

6.10 Setting Up a Test for the Difference of Two Population Proportions

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS pooled (combined) proportion 合并比例 • null hypothesis 原假设
• test statistic 检验统计量

Objective

Build the skills to answer exam questions on **setting up a test for a difference of two proportions**.

You must be able to:

- state the hypotheses $H_0 : p_1 = p_2$ and H_a
- explain why a **pooled (combined) proportion** 合并比例 is used
- write the pooled proportion $\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2}$

1 Worked examples

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

■ Hypotheses

- **Null** $H_0 : p_1 = p_2$ (no difference).
- **Alternative** $H_a : p_1 \neq p_2$ (or one-sided).

■ The pooled proportion

Because H_0 assumes the proportions are **equal**, we combine both samples to estimate that common value:

$$\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2},$$

and use $\hat{p}_c$ in the standard error of the test statistic.

2 Practice

2.1 State the null hypothesis for a two-proportion test.

[1]

2.2 State why a pooled proportion is used in the test. [1]

2.3 Write the formula for the pooled proportion. [1]

3 Exam-style questions

3.1 The null hypothesis in a two-proportion test is [1]

A	B
C	D

A $p_1 \neq p_2$

B $p_1 = p_2$

C $p_1 = 0$

D $\hat{p}_1 = \hat{p}_2$

3.2 The pooled proportion combines [1]

A	B
C	D

A only group 1

B both groups' successes and sample sizes

C the two means

D nothing

3.3 Group 1 has 30 successes in 100; group 2 has 20 in 100.

(a) Find $\hat{p}_1$. [1]

(b) Find $\hat{p}_2$. [1]

(c) Find the pooled proportion $\hat{p}_c$. [1]