Using Your TI-83/84 Calculator: Estimating a Population Proportion

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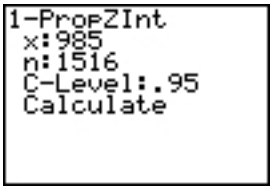
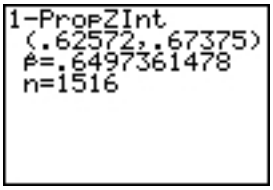
The 1-PropZInt command is used to construct a confidence-interval estimate of a population proportion (p) or percentage.

1. Press [STAT] and use [▸] to scroll right to the TESTS menu.
2. Scroll down to A:1-PropZInt and press [ENTER].
3. Your calculator will prompt you for the following information:
   - **x:** This is the number of "successes." Note that <u>x must be a whole number</u>. You will get a domain error message if you don't enter a whole number here; no decimals are allowed. If you are given the sample proportion $\hat{p}$ instead of x, keep in mind that $x = n \cdot \hat{p}$, and remember to round x to the nearest whole number. A trick that I use is to enter $n \cdot \hat{p}$ on the input line for x, and then scroll back up and round the answer as needed.
   - **n:** This is the number of trials. When working with the results of a public opinion poll, n will correspond to the number of people surveyed.
   - **C-Level:** This is where you specify the confidence level. Note that you must enter the confidence level in decimal form. For example, enter 0.95 if you want to find a 95% confidence interval.

   After you have entered all of this information, highlight Calculate and press [ENTER].
4. A recent Gallup poll found that 985 of 1,516 American adults surveyed said they drink beer, wine, or hard liquor at least occasionally. Let's construct a 95% confidence interval estimate of the true proportion (p) of all American adults who drink alcohol at least occasionally. Start by entering this data into your calculator as described above.



5. Your calculator will return the output screen shown to the right. Note that it returns the confidence interval in the form $(\hat{p} - E, \hat{p} + E)$, which is (0.626, 0.674) once you round to 3 significant figures.



6. *What does this mean?* We are 95% confident that the interval from 0.626 to 0.674 actually does contain the true proportion of all American adults who consume alcohol at least occasionally.
7. Experiment with varying the confidence level (C-Level). What effect does decreasing the confidence level to 0.90 have on the size of the confidence interval? What is the effect of increasing the confidence level to 0.99?
8. There are several ways to express a confidence interval. For instance, we could also express a 1-proportion z interval as $\hat{p} - E < p < \hat{p} + E$, which would be $0.626 < p < 0.674$ for this example.

9. Take a look at the output screen again. Underneath the confidence interval, your calculator tells you that $\hat{p}$ = .6497361478. Recall that $\hat{p}$ is the sample proportion. Multiplying $\hat{p}$ by 100 and tacking on a "%" sign will give you the sample percentage. In either case, round your answer to 3 significant figures. Hence, $\hat{p}$ = 0.650 (or 65.0%) for this example. Whether you report $\hat{p}$ as a proportion (in decimal form) or as a percentage (with a "%" sign) depends on the nature of the problem that you are trying to solve.

10. Next, let's find the **margin of error (*E*)**. Given that the margin of error represents half the confidence interval, we can calculate it using the following formula:

$$E = \frac{\text{upper confidence limit - lower confidence limit}}{2}$$

For this example, $E = \frac{0.67375 - 0.62575}{2} = 0.024$. Use all available decimal places to calculate *E*. If necessary, round the margin of error to 3 significant figures at the end of your calculations.

11. Now that we have found both $\hat{p}$ and *E*, we can express our 95% confidence interval in the form $\hat{p} \pm E$, which is 0.650 ± 0.024 for this example.

12. You will often see the margin of error for a 1-proportion *z* interval expressed in terms of **percentage points**. For example, public opinion polls use this format. If we wanted to construct a 95% confidence interval estimate of the percentage of all American adults who drink alcohol at least occasionally, we could express it as 65.0 % ± 2.4 percentage points. You can convert *E* into percentage points by multiplying your original margin of error by 100. Note that "2.4 percentage points" is the same as simply saying 2.4%. Polling organizations like the Gallup Poll or Harris Interactive generally round their margins of error to the nearest percentage point. Margins of error of 2, 3, or 4 percentage points are very common. (Pay attention the next time you read some poll results in the newspaper.) The survey results we used for our example were originally reported as "65% of American adults drink beer, wine, or hard liquor at least occasionally, +/- 2 percentage points for a 95% confidence level."