

INTERPRETING DATA

In this unit, you will be analyzing information in tables and graphs. Data is presented in tables and graphs to convey the meaning of the data in a more visually appealing manner. You will be looking closely at statistical data by reading, interpreting, and constructing box-and-whiskers plots along with other types of graphs and tables.

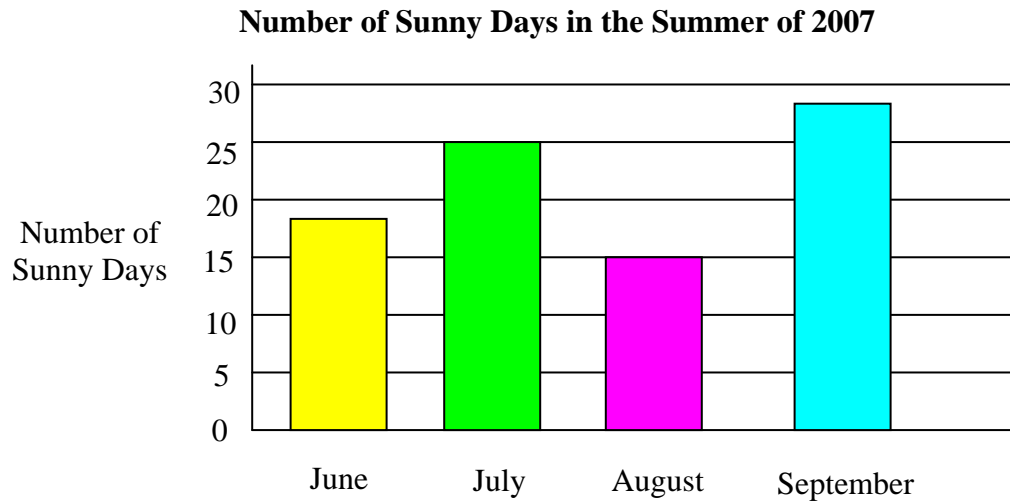
Graphs

Box-and-Whiskers Plots

Graphs

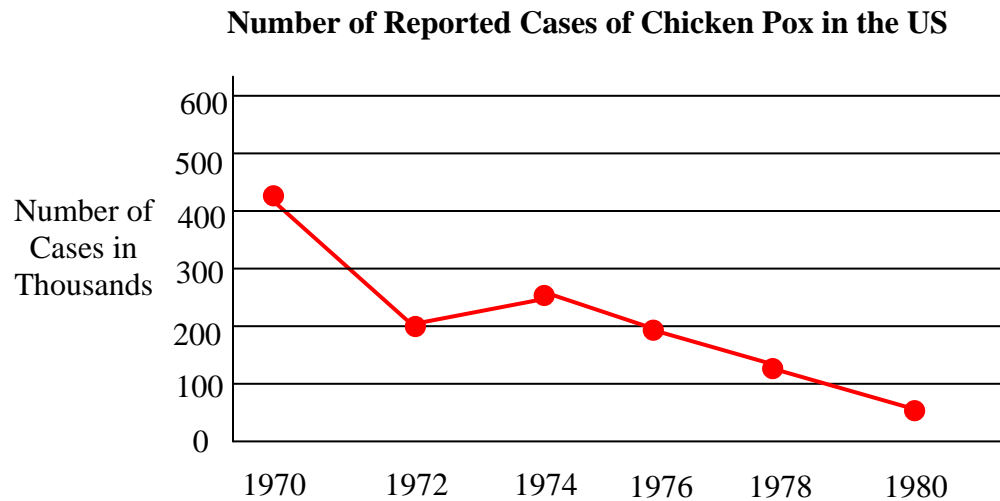
Bar Graph

A bar graph is made from rectangular bars that represent data.



Line Graph

A line graph uses line segments between known data points to show changes that occur over time.



