Unit 4
Statistics and Probability

Focal Point
Use statistical measures and probability to describe data.

CHAPTER 9
Statistics: Analyzing Data

BIG Idea Understand that the way a set of data is displayed influences its interpretation.

BIG Idea Use measures of central tendency and range to describe a set of data.

CHAPTER 10
Probability

BIG Idea Recognize that a physical or mathematical model can be used to describe the experimental and theoretical probability of real-life events.

Cross-Curricular Project

Math and Recreation

Step Right Up and Win A Prize What are my chances of winning? You may ask yourself that any time you play a game. You're about to embark on a gaming adventure. You'll investigate the mathematical probabilities of winning various carnival games. You'll also research and design a game of your own. So, come on and take a chance! Sharpen up that hand-eye coordination and grab your probability tool kit. This adventure is a win-win situation!

MathOnline **Log on to tx.msmath2.com to begin.**

CHAPTER 9

Statistics: Analyzing Data

Knowledge and Skills

- Understand that the way a set of data is displayed influences its interpretation. **TEKS 7.11**
- Use measures of central tendency and range to describe a set of data. **TEKS 7.12**

Key Vocabulary

histogram (p. 462)

measures of central tendency (p. 448)

range (p. 443)

scatter plot (p. 477)

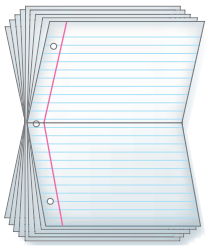
Real-World Link

Amusement Parks Six Flags Over Texas in Arlington, Texas, is home to some of the fastest roller coasters. You can use a bar graph to display and then compare the speeds of these coasters.

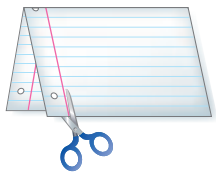
FOLDABLES Study Organizer

Statistics: Analyzing Data Make this Foldable to help you organize your notes. Begin with nine sheets of notebook paper.

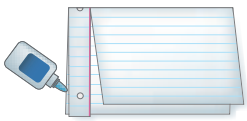
1. **Fold** 9 sheets of paper in half along the width.



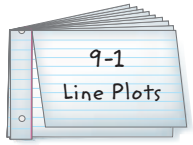
2. **Cut** a 1″ tab along the left edge through one thickness.



3. **Glue** the 1″ tab down. Write the lesson number and title on the front tab.



4. **Repeat** Steps 2 and 3 for the remaining sheets. Staple them together on the glued tabs to form a booklet.



Jason Knutson/coasterphotos.com

GET READY for Chapter 9

Diagnose Readiness You have two options for checking Prerequisite Skills.

Option 1

Take the Quick Quiz below. Refer to the Quick Review for help.

QUICK Quiz

Order from least to greatest.

(Used in Lessons 9-2 and 9-3)

1. 96.2, 96.02, 95.89
2. 5.61, 5.062, 5.16
3. 22.02, 22, 22.012
4. **JEANS** A store sells bootcut jeans for $49.97, classic for $49.79, and flared for $47.99. Write these prices in order from least to greatest.

Order from greatest to least.

(Used in Lessons 9-2 and 9-3)

5. 74.65, 74.67, 74.7
6. 1.26, 1.026, 10.26
7. 3.304, 3.04, 3.340

Evaluate each expression.

(Used in Lesson 9-2)

8. $\frac{23 + 44 + 37 + 45}{4}$
9. $\frac{1.7 + 2.6 + 2.4 + 3.1 + 1.8}{5}$
10. **PIZZA** Four friends ordered a large pizza for $14.95, a salad for $3.75, and two bottles of soda for $2.25 each. If they split the cost evenly, how much does each person owe?

QUICK Review

Example 1

Order 47.7, 47.07, and 40.07 from least to greatest.

47.7
47.07
40.07

Line up the decimal points and compare place value.

The numbers in order from least to greatest are 40.07, 47.07, and 47.7.

Example 2

Order 2.08, 20.8, 0.28 from greatest to least.

2.08
20.8
0.28

Line up the decimal points and compare place value.

The numbers in order from greatest to least are 20.8, 2.08, and 0.28.

Example 3

Evaluate $\frac{3.4 + 4.5 + 3.8}{3}$.

$\frac{3.4 + 4.5 + 3.8}{3} = \frac{11.7}{3}$ Add 3.4, 4.5, and 3.8.

$= 3.9$ Divide 11.7 by 3.

Option 2

MathOnline Take the Online Readiness Quiz at tx.msmath2.com.

9-1 Line Plots

Main IDEA

Display and analyze data using a line plot.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including line plot,** line graph, bar graph, stem and leaf plot, circle graph, and Venn diagrams, **and justify the selection.** *Also addresses TEKS 7.11(B), 7.12(A).*

NEW Vocabulary

statistics
data
line plot
cluster
outlier
range
analyze

READING in the Content Area

For strategies in reading this lesson, visit tx.msmath2.com.

