

Exercise walk-through

Probability ■ 5.3

eXercise

You must be able to

- use $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- test independence with $P(A \cap B) = P(A)P(B)$
- use $P(A | B) = \frac{P(A \cap B)}{P(B)}$

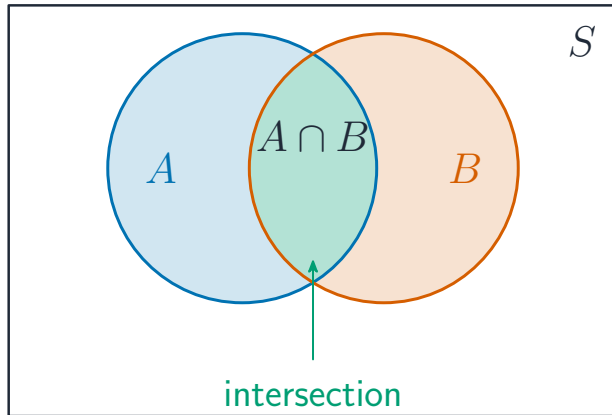
Method — Rules & independence

$P(A) = 0.5$, $P(B) = 0.4$, $P(A \cap B) = 0.2$. **Independent?**

$P(A)P(B) = 0.2 = P(A \cap B)$ — yes.

Conditional: $P(A \mid B) = \frac{0.2}{0.4} = 0.5$.

Method — Rules & independence



Two overlapping circles in a rectangle, the overlap shaded

Practice 2.1 ■ 2 marks

Events are mutually exclusive with $P(A) = 0.3$, $P(B) = 0.45$. Find $P(A \cup B)$.

Solution 2.1

Worked steps

mutually exclusive $\rightarrow P(A \cup B) = 0.3 + 0.45 = 0.75$ **M1** **A1**.

Practice 2.2 ■ 1 mark

State the test for two events A and B to be independent.

Solution 2.2

Worked steps

$$P(A \cap B) = P(A) \times P(B) \quad \text{B1}.$$

Exam-style 3.1 ■ 1 mark

For independent events with $P(A) = 0.6$ and $P(B) = 0.5$, $P(A \cap B)$ is:

A 1.1

B 0.3

C 0.1

D 0

Solution 3.1

A 1.1

B 0.3



C 0.1

D 0

Worked steps

B. $0.6 \times 0.5 = 0.3$.

Exam-style 3.2 ■ 2 marks

A and B are events with $P(A) = 0.6$, $P(B) = 0.5$ and $P(A \cup B) = 0.8$.

- (a) Find $P(A \cap B)$.
- (b) Determine whether A and B are independent.
- (c) Find $P(A \mid B)$.

Solution 3.2

Worked steps

(a) $0.8 = 0.6 + 0.5 - P(A \cap B) \Rightarrow P(A \cap B) = 0.3$ **M1** **A1**.

(b) $P(A)P(B) = 0.6 \times 0.5 = 0.3 = P(A \cap B)$, so they **are** independent **M1** **A1**.

(c) $P(A | B) = \frac{0.3}{0.5} = 0.6$ **M1** **A1**.

Exam-style 3.3 ■ 3 marks

A bag has 5 red and 3 blue balls. Two are drawn without replacement. Find the probability that both are red.

Solution 3.3

Worked steps

$$P(\text{both red}) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14} \quad \text{M1 M1 A1}.$$