

Exercise walk-through

Function Model Selection and Assumption Articulation ■ 1.13

eXercise

You must be able to

- select an appropriate **function model** 函数模型 (linear, quadratic, polynomial, rational) from how a quantity changes
- articulate the **assumptions** 假设 and **limitations** 局限性 of a model

Method — Choosing a model

- **constant** rate of change $\rightarrow$ linear;
- constant **second difference** $\rightarrow$ quadratic;
- several turning points $\rightarrow$ higher-degree polynomial;
- a horizontal asymptote $\rightarrow$ rational.

Method — Assumptions and limitations

State the **domain** over which the model is valid, and note that predictions far outside the data (**extrapolation** 外推) may be invalid.

Practice 2.1 ■ 1 mark

State the type of function that has a constant rate of change.

Solution 2.1

Method: Choosing a model

Worked steps

a linear function **B1**.

Practice 2.2 ■ 1 mark

State the type of function whose graph can have a horizontal asymptote.

Solution 2.2

Method: Choosing a model

Worked steps

a rational function **B1**.

Practice 2.3 ■ 1 mark

A data set has a constant second difference. State the best model type.

Solution 2.3

Method: Choosing a model

Worked steps

quadratic **B1**.

Exam-style 3.1 ■ 1 mark

A quantity changes at a constant rate. The best model is

- A** linear
- B** exponential
- C** rational
- D** constant

Solution 3.1

Method: Choosing a model

A linear



B exponential

C rational

D constant

Worked steps

A.

Exam-style 3.2 ■ 1 mark

A model built from data should state its

- A** colour
- B** domain of validity and assumptions
- C** author
- D** title

Solution 3.2

Method: Assumptions and limitations

A colour

B domain of validity and assumptions



C author

D title

Worked steps

B.

Exam-style 3.3 ■ 1 mark

A population is recorded each year for 5 years, and the yearly increases are equal.

- (a) State the best model type.
- (b) State one assumption in using it to predict year 20.
- (c) State one limitation.

Solution 3.3

Worked steps

(a) linear **B1**. (b) that the constant yearly increase continues unchanged **B1**. (c) extrapolating far beyond the 5 years of data may be unreliable **B1**.