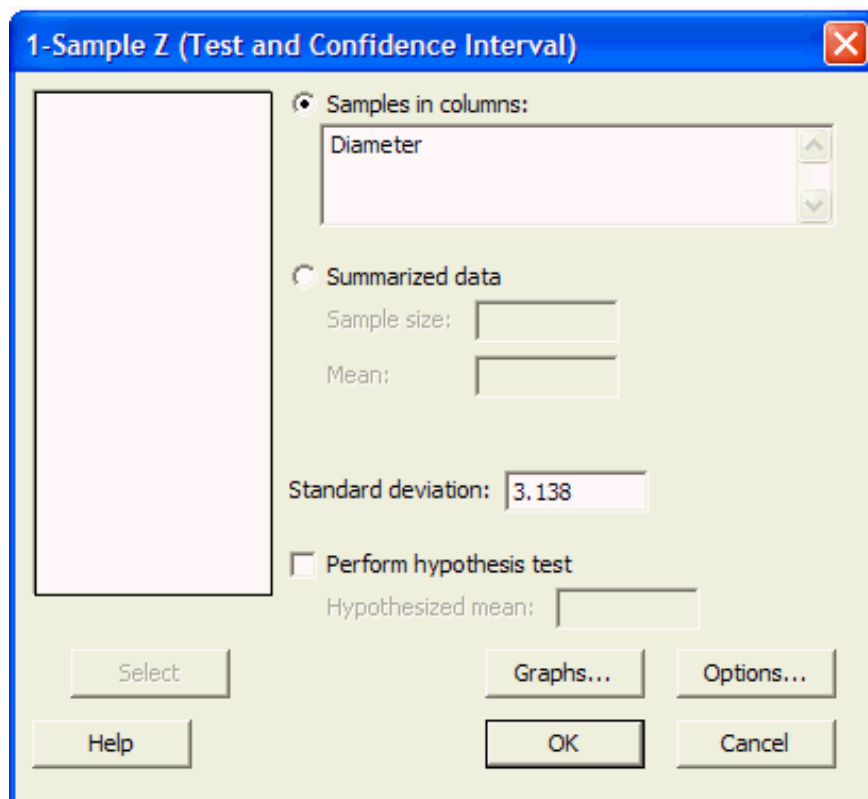


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LESSON 11 - CONFIDENCE INTERVALS

Suppose we want to find a 95% confidence interval for the mean diameter of the trees in K:\minitab15\MINITAB\MiniTab\Trees.mtw. Load this worksheet then clear the session window below the date/time stamp. Type your name, Lesson 11, Example, and the definition of the variable below the date/time stamp (in this case the definition of the variable is X = the diameter of a tree). We need to find the standard deviation for the diameters before we can compute the confidence interval. You will find this under **Stat > Basic Statistics > Display Descriptive Statistics** as we did in Lesson 6. We note that $n = 31 > 30$, so we are justified by the Central Limit Theorem to assume that the means of the sample means will be normally distributed.

Now, to find the confidence interval, click on **Stat > Basic Statistics > 1-Sample Z**. Click on the box under "Samples in columns:" and select Diameter into it. Now type the value of the standard deviation (3.138 in this case) into the "Standard deviation:" box. The 1-Sample Z dialog box should now look like the figure below.



Now click "OK" and you will get a 95% confidence interval (abbreviated 95.0 % C.I. in Minitab)

of (12.1437, 14.3530).

To get a 99% confidence interval get back to the 1-Sample Z dialog box as you did above and click on "Options..." . Type 99 into the "Confidence level:" box, then click "OK" to close the options dialog box and "OK" again to find the 99% confidence interval. For a 90% confidence interval repeat but type 90 into the "Confidence level:" box. An example of the output, after excessive blank lines and other extraneous material has been removed, is shown below. Notice what happens to the length of the interval as the degree of confidence changes.

```
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Jeonghun Kim
Lesson 11
Example

X = the diameter of a tree

Results for: Trees.MTW

Descriptive Statistics: Diameter

      Total
Variable  Count    Mean  SE Mean  StDev  Minimum    Q1  Median    Q3
Diameter   31  13.248   0.564   3.138    8.300   11.000  12.900  16.000

One-Sample Z: Diameter

The assumed standard deviation = 3.138

Variable   N    Mean   StDev  SE Mean      95% CI
Diameter  31  13.2484  3.1381   0.5636  (12.1437, 14.3530)

One-Sample Z: Diameter

The assumed standard deviation = 3.138

Variable   N    Mean   StDev  SE Mean      99% CI
Diameter  31  13.2484  3.1381   0.5636  (11.7966, 14.7001)

One-Sample Z: Diameter

The assumed standard deviation = 3.138

Variable   N    Mean   StDev  SE Mean      90% CI
Diameter  31  13.2484  3.1381   0.5636  (12.3213, 14.1754)
```

The same solutions should be obtained by clicking the button for "Summarized data" and typing in the sample size (31 in this case) and mean (13.248 in this case) in the appropriate boxes of the 1-Sample Z dialog box and clicking "OK". The results of this are shown below for a 95% confidence interval.

One-Sample Z			
The assumed standard deviation = 3.138			
N	Mean	SE Mean	95% CI
31	13.2484	0.5636	(12.1438, 14.3530)

Compare this to the 95% confidence interval above that was computed using the raw data. We see a minor discrepancy in the lower limit. This was no doubt the result of using a value for the mean that was rounded to 6 significant figures when we typed it in, while the computer used 8 significant figures when the computations were done from the raw data. The moral of the story is "Let Minitab use raw data whenever possible."

In some cases, however, we have no choice. Consider, for example, Problem 38 on page 318 of our text. After getting into the 1-Sample Z dialog box we must click on "Summarized data", enter 35 for "Sample size:", 23.20 for "Mean:", 4.34 for "Standard deviation:" and click "OK". For a 90% confidence interval repeat but type into the "Confidence level:" box. The result is shown below.

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Jeonghun Kim			
Lesson 11			
Example			
X = a closing stock price for Hasbro			
One-Sample Z			
The assumed standard deviation = 4.34			
N	Mean	SE Mean	90% CI
35	23.200	0.734	(21.993, 24.407)
One-Sample Z			
The assumed standard deviation = 4.34			
N	Mean	SE Mean	95% CI
35	23.200	0.734	(21.762, 24.638)

MINITAB ASSIGNMENT 11

See instructions on page 8.

For each problem be sure to define the appropriate random variable as in the sample problem.

1. Create 90%, 95%, and 99% confidence intervals for the mean weight of bears from the worksheet K:\minitab15\MINITAB\MiniTab\Bears.MTW.
2. Enter the data from Problem 67 on page 322 into the data window.
 - (a) Display the data.
 - (b) Create 90%, 95%, and 99% confidence intervals for the mean. Be sure to save this data on your disk or J:\ drive as you will need it again for Minitab Assignment 12.
3. Do Problem 42 on page 319.

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