AP STATISTICS • EXERCISE SHEET

5.7 Sampling Distributions for Sample Means

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

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 $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$ (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 $\bar{x}$:

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

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

Example

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

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]

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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** $\dfrac{\sigma}{\sqrt{n}}$
- **C** $\dfrac{\sigma}{n}$
- **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]

4 Go further

- work through the **5.7 Sampling Distributions for Sample Means** lesson on the **Learn** page;
- read the **Sampling Distributions** section of the AP Statistics handout on the **Know** page.

Solutions

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

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

2.3 it decreases.

3.1 B.

3.2 B.

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