

2.14 Logarithmic Function Context and Data Modeling

Name: _____ Class: _____ Date: _____

Total: 8 marks

Objective

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

You must be able to:

- recognise real quantities measured on a **logarithmic scale** 对数刻度 (pH, decibels, Richter)
- interpret a change of one unit on a base-10 log scale

1 Worked examples

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

■ Logarithmic models and scales

A logarithmic model $y = a + b \ln(x)$ rises quickly, then levels off.

Logarithmic **scales** (pH, decibels, Richter) turn multiplicative steps into additive ones: on a base-10 scale, each +1 unit is a factor of 10.

■ Example

+2 units on a base-10 scale is a factor of $10^2 = 100$.

2 Practice

2.1 State one real quantity measured on a logarithmic scale. [1]

2.2 On a base-10 log scale, a change of 1 unit means what factor? [1]

2.3 State the shape of a logarithmic growth curve. [1]

3 Exam-style questions

3.1 The Richter scale for earthquakes is [1]

- **A** linear
 - **B** logarithmic
 - **C** exponential
 - **D** quadratic
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3.2 On a base-10 log scale, +2 units corresponds to a factor of [1]

- **A** 2
 - **B** 10
 - **C** 20
 - **D** 100
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3.3 A sound rises from 40 dB to 60 dB (a base-10 scale where +10 dB = $\times 10$ intensity).

- (a) State the increase in dB. [1]
- (b) State how many factors of 10 this is. [1]
- (c) State the intensity factor. [1]

4 Go further

- work through the **2.14 Logarithmic Function Context and Data Modeling** lesson on the **Learn** page;
- read the **Exponential and Logarithmic Functions** section of the AP Precalculus handout on the **Know** page.

Solutions

2.1 any of: pH, sound level in decibels, earthquake magnitude (Richter).

2.2 a factor of 10.

2.3 rises quickly at first, then levels off (increasing and concave down).

3.1 B.

3.2 D.

3.3 (a) 20 dB. (b) 2. (c) $\times 100$.