# **Reject or Fail to Reject?**

ID: 13714

Time required 15 minutes

## **Activity Overview**

In this activity, students find P-values, to test claims about proportions, using the **1-Prop z Test** command in the Calculator application.

## **Topic: Hypothesis Testing**

Use the sampling distribution of a proportion p̂ to test the null hypothesis H₀: p = p₀ against the alternative one-tailed hypothesis H₀: p < p₀ or the two-tailed hypothesis H₀: p ≠ p₀.</li>

#### **Teacher Preparation and Notes**

- This activity is intended to be mainly **student-centered**, with breaks for discussion.
- This activity assumes knowledge of binomial experiments and the requirements for a binomial experiment.
- Students should already be familiar with the basic concepts behind hypothesis testing, including finding z-scores and critical values to test claims.
- To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "13714" in the quick search box.

#### Associated Materials

- *RejectNotReject\_Student.doc*
- RejectNotReject.tns
- RejectNotReject\_Soln.tns

#### **Suggested Related Activities**

To download any TI-Nspire technology activity listed, go to <u>education.ti.com/exchange</u> and enter the number in the quick search box.

- Estimating a Population Proportion (TI-Nspire technology) 9986
- Claims About Two Proportions (TI-Nspire technology) 10259
- Difference Between Two Proportions (TI-Nspire technology) 10082
- Candy Pieces (TI-Nspire technology) 9997

## **Problem 1 – Lefties**

Discuss how hypothesis testing can be used to test claims about proportions, and that the test statistic is z, given that the requirements for a binomial experiment are met.

On page 1.2, students are told to test the claim that 10% of Americans are left-handed.

Explain to students that testing at  $\alpha$  = 0.05 means testing at a 95% confidence level.

On page 1.3, students are to select the null and alternative hypotheses. This is a two-tailed test.

On page 1.4, students are to use the **1-Prop z Test** command (**MENU > Statistics > Stat Tests**) to find the *P*-values for each test. The *P*-values are about 0.55 and 0.17, both above 0.10, the significance level.

Discuss with students if they should reject or fail to reject the 10% claim for the students at this school.

The *P*-value is about 23.9%, much greater than 5%, so they should fail to reject the null hypothesis.

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| <ul> <li>I.2 I.3</li> <li>Find the <i>i</i></li> <li>Test corr</li> <li>I.3 I.4</li> <li>Do you rej</li> <li>Fail to reje</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 1.4 ▶ *RejectNotRej<br>value below using the<br>immand in the Statistics in<br>"Title" "1<br>"Alternate Hyp" "p<br>"z" -<br>"PVal" ()<br>"p" ()<br>"p" ()<br>"n"<br>4 1.5 ▶ *RejectNotRej<br>ect or fail to reject H <sub>0</sub> ? 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| <ul> <li>I.2 I.3</li> <li>Find the <i>l</i></li> <li>Test com</li> <li>I.3 I.4</li> <li>Do you rej</li> <li>Fail to reje</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3       1.4       ★ *RejectNotReji         2-value below using the immand in the Statistics in the statistics in the statistics in the immand in the statistics in the statistex and in the statistics in the statistics in the stat | ect ▼ 1<br>e 1-Prop z<br>menu.<br>Prop z Test"<br>prop ≠ p0"<br>-1.17794<br>0.238822<br>0.060976<br>82.<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |
| <ul> <li>I.2 1.3</li> <li>Find the <i>l</i></li> <li>Test corr</li> <li>I.3 1.4</li> <li>Do you rej</li> <li>Fail to reje</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 1.4  ★ *RejectNotRej<br>value below using the<br>immand in the Statistics in<br>"Title" "1<br>"Alternate Hyp" "p<br>"z" -<br>"PVal" ()<br>"p" ()<br>"p" ()<br>"n"<br>4 1.5  ★ *RejectNotRej<br>ect or fail to reject H <sub>0</sub> ? WI<br>act, the <i>p</i> -value is greater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ect ▼ 1<br>e 1-Prop z<br>menu.<br>Prop z Test"<br>orop ≠ p0"<br>-1.17794<br>0.238822<br>0.060976<br>82.<br>1000<br>82.<br>1000<br>1000<br>1000<br>82.<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>1000<br>10 |   |
| <ul> <li>I.2 I.:</li> <li>Find the <i>i</i></li> <li>Test corr</li> <li>I.3 I</li> <li>Do you rej</li> <li>Fail to reje</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3 1.4  ★ *RejectNotRej<br>value below using the<br>imand in the Statistics i<br>"Title" "1-<br>"Alternate Hyp" "p<br>"z" -<br>"PVal" ()<br>"p" ()<br>"p" ()<br>"n"<br>4 1.5  ★ *RejectNotRej<br>ect or fail to reject H <sub>0</sub> ? WI<br>ect, the <i>p</i> -value is greater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ect ▼ 1<br>e 1-Prop z<br>menu.<br>Prop z Test"<br>orop ≠ p0"<br>-1.17794<br>0.238822<br>0.060976<br>82.<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |
| <ul> <li>I.2 I.3</li> <li>Find the <i>l</i></li> <li>Test com</li> <li>I.3 I.4</li> <li>Do you rej</li> <li>Fail to reje</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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## Problem 2 – Loaded Cube?

Students are introduced to the loaded number cube scenario on page 2.1. Confirm that the requirements for a binomial experiment are met.

Students are to determine their null and alternative hypotheses on the next page. This is a right-tailed test.

 $H_0: p = 0.1\overline{6}, H_a: p > 0.1\overline{6}$ 

Students are to find the *P*-value on the next page. The value is about 0.000405.

Discuss with students if they should reject or fail to reject the claim that sixes come up more than they should.

Because the *P*-value is less than the significance level of 0.01, the students should reject the null hypothesis. Sixes are coming up more than expected.

