EXPLORING DATA AND STATISTICS

1.6

Tables and Graphs

What you should learn

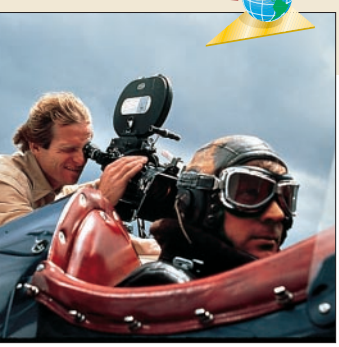
GOAL 1 Use tables to organize data.

GOAL 2 Use graphs to organize **real-life** data, such as the amounts of various foods consumed in **Example 2**.

Why you should learn it

▼ To help you see relationships among **real-life** data, such as the average cost of making a movie in **Example 3**.

REAL LIFE



GOAL 1 USING TABLES TO ORGANIZE DATA

Almost every day you have the chance to interpret **data** that describe real-life situations. The word *data* is plural and it means information, facts, or numbers that describe something.

A collection of data is easier to understand when the data are organized in a table or in a graph. There is no "best" way to organize data, but there are many good techniques. Often it helps to put numbers in either increasing or decreasing order. It also helps to group numbers so that patterns or trends are more apparent.

EXAMPLE 1 *Using a Table*

The data in the table were taken from a study on what people in the United States eat. The study grouped what people eat into over twenty categories. The three top categories (listed in pounds per person per year) are shown in the table.

Top Categories of Food Consumed by Americans (lb per person per year)							
Year	1970	1975	1980	1985	1990	1995	2000
Dairy	563.8	539.1	543.2	593.7	568.4	584.4	590.0
Vegetables	335.4	337.0	336.4	358.1	382.8	405.0	410.0
Fruit	237.7	252.1	262.4	269.4	273.5	285.4	290.0

INTERNET **DATA UPDATE** of U.S. Department of Agriculture at www.mcdougallittell.com
Year 2000 data are projected by the authors.

In which 5-year period did the total consumption per person of dairy, fruit, and vegetables increase the most? When was there a decrease in total consumption?

SOLUTION

Add two more rows to the table. Enter the total consumption per person of all three categories and the amount of change from one 5-year period to the next.

Year	1970	1975	1980	1985	1990	1995	2000
Total	1136.9	1128.2	1142.0	1221.2	1224.7	1274.8	1290.0
Change	———	−8.7	13.8	79.2	3.5	50.1	15.2

▶ From the table, you can see that the greatest increase in total consumption per person occurred from 1980 to 1985. During that 5-year period, total yearly consumption of dairy, vegetables, and fruit increased by 79.2 pounds per person. The minus sign indicates a decrease of 8.7 pounds from 1970 to 1975.

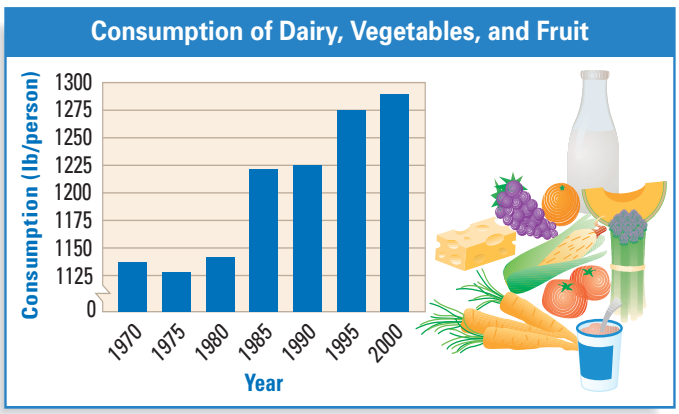
GOAL 2 USING GRAPHS TO ORGANIZE DATA

One way to organize data is with a **bar graph**. The bars can be either vertical or horizontal. Example 2 shows a vertical bar graph of the data from Example 1.

REAL LIFE *Eating Habits*

EXAMPLE 2 *Interpreting a Bar Graph*

The bar graph shows the total amount of dairy products, vegetables, and fruit consumed by Americans in a given year. If you glance at the graph, it appears Americans ate seven times the amount of dairy products, vegetables, and fruit in 1995 as compared with 1970. If you study the data in Example 1, you can see that the bar graph could be misleading.



a. Explain why the graph could be misleading.

