Due Wednesday 11/8 at 10:20. The data files (IBI for #1, TV for #3) are found in the instructor’s shared folder in LakerApps. You may work with no more than one other person from your section, and submit a shared paper: Each contributor is equally and fully responsible for all work and results. Take responsibility for the work you submit.

1. Pollution of water resources is a serious problem that can require substantial effort and funding to improve. To determine the financial resources required, an accurate assessment of the situation is required. The index of biological integrity is a measure of the water quality in streams. (See Wikipedia: higher values indicate better, “more natural” conditions.) IBI measurements for a sample of streams in the Ozark Highland ecoregion of Arkansas were collected as apart of a study. (Report all values to the nearest 0.1 accuracy at the least.)

a) Obtain a histogram and boxplot of the data. Print both; staple the hardcopy behind this sheet.

b) Obtain descriptive statistics for the data.

c) Based on the graphical information and on your descriptive statistics, what shape is the distribution of IBI?

__________

d) Obtain a 90% confidence interval for the mean IBI for streams in the Ozark Highland ecoregion of Arkansas. (Use \( t_{0.05} = 1.677 \) – if you examine 45 to 50 degrees of freedom in the table you ought to see why this is correct.) It’s a good idea to do this two ways: pretty much by hand; then have Minitab do it. (If you want to see the confidence interval plotted with the histogram or boxplot, use the Graphs button in the dialog box for confidence intervals.)

\[
\text{__________} < \mu < \text{__________}
\]

Interpret your interval by completing this statement: I am 90% confident that...

Report the point estimate and the error margin for the interval.

Point estimate = __________  Error Margin = __________

e) In Excel, determine the 5th and 95th percentiles of the data. (Use \text{PERCENTILE.EXC} if you have it; if not use \text{PERCENTILE}.) The interval bounded by these values forms a 90% prediction interval for the IBI in a single randomly selected stream.

\[
\text{__________} < X < \text{__________}
\]

5th percentile 95th percentile

f) Provide an interpretation of this prediction interval: I am 90% confident that…
g) Circle the selection below that has largest error margin.

A 90% confidence interval for the mean IBI of all streams.  
A 90% prediction interval for the IBI of a single randomly selected stream.

h) A follow-up study is to be conducted a year later, to determine if there’s evidence that IBI measurements have generally been reduced. We want to be 95% confident that our sample mean is within 2.5 years of the population mean. How many streams should be included in the sample for the follow-up study? (Use the standard deviation from above, and the method of Section 7-3, to answer.)

Sample at least __________ streams.

2. What is the average age of all nickels currently in circulation? Before analyzing data, we need to procure data. How much data? We want to be 99% confident that our sample mean is within ½ year of the population mean.

Sample at least ________________ nickels.

3. Interpret the following confidence intervals.

a) A student doing research in psychology is interested in knowing how much television is watched by preschoolers who live in Oswego. There are preschoolers enrolled at the Children’s Center, a day care facility located on campus, and serving faculty and students with children. The student places surveys in the mailboxes at the center, asking parents to complete them. Each parent is asked to report the average daily amount of television (in minutes – parents report to the nearest ¼ hour = 15 minutes) viewed by their child. The student collects the data (see it in the file TV), and obtains a 95% confidence interval: \(37.22 < \mu < 50.82\).

b) Medical researchers have a new treatment for cancer. The treatment is somewhat experimental, and costs a lot of money, so it is thought of as a last chance treatment in cases for which other treatments have failed and survival times are generally quite low (but occasionally lengthy). In an initial test of the treatment, 20 patients are treated. Using the \(T\) confidence interval (as in class and the book) a 90% confidence is determined to be \(4.3 < \mu < 7.9\) (in months).
**T confidence interval in Minitab**

Assume the data are in column C1. (Here C1 is named “IBI.”)

1. ![Minitab interface](image1.png)

2. ![Minitab interface](image2.png)

You can get the graphs other ways – from the Graphs menu. Generally one graphs before one gets a confidence interval (to check for outliers; to check for significant departures from Normality in small samples). However, getting graphs with the confidence interval menu item is not a bad idea: You can see the confidence interval plotted with the graph of the data.

In Intro Stats: See to it that **Alternative** is “not equal” when obtaining a confidence interval.

---

Some Minitab guidance is on page 3 of this assignment, available in the online version.