

Probability

A Level Maths · Knowledge organiser



KEY DEFINITIONS

Mutually exclusive

Events that cannot both happen: $P(A \cap B) = 0$.

Independent

One event does not change the chance of the other: $P(A \cap B) = P(A)P(B)$.

Conditional probability

$P(A | B) = P(A \cap B)/P(B)$, the chance of A once B is known.

Venn diagram

Overlapping regions show events; fill in the intersection first.

YOU SHOULD BE ABLE TO...

- Calculate probabilities from sample spaces and use Venn diagrams with two or three events to find probabilities of unions, intersections and complements.
- Use the addition rule for mutually exclusive events and the multiplication rule for independent events, and test whether two events are independent.
- Use set notation, including unions, intersections and complements, to describe events and calculate probabilities from Venn diagrams.
- Calculate conditional probabilities such as $P(A | B)$ from two-way tables and descriptions, and use them to decide whether events are independent.
- Use the formulae $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ and $P(A \cap B) = P(A | B)P(B)$ to solve probability problems.
- Use tree diagrams and two-way tables to find conditional probabilities, including working backwards to find the probability of an earlier event.

COMMON MISTAKES

- ✗ Correlation read as causation
- ✗ Extrapolation without comment
- ✗ 'independent' confused with 'mutually exclusive'
- ✗ $\log y = \log a + x \log b$ read as gradient a

KEY FORMULAS

B = given in the exam (formula booklet or list); learn the rest.

Union **B** $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Intersection **B** $P(A \cap B) = P(A) \times P(B | A)$

Conditional **B** $P(A | B) = \frac{P(A \cap B)}{P(B)}$

Independent **B** $P(A \cap B) = P(A)P(B)$, $P(A | B) = P(A)$

WORKED EXAMPLE

$P(A) = 0.4$, $P(B) = 0.5$ and $P(A \cap B) = 0.2$. Are A and B independent? Find $P(A \cup B)$.

1. $P(A) \times P(B) = 0.4 \times 0.5 = 0.2 = P(A \cap B)$
2. $P(A \cup B) = 0.4 + 0.5 - 0.2$

Answer: Yes, they are independent; $P(A \cup B) = 0.7$