GET READY for the Lesson

BUILDINGS The table shows the number of stories in Fort Worth's tallest buildings.

1. Do any of the values seem much greater or much less than the other data values?
2. Do some of the buildings have the same number of stories? Is this easy to see? Explain.

Fort Worth's Tallest Buildings Number of Stories				
40	38	40	37	33
23	19	20	19	16
30	20	24	21	17
20	19	14	10	13

Source: fortwortharchitecture.com

Statistics deals with collecting, organizing, and interpreting data. **Data** are pieces of information, which are often numerical. One way to show how data are spread out is to use a line plot. A **line plot** is a diagram that shows the frequency of the data on a number line.

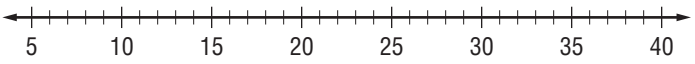
EXAMPLE 1 Display Data Using a Line Plot

BUILDINGS Make a line plot of the data shown above.

Personal Tutor for MAC

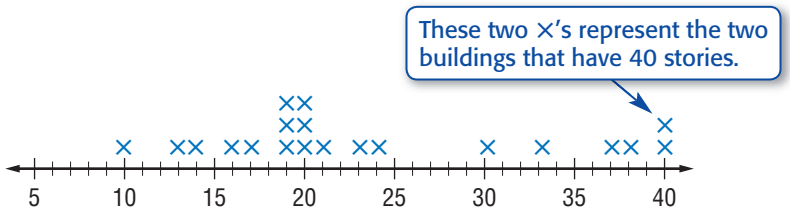
Personal Tutor

Step 1 Draw a number line. The shortest building in the table has 10 stories, and the tallest has 40. You can use a scale of 5 to 40 and an interval of 5. Other scales and intervals could also be used.



Step 2 Put an × above the number that represents the number of stories in each building. Include a title.

Fort Worth's Tallest Buildings
Number of Stories



CHECK Your Progress

a. **BUILDINGS** The number of stories in the 15 tallest buildings in the world are listed at the right. Display the data in a line plot.

World's Tallest Buildings Number of Stories				
101	88	88	110	88
88	80	69	102	78
72	54	73	85	80

Source: *The World Almanac*

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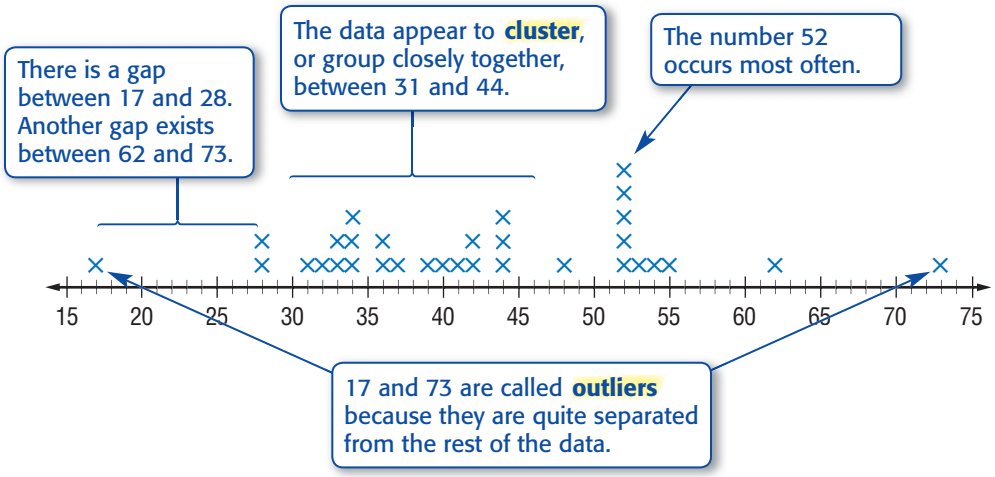
Concepts in Motion
Interactive Lab tx.msmath2.com

You can make some observations about the *distribution* of data, or how data are grouped together or spread out. Consider the line plot below.

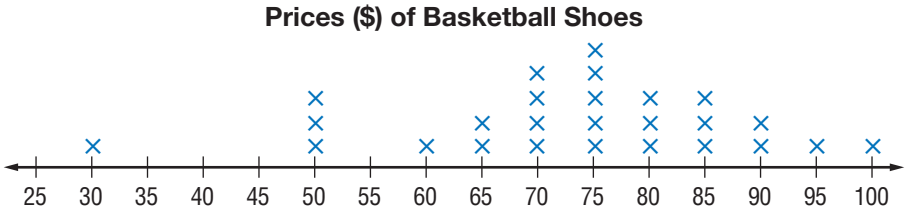


In a line plot, you can easily find the **range**, or spread, of the data, which is the difference between the greatest and least numbers. When you **analyze** data, you use these observations to describe, summarize, and compare data.

