

Math 160/263 – Assignment #4

Title: Confidence Intervals

Worksheet: None

The purpose of this assignment is to explore the characteristics of Confidence Intervals. This assignment uses material from Chapter 13 of the Minitab Manual.

Simulating the Data

1. In Minitab, go to the **Calc** \Rightarrow **Random Data** menu. We will use the Normal Distribution. Generate fifty rows of data in each of one hundred columns (C1-C100). Use $\mu = 100$ and $\sigma = 15$. Each column now is a sample of fifty from the $N(100, 15)$ Normal Distribution.

Calculating and Entering the Confidence Interval Endpoints

2. Using **Stat** \Rightarrow **Basic Statistics** go to the **1-Sample z** dialog box. Enter 15 in the “Standard Deviation” window. Calculate the one hundred 95% Confidence Intervals associated with the samples in C1-C100. They will appear in the Session Window. Put the first ten of them into your ReportPad.

3. We want to find out how many of these 95% Confidence Intervals actually contain the true mean of 100. We must move the numbers representing the endpoints of the one hundred Confidence Intervals into the Worksheet, so they can be used in calculations. This will be simpler to do than inspecting all 100 intervals one by one. Press simultaneously, the “Shift,” “Ctrl,” and “Alt” keys on the keyboard and the left mouse button. Then place the cursor in the session window just after the first Confidence Interval lower endpoint. Carefully drag the mouse to highlight just the column of lower Confidence Interval Endpoints. The numbers will be highlighted as you drag the mouse down the column. Be careful not to get either the parenthesis on the left nor the comma on the right, as this will cause Minitab to think the column is text. After the column of left endpoints is highlighted, press “Ctrl-c” to copy them to the Windows clipboard, and then click on the top cell in column C-101, and paste (“Ctrl-v”) the column into the Worksheet. Check that there is no “T” in the heading of the column. If there is, you collected a comma or a parenthesis; you’ll have to do it again. Label C101 “LE” for “Lower Endpoint.”

4. Repeat the exact procedure with the column of upper endpoints and put them in Column C102, which should be labeled “UE.”

Investigating the Results

5. Rename C-103 “TLE” which stands for “Test Lower Endpoint.” Clearly a Confidence Interval will miss capturing the mean if its lower endpoint is above the mean. Since the underlying distribution has a known mean of 100, we will use Minitab’s calculator to test them all at once. Go to **Calc** \Rightarrow **Calculator**. The calculator will perform arithmetic on entire columns and put the results in another column. We wish to test the lower endpoints in C-101 to see if they are above 100. Enter “C101 > 100,” and place the results in C103. A 0 will appear if the statement is false, i.e. the number in C101 is less than 100, and a 1 will appear if the statement is true i.e. the lower endpoint is above 100 and the Confidence Interval does not capture the mean.

6. Do the same for testing if the Confidence Interval is too low. In that case the number in C102 will be less than 100. Put the results in C104, which should be labeled “TUE.”

7. Now use **Calc** and column statistics to compute the sum of the two test columns. The sum of these two numbers represent the number of Confidence Intervals which miss both high and Low. Are your results consistent with what you learned in class about the behavior of Confidence Intervals? Discuss fully. Now save and edit your report for submission.