

# Activity 9

## Inferential Statistics

**Topic Area:** Data Analysis and Probability

**NCTM Standard:** Develop and evaluate inferences and predictions that are based on data.

**Objective:** The student will be able to utilize the Casio fx-9860G Plus calculator to help students to understand how sample statistics reflect the values of population parameters and to use sampling distributions as the basis for inferences.

**Introduction:** This activity is designed to demonstrate the procedure to enter data into the Casio fx-9860G Plus graphing calculator in order to determine the standard error of the mean and level of confidence that students will need to evaluate from a given set of data.

The students should be familiar with the following vocabulary.

Inferential statistics

Population mean

Sample mean

Standard error of the mean

Level of confidence

## Calculator Notes for Activity 9

**Objective:** The student will be able to utilize the Casio fx-9860G Plus calculator to help students to understand how sample statistics reflect the values of population parameters and to use sampling distributions as the basis for inferences.

### Steps for Using Inferential Statistics

Problem 1: A test was administered to 20,000 students and the results were normally distributed. You administered the test to your class of 30 students and the mean score on the test was 64 and standard deviation was 8. Determine the standard error of the mean.

Problem 2: What is the range of scores such that the probability is 90% that the mean of the entire population of students lies within that range?

Problem 3: One hundred students are randomly selected to take another test. From this sample, the mean score is 62 and the standard deviation is 6. Determine the range of the sample mean that has a 1% confidence level.

Problem 1 Solution: A test was administered to students and the results were normally distributed. You administered the test to your class of 30 students and the

mean score on the test was 64 and standard deviation was 8. Determine the standard error of the mean.

To solve this problem, you will need the following formula:

Standard Error of the Mean:

$$S_x = \frac{S}{\sqrt{N}}$$

Use  $N = 30$  and standard deviation = 8.

Therefore, standard error of the mean =

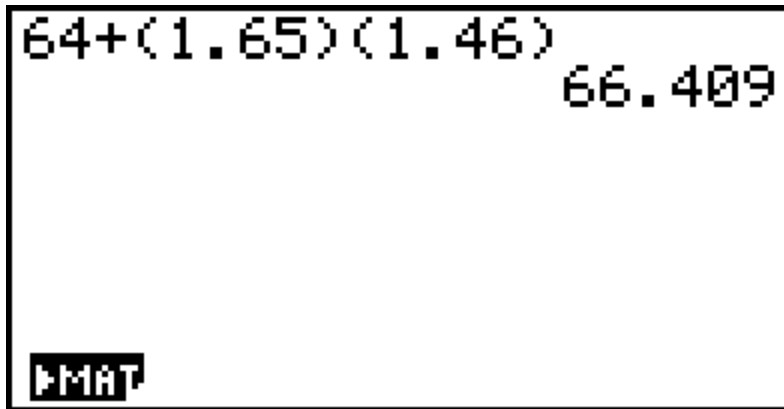
$$\frac{8}{\sqrt{30}} \text{ which is equal to } 1.46.$$

**Problem 2 Solution:** What is the range of scores such that the probability is 90% that the mean of the entire population of students lies within that range?

To solve this problem, use the answer of 1.46 from problem 1 for the standard error of the mean. Using the t-P table 90% ( $p = .9$ ) is 1.65 deviations from the mean. Use the formula:

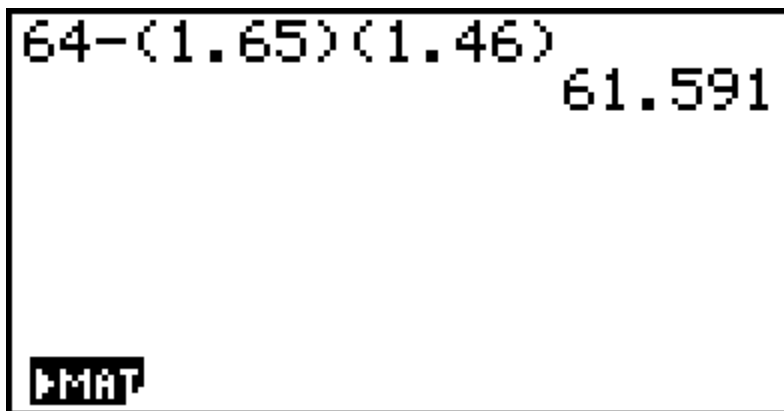
$$Range = \bar{X} \pm tS_x$$

To solve this problem, use the Run Mode on the calculator and perform the addition problem to get the following screen:



There is no need to do the problem from the start for subtraction. Use the calculator's recall capabilities by using the following keystrokes to get the second answer.

