Limitations of extrapolation

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. Data cover times 2 to 10. Classify predictions at 6 and 15. [2 marks]

6 lies inside the interval, but 15 lies outside.

Answer: 6: interpolation; 15: extrapolation.

2. A model is $V = 50 - 5t$. Explain its physical domain for an initially full draining tank. [2 marks]

At 10 min it reaches zero.

Later formula values would be negative volumes.

Answer: $0 \leq t \leq 10$ min.

3. A sales forecast assumes 10% growth every month. State two assumptions needed for a year-ahead prediction. [2 marks]

Give conditions about the process, not just calculator precision.

Answer: For example, the rate stays 10% and supply/customer conditions permit that growth.

4. A model predicts 5000 units, but machine capacity is 3000. Interpret this. [2 marks]

Compare with the stated 3000-unit bound.

A constrained model or revised operating plan is needed.

Answer: The unrestricted prediction exceeds capacity and is not feasible.

5. A tariff is $C = 5 + 3d$ only for trips up to 20 km. Evaluate at 30 km and explain the limit. [2 marks]

$5 + 3(30) = 95$.

30 km is outside the stated tariff range.

Answer: Formula value 95 dollars; actual fare is not established.

6. Residuals from three new observations are all positive and steadily increasing. What should be checked? [3 marks]

The pattern suggests the rule increasingly underpredicts.

Collect relevant observations and compare a different mechanism.

Answer: Whether the rate or model type is changing.