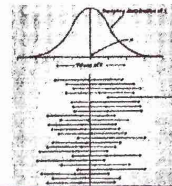# Lesson 8.1: Day 2: What does "95% confident" mean?

In this Activity, you will use the _Confidence Intervals_ applet to learn what it means to say we are "95% confident" that our confidence interval captures the true mean.

1. Go to stapplet.com. Scroll down in the menu until you find the _Confidence Intervals_ applet. Set the confidence level to 95% and the sample size to 5.

2. Click "Sample" to choose an SRS and display the resulting confidence interval. The confidence interval is displayed as a horizontal line segment with a dot representing the sample mean in the middle of the interval. The true mean (μ) is the green vertical line.

   Did the first confidence interval capture the true mean?

   Repeat this 10 times and sketch what you see to the right. How many of the intervals capture the true mean?
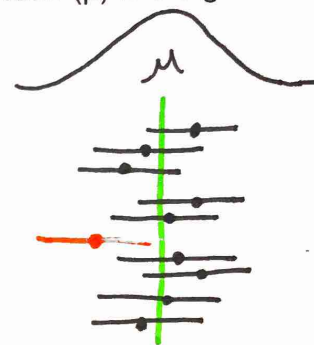
3. "Reset" and then take a total of 100 confidence intervals (sample 25 four times). How many out of 100 captured the true mean? Is this surprising? Why?

   Answers will vary. It should be around 95%. of the intervals

4. Watch your confidence intervals as you drag the confidence level from 95% to 99% (don't "Reset). What happens to the intervals when the confidence level is increased? Why does this make sense?

   ↑confidence } ↑width

   As you increase the confidence level, the interval gets wider so we hit μ more.

5. "Reset", then sample 100 times at an 80% confidence interval. How many of the intervals capture the true mean? _About 80%, answers will vary._

   Interpret the **confidence level**: _If we make many, many 80% confidence intervals, we expect about 80% to capture the true mean._

6. Now we will see what happens when we adjust the sample size. Change the sample size from 5 to 50 and sample for 1 interval. Then change it to 250 and sample for 1 interval. What happens to the interval when the sample size is increased? Why?

   ↑sample size } ↓width

   The interval narrows. As sample size goes up we expect less variability (smaller SD). ✚TheStatsMedic

Name: _____ Hour: _____ Date: _____

Lesson 8.1 Day 2– The Idea of a Sampling Distribution

Important ideas:

LT#1 Interpreting Confidence Level:

If we make many ____%.
Confidence intervals
we expect about
____% to capture the
true ___p/μ___
parameter.

LT#2 What affects margin of Error?

↑Confidence ↑ MOE
Level

↑sample ↓MOE
size

LT#3 margin of error **Never** accounts for bias

Check Your Understanding

As part of a project about response bias, Ellery surveyed a random sample of 25 students from her school. One of the questions in the survey required students to state their GPA aloud. Based on the responses, Ellery said she was 90% confident that the interval from 3.14 to 3.52 captures the mean GPA for all students at her school.

(a) Interpret the confidence level.

If we make many 90% confidence intervals, about 90% will capture the true mean GPA.

(b) Explain what would happen to the length of the interval if the confidence level were increased to 99%.

It would widen because the margin of error increases.

(c) How would a 90% confidence interval based on a sample of size 200 compare to the original 90% interval?

It would be more narrow because an increase in sample decreases the margin of error.

(d) Describe one potential source of bias in Ellery's study that is not accounted for by the margin of error.

Students might not tell the truth about their GPA.

TheStatsMedic