LESSON 14

Appropriate Data Displays

GOAL Use appropriate data displays; recognize misleading data displays.

Different data displays emphasize different aspects of data. Using an appropriate display can help you draw meaningful conclusions about the data.

Using Appropriate Data Displays

Type of Display	How Data are Shown
Circle graph	Shows data as parts of a whole.
Bar graph	Compares data in distinct categories.
Histogram	Compares data in equal intervals.
Line graph	Shows how data change over time.
Stem-and-leaf plot	Shows data in numerical order.
Box-and-whisker plot	Shows the distribution of data in quartiles.

EXAMPLE 1 Displaying the Distribution of Data

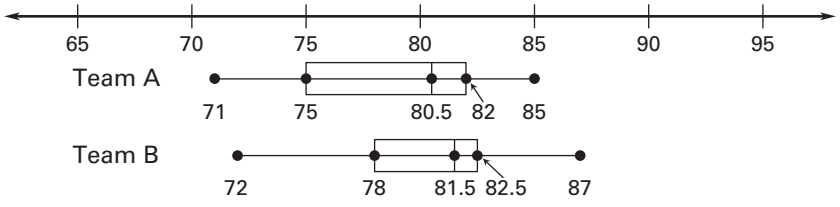
The heights (in inches) of players on two basketball teams are given below. Make a data display that shows how the data are distributed. Which team has taller players? Explain your reasoning.

Team A: 81, 72, 76, 83, 81, 74, 79, 80, 85, 82, 82, 71

Team B: 72, 83, 82, 87, 81, 82, 78, 80, 84, 78, 73, 82

SOLUTION

Use a double box-and-whisker plot to show how the data are distributed over the full range of heights.



Team B has taller players. The double box-and-whisker plot shows that the median, the quartiles, and the extremes for team B are greater than those for team A.

CHECK Example 1

1. For each team in Example 1, make a display that shows the heights in intervals of 5 inches. In each display, which interval contains the heights of the most players?

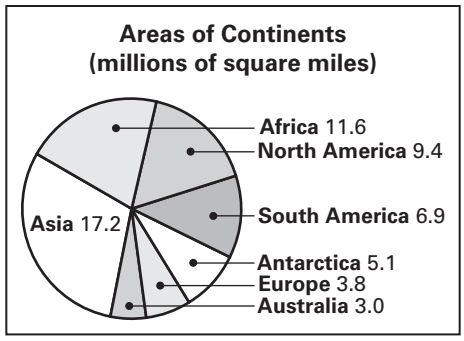
EXAMPLE 2 Displaying Data as Parts of a Whole

The table shows the approximate area (in millions of square miles) of each of the seven continents. Make a data display that compares the area of each continent to the total area of the continents.

Continent	Africa	Antarctica	Asia	Australia	Europe	North America	South America
Area	11.6	5.1	17.2	3.0	3.8	9.4	6.9

SOLUTION

Use a circle graph to compare the area of each continent to the total area of the continents. The total area of the continents is 57,000,000 square miles.



CHECK Example 2

2. Use the data in Example 2 to make a display that compares the area of North America to the area of Asia.

EXAMPLE 3 Displaying a Change in Data Over Time

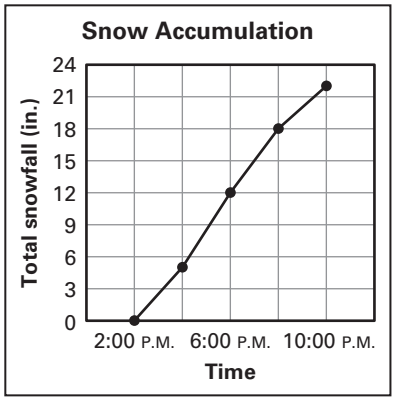
The table shows the amount of snowfall during a blizzard. Make a data display that shows the total accumulation of snow over time.

Time	2:01 P.M.–4:00 P.M.	4:01 P.M.–6:00 P.M.	6:01 P.M.–8:00 P.M.	8:01 P.M.–10:00 P.M.
Snowfall (in.)	5	7	6	4

SOLUTION

A line graph shows how data change over time. In this case, you want to show the accumulation of snow. Find the total accumulation every 2 hours.

Time	Total snowfall (in.)
2:00 P.M.	0
4:00 P.M.	5
6:00 P.M.	12
8:00 P.M.	18
10:00 P.M.	22



CHECK Example 3

3. The table shows the amount of lunch money spent by a person over 1 week. Make a data display that shows the total amount of money spent over time.

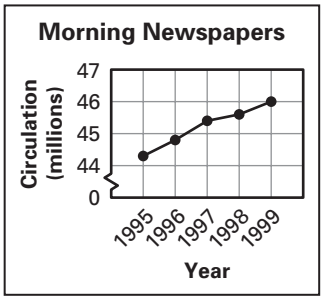
Day	Monday	Tuesday	Wednesday	Thursday	Friday
Amount	$2.50	$1.50	$2.00	$1.50	$5.00

Misleading Data Displays The way that data are displayed can sometimes give a misleading impression. Some characteristics of misleading data displays are broken scales, collapsed data categories, and inappropriate scales.

