

Exercise walk-through

6.10

Setting Up a Test for the Difference of Two Population Proportions

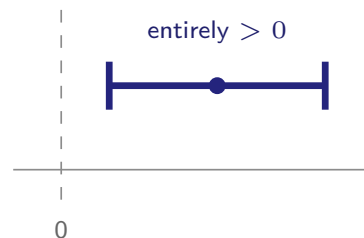
AP Statistics

Comparing two proportions

A two-sample z-interval z :

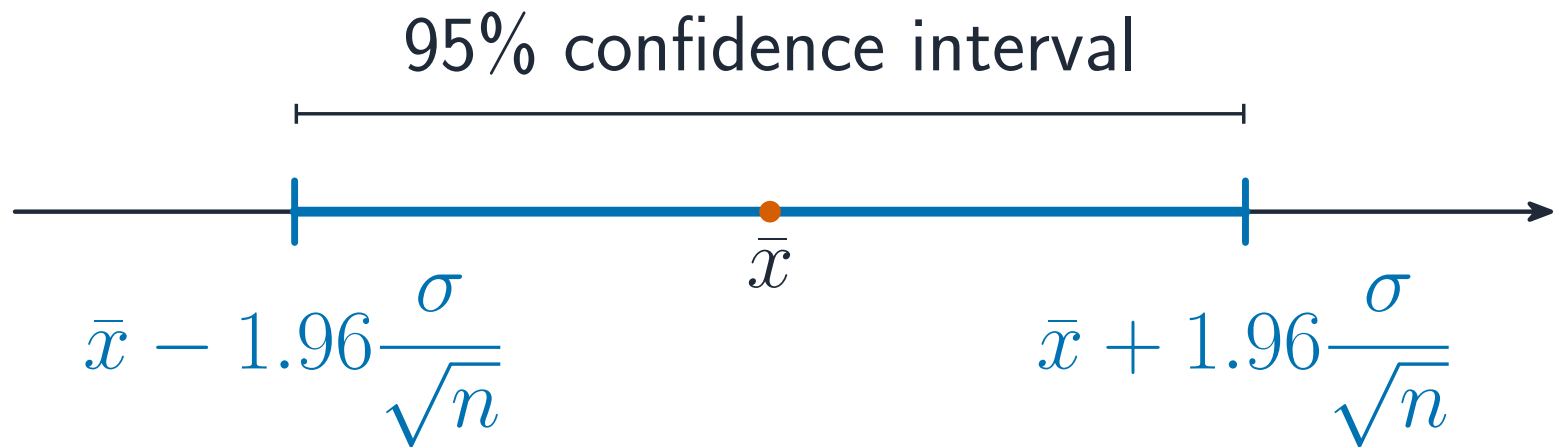
$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

If the interval excludes 0, the groups truly differ. The test pools: $\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2}$.



Excludes 0 $\Rightarrow p_1 > p_2$.

Confidence Interval for a Proportion, continued



A 95% confidence interval reaches 1.96 standard errors each side of the estimate

Why Be Normal?

Because a sample proportion $\hat{p}$ is approximately **normally** distributed (when the conditions hold).

This is what makes **inference** – drawing conclusions about a population from a sample – possible.

Exam tips

- State the conditions (random, 10%, large counts $np, nq \geq 10$) before any proportion inference.
- A **confidence interval** = estimate $\pm$ margin of error; “95% confident” refers to the **method’s** long-run capture rate.
- For a **test**, write H_0 and H_a , compute the test statistic, find the p-value, and compare to α .
- A small p-value is evidence **against** H_0 ; failing to reject does **not** prove H_0 .
- Larger samples shrink the margin of error; a higher confidence level widens it.

Exercises 2.1-2.3

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]

Exercises 2.1-2.3

2.1 State the null hypothesis for a two-proportion test. [1]

2.1

- $H_0 : p_1 = p_2$
-

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

2.2

- H_0 assumes the proportions are equal, so both samples estimate the same common value
-

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

2.3

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

Exercises 3.1-3.2

3.1 The null hypothesis in a two-proportion test is

[1]

☐

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 only group 1

B both groups' successes and sample sizes

C the two means

D nothing

Exercises 3.1-3.2

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3.1 B

- $p_1 = p_2$.

3.2 The pooled proportion combines

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3.2 B

- both groups' successes and sample sizes.

Exercise 3.3 (a)

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

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

[1]

Exercise 3.3 (a)

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

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

[1]

(a)

- 0.30

Exercise 3.3 (b)

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

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

[1]

Exercise 3.3 (b)

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

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

[1]

(b)

- 0.20

Exercise 3.3 (c)

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

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

[1]

Exercise 3.3 (c)

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

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

[1]

(c)

- $$\hat{p}_c = \frac{30 + 20}{100 + 100} = 0.25$$