FREE SAMPLE: THE FIRST QUESTION

Question One (14 marks)

(a) A fictional practice study in Fiordland tested a new fertiliser on tomato plants. The measurement was: mean mass of fruit per plant (kg). A newspaper headline states: ‘The fertiliser makes tomato plants produce more fruit’. The results are in the table.

(i) Calculate the percentage difference between the mean results of the two groups.

(ii) Use the percentage difference, the ranges and the number in each group to decide whether the data support the headline, and give reasons.

(iii) Describe two things that could be done to make the study stronger or the claim more reliable.

Group	Number in group	Mean result	Lowest result	Highest result
Without a new fertiliser (control)	40	34.70	31.20	38.20
With a new fertiliser	40	38.50	34.60	42.40

[7 marks]

(b) A blogger writes: ‘An increase in the number of possum traps set in a forest block causes an increase in number of kiwi chicks surviving’ and displays the data in the table (a fictional practice example).

(i) Describe the relationship shown in the table and calculate the percentage change in chicks surviving from the first to the last column.

(ii) Explain why the data alone do not show that the claim is true.

(iii) Suggest another factor that could explain the relationship, and describe a test that could be carried out to find out whether the claim is true.

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[7 marks]

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THE WORKED ANSWER TO THAT QUESTION

Question 1 (14 marks) [Claims and data]

(a) A fictional practice study in Fiordland tested a new fertiliser on tomato plants. The measurement was: mean mass of fruit per plant (kg). A newspaper headline states: ‘The fertiliser makes tomato plants produce more fruit’. The results are in the table. (i) Calculate the percentage difference between the mean results of the two groups. (ii) Use the percentage difference, the ranges and the number in each group to decide whether the data support the headline, and give reasons. (iii) Describe two things that could be done to make the study stronger or the claim more reliable.

(a) Answer: (i) 11.0%; (ii) the data do not support the claim strongly enough (ranges overlap, n = 40); (iii) larger sample and repeat

- Evidence level: Merit (percentage difference = (treatment − control) ÷ control × 100; compare with the overlap of the ranges).
- (i) (38.50 − 34.70) ÷ 34.70 × 100 = 11.0%.
- (ii) The ranges overlap (31.20–38.20 and 34.60–42.40) and the difference is 11.0%, so the data do not support the claim strongly enough. With only 40 in each group, the sample is reasonably large, which makes the result more reliable.
- Achievement: (iii) Gives one improvement (for example a larger sample).
- Merit: Gives two improvements (for example a larger sample and repeating the trial).
- Excellence: Full answer: use more subjects so that chance is less likely to explain the result; repeat the trial (replication) to see whether the same result is obtained; keep all other variables the same for both groups (fair test) and assign subjects to groups at random; use a blind or double-blind design so expectations do not influence the results; have the study reviewed by other scientists before reporting it.

> **KEY TAKEAWAY**
> Evaluating claims: calculate the percentage difference, compare it with the variation (ranges), check the sample size and the fair test, then decide whether the evidence supports the claim.

(b) A blogger writes: ‘An increase in the number of possum traps set in a forest block causes an increase in number of kiwi chicks surviving’ and displays the data in the table (a fictional practice example). (i) Describe the relationship shown in the table and calculate the percentage change in chicks surviving from the first to the last column. (ii) Explain why the data alone do not show that the claim is true. (iii) Suggest another factor that could explain the relationship, and describe a test that could be carried out to find out whether the claim is true.

(b) Answer: (i) positive relationship; change 525%; (ii) correlation is not cause; (iii) the amount of funding for the whole conservation programme

- Evidence level: Merit (describe the trend, calculate the percentage change, then separate correlation from cause).
- (i) As traps set increases, chicks surviving generally increases (a positive correlation). Change = (25 − 4) ÷ 4 × 100 = 525%.
- Achievement: (ii) States that correlation does not prove cause.
- Merit: Links to another variable: both could be affected by a third factor.
- Excellence: Full explanation: the table shows that the two variables change together (a correlation),

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but this does not show that one causes the other; both could be caused by a third (confounding) variable, the cause and effect could be the other way round, or the pattern could be chance with a small sample of only 5 points.

• Achievement: (iii) Suggests the amount of funding for the whole conservation programme.

• Merit: Links the other factor to both variables.

• Excellence: Full explanation: the amount of funding for the whole conservation programme could cause both variables to change, so they would rise together even if neither caused the other; a fair test would keep the amount of funding for the whole conservation programme constant while changing only the first variable, or compare many more places or times, to see whether the relationship remains.

KEY TAKEAWAY

Correlation and causation: variables that change together are correlated; to show cause, control other variables (fair test) and rule out a third factor.

LOS: Claims and data (91923)

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