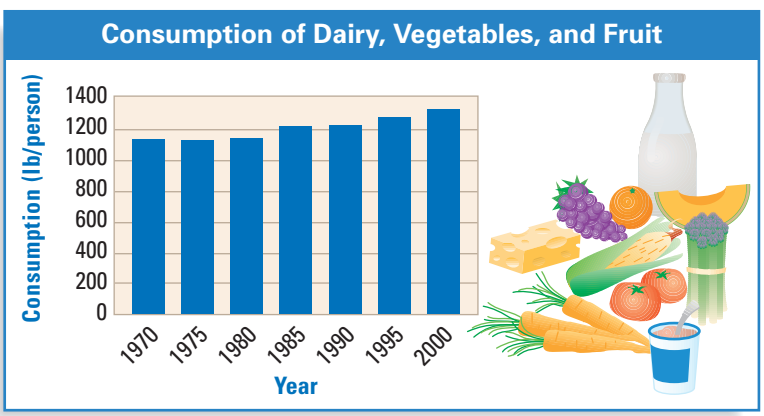
b. Draw a new bar graph that would not be misleading.

SOLUTION

STUDENT HELP
Skills Review
For help with drawing bar graphs, see pp. 792–794.

a. The bar graph could be misleading because the vertical scale is not consistent. A gap exists between 0 and the first tick mark on the vertical axis. This could give the visual impression that consumption for 1970, 1975, and 1980 is much lower than for the other years.

b. To make a bar graph that would not be misleading, you must eliminate the gap and make sure that each tick mark represents the same amount.



STUDENT HELP
INTERNET **HOMEWORK HELP**
Visit our Web site www.mcdougallittell.com for extra examples.

Another way to organize data is with a **line graph**. Line graphs are especially useful for showing changes in data over time.

REAL LIFE *Movie Making*

EXAMPLE 3 *Making a Line Graph*

From 1983 to 1996, the average cost (in millions of dollars) of making a movie is given in the table.

Average Cost of Making a Movie (millions of dollars)							
Year	1983	1984	1985	1986	1987	1988	1989
Average cost	$11.8	$14.0	$16.7	$17.5	$20.0	$18.1	$23.3

Year	1990	1991	1992	1993	1994	1995	1996
Average cost	$26.8	$26.1	$28.9	$29.9	$34.3	$36.4	$33.6

▶ Source: *International Motion Picture Almanac*

a. Draw a line graph of the data.

b. During which three years did the average cost decrease from the prior year?

c. Which year showed the greatest decrease?

FOCUS ON CAREERS

REAL LIFE **DIRECTOR OF PHOTOGRAPHY**

The composition of the movie shots, type of film, and equipment used are chosen by the director of photography who works closely with the director and producer.

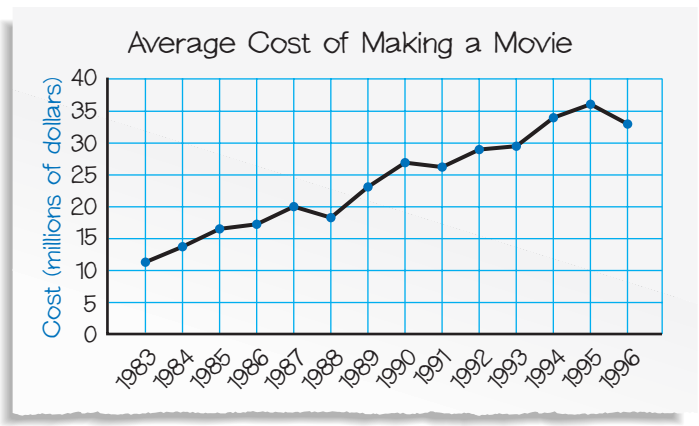
INTERNET **CAREER LINK**
www.mcdougallittell.com

SOLUTION

a. Draw the vertical scale from 0 to 40 million dollars. Use units of 5 for the vertical axis to represent intervals of five million dollars. Draw the horizontal axis and mark the number of years starting with 1983.

For each average cost in the table, draw a point on the graph.

Draw a line from each point to the next point.



b. In 1988, 1991, and 1996 the average cost of making a movie decreased from the prior year.

c. The greatest decrease in the average cost of making a movie occurred in 1996.

