

3 Sine waves and inverse trig – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
amplitude	_____	_____	_____
midline	_____	_____	_____
sinusoidal function	_____	_____	_____
inverse trigono- metric functions	_____	_____	_____

Recall

In Part A you met the sine and cosine ratios. Now their graphs and how to reshape them:

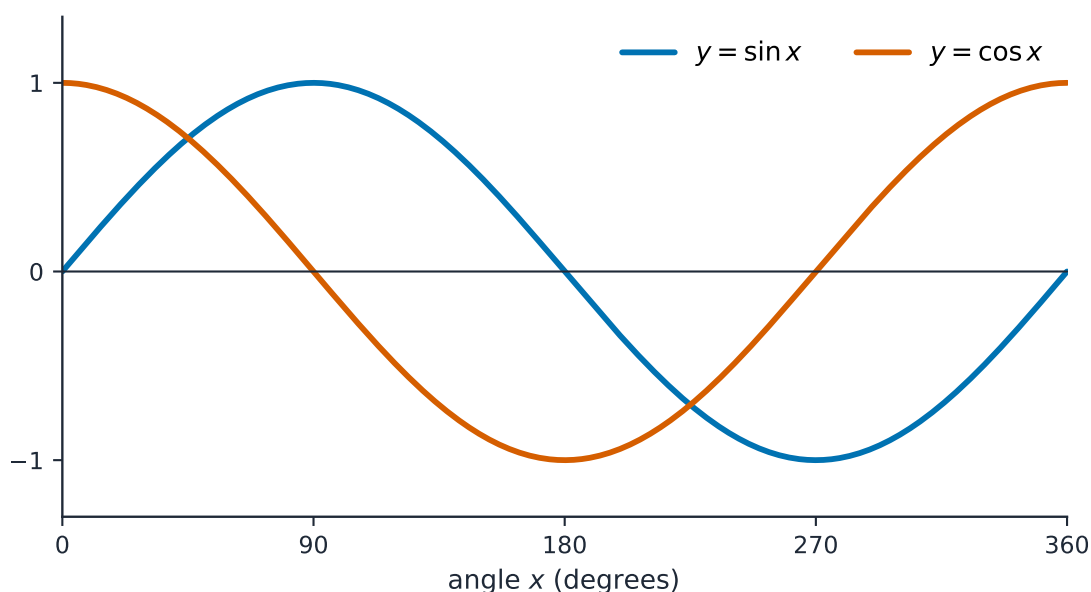
- The sine graph is a smooth, repeating wave.
- Real things like tides and daylight follow wave patterns.

Each idea has a worked example before the Practice.

New ideas

■ 1 Sine and cosine graphs

The graphs $y = \sin \theta$ and $y = \cos \theta$ are smooth waves that swing between -1 and 1 and repeat every 2π (one full turn).



■ 2 Amplitude, period, and midline

For a wave, three numbers describe its shape:

- the **amplitude** = half the distance between the top and bottom,
- the **period** = how far along before it repeats,
- the **midline** = the horizontal centre line.

■ 3 Transforming a sine wave

A general **sinusoidal function** is

$$f(\theta) = a \sin(b\theta) + d,$$

where $|a|$ is the amplitude, the period is $\frac{2\pi}{|b|}$, and d is the midline.

Worked example. For $f(\theta) = 3 \sin(2\theta) + 1$: amplitude = 3, period = $\frac{2\pi}{2} = \pi$, midline $y = 1$. So the maximum is $1 + 3 = 4$ and the minimum is $1 - 3 = -2$.

■ 4 Inverse trig

The **inverse trigonometric functions** (arcsine, arccosine, arctangent) go the other way: give them a ratio and they return the angle.

Watch out: in $a \sin(b\theta) + d$, the number a changes the **amplitude** (height) while b changes the **period** (width). Don't confuse the two – b squeezes the wave sideways, not up and down.

Practice

Try these in order. The methods are all above.

2.1 State the range (lowest to highest value) of $y = \sin \theta$, and its period. [2]

2.2 For $f(\theta) = 5 \sin \theta$, state the amplitude. [1]

2.3 For $f(\theta) = 2 \sin(3\theta)$, find the amplitude and the period. [2]

2.4 For $f(\theta) = 4 \sin(\theta) + 2$, state the midline, the maximum, and the minimum. [3]

2.5 State what an inverse trig function (like arcsine) does. [1]
