

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
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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
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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.