

Probability from a table and a restricted group

Original skill preparation; versioned source scope

Method and conditions

Original counts: condition on the requested group

Group	Lunch	No lunch	Total
Bus	18	12	30
Not bus	12	8	20
Total	30	20	50

- Conditional probability restricts the denominator.
- Fractions; table totals; event and complement.

Worked method 1

Read and reason

Conditional probability restricts the denominator. Of 40 club members, 12 cycle; 8 of those cyclists wear a helmet. $P(H \mid C) = n(H \cap C)/n(C) = 8/12 = 2/3$. The group is cyclists, so 40 is not this denominator.

Original context 1

Read and reason

Task context

Read and reason

Each task below states its own complete data. Values may differ from the worked example.

Attempt 1.1

Read and reason

A survey records 12 tea drinkers and 8 non-tea drinkers among 20 cyclists; among 30 walkers it records 9 tea drinkers and 21 non-tea drinkers. Find $P(\text{tea})$, $P(\text{tea} \mid \text{cyclist})$ and $P(\text{cyclist} \mid \text{tea})$.

Reasoning 1.1

Read and reason

Total tea drinkers are 21 of 50, so $P(T) = 21/50$. Within cyclists, $P(T | C) = 12/20 = 3/5$. Within tea drinkers, $P(C | T) = 12/21 = 4/7$. These different denominators make the conditional probabilities unequal.

Attempt 2.1

Read and reason

In the same survey, are tea drinking and cycling independent? Are they disjoint? Use numbers for both answers.

Reasoning 2.1

Read and reason

They are not independent because $P(T \mid C) = 3/5 \neq 21/50 = P(T)$. They are not disjoint because 12 respondents do both: $P(T \cap C) = 12/50 > 0$.

Attempt 3.1

Read and reason

One respondent is chosen uniformly. Find the probability of walking or drinking tea, including those who do both.

Reasoning 3.1

Read and reason

Use inclusion–exclusion. $P(W \cup T) = (30 + 21 - 9)/50 = 42/50 = 21/25$. The 9 tea-drinking walkers must not be counted twice. Equivalently exclude the 8 cyclists who do not drink tea.

Transfer and limits

Read and reason

Fractions; table totals; event and complement.

Check yourself

Read and reason

Close the worked reasoning. Explain why the method fits the final transfer task, reconstruct its conclusion, and state a condition that would change your answer. Then check the full reasoning in the reference.