

Using Your TI-83/84 Calculator for Hypothesis Testing: The 1-Proportion z Test

Dr. Laura Schultz

The 1-proportion z test is used to test hypotheses regarding population proportions. This handout will take you through one of the examples we will be considering during class. Consult your lecture notes for more details regarding the non-calculator-related aspects of this specific hypothesis test.

Statistics students at the Akademia Podlaka conducted an experiment to test the hypothesis that the one-Euro coin is biased (i.e., not equally likely to land heads up or tails up). Belgian-minted one-Euro coins were spun on a smooth surface, and 140 out of 250 coins landed heads up. Does this result support the claim that one-Euro coins are biased?

1. Before you can proceed with entering the data into your calculator, you will need to symbolize the null and alternative hypotheses. For this example, let's define p as the proportion of 1-Euro coins that land heads up. Then, we can symbolize our null hypothesis (H_0) as $p = 0.5$ and our alternative hypothesis (H_1) as $p \neq 0.5$.

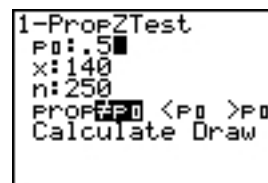
2. Press **[STAT]** and use **[▶]** to scroll right to the TESTS menu. Then, scroll down to 5:1-PropZTest and press **[ENTER]**.



```
EDIT CALC TESTS
1:Z-Test...
2:T-Test...
3:2-SampZTest...
4:2-SampTTest...
5:1-PropZTest...
6:2-PropZTest...
7:Interval...
```

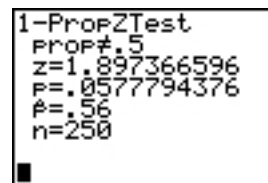
3. Your calculator will prompt you for the following information:

- **p_0** : Enter the numerical value of the population proportion that was used in your statements of H_0 and H_1 . For this example, type 0.5 at the prompt and press **[ENTER]**.
- **x** : Enter the number of "successes." If necessary, you can compute $x = n\hat{p}$. Remember to round x to the nearest whole number; you will get a domain error if you enter a decimal value. For this example, type 140 at the prompt and press **[ENTER]**.
- **n** : Enter the number of trials (or the sample size). For this example, type 250 at the prompt and press **[ENTER]**.
- **prop** Highlight the option that reflects the symbol you used in your alternative hypothesis. For this example, highlight **prop \neq p_0** and press **[ENTER]**. This entry tells your calculator that you are testing the alternative hypothesis **prop \neq p_0** , which is the same as $p \neq 0.5$ for this example. The other two choices represent left-tailed and right-tailed hypothesis tests, respectively. (We are conducting a two-tailed test for this example.)



```
1-PropZTest
p0: .5
x: 140
n: 250
PROP≠p0 <P0 >P0
Calculate Draw
```

4. You have the option of choosing either **Calculate** or **Draw**. Let's start by highlighting **Calculate** and pressing **[ENTER]**. Your calculator will return the output screen shown to the right. First, it confirms the alternative hypothesis being tested as **prop \neq .5**. Then, it gives the z -test statistic and its associated P -value. The sample proportion (\hat{p}) and sample size (n) are also reported. The **Calculate** option is the one you should choose in

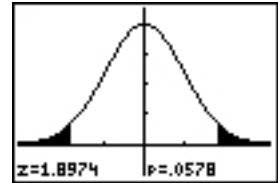


```
1-PropZTest
PROP≠.5
z=1.897366596
P=.0577794376
p̂=.56
n=250
```

most situations.

5. Go back and conduct the 1-proportion z test again, but select **Draw** this time and press **ENTER**.

This option will generate a graph of the normal curve with the area corresponding to the P -value shaded in. It also reports the z -test statistic and its associated P -value. The **Draw** option is useful for reminding yourself that we are conducting a two-tailed hypothesis test (areas under both tails are shaded in). This option is also helpful if you can't remember how many significant digits to report. For 1-proportion z tests, we will round the z -test statistic to 4 decimal places and the P -value to 3 significant figures; these are the same rounding rules your TI-83/84 calculator typically uses in **Draw** mode. However, be aware that your calculator sometimes rounds very low P -values to \emptyset in **Draw** mode. Don't report a P -value as 0 if you can get a more accurate value in **Calculate** mode.



6. We will be using the P -value approach to hypothesis testing in this course, so we now have all the information we need to formally conduct our hypothesis test. Note that I did not specify the significance (α) level that you should use. If no alpha level is specified by the problem, let $\alpha = .05$ be your default choice. Compare the P -value to your alpha level. If the P -value is less than or equal to alpha, you will **reject the null hypothesis (H_0)** and conclude that the sample data support the alternative hypothesis. If the P -value is greater than alpha, you must **fail to reject H_0** and conclude that the sample data are not consistent with the alternative hypothesis. For our example, the P -value (.0578) is greater than .05, so we must fail to reject the null hypothesis.
7. Below I have presented the complete hypothesis test. Note the format I use; I expect you to report the results of your hypothesis tests using this same format. Pay special attention to the wording I use for the conclusion.

Claim: The 1-Euro coin is biased (i.e., not equally likely to land heads up or tails up).

Let p = The proportion of trials that the 1-Euro coin lands heads up.

$H_0: p = 0.5$ (The 1-Euro coin lands heads up for half of the trials.)

$H_1: p \neq 0.5$ (The 1-Euro coin does not land heads up for half of the trials.)

Conduct a two-tailed, 1-proportion z test with a significance level of $\alpha = .05$

Fail to reject H_0 because $0.0578 > 0.05$

Conclusion: There is insufficient evidence to support the claim that the 1-Euro coin is biased ($z = 1.8974$, $P = .0578$, two-tailed).