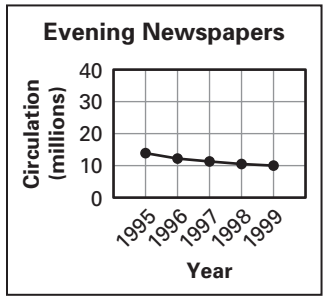
EXAMPLE 4 Recognizing a Misleading Data Display

The line graphs display the morning and evening circulations of daily newspapers from 1995 to 1999. In what way could each graph be misleading?

a.



b.



SOLUTION

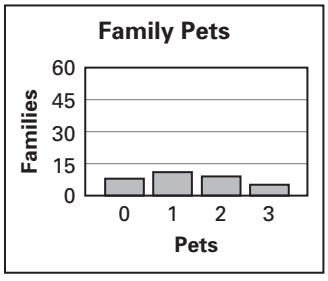
a. The break in the vertical axis gives the line segments steep positive slopes, which suggests dramatic increases in circulation from year to year. This is misleading, because the circulation increased only by about 4% over the 5 years.

b. The intervals of the scale of the vertical axis are larger than necessary. The line segments in the graph have slight negative slopes, which suggests minor decreases in circulation from year to year. This is misleading, because circulation actually decreased by about 28% over the 5 years.

CHECK Example 4

Explain how the data display could be misleading.

4.



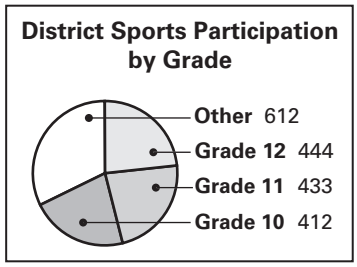
5.

EXAMPLE 5 Recognizing a Misleading Data Display

Explain how the graph in the following newspaper article could be misleading.

Sports Are a Hit in Area Schools

A recent survey of local students in grades 8 through 12 shows a high level of sports participation. According to the survey, 440 students in the 8th grade and 172 students in the 9th grade participate in the district's sports program. Complete results are shown in the graph.

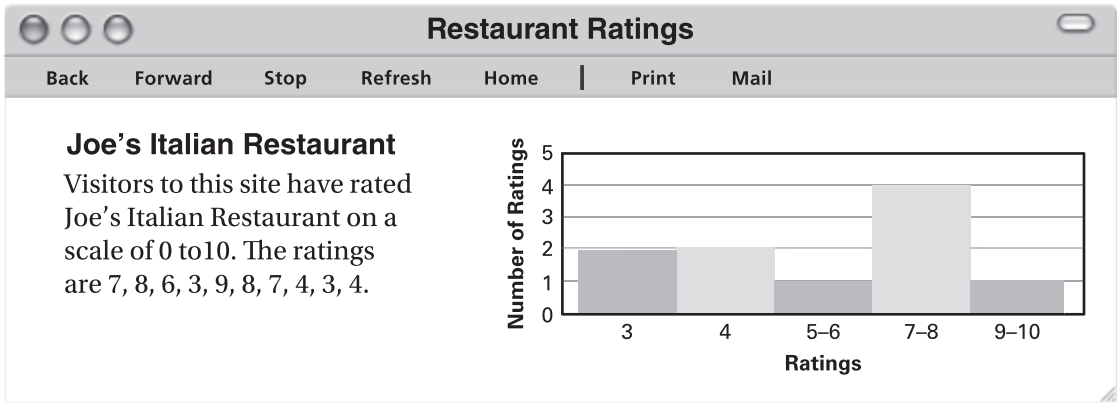


SOLUTION

The circle graph is misleading because it contains collapsed data categories. The "other" category hides the fact that grade 9 has the lowest student participation and grade 8 has the second highest student participation.

CHECK Example 5

6. Explain how the display on the following website could be misleading. Redraw the display so that it is not misleading.



EXERCISES

In Exercises 1–4, tell what type of data display is appropriate for the situation.

1. You want to display the change in value of a share of a stock each week over 28 weeks.

2. You want to display the results of a survey that asked 1000 people to name their favorite car color.

3. You want to display the distribution of the resting heart rates of the students in your class in quartiles.

4. You survey 100 people and ask "Are you going to the football game?" You want to display the number of people who answered *yes*, *no*, and *maybe* as compared to the total number of people surveyed.

5. The table shows the height of a child every two years from age 2 years to age 18 years. Make a data display that shows the change in the child's height over time.

Age (**years**)	2	4	6	8	10	12	14	16	18
Height (**in.**)	34	40	45	50	54	58	64	68	69

6. The weights (in pounds) of fish caught during the first day of a bass fishing tournament are given below. Make a data display that shows the numbers of fish caught in intervals of 0.5 pound.

