

# 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]

### 4 Go further

---

- work through the **7.6 Confidence Intervals for the Difference of Two Means** lesson on the **Learn** page;
- read the **Inference for Quantitative Data: Means** section of the AP Statistics handout on the **Know** page.

## 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)  $\mu_1$  (the interval is positive). (b) no. (c) yes.