

Exercise walk-through

Sampling Distributions for Sample Means ■ 5.7

eXercise

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)

Method — 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.

Method — Example

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

Practice 2.1 ■ 1 mark

Write the mean of the sampling distribution of $\bar{x}$.

Solution 2.1

Worked steps

$$\mu_{\bar{x}} = \mu \quad \text{B1}.$$

Practice 2.2 ■ 2 marks

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

Solution 2.2

Worked steps

$$\sigma_{\bar{x}} = \frac{15}{\sqrt{25}} = 3 \quad \text{M1} \quad \text{A1}.$$

Practice 2.3 ■ 1 mark

State what happens to $\sigma_{\bar{x}}$ as n increases.

Solution 2.3

Worked steps

it decreases **B1**.

Exam-style 3.1 ■ 1 mark

The mean of the sampling distribution of $\bar{x}$ is

A $\bar{x}$

B μ

C σ

D 0

Solution 3.1

A $\bar{x}$

B μ



C σ

D 0

Worked steps

B.

Exam-style 3.2 ■ 1 mark

The standard deviation of $\bar{x}$ is

A σ

B $\frac{\sigma}{\sqrt{n}}$

C $\frac{\sigma}{n}$

D $\sqrt{\sigma}$

Solution 3.2

Method: Centre and spread

A σ

B $\frac{\sigma}{\sqrt{n}}$



C $\frac{\sigma}{n}$

D $\sqrt{\sigma}$

Worked steps

B.

Exam-style 3.3 ■ 1 mark

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

(a) Find $\mu_{\bar{X}}$.

(b) Find $\sigma_{\bar{X}}$.

Solution 3.3

Method: Centre and spread

Worked steps

(a) 50 **B1**. (b) $\sigma_{\bar{x}} = \frac{10}{\sqrt{100}} = 1$ **M1** **A1**.