**Notes:**

1. **Criteria for deciding whether the population is normally distributed:** The normality requirement is loose, so the distribution should appear to be somewhat symmetric with one mode and no outliers.
2. **Sample size $n > 30$:** This is a common guideline, but sample sizes of 15 to 30 are adequate if the population appears to have a distribution that is not far from being normal and there are no outliers. For some population distributions that are extremely far from normal, the sample size might need to be larger than 30.

## using TECHNOLOGY

### Confidence Intervals

**STATDISK** You must first find the sample size $n$, the sample mean $\bar{x}$, and the sample standard deviation $s$. (Find those statistics using the STATDISK procedure described in Section 3-2.) Select **Analysis** from the main menu bar, select **Confidence Intervals,** then select **Population Mean.** Enter the items in the dialog box, then click the **Evaluate** button. The confidence interval will be displayed. STATDISK will automatically choose between the normal and $t$ distributions, depending on whether a value for the population standard deviation is entered.

**MINITAB** Minitab allows you to use either the summary statistics $n$, $\bar{x}$, and $s$ or a list of the original sample values. Select **Stat** and **Basic Statistics.** If $\sigma$ is not known, select **1-sample t** and enter the summary statistics or enter **C1** in the box located at the top right. (If $\sigma$ is known, select **1-sample Z** and enter the summary statistics or enter **C1** in the box located at the top right. Also enter the value of $\sigma$ in the "Standard Deviation" or "Sigma" box.) Use the **Options** button to enter the confidence level, such as 95.0.

**EXCEL** Use XLSTAT. Click on **XLSTAT** at the top, click on **Parametric tests,** then select **One sample t test and z test.** In the screen that appears, for the "Data" box enter the range of data, such as A1:A12 for 12 data values in column A. For "Data Format" select **One sample.** Click on the "Student's t test" box (or click on the "z test" box if $\sigma$ is known). Click on the **Options** tab to enter the desired "Significance level (%)." Enter 5 for a 95% confidence interval. Select the format of "Mean 1 $\neq$ Theoretical mean" and enter any value for the theoretical mean. Click **OK.** After the results are displayed, look for "confidence interval on the mean." (The use of Excel's **CONFIDENCE** tool is not recommended, for a variety of reasons.)

**TI-83/84 PLUS** The TI-83/84 Plus calculator can be used to generate confidence intervals for original sample values stored in a list, or you can use the summary statistics $n$, $\bar{x}$, and $s$. Either enter the data in list L1 or have the summary statistics available, then press STAT. Now select **TESTS** and choose **TInterval** if $\sigma$ is not known. (Choose **ZInterval** if $\sigma$ is known.) After making the required entries, the calculator display will include the confidence interval in the format of $(\bar{x} - E, \bar{x} + E)$. For example, see the TI-83/84 Plus display that accompanies Example 4 in this section.

**STATCRUNCH** Click on **Open StatCrunch.** Click on **Stat,** then select **T statistics.** Select **One sample,** then select **with data** (for a list of sample data) or **with summary** (for summary statistics). Click on **Next,** then select **Confidence Interval** and click on **Calculate.**

### Sample Size Determination

**STATDISK** Select **Analysis** from the main menu bar at the top, then select **Sample Size Determination,** followed by **Estimate Mean.** Enter the confidence level (such as 0.95) and the margin of error $E$. You can also enter the population standard deviation $\sigma$ if it is known. There is also an option that allows you to enter a known population size $N$, assuming that you are sampling without replacement from a finite population.

**MINITAB** Using Minitab 16 or later, select **Stat** from the main menu, select **Power and Sample Size,** then select **Sample Size for Estimation.** Choose the parameter of **Mean (Normal).** Complete the dialog box and click **OK.**

Sample size determination is not available as a built-in function with Excel or StatCrunch or the TI-83/84 Plus calculator.

## 7-3 Basic Skills and Concepts

### Statistical Literacy and Critical Thinking

***In Exercises 1–3, refer to the accompanying screen display that results from a sample of 40 duration times (seconds) of eruptions of the Old Faithful geyser in Yellowstone National Park.***

**TI-83/84 Plus**

```
TInterval
(233.4,256.65)
x̄=245.025
Sx=36.35754604
n=40
```

**1. Confidence Interval** Refer to the accompanying screen display.

**a.** Express the confidence interval in the format that uses the "less than" symbol.

**b.** Identify the best point estimate of $\mu$ and the margin of error.