A π

B 2π

C $\frac{\pi}{2}$

D 1

Solution 3.1

A π

B 2π



C $\frac{\pi}{2}$

D 1

Worked steps

B.

Exam-style 3.2 ■ 1 mark

The range of $y = \cos x$ is

A all real numbers

B $[0, 1]$

C $[-1, 1]$

D $[-2, 2]$

Solution 3.2

A all real numbers

B $[0, 1]$

C $[-1, 1]$



D $[-2, 2]$

Worked steps

C.

Exam-style 3.3 ■ 1 mark

$$y = \sin x.$$

- (a) State its maximum value.
- (b) State its minimum value.
- (c) State the smallest $x > 0$ where the maximum occurs.

Solution 3.3

Worked steps

(a) 1 **B1**. (b) -1 **B1**. (c) $x = \frac{\pi}{2}$ **B1**.