AP STATISTICS • EXERCISE SHEET

5.8 Sampling Distributions for Differences in Sample Means

Name: ______________ Class: __________ Date: ____________ **Total: 9 marks**

KEY WORDS sampling distribution 抽样分布

Objective

Build the skills to answer exam questions on **the sampling distribution of a difference in sample means**.

You must be able to:

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

1 Worked examples

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

■ 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.

■ Example

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

2 Practice

2.1 Write the mean of the sampling distribution of $\bar{x}_1 - \bar{x}_2$. [1]

2.2 For $\sigma_1 = 6$, $n_1 = 36$, $\sigma_2 = 8$, $n_2 = 64$, find the standard deviation. [2]

2.3 State what this sampling distribution compares. [1]

3 Exam-style questions

3.1 The mean of $\bar{x}_1 - \bar{x}_2$ is [1]

- **A** $\mu_1 \cdot \mu_2$
- **B** $\mu_1 - \mu_2$
- **C** $\mu_1 + \mu_2$
- **D** 0

3.2 The standard deviation of $\bar{x}_1 - \bar{x}_2$ is $\sqrt{\_\_\_\_}$ where the blank is [1]

- **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** $\sigma_1 \cdot \sigma_2$

3.3 $\sigma_1 = 10$, $n_1 = 25$, $\sigma_2 = 10$, $n_2 = 25$.

(a) Write the formula for the standard deviation. [1]

(b) Find its value. [2]

Solutions

2.1 $\mu_1 - \mu_2$.

2.2 $\sqrt{\frac{36}{36} + \frac{64}{64}} = \sqrt{1+1} = \sqrt{2} \approx 1.41$.

2.3 the difference between two population means.

3.1 **B**.

3.2 **A**.

3.3 (a) $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$. (b) $\sqrt{\frac{100}{25} + \frac{100}{25}} = \sqrt{8} \approx 2.83$.