E8.4 Conditional probability

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS conditional probability • probability • tree diagram • without replacement • venn diagram

Objective

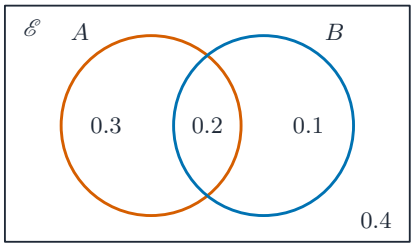
Build the skills to answer Extended exam questions on **conditional probability** – the probability of one event **given that** another has happened, read from a Venn diagram, a two-way table or a tree diagram.

You must be able to:

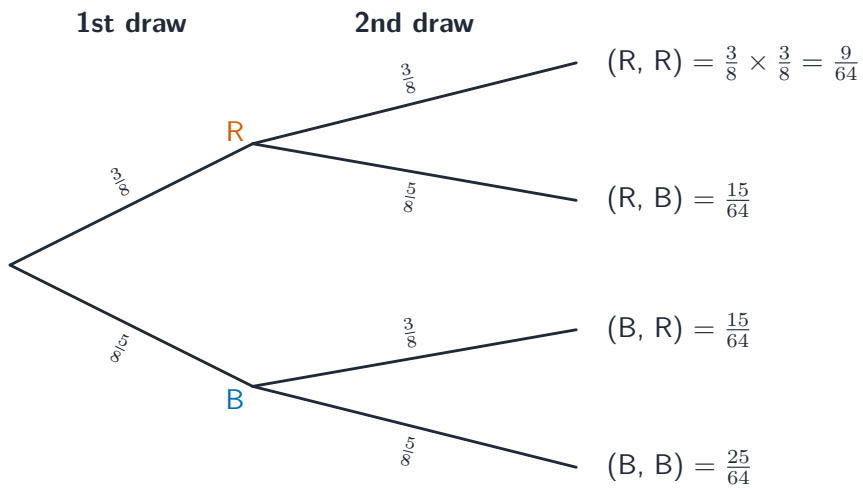
- find a conditional probability from a Venn diagram or table
- restrict attention to the part that matches the condition
- combine with without-replacement reasoning

1 Key knowledge and worked examples

■ Conditional probability



"Given that" means look only at the matching part



A tree diagram handles conditional probability

- **Worked:** 30 students, 18 study French, of whom 7 also study German.
- A French student is picked → P(German | French) = $\frac{7}{18}$ (look only at the 18 French students).

Answer shapes: M1 a correct method, **A1** the correct answer.

2 Practice

2.1 Of 20 people, 12 own a dog and, of those, 5 also own a cat. A dog owner is chosen. Find the probability they also own a cat. [2]

2.2 In a Venn diagram, $P(A) = 0.5$ and $P(A \cap B) = 0.2$. Find $P(B \mid A)$. [2]

2.3 A two-way table shows 40 students; 24 walk to school and 9 of those are girls. A walker is chosen. Find the probability the walker is a girl. [2]

3 Exam-style questions

3.1 A box has 5 red and 3 blue pens. Two are taken **without replacement**.

(a) Find the probability that the first is red and the second is blue. [2]

(b) Find the probability that both are the same colour. [3]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- look only at the 12 dog owners

$$\frac{5}{12}$$

2.2

$$\mathrm{P}(B \mid A) = \frac{\mathrm{P}(A \cap B)}{\mathrm{P}(A)} = \frac{0.2}{0.5} = \mathbf{0.4}$$

2.3

- look only at the 24 walkers

$$\frac{9}{24} = \mathbf{\frac{3}{8}}$$

3.1

(a)

$$\frac{5}{8} \times \frac{3}{7} = \mathbf{\frac{15}{56}}$$

(b)

- $\mathrm{P}(\text{red, red}) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$
- $\mathrm{P}(\text{blue, blue}) = \frac{3}{8} \times \frac{2}{7} = \frac{6}{56}$
- total $\frac{26}{56} = \mathbf{\frac{13}{28}}$