

# Data Displays

**GOAL** Make and interpret data displays.

**Histograms** A **histogram** is a graph that displays data from a *frequency table*. A **frequency table** is used to group data values into equal intervals. The number of data values in each interval is the frequency of the interval.

## EXAMPLE 1 Making a Histogram

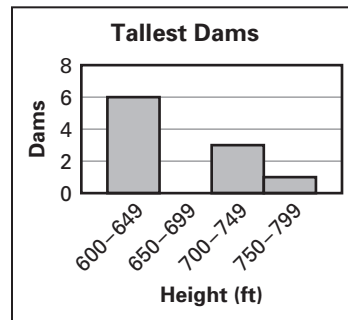
The heights (in feet) of the tallest dams in the United States are 718, 754, 632, 725, 600, 636, 626, 708, 607, and 610. Display the data using a histogram.

### SOLUTION

**Step 1** Choose intervals of equal size that cover all data values. Organize the data in a frequency table.

Height (ft)	Dams
600–649	6
650–699	0
700–749	3
750–799	1

**Step 2** Use the intervals in the frequency table to draw the bars of the histogram.



**Line Graphs** In a **line graph**, points that represent data values are connected by line segments. A line graph can show how data change over time.

## EXAMPLE 2 Making a Line Graph

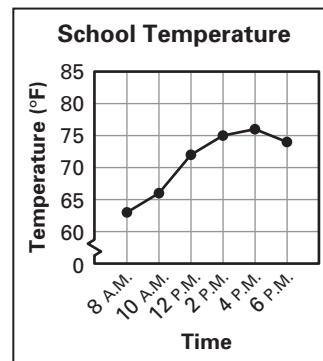
The table shows the temperature outside your school during one day. Display the data using a line graph. When did the greatest temperature change occur?

Time	8:00 A.M.	10:00 A.M.	12:00 P.M.	2:00 P.M.	4:00 P.M.	6:00 P.M.
Temperature	63°F	66°F	72°F	75°F	76°F	74°F

### SOLUTION

Graph the data as points in a coordinate plane. Let the *x*-axis represent time and the *y*-axis represent temperature. Connect the points using line segments.

Because the line segment between 10:00 A.M. and 12:00 P.M. has the steepest slope, this is when the greatest temperature change occurred.



**CHECK Examples 1 and 2**

- The prices of items purchased at a yard sale are given below. Display the data using a histogram.  
\$.50, \$1, \$.25, \$5, \$.50, \$3, \$1, \$1, \$4, \$.75
- The table shows the average retail price of one pound of apples in the United States during each of five years. Display the data using a line graph. Between which two years did the price of apples have the greatest increase?

Year	1990	1992	1994	1996	1998
Price	\$.77	\$.76	\$.72	\$.89	\$.85

**Circle Graphs** A **circle graph** displays data as sections of a circle. The entire circle represents all the data. When the data in a circle graph are expressed as fractions, decimals, or percents, the sum of the data must equal 1, or 100%.

**EXAMPLE 3 Making a Circle Graph**

The bar graph shows the CDs in Diane's collection. Display the data using a circle graph.

**SOLUTION**

**Step 1** For each music category, write a fraction comparing the number of CDs in the category to the total number of CDs in the collection. Then multiply by  $360^\circ$  to find the angle measure of the corresponding section.

$$\text{Country} \quad \frac{15}{50} \cdot 360^\circ = 108^\circ$$

$$\text{Rock} \quad \frac{20}{50} \cdot 360^\circ = 144^\circ$$

$$\text{Classical} \quad \frac{5}{50} \cdot 360^\circ = 36^\circ$$

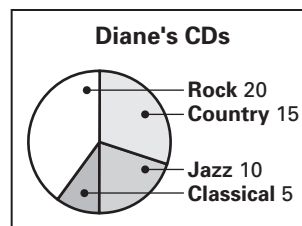
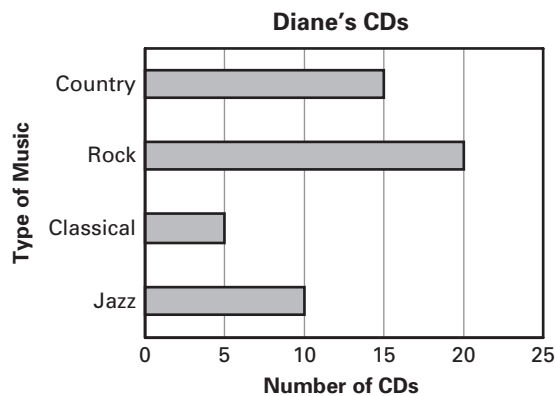
$$\text{Jazz} \quad \frac{10}{50} \cdot 360^\circ = 72^\circ$$

**Step 2** Draw a circle using a compass.

**Step 3** Use a protractor to draw an angle measuring  $36^\circ$ . Then label the section "Classical 5."

**Step 4** Draw and label the remaining sections.

**Step 5** Write a title for the graph.

**CHECK Example 3**

- During one day of summer camp, your group spends 1 hour on a nature walk, 1 hour swimming, 1 hour eating lunch, 3 hours boating, and 2 hours doing arts and crafts. Display the data using a circle graph.

