

4.7 Introduction to Random Variables and Probability Distributions

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

KEY WORDS random variable 随机变量 • probability distribution 概率分布
• discrete random variable 离散随机变量 • random 随机 • probability 概率

Objective

Build the skills to answer exam questions on **random variables and probability distributions**.

You must be able to:

- describe the values of a **random variable** 随机变量 as numerical outcomes
- explain that a **discrete random variable** 离散随机变量 has countable values whose probabilities sum to 1
- represent a **probability distribution** 概率分布 as a table, graph, or function

1 Worked examples

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

■ **Random variables**

The values of a **random variable** are the numerical outcomes of a random process. A **discrete** random variable can take only a **countable** number of values, each with a probability.

■ **The key rule**

The probabilities of all possible values must **sum to 1**. A **probability distribution** lists the values and their probabilities (as a table, graph, or function).

2 Practice

2.1 State what the probabilities in a discrete distribution must sum to. [1]

2.2 A random variable X has $P(0) = 0.2$, $P(1) = 0.5$, and $P(2) = ?$. Find the missing probability. [2]

2.3 Define a discrete random variable. [1]

3 Exam-style questions

3.1 The probabilities of a discrete random variable sum to [1]

- A 0
- B 1
- C 100
- D the mean

3.2 A discrete random variable takes [1]

- A any real value
- B a countable number of values
- C only 0 or 1
- D only negative values

3.3 X has $P(1) = 0.3$, $P(2) = 0.4$, and $P(3) = ?$.

(a) Find $P(3)$. [2]

(b) State what all the probabilities must sum to. [1]

Solutions

2.1 1.

2.2 $P(2) = 1 - 0.2 - 0.5 = 0.3$.

2.3 a variable that can take only a countable number of numerical values, each with a probability.

3.1 B.

3.2 B.

3.3 (a) $P(3) = 1 - 0.3 - 0.4 = 0.3$. (b) 1.