AP STATISTICS • EXERCISE SHEET

4.5 Conditional Probability

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on **conditional probability**.

You must be able to:

- calculate a **conditional probability** 条件概率, $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$
- apply the **multiplication rule** 乘法法则, $P(A \cap B) = P(A) \cdot P(B \mid A)$

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ **Conditional probability**

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

is the probability of A **given** that B has occurred.

■ **Multiplication rule**

$$P(A \cap B) = P(A) \cdot P(B \mid A).$$

■ **Example**

If $P(A \cap B) = 0.2$ and $P(B) = 0.5$, then $P(A \mid B) = \dfrac{0.2}{0.5} = 0.4$.

2 Practice

2.1 Write the formula for $P(A \mid B)$. [1]

2.2 If $P(A \cap B) = 0.12$ and $P(B) = 0.4$, find $P(A \mid B)$. [2]

2.3 State the multiplication rule. [1]

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3 Exam-style questions

3.1 $P(A \mid B)$ equals [1]

- **A** $\dfrac{P(A \cap B)}{P(B)}$
- **B** $P(A) + P(B)$
- **C** $P(A) \cdot P(B)$
- **D** $\dfrac{P(B)}{P(A)}$

3.2 The multiplication rule gives $P(A \cap B) =$ [1]

- **A** $P(A) + P(B \mid A)$
- **B** $P(A) \cdot P(B \mid A)$
- **C** $\dfrac{P(A)}{P(B)}$
- **D** $P(A) - P(B)$

3.3 In a class, $P(\text{likes maths and science}) = 0.3$ and $P(\text{science}) = 0.6$.

(a) Find $P(\text{likes maths} \mid \text{science})$. [2]

(b) Write the general formula for $P(A \mid B)$. [1]

4 Go further

- work through the **4.5 Conditional Probability** lesson on the **Learn** page;
- read the **Probability, Random Variables, and Probability Distributions** section of the AP Statistics handout on the **Know** page.

Solutions

2.1 $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$.

2.2 $P(A \mid B) = \dfrac{0.12}{0.4} = 0.3$.

2.3 $P(A \cap B) = P(A) \cdot P(B \mid A)$.

3.1 **A**.

3.2 **B**.

3.3 (a) $\dfrac{0.3}{0.6} = 0.5$. (b) $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$.