Explanatory/response variables

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. A sports analyst predicts sprint time using training hours. Name x and y with suitable units. [3 marks]

The input is training amount.

The response is the predicted time.

Answer: $x = \text{training hours per week}$; $y = \text{sprint time in seconds}$.

2. A model predicts electricity use from daily maximum temperature. Which measurement goes on the horizontal axis? [3 marks]

It is the explanatory variable.

State the temperature unit on the axis.

Answer: Daily maximum temperature, in degrees Celsius.

3. A table lists test score first and revision time second. Does this force test score to be x? [3 marks]

Variable roles follow the modelling question.

Answer: No. For predicting score from revision time, time is x regardless of column order.

4. A company predicts the time to fill a tank using the flow rate. Identify the response and explain why a negative association may occur. [3 marks]

The predicted quantity is time.

With fixed volume, $\text{time} = \frac{\text{volume}}{\text{flow rate}}$, which decreases as flow increases.

Answer: Response: filling time. Higher flow rate tends to reduce time for a fixed tank volume.

5. A scientist predicts adult mass from body length. Explain why reversing a fitted regression may require a new fit. [3 marks]

Mass-on-length minimises vertical mass residuals.

Length-on-mass minimises length residuals, not the same objective.

Answer: The two fits minimise errors in different response directions.

6. Give an observational study in which x is a useful predictor but cannot be claimed to cause y from the study alone. [3 marks]

Rainy weather can increase both.

Predictive association does not establish that umbrella sales cause raincoat sales.

Answer: For example, umbrella sales predicting raincoat sales.