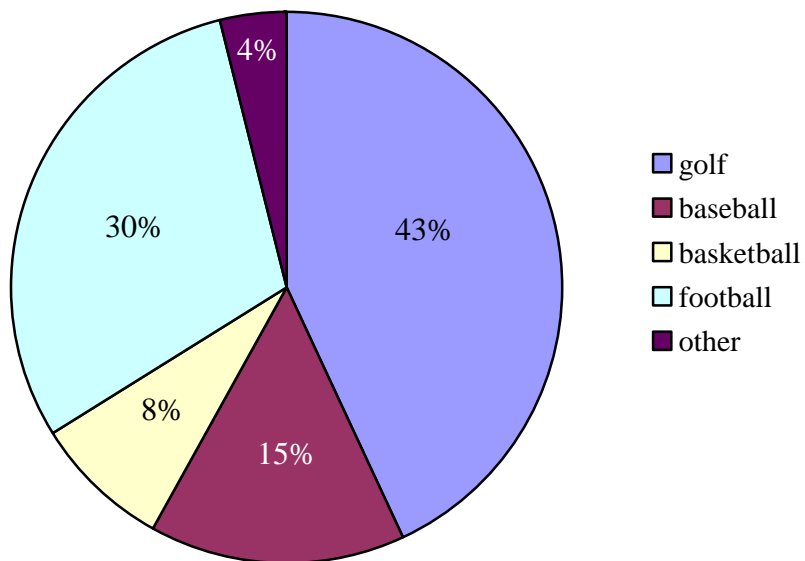
By looking at the general trend you could make a reasonable guess about the number of cases of chicken pox in the United States in 1982.

Circle Graph (Pie Chart)

A circle graph or pie chart represents data using parts of a circle. A circle graph is most effective for looking at parts or percents of a whole.

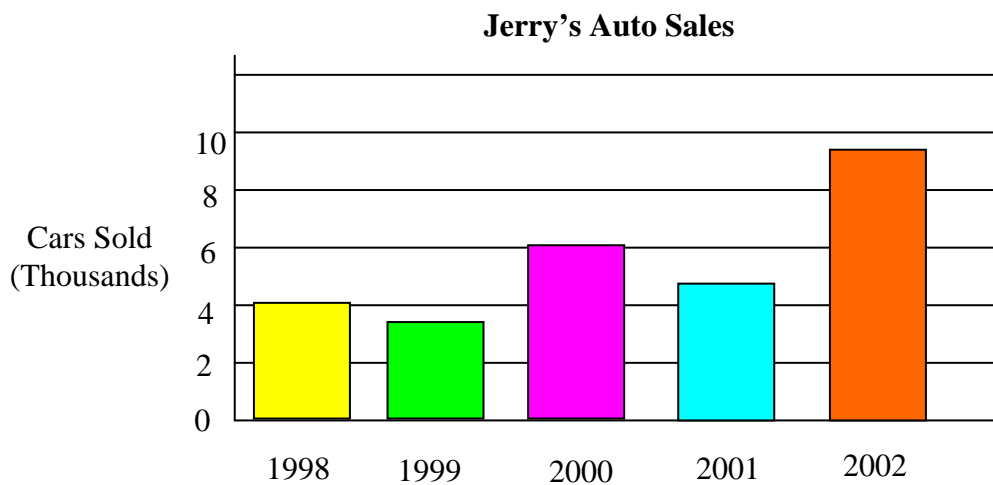
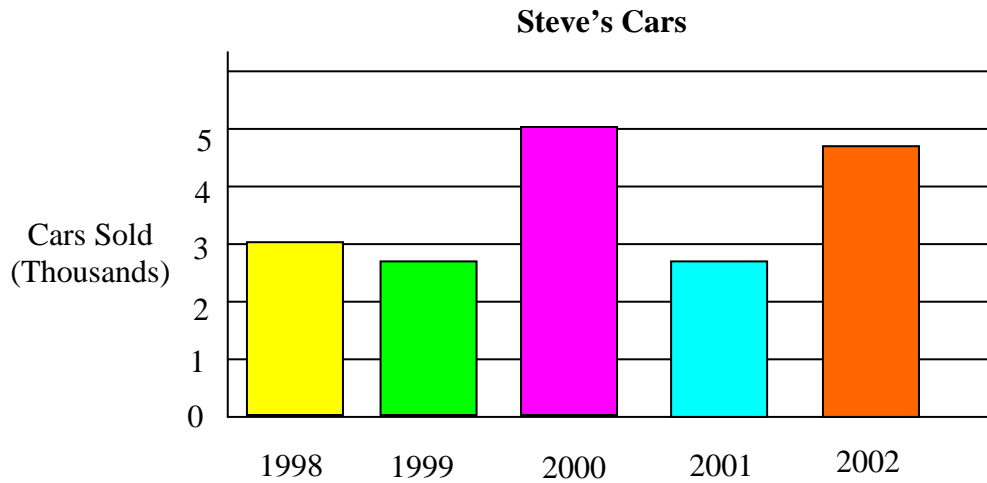
For example: Five hundred people were surveyed and asked what their favorite sport was. The circle graph below illustrates the results.

