

Exercise walk-through

6.11

Carrying Out a Test for the Difference of Two Population Proportions

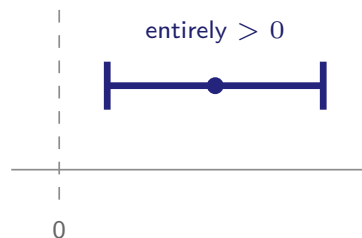
AP Statistics

Comparing two proportions

A two-sample z-interval z :

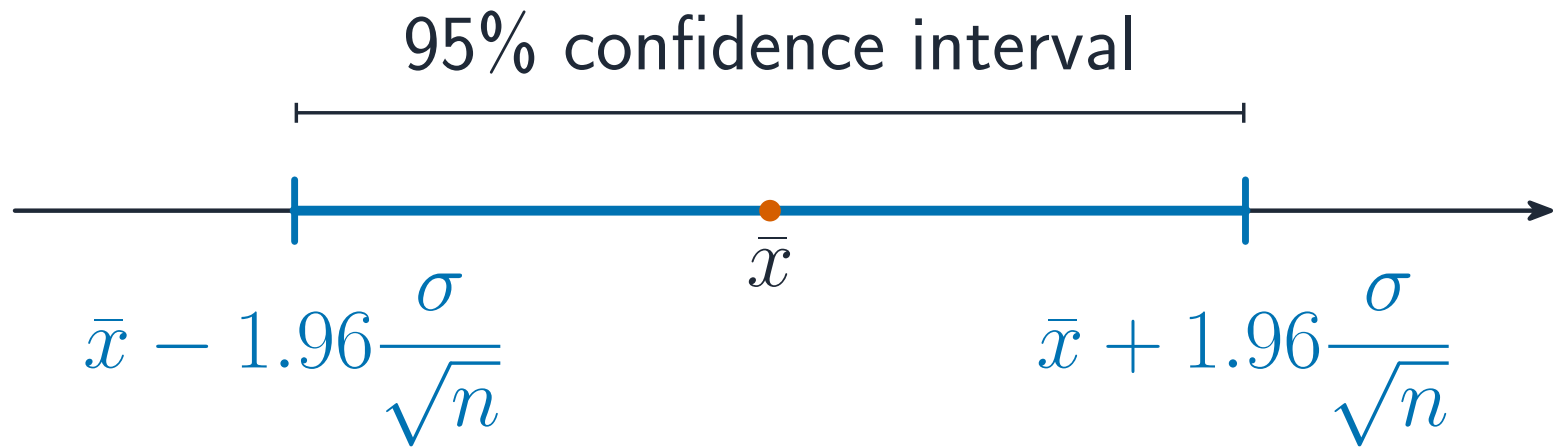
$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

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 steps to carry out a two-proportion test.

[2]

2.2 A two-proportion test gives $z = 2.5$. State whether this is likely significant at $\alpha = 0.05$.

[1]

2.3 State what to compare the p-value to.

[1]

Exercises 2.1-2.3

2.1 State the steps to carry out a two-proportion test.

[2]

2.1

- state hypotheses and check conditions; compute z ; find the p-value; compare to α and conclude in context

2.2 A two-proportion test gives $z = 2.5$. State whether this is likely significant at $\alpha = 0.05$.

[1]

2.2

- yes – $z = 2.5$ gives a small p-value, likely below 0.05

2.3 State what to compare the p-value to.

[1]

2.3

- the significance level α

Exercises 3.1-3.2

3.1 After computing z , you find the

[1]

☐

A slope

B p-value

C mean

D residual

3.2 A two-proportion test rejects H_0 when the p-value is

[1]

☐

A above α

B below α

C exactly zero

D exactly one

Exercises 3.1-3.2

3.1 After computing z , you find the

[1]

☐

A slope

B p-value

C mean

D residual

3.1 B

- p-value.

3.2 A two-proportion test rejects H_0 when the p-value is

[1]

☐

A above α

B below α

C exactly zero

D exactly one

3.2 B

- below α .

Exercise 3.3 (a)

3.3 A two-proportion test gives a p-value of 0.03 at $\alpha = 0.05$.

(a) State the decision.

[1]

Exercise 3.3 (a)

3.3 A two-proportion test gives a p-value of 0.03 at $\alpha = 0.05$.

(a) State the decision.

[1]

(a)

- reject H_0

Exercise 3.3 (b)

3.3 A two-proportion test gives a p-value of 0.03 at $\alpha = 0.05$.

(b) State whether the two proportions differ significantly.

[1]

Exercise 3.3 (b)

3.3 A two-proportion test gives a p-value of 0.03 at $\alpha = 0.05$.

(b) State whether the two proportions differ significantly.

[1]

(b)

- yes

Exercise 3.3 (c)

3.3 A two-proportion test gives a p-value of 0.03 at $\alpha = 0.05$.

(c) State the conclusion in context.

[1]

Exercise 3.3 (c)

3.3 A two-proportion test gives a p-value of 0.03 at $\alpha = 0.05$.

(c) State the conclusion in context.

[1]

(c)

- there is convincing evidence that the two proportions differ