Vocabulary Link
Range
Everyday Meaning in music, all the notes between the high and low notes, as in a singer with a wide range.
Math Use the difference between the greatest number and least number in a set of data.

EXAMPLES Use a Plot to Analyze Data

2 **SHOES** **The line plot below shows the prices for different basketball shoes. Identify any clusters, gaps, and outliers and find the range.**



Many of the data cluster between $70 and $85.

There is a gap between $30 and $50.

Since $30 is apart from the rest of the data, it could be an outlier.

The greatest price is $100 and the least price is $30. So the range of the prices is $100 − $30 or $70.

STUDY TIP
Clusters
You can describe a cluster by stating a range of values or by giving a single value around which the data appear to be grouped.

3 **Write a few sentences that summarize the data based on your findings in Example 2.**

Most of the shoes cost from $70 to $85 and no shoes cost between $30 and $50. A price of $30 is low and not representative of the data set.

CHECK Your Progress **Refer to Example 1.**

b. Identify any clusters, gaps, and outliers and find the range.

c. Write a few sentences that summarize the data based on your findings.

CHECK Your Understanding

Example 1 (p. 442)

Display each set of data in a line plot.

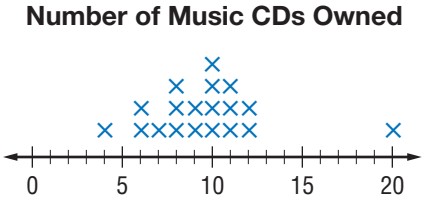
1.

Costs of Video Games ($)			
20	29	40	50
45	20	50	50
20	25	50	40

2.

Sizes of Tennis Shoes					
8	10	9	8	7	6
9	10	9	6	5	7
7	8	11	6	8	7

MUSIC For Exercises 3 and 4, analyze the line plot below.



Example 2 (p. 443)

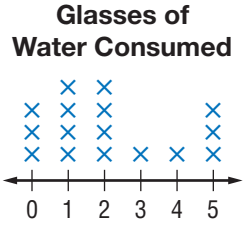
3. Identify any clusters, gaps, and outliers and find the range of the data.

Example 3 (p. 443)

4. Write a few sentences that summarize the data based on your findings.

SURVEYS For Exercises 5–8, analyze the line plot at the right and use the information below.

Jamie asked her classmates how many glasses of water they drink on a typical day. The results are shown.



Example 2 (p. 443)

5. What was the most frequent response?
6. What was the least frequent response?
7. What is the range?

Example 3 (p. 443)

8. Summarize the data in a sentence or two.

Exercises

HOMEWORK HELP

For Exercises	See Examples
9–12	1
13–20	2–3

Display each set of data in a line plot.

9.

Heights of Desert Cacti (ft)				
30	10	1	15	10
10	10	10	2	10
20	3	2	15	5

10.

Test Scores (%)					
98	90	97	85	86	92
92	93	95	79	91	92
91	94	88	90	93	92

11.

Basketball Scores (pts)				
101	105	99	130	120
100	108	126	135	98
120	122	115	129	97

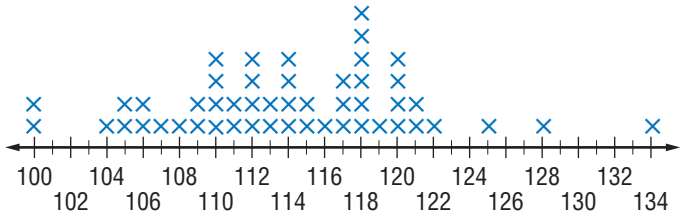
12.

Ages of Students (y)					
12	13	13	13	12	14
13	12	13	13	12	12
13	14	12	13	12	12

Real-World Link
Monahans, Texas, holds the highest temperature ever recorded in Texas, 120°F.
Source: *The World Almanac*

WEATHER **For Exercises 13–16, analyze the line plot that shows the record high temperatures recorded by weather stations in each of the fifty states.**

Record High Temperatures (°F)

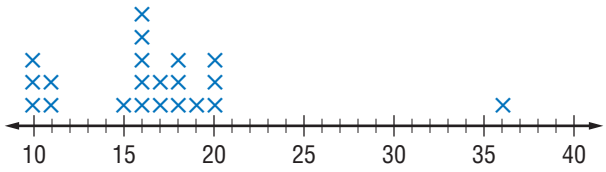


Source: *The World Almanac*

13. What is the range of the data?
14. What temperature occurred most often?
15. Identify any clusters, gaps, or outliers. Summarize the data by using these values.
16. Describe how the range of the data would change if 134°F were not part of the data set.

