population. Using the sample data given above, construct a 95% confidence interval estimate of the population mean μ by using the following procedure.

Procedure Various technologies can be used for this bootstrap procedure. The STATDISK statistical software program is very easy to use. Enter the listed sample values in column 1 of the Data Window, then select the main menu item of **Analysis,** and select the menu item of **Bootstrap Resampling.**

a. In STATDISK, enter 500 for the number of resamplings and click on **Resample.** This will create 500 new samples, each of size 10, by selecting 10 values with replacement from the original 10 sample values given above.

b. Find the mean of each of the 500 bootstrap samples generated in part (a). In STATDISK, the means will be automatically listed in the second column of the Data Window.

c. Sort the 500 means (arrange them in order). In STATDISK, click on the main menu item of **Data,** then select **Sort Data.** Proceed to sort the means in column 2.

d. Find the percentiles $P_{2.5}$ and $P_{97.5}$ for the sorted means that result from the preceding step. ($P_{2.5}$ is the mean of the 12th and 13th values in the sorted list of means; $P_{97.5}$ is the mean of the 487th and 488th values in the sorted list of means.) Identify the resulting confidence interval by substituting the values for $P_{2.5}$ and $P_{97.5}$ in $P_{2.5} < \mu < P_{97.5}$.

Now use the same bootstrap resampling method to find a 95% confidence interval estimate of the population standard deviation σ. Use the same steps given above, but use the standard deviations of the samples. (In STATDISK, the standard deviations are automatically listed in the third column of the data window, so sort that third column and then find $P_{2.5}$ and $P_{97.5}$ for the sorted standard deviations.)

Interpretation Does the confidence interval for μ contain 1480, which is the true value of the population mean? Does the confidence interval for σ contain 2321, which is the true value of σ?

from data TO DECISION

Critical Thinking: What does the survey tell us?

Surveys have become an integral part of our lives. They directly affect us in so many ways, including public policy, the television shows we watch, the products we buy, and the political leaders we elect. Because it is so important that every citizen has the ability to interpret survey results, surveys are the focus of this project.

In a recent Pew Research Center poll, 1501 adults were randomly selected and asked this question: "From what you've read and heard, is there solid evidence that the average temperature on earth has been increasing over the past few decades, or not?" Seventy percent of the 1501 respondents answered "yes."

Analyzing the Data

1. Use the survey results to construct a 95% confidence interval estimate of the *percentage* of all adults who believe that there is solid evidence of increasing temperatures.

2. Identify the margin of error for this survey.

3. Explain why it would or would not be okay for a newspaper to make this statement: "Based on results from a recent survey, the majority of adults believe that there is solid evidence of global warming."

4. Assume that you are a newspaper reporter. Write a description of the survey results for your newspaper.

5. A common criticism of surveys is that they poll only a very small percentage of the population and therefore cannot be accurate. Is a sample of only 1501 adults taken from a population of 241,472,385 adults a sample size that is too small? Write a brief explanation of why the sample size of 1501 is or is not too small.

6. In reference to another survey, the president of a company wrote to the Associated Press about a nationwide survey of 1223 subjects. Here is what he wrote:

> When you or anyone else attempts to tell me and my associates that 1223 persons account for our opinions and tastes here in America, I get mad as hell! How dare you! When you or anyone else tells me that 1223 people represent America, it is astounding and unfair and should be outlawed.

The writer of that letter then proceeds to claim that because the sample size of 1223 people represents 120 million people, his single letter represents 98,000 (120 million divided by 1223) who share the same views. Do you agree or disagree with this claim? Write a response that either supports or refutes this claim.