

4.2 Estimating Probabilities Using Simulation

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS simulation 模拟 • relative frequency 相对频数 • random 随机 • probability 概率

Objective

Build the skills to answer exam questions on **estimating probabilities using simulation**.

You must be able to:

- use a **simulation** 模拟 with random numbers to estimate a probability
- explain how running more trials improves the estimate
- interpret a **relative frequency** 相对频数 as an estimate of a probability

1 Worked examples

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

■ Simulation

A **simulation** uses a **random number generator** to imitate a random process many times. The **relative frequency** of an event (how often it happens $\div$ number of trials) estimates its probability.

■ More trials, better estimate

By the long-run pattern of randomness, the estimate gets **closer to the true probability** as the number of simulated trials increases.

2 Practice

2.1 State what a simulation uses to estimate a probability.

[1]

2.2 State how the estimate improves.

[1]

2.3 State what the relative frequency of an event approximates. [1]

3 Exam-style questions

3.1 A simulation estimates a probability using [1]

A	B
C	D

- A** a single trial
- B** many random trials
- C** a formula only
- D** a guess

3.2 As the number of simulated trials increases, the estimate [1]

A	B
C	D

- A** gets worse
- B** gets closer to the true probability
- C** stays fixed
- D** becomes 1

3.3 A student simulates rolling a die 1000 times to estimate $P(\text{six})$.

(a) State the tool that provides the randomness. [1]

(b) State what the relative frequency of sixes estimates. [1]

(c) State how to improve the estimate. [1]