MOVIES **For Exercises 17–20, analyze the line plot below that shows the number of digital video discs various students have in their DVD collection.**

Digital Video Disc (DVD) Collection



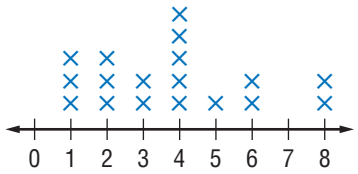
17. Find the range of the data.
18. What number of DVDs occurred most often?
19. How many students have more than 15 DVDs in their collection?
20. Are there any clusters, gaps, or outliers? If so, identify them and then summarize the data using these values.

Determine whether each statement is *sometimes*, *always*, or *never* true. Explain your reasoning.

21. You can determine the number of items in a data set from a line plot.
22. If there is a cluster, it will appear in the center of the line plot.

BOOKS **For Exercises 23–25, analyze the line plot at the right.**

Number of Books Read



23. How many students read 4 or more books?
24. How many more students read 1–2 books than 5–6 books?
25. About what percent of the students read less than 5 books?

ANIMALS For Exercises 26–28, refer to the table.

Average Life Spans					
Animal	Span (yr)	Animal	Span (yr)	Animal	Span (yr)
black bear	18	giraffe	10	lion	15
camel	12	gorilla	20	pig	10
cat	12	grizzly bear	25	polar bear	20
chipmunk	6	horse	20	rhesus monkey	15
dog	12	kangaroo	7	squirrel	10
elephant	40	leopard	12	white rhinoceros	20

Source: *The World Almanac for Kids*

26. Display the data in a line plot.

27. Find the range and determine any clusters or outliers.

28. Use the line plot to summarize the data in a sentence or two.

29. The *maximum* life spans, in order, of the animals in the table above are 36, 50, 28, 10, 20, 77, 36, 54, 50, 50, 24, 23, 30, 27, 45, 37, 24, and 50 respectively. Display this data in a line plot. Compare this line plot to the line plot you made in Exercise 26. Include a discussion about clusters, outliers, range, and gaps in data.

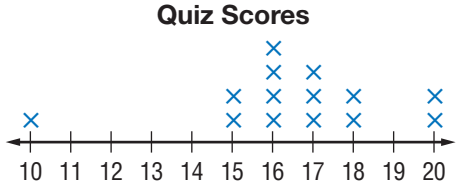
EXTRA PRACTICE
See pages 738, 763.
Math Online
Self-Check Quiz at tx.msmath2.com

30. **COLLECT THE DATA** Conduct a survey of your classmates to determine how many hours of television they watch on a typical school night. Then display and analyze the data in a line plot. Use your analysis of the data to write a convincing argument about television viewing on a school night.

H.O.T. Problems

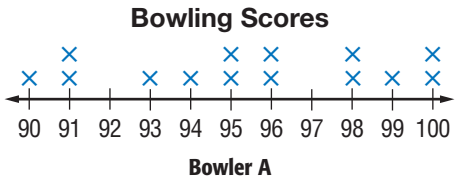
31. **OPEN ENDED** Create a set of data that are clustered between 20 and 30 with a range of 15.

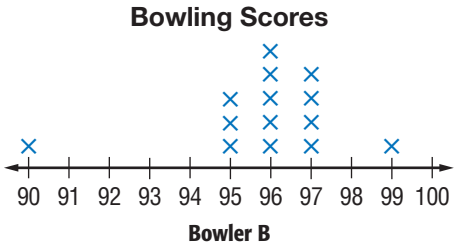
32. **FIND THE ERROR** Ryan and Darnell are analyzing the data shown in the line plot at the right. Who is correct? Explain.



33. **CHALLENGE** Compare and contrast line plots and frequency tables. Include a discussion about what they show and when it is better to use each one.

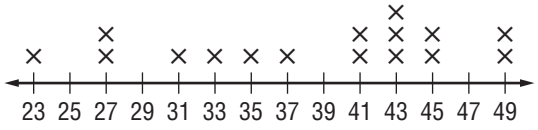
34. **WRITING IN MATH** The last 14 bowling scores of two people are shown. Describe which person is more consistent and explain how you know.





TEST PRACTICE

35. The graph shows the weight of the emperor penguins at a zoo.



Which statement is NOT supported by the data?

A More than half of these penguins weigh at least 41 kilograms.

B There are 16 emperor penguins at the zoo.

C Of these penguins, 30% weigh between 30 and 38 kilograms.

D The range of the emperor penguins' weight is 49 − 23 or 26 kilograms.

36. The table shows the math scores for 24 students in Mr. Baker's class.

Math Test Scores					
90	86	96	89	85	91
100	65	73	85	85	93
71	70	75	80	82	99
93	82	77	84	89	75

What is the range of the test scores?