From the circle graph we can determine that 215 people said their favorite sport was golf. (43% of 500)



It is very important to be able to read graphs because sometimes graphs are used to intentionally mislead people.

For example, look at the two bar graphs below. Each shows the sales of cars (in thousands) of two car dealers for five (5) consecutive years. Compare the graphs and answer the questions below.



Use the bar graphs above to answer the following questions. Scroll down to check your response.

- a.) What is the approximate number of cars sold by "Steve's Cars" in 2000?
- b.) What is the approximate number of cars sold by Jerry's Auto Sales in 2000?
- c.) Which car dealer's bar graph has a longer bar used to represent sales in 2000?
- d.) Which car dealer actually sold the most cars in 2000?

Keep in mind that when you are reading data from a graph, it is important that you accurately interpret the information shown.

Answers: a.) 5000 b.) 6000 c.) Steve's Cars d.) Jerry's Auto Sales

Notice that at first glance at the graphs and comparing the bars only, it appears that Steve's Cars sold more cars than Jerry's Cars in 2000. **HOWEVER**, after closely examining the vertical scales in the charts that represent the number of cars sold, it is evident that Jerry's Auto Sales sold more cars in 2000.

Box-and-Whiskers Plots

Box-and-whiskers plots are used to separate data into four sections. The parts will differ in length in the graph, but each part will contain one fourth of the data, with the exception of the outliers.

- **Median** - separates the entire data set in half
- **LQ – Lower Quartile** - median of the lower half of the data
- **UQ – Upper Quartile** - median of the upper half of the data
- **Interquartile Range** – difference between the UQ and LQ
- **Outliers** – data points that fall beyond the upper quartile or below the lower quartile (They are points that are more than 1.5 times the value of the interquartile range plus the UQ or minus the LQ.)
- **Lower Extreme** – smallest data point (excluding the outlier)
- **Upper Extreme** – largest data point (excluding the outlier)

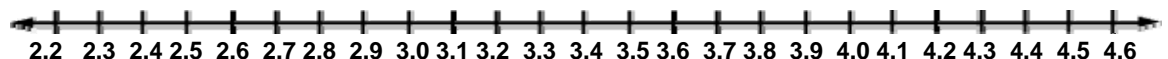
Follow the steps below to make a box-and-whiskers plot for the given data set. The data set represents the average monthly precipitation that occurred in Columbus, OH, in 2003. Also check the data set for outliers.

Average Monthly Precipitation Columbus, OH (in inches) 2003			
2.5	2.2	2.9	3.3
3.9	4.1	4.6	3.7
2.9	2.3	3.2	2.9

Step 1: Put the data in **order** from **least to greatest**.

2.2, 2.3, 2.5, 2.9, 2.9, 2.9, 3.2, 3.3, 3.7, 3.9, 4.1, 4.6

Step 2: Draw a **number line** with a **scale** that fits the data.



Step 3: Find the **median**.

$$\frac{2.9 + 3.2}{2} = 3.05$$

Step 4: Find the quartiles (**LQ** and **UQ**).

