

5.7 Sampling Distributions for Sample Means

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS sampling distribution 抽样分布 • standard error 标准误

Objective

Build the skills to answer exam questions on **the sampling distribution of a sample mean**.

You must be able to:

- use the mean $\mu_{\bar{x}} = \mu$
- use the standard deviation $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ (the standard error)

1 Worked examples

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

■ Centre and spread

For the sample mean $\bar{x}$:

$$\mu_{\bar{x}} = \mu, \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}.$$

The standard deviation of $\bar{x}$ shrinks as n grows — larger samples give **less** variable means.

■ Example

$$\sigma = 20, n = 100: \sigma_{\bar{x}} = \frac{20}{\sqrt{100}} = 2.$$

2 Practice

2.1 Write the mean of the sampling distribution of $\bar{x}$. [1]

2.2 For $\sigma = 15$ and $n = 25$, find $\sigma_{\bar{x}}$. [2]

2.3 State what happens to $\sigma_{\bar{x}}$ as n increases. [1]

3 Exam-style questions

3.1 The mean of the sampling distribution of $\bar{x}$ is [1]

- **A** $\bar{x}$
 - **B** μ
 - **C** σ
 - **D** 0
-

3.2 The standard deviation of $\bar{x}$ is [1]

- **A** σ
 - **B** $\frac{\sigma}{\sqrt{n}}$
 - **C** $\frac{\sigma}{n}$
 - **D** $\sqrt{\sigma}$
-

3.3 A population has $\mu = 50$ and $\sigma = 10$; samples of size $n = 100$ are taken.

(a) Find $\mu_{\bar{x}}$. [1]

(b) Find $\sigma_{\bar{x}}$. [2]

Solutions

2.1 $\mu_{\bar{x}} = \mu.$

2.2 $\sigma_{\bar{x}} = \frac{15}{\sqrt{25}} = 3.$

2.3 it decreases.

3.1 B.

3.2 B.

3.3 (a) 50. (b) $\sigma_{\bar{x}} = \frac{10}{\sqrt{100}} = 1.$