F 35

G 80

H 85

J 100

Spiral Review

Find the interest earned to the nearest cent for each principal, interest rate, and time. (Lesson 8-9)

37. $300, 10%, 2 years

38. $900, 5.5%, 4.5 years

39. **BASEBALL CARDS** What is the total cost of a package of baseball cards if the regular price is $4.19 and the sales tax is 6.5%? (Lesson 8-8)

40. Solve $m + 18 = 33$ mentally. (Lesson 1-7)

GET READY for the Next Lesson

PREREQUISITE SKILL **Add or divide. Round to the nearest tenth if necessary.**

41. $16 + 14 + 17$

42. $4.6 + 2.5 + 9$

43. $\frac{202}{16}$

44. $\frac{255}{7}$

9-2 Measures of Central Tendency and Range

Main IDEA

Describe a set of data using mean, median, mode, and range.

Targeted TEKS 7.12 The student uses measures of central tendency and range to describe a set of data. **(B) choose among mean, median, mode, or range to describe a set of data and justify the choice for a particular situation.** *Also addresses TEKS 7.12(A).*

NEW Vocabulary

measures of central tendency
mean
median
mode

MINI Lab

The table shows scores for five quizzes.

Quiz	Score
1	8
2	7
3	9
4	6
5	10

- Place pennies in each cup to represent each score.

- Move the pennies among the cups so that each cup has the same number of pennies.

1. What was the average score for the five quizzes?
2. If the quiz score of 14 points is added to the data, how many pennies would be in each cup?

A number used to describe the *center* of a set of data is a **measure of central tendency**. The most common of these measures is the mean.

KEY CONCEPT Mean

Words The **mean** of a set of data is the sum of the data divided by the number of items in the data set. The mean is also referred to as *average*.

Examples data set: 1 cm, 1 cm, 5 cm, 2 cm, 2 cm, 4 cm, 2 cm, 5 cm

mean: $\frac{1 + 1 + 5 + 2 + 2 + 4 + 2 + 5}{8}$ or 2.75 cm

EXAMPLE 1 Find the Mean

NUTRITION The table shows the grams of sugar in 20 different breakfast bars.

Grams of Sugar in Breakfast Bars				
14	11	7	14	15
22	18	18	21	10
10	10	11	9	11
11	9	12	8	12

Source: www.cspinnet.org

Find the mean.

$$\text{mean} = \frac{14 + 11 + \ldots + 12}{20} \leftarrow \text{sum of data} \leftarrow \text{number of data items}$$

$$= \frac{253}{20} \text{ or } 12.65 \text{ grams}$$

CHECK Your Progress

a. **MONEY** Adam earned \$14, \$10, \$12, \$15, and \$13 by doing chores around the house. What is the mean amount Adam earned doing these chores?

Two other common measures of central tendency are median and mode.

Vocabulary Link
Median
Everyday Use the middle paved or planted section of a highway, as in median strip.
Math Use the middle number of the ordered data.

KEY CONCEPT — Median

Words The **median** of a set of data is the middle number of the ordered data, or the mean of the middle two numbers.

Example data set: 7 yd, 11 yd, 15 yd, 17 yd, 20 yd, 20 yd

median: $\frac{15 + 17}{2}$ or 16 yd — The median divides the data in half.

Mode

Words The **mode** or modes of a set of data is the number or numbers that occur most often.

Example data set: 50 mi, (45 mi, 45 mi), 52 mi, 49 mi, (56 mi, 56 mi)

modes: 45 mi and 56 mi

EXAMPLE 2 Find the Mean, Median, and Mode

MOVIE RENTALS **The number of DVDs rented during one week at Star Struck Movie Rental is shown in the table. What are the mean, median, and mode of the data?**

Star Struck Movie Rental Daily DVD Rentals						
S	M	T	W	TH	F	S
55	34	35	34	57	78	106

mean: $\frac{55 + 34 + 35 + 34 + 57 + 78 + 106}{7} = \frac{399}{7}$ or 57

median: 34, 34, 35, (55), 57, 78, 106 — median

mode: 34 — It is the only value that occurs more than once.

The mean is 57 DVDs, the median is 55 DVDs, and the mode is 34 DVDs.

CHECK Your Progress

b. **BICYCLES** The sizes of the bicycles owned by the students in Ms. Garcia's class are listed in the table. What are the mean, median, and mode of the data?

Students' Bicycle Sizes (in.)			
20	24	20	26
24	24	24	26
24	29	26	24

c. **FOOTBALL** The total number of points scored in each game by Darby Middle School's football team for 9 games are 21, 35, 14, 17, 28, 14, 7, 21, and 14. Find the mean, median, and mode.

TEST EXAMPLE

3 Twenty-nine students were asked how many times they used the Internet while doing a science project. The responses are shown.

Internet Use	
Number of Times Used	**Number of Students**
10	11
11	5
12	4
13	8
14	1

Which measure of data represents the most common number of times the students used the Internet?

