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Course > Inference: Estimation > Estimation: Population Mean >

Statistics Package Exercise: Calculating Confidence Intervals for μ When σ is Unknown

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Statistics Package Exercise: Calculating Confidence Intervals for μ When σ is Unknown

Learning Objective: Explain what a confidence interval represents and determine how changes in sample size and confidence level affect the precision of the confidence interval.

Learning Objective: Find confidence intervals for the population mean and the population proportion (when certain conditions are met), and perform sample size calculations.

The purpose of this activity is to learn how to use statistical software for calculating confidence intervals for μ when σ is unknown. In this case, using software is useful in the case when all you have is the raw data, **and** in the case when only summary statistics are provided (more specifically, the sample mean and the sample standard deviation s). The reason for using software in the latter case is, as mentioned before, the complexity of determining the appropriate t^* .

Background: As part of a large survey conducted at a large state university, a random sample of 142 students were asked: "How many hours do you sleep in a typical day?" The datafile linked below contains the data. Use these data to estimate μ , the mean number of hours college students at this university sleep in a typical day, with a 95% confidence interval.

-  **StatCrunch**  **TI Calculator**  **Minitab**  **Excel**

R Instructions

To open R with the data set preloaded, right-click here and choose "Save Target As" to download the file to your computer. Then find the downloaded file and double-click it to open it in R.

The data have been loaded into the data frame

```
sleep
```

. Enter the command

```
sleep
```

to see the data. The variable in the data frame is also called

```
sleep
```

.

Note that in this case we need to find a confidence interval for the population mean when the population variance is unknown, and we will therefore use the interval that we have just introduced (t-interval). R will do this for us. Enter the command:

- ```
t.test(sleep$sleep, conf.level=0.95)$conf.int
```

To change the confidence level, simply change the 0.95 in the code to the appropriate level (in decimal form) and rerun the code.

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## Learn By Doing (1/1 point)

What is the 95% confidence interval for  $\mu$ ? Interpret it in context.

**Your Answer:**

Interval is (7.090439, 7.620828).

The population -- university students, most likely -- have a mean amount of sleep within 7.09 hours to 7.62 hours of sleep.

### Our Answer:

RStatCrunch TI Calculator Minitab Excel R Here is the R output: We are 95% certain that the mean number of hours college students in this state university sleep in a typical day is between 7.09 and 7.62. StatCrunch The 95% confidence interval is (7.09044, 7.62083). Thus, we are 95% certain that the mean number of hours college students in this state university sleep in a typical day is between 7.09 and 7.62. TI Calculator If you enter: and choose CALCULATE, then press ENTER, you should see: Thus, we are 95% certain that the mean number of hours college students in this state university sleep in a typical day is between 7.09 and 7.62. Minitab Here is the Minitab output: We are 95% certain that the mean number of hours college students in this state university sleep in a typical day is between 7.09 and 7.62. Excel Using Excel, we find the following:  $t^*$ : 1.98 mean: 7.356 standard deviation: 1.599 We then calculate the standard error to be 0.134, and the margin of error to be 0.265. Thus, we are 95% certain that the mean number of hours college students in this state university sleep in a typical day is between 7.09 and 7.62.

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