**Stem-and-Leaf Plots** A **stem-and-leaf plot** shows how quantitative data are distributed according to their leading digit(s).

**EXAMPLE 4 Making a Stem-and-Leaf Plot**

The travel times (in minutes) for 14 students on a school bus are 15, 12, 8, 22, 17, 6, 13, 24, 11, 27, 7, 3, 12, and 14. Display the data using a stem-and-leaf plot.

**SOLUTION**

The times vary from 3 to 27, so let the *stems* be the tens' digits from 0 to 2. Let the *leaves* be the ones' digits. Make a key that shows how to interpret the digits.

Stems	Leaves	
0	3 6 7 8	
1	1 2 2 3 4 5 7	
2	2 4 7	<b>Key:</b> 2 7 = 27

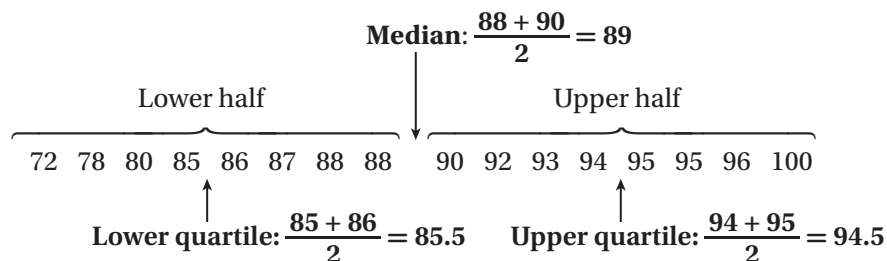
**Box-and-Whisker Plots** A **box-and-whisker plot** divides quantitative data into four parts. The *median* divides the data into a lower half and an upper half. The **median** of a set of data is the middle value when the values are written in increasing order. The median of the lower half is the **lower quartile**. The median of the upper half is the **upper quartile**.

**EXAMPLE 5 Making a Box-and-Whisker Plot**

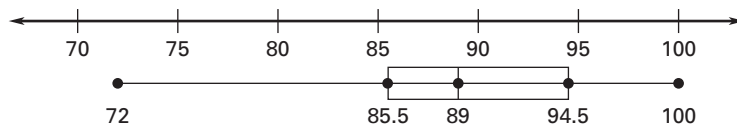
The scores on a test in your science class are 85, 90, 72, 95, 93, 87, 88, 80, 78, 100, 96, 92, 86, 95, 94, and 88. Display the data using a box-and-whisker plot.

**SOLUTION**

Write the data in increasing order. Find the median and the quartiles.



Use a number line to draw the box-and-whisker plot.



**CHECK** Examples 4 and 5

In Exercises 4 and 5, use the following information.

The number of free throws made by each of 18 players during one basketball practice are 12, 32, 42, 50, 39, 38, 27, 34, 42, 35, 48, 36, 13, 15, 23, 16, 25, and 43.

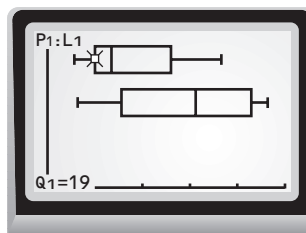
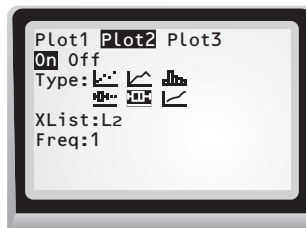
- 4. Display the data using a stem-and-leaf plot.
- 5. Display the data using a box-and-whisker plot.

A **double box-and-whisker plot** compares two sets of data using the same number line. In the following activity, you will use a graphing calculator to make a double box-and-whisker plot.