GUIDED PRACTICE

Vocabulary Check ✓

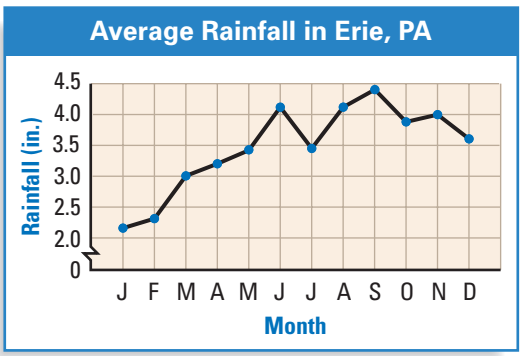
Concept Check ✓

1. Explain what *data* are and give an example.
2. What kind of graph is useful for showing changes over time?
3. **OLYMPIC EVENTS** For a report about the Olympic Games, you want to include the winning times for women running the 100-meter, 200-meter, 400-meter, 800-meter, 1500-meter, and 3000-meter races in 1992, 1996, and 2000. Make a table that you could use to organize the data.

Skill Check ✓

WEATHER **Based on the graph, decide whether each statement is *true* or *false*.**

4. Rainfall increased each month.
5. The amount of rainfall was about the same in May and July.
6. The greatest amount of rainfall occurred in June.
7. The amount of rainfall was the same in January and July.



▶ Source: National Oceanic and Atmospheric Administration

PRACTICE AND APPLICATIONS

STUDENT HELP

▶ **Extra Practice** to help you master skills is on p. 797.

SALARIES **In Exercises 8–10, use the table. It shows average salaries for females of different ages with different numbers of years of education. Based on the table, decide whether each statement is *true* or *false*.**

Age (years)	9–11 years of school	High school graduate	Associate degree	Bachelor's degree
18–24	$2948	$7758	$11,804	$15,245
25–34	$9838	$15,017	$20,835	$25,800
35–44	$11,044	$15,720	$21,807	$26,831
45–54	$11,415	$16,603	$21,944	$27,716

▶ Source: U.S. Bureau of the Census

8. As the years of education increase, the average salary increases.
9. As the years of education increase, the average salary decreases.
10. As the age increases, the average salary increases.
11. **WATER NEEDS** The table shows the number of gallons of water needed to produce one pound of some foods. Make a bar graph of the data.

STUDENT HELP

▶ **HOMEWORK HELP**

Example 1: Exs. 8–10
Example 2: Exs. 11–14
Example 3: Exs. 15–19

Food (1 lb)	lettuce	tomatoes	melons	broccoli	corn
Water (gallons)	21	29	40	42	119

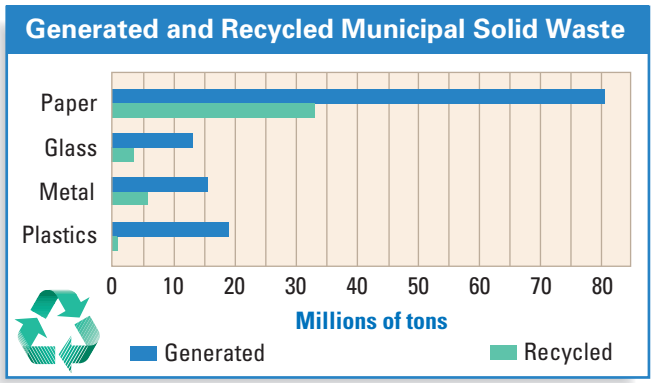
▶ Source: Water Education Foundation

MUNICIPAL WASTE **In Exercises 12–14, use the double bar graph, which shows the amount of different kinds of waste generated and recycled by city and town dwellers in the United States in 1995.**

12. Which was the most common waste generated by city dwellers? How many millions of tons of this waste were generated?

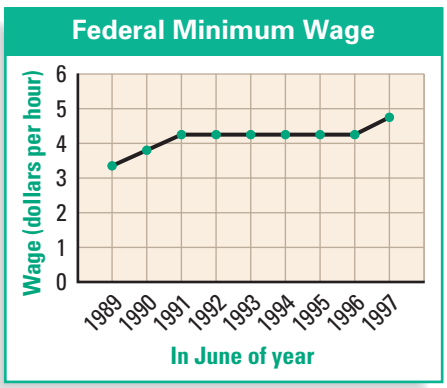
13. Which kind of waste had the greatest amount recycled? How many millions of tons of this waste were recycled?

14. Which kind of waste had the least amount recycled? How many millions of tons of this waste were recycled?



Source: Franklin Associates

MINIMUM WAGE **In Exercises 15–17, use the line graph, which shows the minimum wage for different years.**



Source: U.S. Bureau of Labor Statistics

15. For how many years did the minimum wage remain the same?

16. What was the minimum wage during the time when it remained the same?

17. In which year did the minimum wage increase to over $4?

18. **TELEVISION STATIONS** The table shows the number of commercial television stations for different years. Make a line graph of the data. Discuss what the line graph shows.