- lower quartile (LQ) - median of the lower half

$$\frac{2.5 + 2.9}{2} = 2.7$$

- upper quartile (UQ) - median of the upper half

$$\frac{3.7 + 3.9}{2} = 3.8$$

Step 5: Calculate the interquartile range. (UQ – LQ)

$$3.8 - 2.7 = 1.1$$

Step 6: Check for outliers.

First, multiply the interquartile range by 1.5.

$$1.1 \times 1.5 = 1.65$$

Second, Add 1.65 to the upper quartile. (UQ + 1.65)

$$3.8 + 1.65 = 5.45$$

Compare data points to 5.45. Are there any data points greater than 5.45? No!

Third, Subtract 1.65 from the lower quartile. (LQ – 1.65)

$$2.7 - 1.65 = 1.05$$

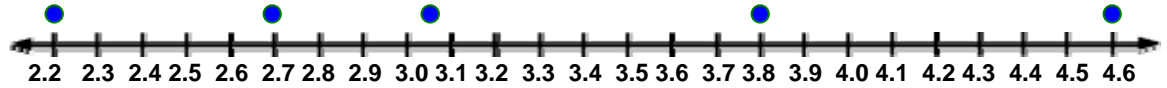
Compare data points to 1.05. Are there any data points lower than 1.05? No!

There are no outliers in this data set.

Step 7: Find the lower extreme (lowest point of the data). It is 2.2.

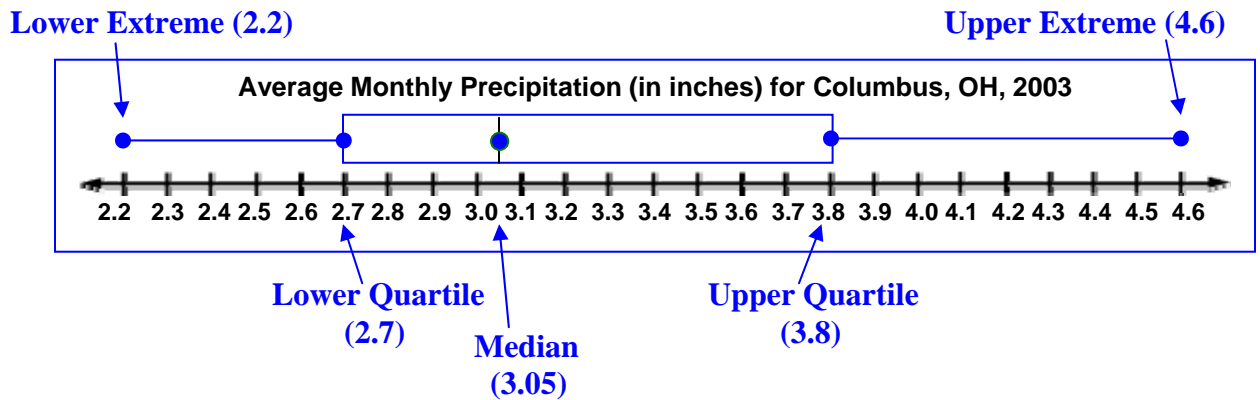
Step 8: Find the upper extreme (highest point of the data). It is 4.6.

Step 9: **Plot the points** for the following data points: **lower extreme, LQ, median, UQ, and upper extreme.**



Step 10: Draw the **box-and-whiskers** graph.

- A rectangle (box) extends from the lower quartile (LQ) to the upper quartile (UQ).
- A vertical line is drawn through the median of the data set.
- Line segments (whiskers) extend from LQ to the lower extreme data point and from UQ to the upper extreme data point.
- Add a title to the graph.



- Data points 2.2, 2.3, and 2.5 are located under the left “whisker”.
($\frac{1}{4}$ th of the data points)
- Data points 2.9, 2.9, and 2.9 are located to the left of the median under the “box”. ($\frac{1}{4}$ th of the data points)
- Data points 3.2, 3.3, and 3.7 are located to the right of the median under the “box”. ($\frac{1}{4}$ th of the data points)
- Data points 3.9, 4.1, and 4.6 are located under the right “whisker”.
($\frac{1}{4}$ th of the data points)

*Note: If any outliers did exist in the data set, they would be plotted as separate points above the number line.