

# 4.1 Introducing Statistics: Random and Non-Random Patterns?

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 8 marks

## Objective

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Build the skills to answer exam questions on **random and non-random patterns**.

**You must be able to:**

- explain that a **random process** 随机过程 is unpredictable in the short run but patterned in the long run
- distinguish **random** from **non-random** patterns
- give examples of random processes

## 1 Worked examples

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

### ■ Random processes

A single outcome of a **random process** cannot be predicted, but over **many** repetitions a stable pattern emerges —this long-run regularity is what probability describes.

### ■ Random vs non-random

A **coin flip** is random (each result unpredictable); a fixed daily schedule is **non-random** (predictable).

## 2 Practice

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**2.1** State what happens to a random process's behaviour in the long run. [1]

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**2.2** State the difference between random and non-random patterns. [1]

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**2.3** Give one example of a random process. [1]

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### 3 Exam-style questions

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3.1 A random process is unpredictable in the short run but shows a pattern [1]

- **A** never
  - **B** in the long run
  - **C** only once
  - **D** immediately
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3.2 Which of these is a random process? [1]

- **A** the exact sunrise time tomorrow
  - **B** a coin flip
  - **C** a fixed timetable
  - **D** the value of  $2 + 2$
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3.3 A fair coin is flipped many times.

(a) State whether the result of a single flip is predictable. [1]

(b) State what emerges over many flips. [1]

(c) State the long-run proportion of heads for a fair coin. [1]

### 4 Go further

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- work through the **4.1 Random and Non-Random Patterns?** lesson on the **Learn** page;
- read the **Probability, Random Variables, and Probability Distributions** section of the AP Statistics handout on the **Know** page.

## Solutions

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**2.1** it settles into a stable, predictable pattern (relative frequency).

**2.2** a random pattern is unpredictable in the short run; a non-random one is predictable.

**2.3** a coin flip, a die roll, or drawing a card (any one).

**3.1 B.**

**3.2 B.**

**3.3** (a) no. (b) a stable pattern —about half heads. (c) 0.5.