

3.7 Sinusoidal Function Context and Data Modeling

Name: _____ Class: _____ Date: _____

Total: 9 marks

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

Objective

Build the skills to answer exam questions on **sinusoidal function context and data modeling**.

You must be able to:

- build a sinusoidal model from a maximum, minimum, and **period** 周期

1 Worked examples

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

■ Building a sinusoid from data

- amplitude = $\frac{\max - \min}{2}$;
- midline = $\frac{\max + \min}{2}$;
- $b = \frac{2\pi}{\text{period}}$.

■ Example

A tide with max 6 m, min 2 m, period 12 h: amplitude 2, midline 4, $b = \frac{2\pi}{12} = \frac{\pi}{6}$, giving $y = 2 \sin\left(\frac{\pi}{6}t\right) + 4$.

2 Practice

2.1 State the formula for b given the period.

[1]

2.2 A quantity has max 10 and min 4. Find the amplitude and midline.

[2]

2.3 State b for a period of 24. [1]

3 Exam-style questions

3.1 Given period P , the value b equals [1]

- **A** $P/2\pi$
 - **B** $2\pi/P$
 - **C** πP
 - **D** $2\pi P$
-

3.2 The midline of a sinusoidal model equals [1]

- **A** $\frac{\max - \min}{2}$
 - **B** $\frac{\max + \min}{2}$
 - **C** $\max$
 - **D** $\min$
-

3.3 A Ferris wheel has maximum height 50 m, minimum 2 m, and period 60 s.

(a) Find the amplitude. [1]

(b) Find the midline. [1]

(c) Find the value of b . [1]

Solutions

2.1 $b = \frac{2\pi}{\text{period}}.$

2.2 amplitude $= \frac{10 - 4}{2} = 3$; midline $= \frac{10 + 4}{2} = 7.$

2.3 $b = \frac{2\pi}{24} = \frac{\pi}{12}.$

3.1 B.

3.2 B.

3.3 (a) $\frac{50 - 2}{2} = 24$ m. (b) $\frac{50 + 2}{2} = 26$ m. (c) $b = \frac{2\pi}{60} = \frac{\pi}{30}.$