A Mean
B Median
C Mode
D Range

Test-Taking Tip

Reading the Question
Read the question carefully. It may not be necessary to do any calculations in order to answer the question.

Read the Test Item

You are asked to identify the measure that represents the *most common number* of times the students used the Internet.

Solve the Test Item

The most common number is the one that occurs most often, which is the definition of a mode. So, the answer is C.

CHECK Your Progress

d. In which data set are the mean, median, mode, and range all the same number?

F {2, 4, 6, 6, 4, 2, 4}
G {2, 4, 6, 2, 4, 6, 2}
H {2, 6, 6, 6, 4, 6, 2}
J {4, 4, 2, 4, 6, 4, 6}

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In addition to the mean, median, and mode, you can also use the range to describe a set of data. Below are some guidelines for using these measures.

CONCEPT Summary — Mean, Median, Mode, and Range

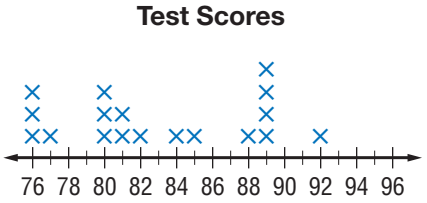
Measure	Most Useful When...
Mean	• data set has no outliers
Median	• data set has outliers • there are no big gaps in the middle of the data
Mode	• data set has many identical numbers
Range	• describing the spread of the data

EXAMPLE Choose Mean, Median, or Range

STUDY TIP

Median
When there is an odd number of data, the median is the middle number of the ordered set. When there is an even number of data, the median is the mean of the two middle numbers.

4 **TESTS** The line plot shows the test scores of the students in Mrs. Hiroshi's math class. Would the mean, median, mode, or range best represent the test scores?



mean: $\frac{76 + 76 + 76 + \ldots + 92}{18}$ or 83

median: $\frac{9\text{th term} + 10\text{th term}}{2} = \frac{81 + 82}{2}$ or 81.5

mode: 89

range: 92 – 76 or 16

The mode of 89 misrepresents the scores. Either the mean of 83 or the median of 81.5 best represents the scores.

CHECK Your Progress

e. **GAMES** The table shows the cost of various board games. Would the mean, median, mode, or range best represent the costs? Explain.

Board Game Costs ($)			
12	15	40	22
14	40	15	17
20	18	40	19
16	21	19	16

CHECK Your Understanding

Examples 1, 2 (pp. 448–449)

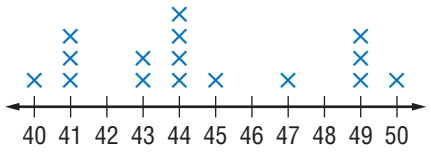
Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

1. Miles traveled on the weekend: 29, 14, 80, 59, 78, 30, 59, 69, 55, 50

2.

Team	Number of Wins
Eagles	10
Hawks	8
Zipps	9
Falcons	11

3.



Example 3 (p. 450)

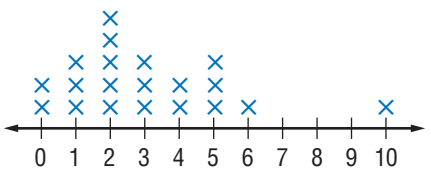
4. **TEST PRACTICE** During a week, the daily low temperatures were 52°F, 45°F, 50°F, 51°F, and 48°F. Which expression can be used to find the average daily low temperature during that week?

A $52 + 45 + (-50) + 51 + 48 \div 5$ **C** $52 + 45 + 50 + 51 + 48 \div 5$

B $(52 + 45 + 50 + 51 + 48) \div 5$ **D** $[52 + 45 + 50 + 51 + 48] \times 5$

Example 4 (p. 451)

5. **SCHOOL** The line plot shows the number of times per day that students drink from the water fountain at school. Which measure best describes the data: mean, median, mode, or range? Explain.



Exercises

HOMEWORK HELP

For Exercises	See Examples
6–11	1,2
30–32	3
12–13	4

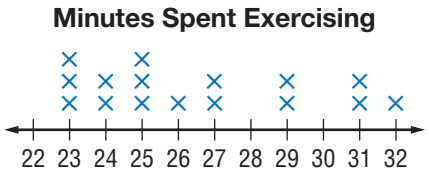
Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

6. Number of dogs groomed each week: 65, 56, 57, 75, 76, 66, 64
7. Daily number of boats in a harbor: 93, 84, 80, 91, 94, 90, 78, 93, 80
8. Scores earned on a math test: 95, 90, 92, 94, 91, 90, 98, 88, 89, 100
9. Prices of books: $10, $18, $11, $6, $6, $5, $10, $11, $46, $7, $6, $8

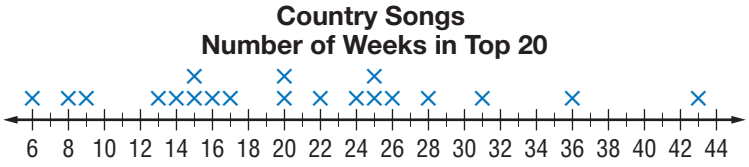
10.