1.2, 3.8, 4.7, 0.9, 1.8, 4.1, 2.3, 4.4, 1.3, 2.2, 1.4, 3.1, 4.6, 3.0, 0.8

7. The numbers of years of experience of the toolmakers and the machinists working in a shop are given below. Make a data display that compares the distribution of each data set over the full range of years of experience.

Toolmakers: 11, 18, 21, 6, 23, 31, 8, 16, 19

Machinists: 18, 22, 25, 31, 23, 14, 12, 15, 34, 39

8. The results of a survey asking the question "By which method do you prefer to receive marketing offers?" are given below. Create a display that compares the number of responses for each method to the total number of responses.

Method	telephone	mail	television	personal visit	radio
Responses	12	34	26	11	17

9. As a census volunteer, you must find the number of people in each household within a given area. Would it be helpful to organize the data with a stem-and-leaf plot? Explain your reasoning.

10. A meteorologist uses a weather balloon to record the air temperature in 100-foot increments starting from the ground. Is a line graph an appropriate display to show the change in temperature as the altitude increases? Explain your reasoning.

11. The table below gives the height of a baseball over time after the baseball is hit. Make a data display that shows the change in the height of the baseball over time.

Time (**sec**)	0	0.5	1	1.5	2	2.5	3
Height (**ft**)	3	22.5	34	37.5	33	20.5	0

12. The ID numbers marked on 20 pairs of rental skis are given below. Make a data display that organizes the ID numbers in numerical order.

60, 80, 57, 62, 84, 59, 55, 66, 78, 74, 54, 65, 77, 75, 51, 71, 61, 67, 73, 86

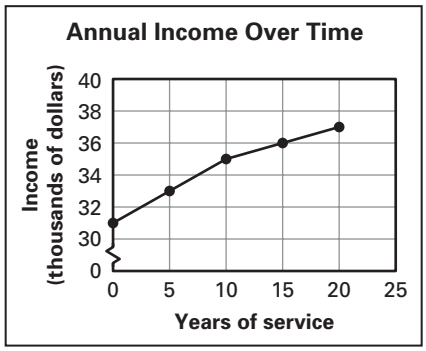
13. The number of items sold by a frozen food vendor on each of 15 days is given below. Make two different data displays to represent the data. Tell what each display emphasizes about the data.

59, 98, 77, 58, 52, 85, 72, 66, 83, 55, 91, 88, 54, 63, 70

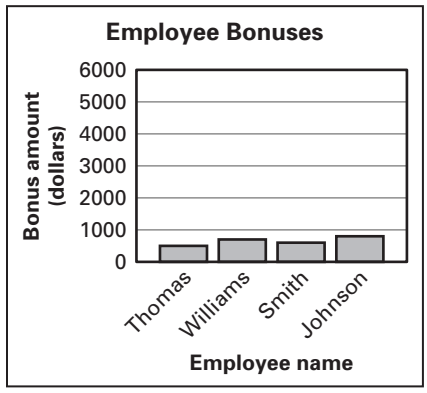
14. Prepare a survey for classmates on the topic of your choice. Survey at least 20 students and enter the data in a spreadsheet. Use the spreadsheet to make as many appropriate data displays as possible.

In Exercises 15 and 16, explain how the data display could be misleading. Then explain how you could redraw the display so that it is not misleading.

15.



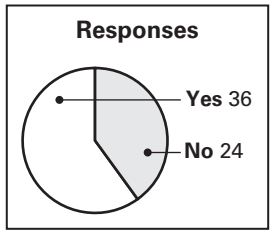
16.



17. Explain how the circle graph in the magazine article could be misleading. Then redraw the circle graph so that it is not misleading.

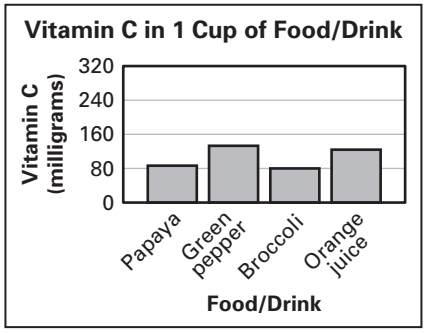
Get Ready to Get Healthy!

Health Expo, the popular fitness fair, is coming up at the end of the month! A survey of 70 fitness instuctors found that 36 plan to attend the fair, 24 do not plan to attend, and 10 are undecided.

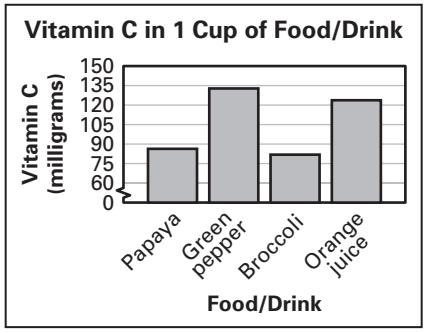


18. Which bar graph gives a misleading impression of the data? Explain.

A.



B.



19. The bar graphs below show the results of a baseball team's season. Compare the data in the graphs. Explain how the graphs might lead you to make an incorrect conclusion.