

7.6 Confidence Intervals for the Difference of Two Means

Name: _____ Class: _____ Date: _____ Total: 8 marks

Objective

Build the skills to answer exam questions on a **confidence interval for the difference of two means**.

You must be able to:

- use the point estimate $\bar{x}_1 - \bar{x}_2$
- build the interval $(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$
- use the interval to judge whether the two means differ

1 Worked examples

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

■ The two-mean interval

$$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}.$$

■ Judging a difference

If the interval **contains** 0, the two means may not differ. If it is entirely **positive** ($\mu_1 > \mu_2$) or **negative** ($\mu_1 < \mu_2$), there is a significant difference.

2 Practice

2.1 Write the point estimate for the difference of two means. [1]

2.2 State how to judge whether the means differ using the interval. [1]

2.3 For $\bar{x}_1 = 52$ and $\bar{x}_2 = 48$, find the point estimate of the difference. [1]

3 Exam-style questions

3.1 A confidence interval for $\mu_1 - \mu_2$ is centred on [1]

- A $\bar{x}_1 \cdot \bar{x}_2$
- B $\bar{x}_1 - \bar{x}_2$
- C 0
- D $\bar{x}_1 + \bar{x}_2$

3.2 If a 95% CI for $\mu_1 - \mu_2$ contains 0, the two means [1]

- A definitely differ
- B may not differ
- C are exactly equal
- D are both zero

3.3 A 95% CI for $\mu_1 - \mu_2$ is (1.5, 4.5).

(a) State which mean is larger. [1]

(b) State whether 0 is in the interval. [1]

(c) State whether there is a significant difference. [1]

Solutions

2.1 $\bar{x}_1 - \bar{x}_2$.

2.2 if the interval contains 0, there is no significant difference; if not, there is.

2.3 $52 - 48 = 4$.

3.1 B.

3.2 B.

3.3 (a) μ_1 (the interval is positive). (b) no. (c) yes.