Cost	Number of Coats
$75	8
$80	3
$85	6

11.



12. **MUSIC** The line plot shows the number of weeks that songs have been on the Top 20 Country Songs list. Would the mean, median, mode, or range best represent the data? Explain.



Real-World Link
The International Space Station measures 356 feet by 290 feet, and contains almost an acre of solar panels.
Source: *The World Almanac*

13. **SPACE** Twenty-seven countries have sent people into space. The table shows the number of individuals from each country. Which measure best describes the data: mean, median, mode, or range? Explain.

People in Space								
267	1	9	8	1	1	1	1	1
97	1	1	1	3	1	1	2	1
11	2	1	1	5	1	1	1	1

Source: *The World Almanac*

Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

14. Weight in ounces of various insects: 6.1, 5.2, 7.2, 7.2, 3.6, 9.0, 6.5, 7.4, 5.4
15. Miles traveled on a bicycle: 6.4, 6.5, 7.1, 6.4, 6.6, 6.4, 8.0, 6.6
16. Prices of magazines: $3.50, $3.75, $3.50, $4.00, $3.00, $3.50, $3.25
17. Daily low temperatures: −2°F, −8°F, −2°F, 0°F, −1°F, 1°F, −2°F, −1°F

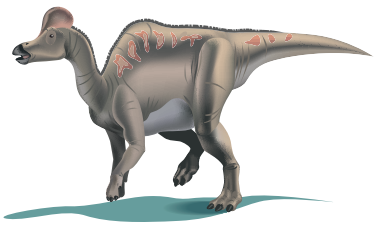
SURVEY **For Exercises 18 and 19, use the following information.**

Conduct a survey of your classmates to determine how many minutes it takes them to travel from their home to the school.

18. Which measure best describes the data: mean, median, mode, or range?
19. Which measure might students use to convince the school board that the tardy bell should ring at a later time? Explain your reasoning.

DINOSAURS **For Exercises 20–22, use the lengths of the dinosaurs shown below.**

Tyrannosaurus Rex
Length: 480 inches



Corythosaurus
Length: 396 inches

Parasaurolophus
Length: 480 inches

20. What is the mean length of the dinosaurs?

21. One of the largest dinosaurs ever is the Brachiosaurus. Its length was 960 inches. If this data value is added to the lengths of the dinosaurs above, how will it affect the mean? Explain your reasoning.

22. Which measure best describes the data if the length of the Brachiosaurus is included: mean, median, mode, or range? If the length of the Brachiosaurus is *not* included? Explain any similarities or differences.

EXTRA PRACTICE
See pages 739, 763.
MathOnline
Self-Check Quiz at
tx.msmath2.com

23. **SPORTS** The table shows the points scored by a lacrosse team so far this season. The team will play 14 games this season. How many points need to be scored during the last game so that the average number of points scored this season is 12? Explain.

Hawks Lacrosse Team Points Scored						
11	15	12	10	10	10	13
14	13	13	10	15	12	

24. **FIND THE DATA** Refer to the Texas Data File on pages 16–19. Choose some data and then describe it using the mean, median, mode and range.

H.O.T. Problems

25. **OPEN ENDED** Give an example of a set of data in which the mean is not the best representation of the data set. Explain why not.

26. **Which One Doesn't Belong?** Identify the term that does not have the same characteristic as the other three. Explain your reasoning.

mean	median	range	mode

27. **REASONING** Determine whether the median is *sometimes*, *always*, or *never* part of the data set. Explain your reasoning.

28. **CHALLENGE** Without calculating, would the mean, median, or mode be most affected by eliminating 1,000 from the data shown? Which would be the least affected? Explain your reasoning.

50, 100, 75, 60, 75, 1,000, 90, 100

29. **WRITING IN MATH** According to the U.S. Census Bureau, the typical number of family members per household in Texas is 3.28. State whether this measure is a mean or mode. Explain how you know.

TEST PRACTICE

30. The table below shows the number of soup labels collected in one week by each homeroom in grade 7.

Classroom	Number of Soup Labels
Mr. Martin	138
Ms. Davis	125
Mr. Cardona	89
Mrs. Turner	110
Mr. Wilhelm	130
Mrs. LaBash	?

Which number could be added to the set of data in order for the mode and median of the set to be equal?

A 89 **C** 125

B 110 **D** 130

31. The table shows the hourly wages for the employees at a pizza shop.

Hourly Wages				
$5.00	$6.25	$8.00	$5.25	$8.00
$6.50	$5.00	$6.75	$6.00	$5.00
$5.00	$6.00	$5.25	$6.25	$6.50
$5.25	$8.00	$6.00	$5.00	$6.25

Which measure of data is represented by $6.00?

