

Exercise walk-through

6.6

Concluding a Test for a Population Proportion

AP Statistics

Setting up a test

A **significance test** weighs evidence against a claim.

■ **null** $H_0 : p = p_0$ (“no effect”)

■ **alternative** $H_a : p >, <, \text{ or } \neq p_0$

The **test statistic** (one-sample z-test), using p_0 :

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}$$

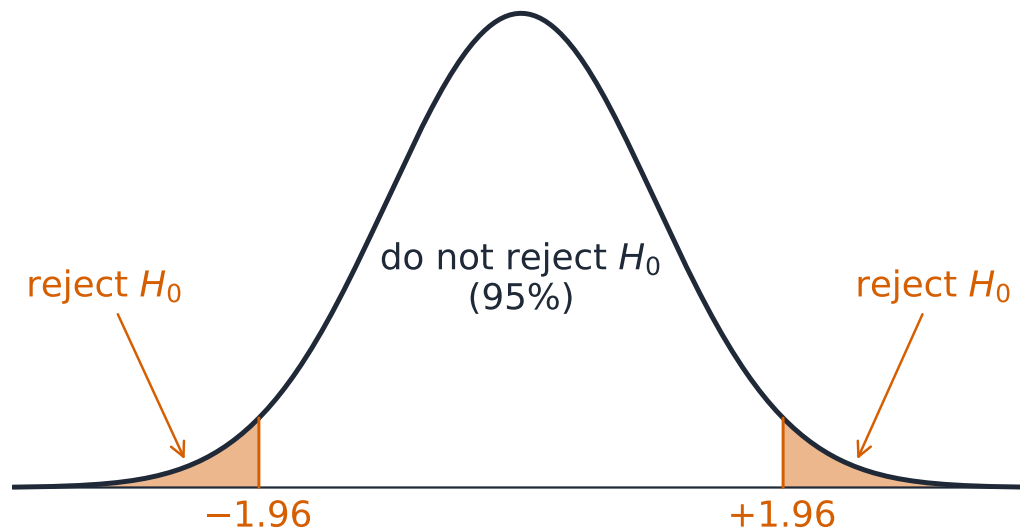
Check conditions with the **assumed** p_0 , not $\hat{p}$.

A coin

58 heads in 100: $\hat{p} = 0.58$, $H_0 : p = 0.5$, $H_a : p > 0.5$.

$$z = \frac{0.58 - 0.50}{0.05} = 1.6$$

Setting Up a Test for a Proportion



A two-tailed 5% test rejects the null hypothesis in the shaded tails

Worked example – a one-proportion z-test

A company claims 90% satisfaction. A sample of 100 finds 84 satisfied. Test $H_0 : p = 0.90$ against $H_a : p < 0.90$.

- $\hat{p} = 0.84$; use p_0 in the standard error, not $\hat{p}$
- $SE = \sqrt{\frac{0.90(0.10)}{100}} = 0.03$
- $z = \frac{0.84 - 0.90}{0.03} = -2.0$, so $p \approx 0.023$
- $0.023 < 0.05$: **reject H_0**

A *test* uses the **claimed** p_0 in the standard error; an *interval* uses $\hat{p}$. Mixing them is the commonest error here.

Exercises 2.1-2.3

2.1 State the decision rule using the p-value and α .

[1]

2.2 A test has a p-value of 0.03 and $\alpha = 0.05$. State the decision.

[1]

2.3 State what "fail to reject H_0 " means.

[1]

Exercises 2.1-2.3

2.1 State the decision rule using the p-value and α . [1]

2.1

- reject H_0 if the p-value $< \alpha$; otherwise fail to reject H_0
-

2.2 A test has a p-value of 0.03 and $\alpha = 0.05$. State the decision. [1]

2.2

- reject H_0 ($0.03 < 0.05$)
-

2.3 State what "fail to reject H_0 " means. [1]

2.3

- there is not enough evidence to reject H_0

Exercises 3.1-3.2

3.1 If the p-value is less than α , you

[1]

☐

A reject H_0

B accept H_0

C fail to reject H_0

D do nothing

3.2 A test with p-value 0.10 and $\alpha = 0.05$ leads to

[1]

☐

A rejecting H_0

B failing to reject H_0

C an error

D bias

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A reject H_0

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3.1 A

- reject H_0 .

3.2 A test with p-value 0.10 and $\alpha = 0.05$ leads to

[1]

☐

A rejecting H_0

B failing to reject H_0

C an error

D bias

3.2 B

- failing to reject H_0 .

Exercise 3.3 (a)

3.3 A test of $p \neq 0.5$ gives a p-value of 0.01 at $\alpha = 0.05$.

(a) State the decision.

[1]

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[1]

(a)

- reject H_0

Exercise 3.3 (b)

3.3 A test of $p \neq 0.5$ gives a p-value of 0.01 at $\alpha = 0.05$.

(b) State whether the result is statistically significant.

[1]

Exercise 3.3 (b)

3.3 A test of $p \neq 0.5$ gives a p-value of 0.01 at $\alpha = 0.05$.

(b) State whether the result is statistically significant. [1]

(b)

- yes

Exercise 3.3 (c)

3.3 A test of $p \neq 0.5$ gives a p-value of 0.01 at $\alpha = 0.05$.

(c) State the conclusion in context.

[1]

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(c) State the conclusion in context.

[1]

(c)

- there is convincing evidence that $p \neq 0.5$