

Exercise walk-through

Logarithmic Function Context and Data Modeling ■ 2.14

eXercise

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

Method — 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.

Method — Example

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

Practice 2.1 ■ 1 mark

State one real quantity measured on a logarithmic scale.

Solution 2.1

Method: Logarithmic models and scales

Worked steps

any of: pH, sound level in decibels, earthquake magnitude (Richter) **B1**.

Practice 2.2 ■ 1 mark

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

Solution 2.2

Worked steps

a factor of 10 **B1**.

Practice 2.3 ■ 1 mark

State the shape of a logarithmic growth curve.

Solution 2.3

Worked steps

rises quickly at first, then levels off (increasing and concave down) **B1**.

Exam-style 3.1 ■ 1 mark

The Richter scale for earthquakes is

- A** linear
- B** logarithmic
- C** exponential
- D** quadratic

Solution 3.1

Method: Logarithmic models and scales

- A linear
- B logarithmic
- C exponential
- D quadratic



Worked steps

B.

Exam-style 3.2 ■ 1 mark

On a base-10 log scale, +2 units corresponds to a factor of

A 2

B 10

C 20

D 100

Solution 3.2

A 2

B 10

C 20

D 100

**Worked steps**

D.

Exam-style 3.3 ■ 1 mark

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.
- (b) State how many factors of 10 this is.
- (c) State the intensity factor.

Solution 3.3

Method: Logarithmic models and scales

Worked steps

(a) 20 dB **B1**. (b) 2 **B1**. (c) $\times 100$ **B1**.