

5.2 The Normal Distribution, Revisited

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

KEY WORDS standard normal 标准正态

Objective

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

You must be able to:

- calculate a **z-score** $z = \frac{x - \mu}{\sigma}$
- use the **standard normal** 标准正态 distribution to find proportions and percentiles

1 Worked examples

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

■ The z-score

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

gives how many standard deviations x is from the mean. Positive is above the mean; negative is below.

■ The standard normal

The **standard normal** distribution has mean 0 and standard deviation 1. Converting to a **z-score** lets you look up **proportions** and **percentiles**. For $\mu = 70$, $\sigma = 10$, $x = 85$: $z = 1.5$.

2 Practice

2.1 Write the z-score formula. [1]

2.2 For $\mu = 60$, $\sigma = 8$, find the z -score of $x = 76$. [2]

2.3 State what a z -score of 0 means. [1]

3 Exam-style questions

3.1 A z -score of 2 means a value is [1]

- A at the mean
- B 2 standard deviations above the mean
- C 2 below the mean
- D impossible

3.2 The standard normal distribution has mean and standard deviation [1]

- A 0 and 1
- B 1 and 0
- C 100 and 15
- D any values

3.3 Test scores are normal with $\mu = 500$ and $\sigma = 100$.

(a) Find the z -score for a score of 650. [2]

(b) State whether 650 is above or below average. [1]

Solutions

2.1 $z = \frac{x - \mu}{\sigma}.$

2.2 $z = \frac{76 - 60}{8} = 2.$

2.3 the value equals the mean.

3.1 B.

3.2 A.

3.3 (a) $z = \frac{650 - 500}{100} = 1.5.$ (b) above average.