## Activity

### Making a Double Box-and-Whisker Plot

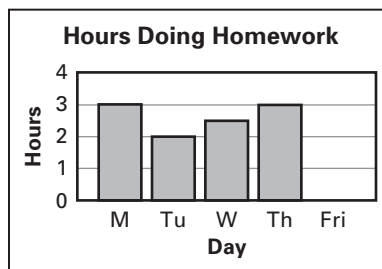
- 1 Find and record the heights (in inches) of students in your class. Keep separate lists for male and female students.
- 2 Enter the male heights in L1 and the female heights in L2.
- 3 Choose a box-and-whisker plot for Plot 1 and set the XList to L1. Choose a box-and-whisker plot for Plot 2 and set the XList to L2.
- 4 Choose a viewing window. Press **GRAPH** to see the double box-and-whisker plot. A sample plot is shown.
- 5 Use **TRACE** and the direction arrows to find quartile values.
- 6 Are the heights more varied among female students or male students?



## EXERCISES

In Exercises 1–3, use the bar graph, which shows the time a student spent doing homework on each of five days.

1. How many hours did the student spend doing homework on Monday?
2. How many more hours did the student spend doing homework on Thursday than on Friday?
3. What is the total number of hours that the student spent doing homework on Monday and Tuesday?

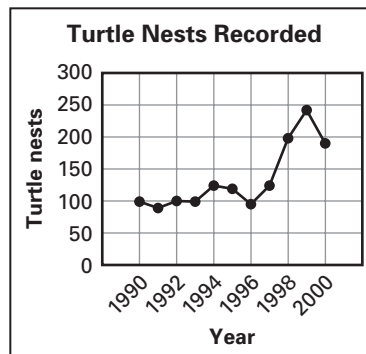


Display the data using a bar graph or a histogram.

4. Grade levels of 13 students in an art class:  
11, 12, 9, 10, 10, 11, 10, 12, 9, 11, 9, 10, 10
5. Sizes (small, medium, or large) of 20 beverages ordered:  
M, S, L, L, M, S, L, S, S, L, M, S, L, S, L, L, S, M, L, L
6. Total costs of 13 purchases made at a convenience store:  
\$15, \$20, \$12.50, \$20, \$17.74, \$10, \$22.75, \$5, \$10, \$18.94, \$10, \$25, \$3

In Exercises 7–9, use the line graph, which shows the number of turtle nests recorded in Cape Lookout, North Carolina, from 1990 to 2000.

7. Between which two years did the number of turtle nests decrease the most?
8. Between which two years did the number of turtle nests increase the most?
9. In which year was the greatest number of turtle nests recorded? Estimate the number of turtle nests recorded that year.



Display the data using a line graph.

10. Closing value of a share of a stock on each of 7 days:

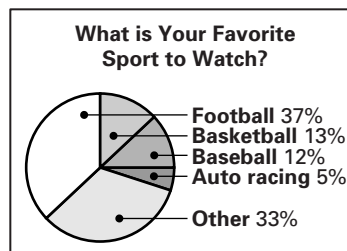
Day	1	2	3	4	5	6	7
Value	\$4.78	\$4.83	\$4.89	\$4.87	\$4.83	\$4.92	\$4.91

11. Speed of an automobile each minute over 10 minutes:

Time (min)	1	2	3	4	5	6	7	8	9	10
Speed (mi/h)	61	58	57	58	59	61	61	61	60	59

In Exercises 12–14, use the circle graph, which shows the results of a survey asking “What is your favorite sport to watch?”

12. What percent of people surveyed named football or basketball as their favorite sport to watch?
13. What percent of people surveyed did not name football as their favorite sport to watch?



14. Suppose 200 people were surveyed.
  - a. Make a chart showing the number of people who gave each response.
  - b. Display the data using a bar graph.

Display the data using a circle graph.

15. Electricity generation sources in the United States in 2000:

Fossil fuel: 71%, Nuclear: 20%, Hydro: 7%, Other: 2%

16. Student enrollment by class at a small college:

Level	Enrollment
Senior	229
Junior	234
Sophomore	262
Freshman	316

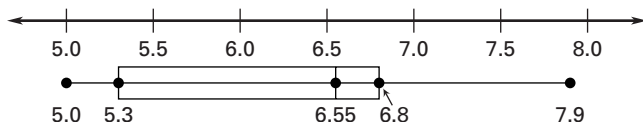
In Exercises 17–19, use the stem-and-leaf plot, which shows the ages of people in one family.

- |  |   |                 |               |
|--|---|-----------------|---------------|
| 17. How many family members are 30 years old or older? | 0 | 1               |               |
|  | 1 | 0 2 5 5 7 8     |               |
| 18. How many family members are under the age of 10?   | 2 | 0 0 1 2 5 6     |               |
|  | 3 |                 |               |
| 19. What is the median age of people in the family?    | 4 | 7 7 7 8         |               |
|  | 5 | 0 1 2 4 5 5 6 6 | Key: 4 7 = 47 |

Display the data using a stem-and-leaf plot.

