Conditional versus unconditional probabilities

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Find $P(\text{cycle})$ from the travel table. [2 marks]

Invented survey of 60 students; every student is in exactly one travel category.

Travel	Girl	Boy	Total
Cycle	12	8	20
Walk	18	22	40
Total	30	30	60

$\frac{20}{60} = \frac{1}{3}$.

Answer: $\frac{1}{3}$.

2. Find $P(\text{boy and cycle})$. [2 marks]

Invented survey of 60 students; every student is in exactly one travel category.

Travel	Girl	Boy	Total
Cycle	12	8	20
Walk	18	22	40
Total	30	30	60

$\frac{8}{60} = \frac{2}{15}$.

Answer: $\frac{2}{15}$.

3. Find $P(\text{boy} \mid \text{cycle})$. [2 marks]

Invented survey of 60 students; every student is in exactly one travel category.

Travel	Girl	Boy	Total
Cycle	12	8	20
Walk	18	22	40
Total	30	30	60

$\frac{8}{20} = \frac{2}{5}$.

Answer: $\frac{2}{5}$.

4. Are being a boy and cycling independent in this table? [3 marks]

Invented survey of 60 students; every student is in exactly one travel category.

Travel	Girl	Boy	Total
Cycle	12	8	20
Walk	18	22	40
Total	30	30	60

$P(\text{boy}) = \frac{1}{2}$, but $P(\text{boy} \mid \text{cycle}) = \frac{2}{5}$.

Answer: No.

5. $P(A) = 0.25$ and $P(A \mid B) = 0.25$, with $P(B) > 0$. What can you conclude? [2 marks]

The condition does not change the probability of A.

Answer: A and B are independent.

6. A survey links extra tutoring with higher scores. Explain why a conditional proportion alone does not prove tutoring caused the increase. [3 marks]

Prior attainment, motivation and sampling can affect both groups.

A probability comparison alone does not isolate a cause.

Answer: Other differences may explain the association.