

4.3 Introduction to Probability

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS complement 补 • sample space 样本空间 • probability 概率 • random 随机

Objective

Build the skills to answer exam questions on **the basics of probability**.

You must be able to:

- identify the **sample space** 样本空间 of a random process
- calculate $P(E) = \frac{\text{outcomes in } E}{\text{total outcomes}}$ for equally likely outcomes
- use that a probability is between 0 and 1
- find the **complement**, $P(E') = 1 - P(E)$

1 Worked examples

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

■ Basic probability

The **sample space** is the set of all possible outcomes. If all are equally likely:

$$P(E) = \frac{\text{number of outcomes in } E}{\text{total number of outcomes}}.$$

■ Range and complement

Every probability satisfies $0 \leq P(E) \leq 1$. The **complement** (not E) has $P(E') = 1 - P(E)$. A probability is the **long-run relative frequency** of the event.

■ Example

A fair die: $P(\text{even}) = \frac{3}{6} = 0.5$.

2 Practice

2.1 State the range of any probability. [1]

2.2 A fair die is rolled. Find $P(\text{rolling a 4})$. [1]

2.3 If $P(\text{rain}) = 0.3$, find $P(\text{no rain})$. [2]

3 Exam-style questions

3.1 The probability of the complement of E is [1]

- **A** $P(E)$
- **B** $1 - P(E)$
- **C** $1 + P(E)$
- **D** 0

3.2 A probability must be between [1]

- **A** -1 and 1
- **B** 0 and 1
- **C** 0 and 100
- **D** any two values

3.3 A bag has 3 red and 7 blue balls, drawn at random.

(a) Find $P(\text{red})$. [2]

(b) Find $P(\text{not red})$. [1]

Solutions

2.1 between 0 and 1 (inclusive).

2.2 $\frac{1}{6} \approx 0.167$.

2.3 $P(\text{no rain}) = 1 - 0.3 = 0.7$.

3.1 B.

3.2 B.

3.3 (a) $P(\text{red}) = \frac{3}{10} = 0.3$. (b) $1 - 0.3 = 0.7$.