20. Number of cars in a parking lot on each of 15 days:  
150, 167, 181, 156, 168, 135, 146, 142, 166, 163, 155, 139, 148, 156, 127
21. Number of books read in one year by each of 20 people:  
0, 15, 16, 16, 12, 8, 2, 4, 20, 10, 36, 6, 14, 15, 14, 14, 19, 24, 19, 12

In Exercises 22 and 23, use the box-and-whisker plot, which shows average wind speeds (in miles per hour) in 16 California locations in January.



22. What is the median wind speed?
23. What are the upper and lower quartiles of the data set?

Display the data using a box-and-whisker plot.

24. Number of movies rented in one month by each of 25 families:  
2, 8, 5, 1, 0, 10, 4, 5, 3, 2, 3, 4, 6, 4, 7, 5, 8, 10, 1, 2, 0, 1, 3, 4, 7
25. Number of home runs scored by each of 20 players on a baseball team in one season:  
0, 0, 33, 7, 24, 0, 18, 14, 1, 1, 2, 20, 10, 0, 24, 4, 7, 5, 3, 0
26. Ages of 16 contestants that participated in a state talent show:  
8, 10, 9, 14, 12, 10, 11, 23, 20, 18, 15, 16, 7, 22, 9, 11

In Exercises 27–29, use the spreadsheet, which shows the number of grams of fat and the number of calories in one ounce of various types of cheese.

27. Are the data univariate or bivariate? Why?
28. Describe any relationship(s) you see between the number of grams of fat and the number of calories.
29. One ounce of Roquefort cheese has 8.9 grams of fat. Estimate the number of calories in one ounce of Roquefort cheese. Explain how you made the estimate.

	A	B	C
1	Cheese	Fat (g)	Calories
2	Blue	8.1	100
3	Brie	7.0	85
4	Cheddar	9.4	114
5	Feta	6.0	75
6	Gouda	8.0	101
7	Jack	9.0	106
8	Mozzarella	6.1	80
9	Ricotta	3.7	49
10	Swiss	7.0	100

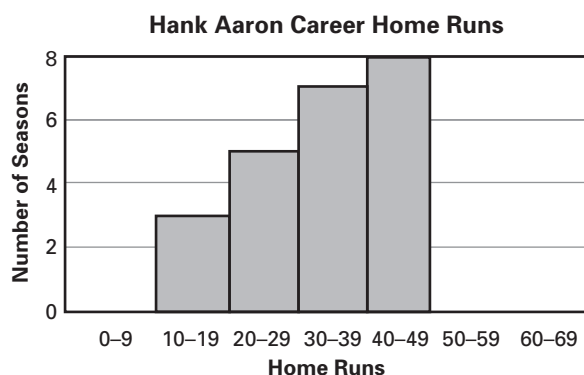
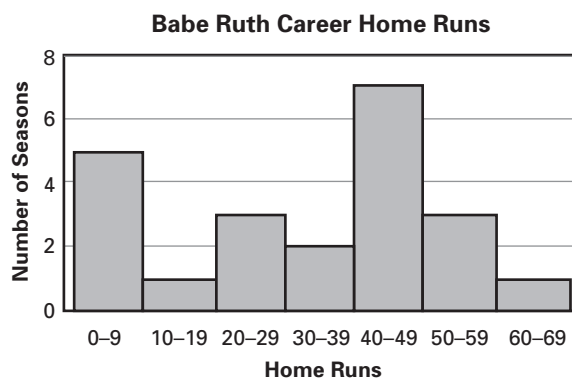
In Exercises 30 and 31, use the following information.

A *double stem-and-leaf plot* is used to compare two sets of data. The stems are in the middle of the plot, so that they apply to both sets of data. The double stem-and-leaf plot below shows the number of points scored by two different basketball teams in each of their first 12 games.

Team 1	Stems	Team 2	
5 3 2 2	7	5	
6 4 1 0 0	8	2 2 5 8 8	
5 2 0	9	2 3 6 6 6	
	10	0	Key: 2 7 5 = 72, 75

30. Use the double stem-and-leaf plot to make a conclusion about the number of points scored by the two teams.
31. Use the data in the double stem-and-leaf plot to make a double box-and-whisker plot.

In Exercises 32–35, use the histograms, which show the number of home runs hit during each season in the careers of Babe Ruth and Hank Aaron.



32. Which player played for more seasons? How many more?
33. Is it possible to tell from the histograms which player had more career home runs? Explain.
34. Which player had a greater number of seasons in which he hit at least 40 home runs?
35. What conclusions can you draw about the two players based on the histograms?