Correlation and causation

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Sales of heaters and cough medicine rise together. Give a plausible confounder. [3 marks]

Seasonal conditions can increase both demand for heating and respiratory illness.

Answer: Cold weather or winter season.

2. A survey finds students who seek tutoring have lower earlier scores. Does this prove tutoring reduces achievement? [3 marks]

The direction can be reversed.

Compare appropriate baseline-adjusted outcomes using a better study design.

Answer: No. Earlier difficulty may cause students to seek tutoring.

3. An online poll links sleep and concentration, but only volunteers respond. Name two limitations. [3 marks]

Volunteers may not represent the population.

Other variables may affect both sleep and concentration.

Answer: Self-selection bias and uncontrolled confounding, such as workload or health.

4. A randomised experiment reports a mean improvement. Does random assignment guarantee every participant improves? [3 marks]

Individual responses vary.

The observed mean is an aggregate result.

Answer: No. It supports group-level comparison, not identical individual effects.

5. Rewrite “Eating breakfast causes higher scores”, when the only evidence is an observational correlation. [3 marks]

Remove the causal claim.

Keep the population/sample qualification.

Answer: In this sample, eating breakfast was associated with higher scores.

6. Explain why a plausible mechanism is helpful but does not by itself prove causation. [3 marks]

Evidence must distinguish competing explanations.

A story alone is not a controlled comparison.

Answer: A mechanism makes an explanation credible, but alternative causes and study bias still need to be addressed.