

Statistics Activity:

Central Limit Theorem Simulation

Kathleen Mittag

CALCULATORS: Casio: *fx-9750G Plus & CFX-9850G Series*

Teaching Notes and Answers

An easy way to simulate the Central Limit Theorem is to use the last four digits of student social security numbers. Do this by writing each of the ten digits (0-9) on the board and have students come to the board and put a check under each of the digits that are in the last four digits of their social security number.

If a digit appears more than once in their number, just put more than one check. This method retains confidentiality. You will need at least 30 students to have this work properly. The first boxplot (social security numbers) should be a uniform distribution and the second boxplot (last 4 digit means) should be a normal distribution.

Then have each student calculate the mean of the last four digits of his/her social security number and record all the means in List 1 of your graphing calculator.

Answers to the Problems:

Answers will vary depending on data. The student social security number simulation should produce a uniform distribution. The means should produce a normal distribution and the mean and standard deviation of the means should be very close to the Central Limit Theorem values.

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Student Worksheet

The Central Limit Theorem (CLT) is essential for inferential statistics but difficult for students to understand. The CLT is:

The Central Limit Theorem states that if n is sufficiently large, the sample means of random samples from a population with mean m and finite standard deviation s are approximately normally distributed with mean m and standard deviation $\frac{\sigma}{\sqrt{n}}$.

An easy way to simulate the CLT is to use the last four digits of student social security numbers. Your teacher will write the ten digits (0-9) on the board. Each students will go to the board and put a check under each of the digits that are in the last four digits of his or her social security number. If a digit appears more than once in their number, just put more than one check. Then fill in the table below with the total number for each digit.

Digit	0	1	2	3	4	5	6	7	8	9
# of Digits										

1. Sketch and label the graph of the boxplot to the right with minimum, Q1, median, Q3, and maximum. Use the calculator.

2. What does the distribution appear to be? _____
Now calculate the mean of the last four digits of your social security number and record all the means in List 1 of your graphing calculator.

3. Sketch and label the graph of the boxplot at the right with minimum, Q1, median, Q3, and maximum. Use the calculator.

4. What does the distribution appear to be? _____
5. Use the calculator to calculate the mean and standard deviation of the data used for questions 3 and 4. Compare these values to the CLT.

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Keystrokes for the Calculator

From the Main Menu, press **2** for STAT.

If there are data in List 1, follow these directions:

- Press **F6** (make sure that the highlighted cell is List 1 by pressing the right/left arrow).
- Press **F4** (DEL-A) then press **F1** (YES).

Enter Data:

- Type the data in List 1.
- With appropriate cell highlighted, type numerical value then **EXE** to store.

Find One-Variable Statistics:

- Press **F2** (calculate) then **F6** (set).
- With 1Var Xlist highlighted, press **F1**.
- Press **EXIT**.
- Press **F1** (1VAR).
- Use the down arrow key to scroll for more values.

Create a Boxplot: In the STAT mode

- Press **EXIT** .
- Press **F1** (GRPH), **F4** (make sure Graph 1 is turned on) then press **EXIT** .
- Press **F6** (SET). Press **down arrow key** to Graph Type, **F6** then press **F2** for Median Boxplot then **EXE** .
- Press **down arrow key** to Xlist, press **F1**(List 1), then set the frequency to 1.
- Press **EXIT**, **F1** for Graph 1 and the graph should appear.
- To Trace, press **SHIFT F1** .

If your graph does not appear, follow these directions:

- Press **SHIFT** then **SETUP**.
- Press **F1** to change Stat Window to Auto.
- Press **EXIT**.