!!!!!!!-|



Therefore, the range of scores are from 62 to 66.

Problem 3 Solution: One hundred students are randomly selected to take another test. From this sample, the mean score is 62 and the standard deviation is 6. Determine the range of the sample mean that has a 1% confidence level.

To solve this problem, recall that a 1% confidence level is the same as  $p = .99$  ( $100\% - 1\% = 99\%$ ). Using the t-P table  $p = .99$  yields  $t = 2.58$  deviations.

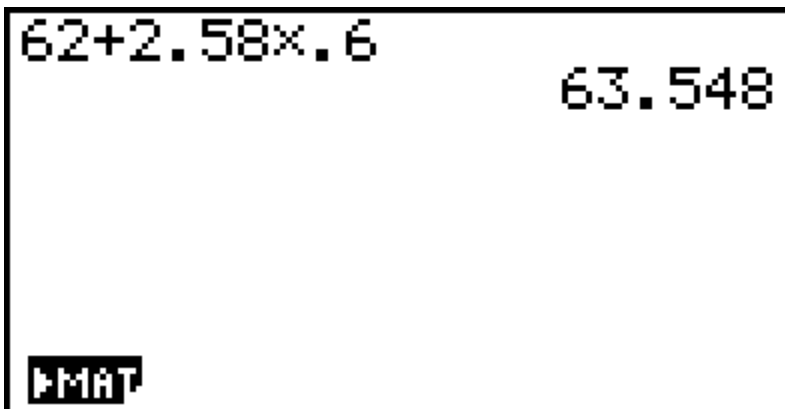
Now, find the standard error of the mean = 6 divided by the square root of 100.

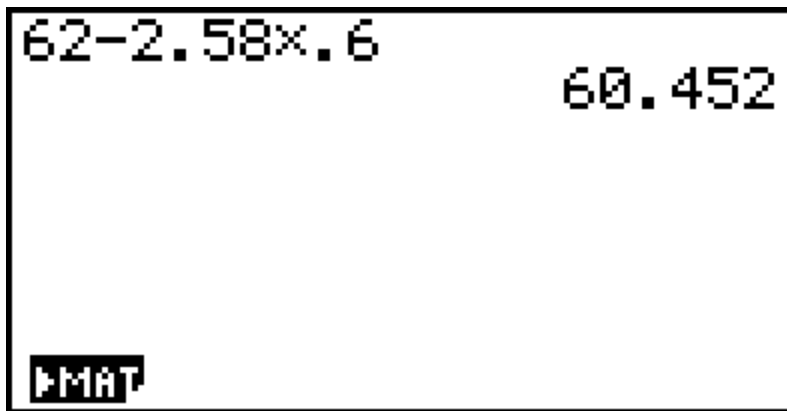


The standard error of the mean = .6

Next, find the range:

$$\text{Range} = \bar{X} \pm tS_x$$





Therefore, the range is between 60.5 and 63.5

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## **Activity 9: Worksheet Inferential Statistics**

Problem 1: A test was administered to 20,000 students and the results were normally distributed. You administered the test to your class of 30 students and the mean score on the test was 85 and standard deviation was 5. Determine the standard error of the mean.

Problem 2: What is the range of scores such that the probability is 95% that the mean of the entire population of students lies within that range? ( $t = 1.96$ )

Problem 3: Sixty students are randomly selected to take another test. From this sample, the mean score is 80 and the standard deviation is 8. Determine the range of the sample mean that has a 5% confidence level.

## **Solutions to Activity 9: Worksheet**

1. .91
2. 83.216 to 86.784
3. 77.981 to 82.019