Exercise walk-through

Sampling Distributions for Differences in Sample Means ▪ 5.8

eXercise

You must be able to

- use the mean $\mu_{\bar{x}_1 - \bar{x}_2} = \mu_1 - \mu_2$
- use the standard deviation $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

Method — Difference in means

To compare two group means, use $\bar{x}_1 - \bar{x}_2$:

$$\mu_{\bar{x}_1 - \bar{x}_2} = \mu_1 - \mu_2, \qquad \sigma = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}.$$

Again the two **variances** add under the square root.

Method — Example

$$\sigma_1 = 6,\ n_1 = 36,\ \sigma_2 = 8,\ n_2 = 64\text{:}\ \sigma = \sqrt{\frac{36}{36} + \frac{64}{64}} = \sqrt{2} \approx 1.41.$$

Practice 2.1 ▪ 1 mark

Write the mean of the sampling distribution of $\bar{x}_1 - \bar{x}_2$.

Solution 2.1

Worked steps

$\mu_1 - \mu_2$ B1.

Practice 2.2 ▪ 2 marks

For $\sigma_1 = 6$, $n_1 = 36$, $\sigma_2 = 8$, $n_2 = 64$, find the standard deviation.

Solution 2.2

Worked steps

$$\sqrt{\frac{36}{36}+\frac{64}{64}}=\sqrt{1+1}=\sqrt{2}\approx 1.41 \quad \text{M1}\ \text{A1}.$$

Practice 2.3 ▪ 1 mark

State what this sampling distribution compares.

Solution 2.3

Worked steps

the difference between two population means B1.

Exam-style 3.1 ▪ 1 mark

The mean of $\bar{x}_1 - \bar{x}_2$ is

A $\mu_1 \cdot \mu_2$

B $\mu_1 - \mu_2$

C $\mu_1 + \mu_2$

D 0

Solution 3.1

A $\mu_1 \cdot \mu_2$

B $\mu_1 - \mu_2$ ✓

C $\mu_1 + \mu_2$

D 0

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

The standard deviation of $\bar{x}_1 - \bar{x}_2$ is $\sqrt{}$ where the blank is

A $\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}$

B $\dfrac{\sigma_1}{n_1} + \dfrac{\sigma_2}{n_2}$

C $\sigma_1^2 - \sigma_2^2$

D $\sigma_1 \cdot \sigma_2$

Solution 3.2

A $\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}$ ✓

B $\dfrac{\sigma_1}{n_1} + \dfrac{\sigma_2}{n_2}$

C $\sigma_1^2 - \sigma_2^2$

D $\sigma_1 \cdot \sigma_2$

Worked steps

A.

Exam-style 3.3 ▪ 1 mark

$\sigma_1 = 10$, $n_1 = 25$, $\sigma_2 = 10$, $n_2 = 25$.

(a) Write the formula for the standard deviation.

(b) Find its value.

Solution 3.3

Worked steps

(a) $\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$ B1. (b) $\sqrt{\dfrac{100}{25} + \dfrac{100}{25}} = \sqrt{8} \approx 2.83$ M1 A1.