Year	1991	1992	1993	1994	1995	1996
Number of stations	1098	1118	1137	1145	1161	1174

Source: *Television Digest*

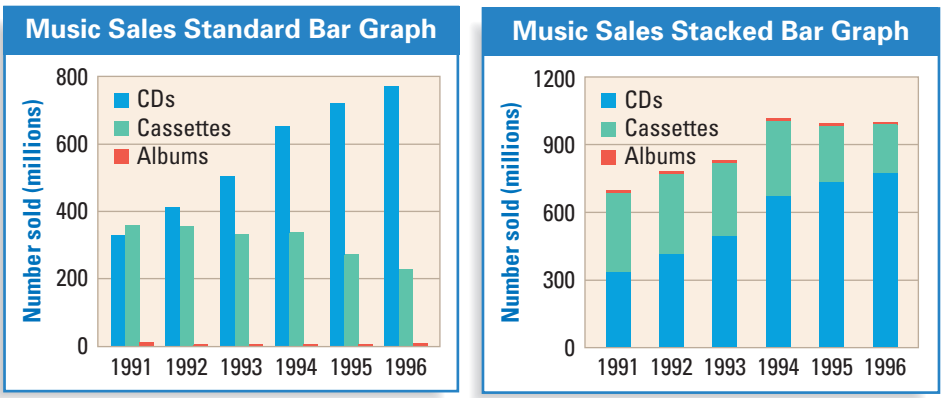
19. **FUEL EFFICIENCY** The table shows the average fuel efficiency for passenger cars for different years. Make a line graph of the data.

Year	1980	1985	1990	1995	1996
Fuel efficiency (miles per gallon)	24.3	27.6	28.0	28.6	28.7

Source: National Highway Traffic Safety Administration

Test Preparation

20. MULTI-STEP PROBLEM Use the graphs below.



▶ Source: Recording Industry Association of America

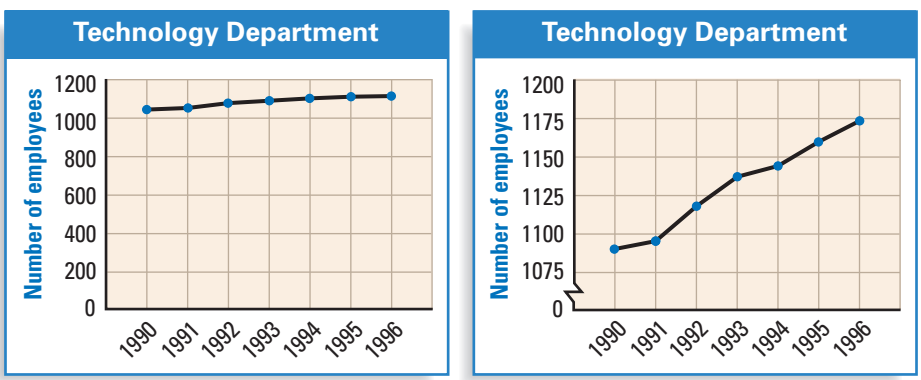
a. From 1991 to 1996 which type of recording showed an increase in the number sold? Which showed a decrease? Which remained about the same?

b. In which two years did the total number of all types of recordings sold remain about the same?

c. CHOOSING A DATA DISPLAY Compare the usefulness of the two graphs.

★ Challenge

21. *Writing* The graphs show the same data. Write a statement supported by one graph but *not* the other. Could either graph be misleading? Why?



EXTRA CHALLENGE
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MIXED REVIEW

SOLUTIONS Is the number given a solution of the equation? (Review 1.4 for 1.7)

22. $5x + 2 = 17$; 3

23. $12 - 2y = 6$; 4

24. $3x - 4 = 12 - 5x$; 2

25. $2y + 8 = 4y - 2$; 5

TRANSLATING Translate the verbal sentence into an equation. (Review 1.5)

26. 3 more than a number is 5.

27. Twelve is the quotient of a number and 3.

28. STAMP COLLECTION In your collection of 53 stamps, 37 cost less than \$.25. Let y be the number of stamps that cost \$.25 or more. Which equation models the situation? (Review 1.5)

A. $53 - y = 37$ **B.** $53 + y = 37$ **C.** $53 + 37 = y$