

1.10 The Normal Distribution

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS normal distribution 正态分布 • -score 分数 • empirical rule 经验法则 • mean 均值
• standard deviation 标准差

Objective

Build the skills to answer exam questions on **the normal distribution**.

You must be able to:

- describe the **normal distribution** 正态分布 as a symmetric, bell-shaped model with mean μ and standard deviation σ
- apply the **empirical rule** 经验法则 (68-95-99.7)
- calculate a ***z*-score** z 分数 and use the standard normal distribution

1 Worked examples

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

■ **The normal distribution**

Symmetric and bell-shaped, fully described by its **mean** μ (center) and **standard deviation** σ (spread).

■ **The empirical rule**

For a normal distribution, about **68%** of values lie within 1σ , **95%** within 2σ , and **99.7%** within 3σ of the mean.

■ **The *z*-score**

$$z = \frac{x - \mu}{\sigma}$$

gives how many standard deviations x is from the mean. With $\mu = 100$, $\sigma = 15$, $x = 130$: $z = 2$.

2 Practice

2.1 State the three percentages of the empirical rule. [2]

2.2 A normal distribution has $\mu = 50$, $\sigma = 5$. Find the z -score of $x = 60$. [2]

2.3 State the two parameters that define a normal distribution. [1]

3 Exam-style questions

3.1 The empirical rule says about 95% of data lie within [1]

- A 1
- B 2
- C 3
- D 4

standard deviations of the mean.

3.2 A z -score measures [1]

- | | |
|---|---|
| A | B |
| C | D |
- A the mean
 - B how many standard deviations a value is from the mean
 - C the median
 - D the range

3.3 IQ scores are normal with $\mu = 100$ and $\sigma = 15$.

(a) Find the z -score for $x = 115$. [2]

(b) State the percentage of scores within 1 standard deviation of the mean. [1]