

# 3.6 Sinusoidal Function Transformations

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ Total: 9 marks

**KEY WORDS** period 周期 • sinusoidal function 正弦型函数 • amplitude 振幅 • midline 中线

## Objective

Build the skills to answer exam questions on **sinusoidal function transformations**.

**You must be able to:**

- describe how  $a$ ,  $b$ ,  $h$ , and  $k$  transform  $y = \sin x$

## 1 Worked examples

Study these first. Each one shows the method for a question type used later.

### ■ Transformations of a sinusoid

Starting from  $y = \sin x$ , in  $y = a \sin(b(x - h)) + k$ :

- $a$  scales vertically (sets the amplitude);
- $b$  scales horizontally (period =  $\frac{2\pi}{b}$ );
- $h$  shifts horizontally;
- $k$  shifts vertically (sets the midline).

### ■ Example

$y = 2 \sin(x) - 3$ : amplitude 2, midline  $y = -3$ .

## 2 Practice

**2.1** State the effect of  $a$  in  $y = a \sin x$ . [1]

**2.2** State the effect of  $k$  in  $y = \sin x + k$ . [1]

**2.3** For  $y = 2 \sin(x) - 3$ , state the amplitude and midline. [2]

## 3 Exam-style questions

**3.1** In  $y = a \sin(bx)$ , increasing  $b$  [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A raises the midline
  - B shortens the period
  - C raises the amplitude
  - D shifts the graph right

**3.2** The  $+k$  in  $y = \sin x + k$  [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A changes the period
  - B shifts the midline
  - C changes the amplitude
  - D reflects the graph

**3.3**  $y = 4 \sin(x) + 2$ .

- (a) State the amplitude. [1]
- (b) State the midline. [1]
- (c) State the maximum value. [1]