



### About the Mathematics

This activity involves generating a confidence interval for a population proportion from a random sample of size 100 and considering how certain one can be that this interval contains the actual population proportion.

This activity will give students the following opportunities:

1. Generate fifty confidence intervals from samples of size 100, drawn from the same population, and observe the variability in the intervals.
2. Estimate the proportion of intervals that will actually contain the true population proportion.
3. Use the actual population proportion to check estimates and to develop an understanding of the meaning of confidence level.
4. Experiment with different confidence levels and investigate the relationship between confidence levels and width of the confidence intervals.

### Math Objectives

- Students will interpret a confidence level as the degree of confidence in the process used to produce an interval that will contain the true population proportion.
- Students will recognize that as the confidence level increases, on average the confidence interval increases in width.
- Students will reason abstractly and quantitatively (CCSS Mathematical Practices).

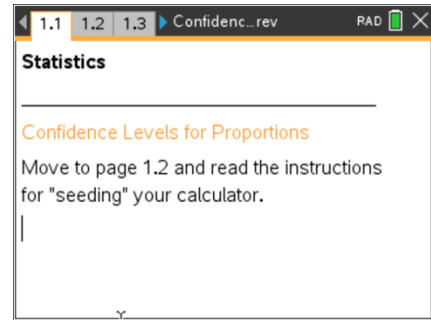
### Prerequisite Knowledge

Students should be familiar with calculating a confidence interval (see the Statistics Nspired activity *Confidence Intervals for Proportions*).

### Using the Document

#### Page 2.1: Generate a Sample and Confidence Interval

On Page 2.1, clicking the arrow will generate a sample of size 100 from an unknown population, display the proportion of successes in that sample on the horizontal axis, and—based on the sample proportion—display the confidence interval for the population proportion.



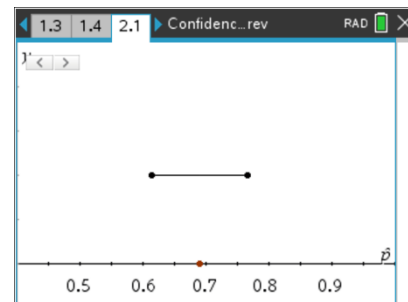
#### TI-Nspire™ Technology Skills:

- Open a document
- Move between Pages
- Click on a minimized slider

#### Lesson Materials:

Confidence\_Levels\_for\_Proportions.tns

Visit [www.mathnspired.com](http://www.mathnspired.com) for lesson updates.





### Page 3.1: Generate Multiple Confidence Intervals

Although in practice, it is usually possible to draw only a single sample, clicking the arrow on Page 3.1 simulates the possibility of being able to draw up to 50 samples (with replacement) from the population and displays the confidence interval for the proportion of successes based on each sample. Students should note the variability in the intervals and begin to count those that seem to be "out of the ordinary."

### Page 3.3: Check Against Real Population Proportion

Page 3.3 displays the actual population proportion of successes, 0.70, and allows students to estimate the number of confidence intervals that did not contain the true proportion. At this point, do not make a big issue of how exact the count should be, for example, with respect to end points. The concept of some "miss" and others "hit" should be the focus.

The reset arrow will clear the existing intervals and provide the opportunity to make and check conjectures about the percent of "misses." For samples on Page 3.3, the confidence level is actually 90%. Thus, about 90% of the samples should produce intervals that contain the actual population proportion.

### Page 4.1: Confidence Level and Width of Confidence Intervals

The lower left arrow on Page 4.1 allows students to investigate the relationship between the width of a confidence *interval* and the size of a confidence *level*.

## Possible Applications

This activity provides the opportunity to ask probing questions such as:

- On Page 3.3, are the results for the percent of confidence intervals that seem to contain the actual population proportion consistent when you reset and generate another set of 50 samples? Why do you think this might be the case?
- On Page 3.1, make a conjecture about the percent of samples you think led to a confidence interval that contained the actual mean. Check your conjecture on Page 3.3.
- What do you think a confidence level is and how can you use the .tns file to support your reasoning?
- Do you think increasing the confidence level will affect the confidence interval? If so, how and why?

TI-Nspire™ Navigator™ or can be used to display the different outcomes on Page 3.3, or students can be asked to view each other's screens to observe the similarities and differences.

## Related Activities

This activity can be used after the Statistics Nspired activity *Confidence Intervals for Proportions* as a teacher led discussion. It can also be used with questions adapted from the activity *Confidence Levels for Means*.