Choosing and evaluating models

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. A quantity is $12, 18, 24, 30$ at equal steps. Choose linear or exponential and justify. [2 marks]

The increase is always 6, but the ratios vary.

Answer: Linear

2. Fit an exponential model to $8, 24, 72$ at $t = 0, 1, 2$. [2 marks]

Initial value 8 and ratio 3.

Answer: $Q = 8(3^t)$

3. Using $Q = 8(3^t)$, predict at $t = 4$. [2 marks]

$8 \times 3^4 = 8 \times 81 = 648$.

Answer: 648

4. A model predicts 250 and the observation is 238. Find the residual. [2 marks]

$238 - 250 = -12$.

Answer: -12

5. A model is fitted to data from years 0-5. Is using it at year 3 interpolation or extrapolation? What about year 9? [2 marks]

Year 3 lies inside and year 9 outside the observed interval.

Answer: Year 3: interpolation; year 9: extrapolation.

6. A school club grows by 20% monthly in a model. State one reason this may fail over many years. [3 marks]

The model assumes a constant percentage and no capacity limit; membership cannot grow beyond all eligible people indefinitely.

Answer: A finite school population limits continued growth.