Homework — Part 1: Review of the lesson

6 problems. Solve them in your notebook. Problems 1–5: no calculator — leave answers as simplified fractions or exact decimals. Problem 6 is Paper 2 (calculator allowed).

Key formulas

Independent: $P(A \cap B) = P(A)P(B)$ Conditional: $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Tree: **multiply along** a path, **add** different paths. Without replacement → the total goes down by 1.

Level 1 — Basic

1. A and B are independent events. $P(A) = 0.4$ and $P(B) = 0.25$.

(a) **Find** $P(A \cap B)$. **[1]**

(b) **Find** $P(A \cup B)$. **[2]**

2. A bag contains 2 red and 3 yellow balls. A ball is taken at random, its colour is noted and it is **put back**. Then a second ball is taken.

(a) **Draw** a tree diagram to show this information. **[2]**

(b) **Find** the probability that both balls are yellow. **[1]**

(c) **Find** the probability that the balls are different colours. **[2]**

Level 2 — Medium

3. 30 students were asked if they like mathematics.

	Likes maths	Does not like maths	Total
Boys	8	7	15
Girls	9	6	15
Total	17	13	30

A student is chosen at random.

(a) **Find** the probability that the student likes maths, given that the student is a girl. **[2]**

(b) **Find** the probability that the student is a boy, given that the student likes maths. **[2]**

(c) **Determine** whether the events “girl” and “likes maths” are independent. **Justify** your answer. **[2]**

4. A box contains 3 blue and 5 black pens. Two pens are taken at random, one after the other, **without replacement**.

(a) **Find** the probability that both pens are black. **[2]**

(b) **Find** the probability that at least one pen is blue. **[2]**

Level 3 — Exam style

5. Paper 1 — no calculator

A and B are independent events with $P(A) = 0.5$ and $P(B) = 0.3$.

(a) **Find** $P(A \cap B)$. **[1]**

(b) **Find** $P(A \cup B)$. **[2]**

(c) **Find** $P(A \mid B')$. **[3]**

(d) **Determine** whether A and B are mutually exclusive. **Justify** your answer. **[2]**

6. Paper 2 — calculator

Jo goes to school by bus with probability 0.65; otherwise Jo walks. If Jo takes the bus, the probability that Jo is late is 0.1. If Jo walks, the probability that Jo is late is 0.2.

(a) **Draw** a tree diagram to show this information. **[2]**

(b) **Find** the probability that Jo is late on a given day. **[2]**

(c) Jo is late. **Find** the probability that Jo took the bus. **[3]**

(d) The days are independent. **Find** the probability that Jo is on time on two days in a row. **[2]**

Answers

1	(a) 0.1 (b) 0.55
2	(b) $\frac{9}{25}$ (c) $\frac{12}{25}$
3	(a) $\frac{9}{15} = \frac{3}{5}$ (b) $\frac{8}{17}$ (c) not independent: $P(\text{likes}) = \frac{17}{30} \neq \frac{3}{5}$
4	(a) $\frac{20}{56} = \frac{5}{14}$ (b) $\frac{9}{14}$
5	(a) 0.15 (b) 0.65 (c) 0.5 (d) no, $P(A \cap B) = 0.15 \neq 0$
6	(b) 0.135 (c) $\frac{13}{27} \approx 0.481$ (d) 0.748