Quantitative problem solving and data

Original classroom teaching; not an official form or score predictor

GRE Quantitative Problem Solving and Data

- Solve problems in arithmetic, algebra, geometry and data analysis; no calculus is needed.
- Use **conditional probability 条件概率** and percentages of a subgroup.
- Answer in the format asked: one choice, all correct choices, or **numerical entry 数值填答**.
- Check units and the form of the answer before submitting.

Read the question format

- Multiple choice, one answer: choose one.
- Multiple choice, one or more answers: test every option; choose all that work.
- **Numerical entry**: type a number or a fraction, in the form the box asks for (a decimal, a fraction, or rounded as told).

Conditional probability and subgroups

- "Given that", "of those who", "among" restrict the group. The denominator becomes that group's total.
- $P(A \mid B) = \dfrac{\text{number in both}}{\text{number in } B}$; usually $P(A \mid B) \neq P(B \mid A)$.
- In a percentage question, ask "per cent of what?".

Figure: Conditional probability and subgroups



$P(\text{cycles}) = 7/20$

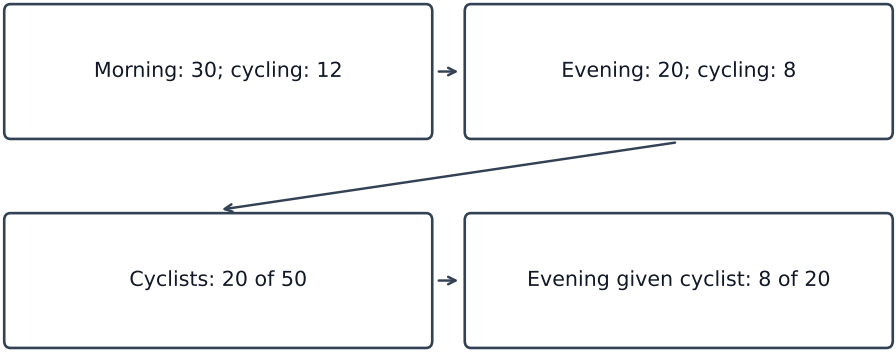
$P(\text{afternoon} \mid \text{cycles}) = 4/7$

- Conditioning shrinks the denominator to the cyclists.
- Match each part of the diagram to the text.

Estimating and the calculator

- Estimate first, so you can spot a calculator slip.
- Keep exact fractions until the last step, then convert if asked.
- Do not assume a geometric figure is drawn to scale.

Figure: Estimating and the calculator



- Condition on cyclists: 8 of the 20 cyclists travelled in the evening

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Worked example: a small table

- $P(\text{cycles}) = \dfrac{3+4}{20} = \dfrac{7}{20} = 0.35.$
- $P(\text{afternoon} \mid \text{cycles}) = \dfrac{4}{7}$: only the 7 cyclists count.
- $P(\text{cycles} \mid \text{afternoon}) = \dfrac{4}{8} = \dfrac{1}{2}$: a different question with a different denominator.

Worked example: an original application

- In an original survey table, morning students number 30 and evening students 20.
- Twelve morning and eight evening students cycle.
- Enter the probability that a randomly chosen student cycles as a decimal.
- Enter the probability that a cyclist is an evening student as a fraction.

Independent transfer

- A rectangular display has area $48\ \mathrm{cm}^2$, positive integer side lengths and perimeter at most $32\ \mathrm{cm}$.
- Select all possible lengths of its longer side: 6, 8, 12, 16, 24.
- Show why your list is complete.
- **8 and 12.** Let the longer side be L and shorter side $48/L$.

Common errors

- Using the grand total when the question restricts the group.
- Swapping $P(A \mid B)$ and $P(B \mid A)$.
- Entering a percentage when the box asks for a probability.

Common errors (2)

- Stopping after one answer in a select-all question.
- Reading a figure as if it were to scale.

Key terms

- **conditional probability**: The probability of an event within a restricted group.
- **numerical entry**: A question format in which you type the answer instead of choosing it.

Check yourself

- Of 40 students, 10 study French; 6 of those also study Spanish. Find $P(\text{Spanish} \mid \text{French})$.
- The box asks for a probability as a decimal. Do you enter 35 or 0.35?
- A price rises from 80 to 100. What is the percentage increase?