

Exercise walk-through

6.9

Justifying a Claim Based on a Confidence Interval for a Difference of Population Proportions

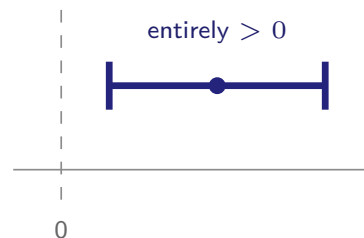
AP Statistics

Comparing two proportions

A two-sample z-interval z :

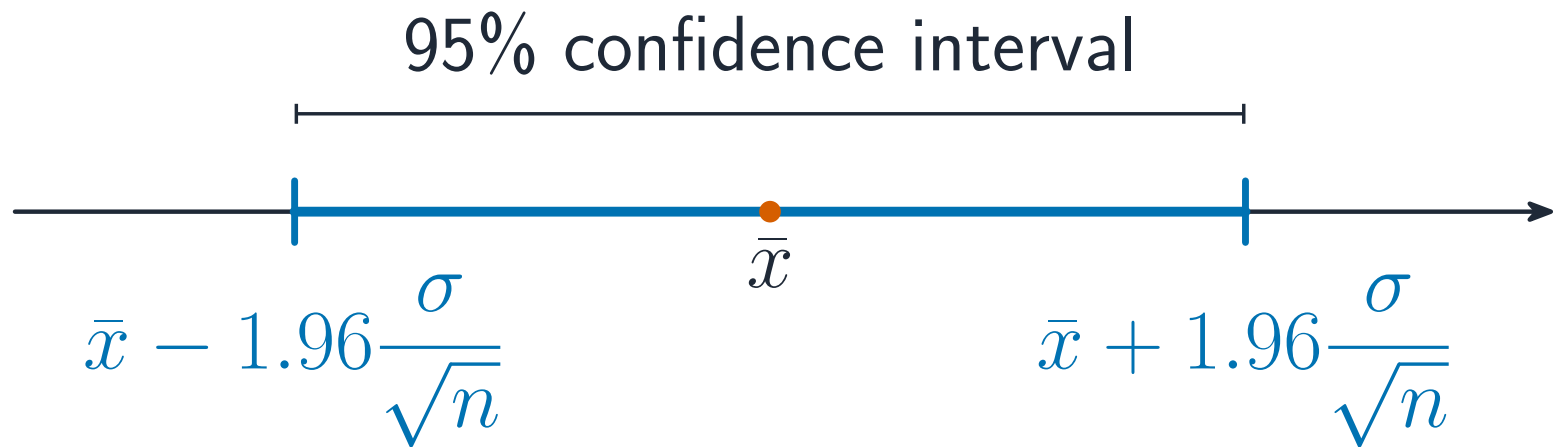
$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

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 how a CI for $p_1 - p_2$ can justify a claim of no difference. [1]

2.2 A 95% CI for $p_1 - p_2$ is $(-0.03, 0.05)$. State whether "no difference" is plausible. [1]

2.3 State what a fully positive interval implies. [1]

Exercises 2.1-2.3

2.1 State how a CI for $p_1 - p_2$ can justify a claim of no difference. [1]

2.1

- if the interval contains 0, "no difference" is plausible
-

2.2 A 95% CI for $p_1 - p_2$ is $(-0.03, 0.05)$. State whether "no difference" is plausible. [1]

2.2

- yes, plausible (0 is inside the interval)
-

2.3 State what a fully positive interval implies. [1]

2.3

- that $p_1 > p_2$ (a real difference)

Exercises 3.1-3.2

3.1 A claim of "no difference" ($p_1 = p_2$) is plausible if the CI for $p_1 - p_2$ contains [1]

☐

A 1

B 0

C $\hat{p}_1$

D the mean

3.2 A 95% CI for $p_1 - p_2$ is (0.04, 0.12). The claim $p_1 = p_2$ is [1]

☐

A supported

B not supported

C certainly true

D unknown

Exercises 3.1-3.2

3.1 A claim of "no difference" ($p_1 = p_2$) is plausible if the CI for $p_1 - p_2$ contains [1]

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A 1

B 0

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D the mean

3.1 B

- 0.

3.2 A 95% CI for $p_1 - p_2$ is (0.04, 0.12). The claim $p_1 = p_2$ is [1]

☐

A supported

B not supported

C certainly true

D unknown

3.2 B

- not supported.

Exercise 3.3 (a)

3.3 A 95% CI for the difference in approval between two groups is $(-0.02, 0.08)$.

(a) State whether 0 is in the interval.

[1]

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3.3 A 95% CI for the difference in approval between two groups is $(-0.02, 0.08)$.

(a) State whether 0 is in the interval.

[1]

(a)

- yes

Exercise 3.3 (b)

3.3 A 95% CI for the difference in approval between two groups is $(-0.02, 0.08)$.

(b) State whether the groups differ significantly.

[1]

Exercise 3.3 (b)

3.3 A 95% CI for the difference in approval between two groups is $(-0.02, 0.08)$.

(b) State whether the groups differ significantly.

[1]

(b)

- no

Exercise 3.3 (c)

3.3 A 95% CI for the difference in approval between two groups is $(-0.02, 0.08)$.

(c) State the plausible conclusion.

[1]

Exercise 3.3 (c)

3.3 A 95% CI for the difference in approval between two groups is $(-0.02, 0.08)$.

(c) State the plausible conclusion.

[1]

(c)

- there is no significant difference between the groups