F Mean **H** Range

G Mode **J** Median

32. GRIDDABLE An antique dealer purchased 5 antiques for a total of $850.00. He later bought another antique for $758.00. What was the mean cost of all the antiques?

Spiral Review

33. NUTRITION The table shows the grams of fiber in one serving of 15 different cereals. Make a line plot of the data. (Lesson 9-1)

Fiber in Cereal (g)				
5	5	4	3	3
3	1	1	1	2
1	1	1	1	0

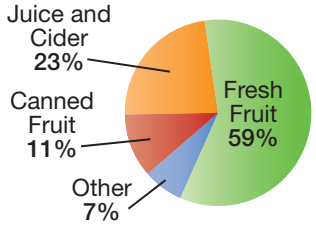
Find the interest earned to the nearest cent for each principal, interest rate, and time. (Lesson 8-9)

34. $1,250, 3.5%, 2 years

35. $569, 5.5%, 4 months

36. FOOD The United States produced almost 11 billion pounds of apples in a recent year. Use the information in the graph to find how many pounds of apples were used to make juice and cider. (Lesson 8-1)

Uses of Apples in the United States



Source: usapple.org

Name the property shown by each statement. (Lesson 1-8)

37. $4 \times 6 = 6 \times 4$

38. $2(3 + 9) = 2 \cdot 3 + 2 \cdot 9$

GET READY for the Next Lesson

PREREQUISITE SKILL **Name the place value of the underlined digit.** (p. 709)

39. $\underline{5}81$ **40.** 6,29$\underline{5}$ **41.** $\underline{4}$,369 **42.** 2.$\underline{8}4$

Extend 9-2

Graphing Calculator Lab
Mean and Median

Main IDEA

Use technology to calculate the mean and median of a set of data.

Targeted TEKS 7.12 The student uses measures of central tendency and range to describe a set of data. **(A) describe a set of data using mean, median, mode, and range.**

You can more efficiently calculate the mean and median of a large set data using a TI-83/84 Plus graphing calculator.

ACTIVITY

COMPUTERS **Kendrick surveys thirty seventh-graders and asks them how many times they had to wait longer than 5 minutes during the previous week to use a computer in the school library. The results are shown below.**

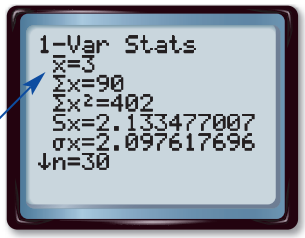
Number of Times a Student Had to Wait to Use the Library Computer									
5	2	9	1	1	2	1	2	5	2
3	4	2	1	4	0	4	2	2	5
4	2	2	3	2	1	3	9	5	2

Find the mean and median of the data.

STEP 1 Clear list L1 by pressing STAT ENTER ▲ CLEAR ENTER

STEP 2 Enter the number of times students had to wait in L1. Press 5 ENTER 2 ENTER . . . 2 ENTER.

STEP 3 Display a list of statistics for the data by pressing STAT ▶ ENTER 2nd 1 ENTER.



The first value, x, is the mean.

Use the down arrow key to locate **Med**. The mean number of times a student waited was 3 and the median number of times was 2.

STUDY TIP

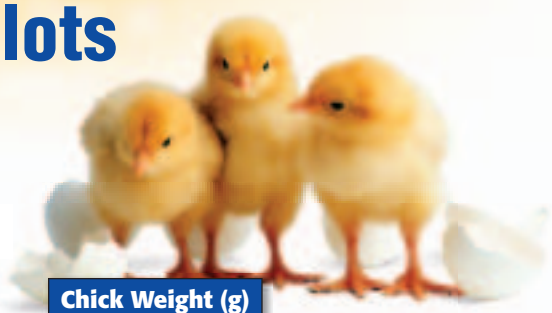
Median The median, 2 times, means that half of the students waited more than 2 times to use a computer and half waited fewer than 2 times.

Analyze the Results

1. **WRITING IN MATH** Kendrick claims that, on average, students had to wait more than 5 minutes about 3 times last week. Based on your own analysis of the data, write a convincing argument to dispute his claim. (*Hint*: Create and use a line plot of the data to support your argument.)

2. **COLLECT THE DATA** Collect some numerical data from your classmates. Then use a graphing calculator to calculate the mean and median of the data. After analyzing the data, write a convincing argument to support a claim you can make about your data.

9-3 Stem-and-Leaf Plots



Main IDEA

Display and analyze data in a stem-and-leaf plot.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plot, line graph, bar graph, **stem and leaf plot,** circle graph, and Venn diagrams, **and justify the selection.** *Also addresses TEKS 7.11(B).*

NEW Vocabulary

stem-and-leaf plot
leaf
stem
inferences

GET READY for the Lesson

BIRDS The table shows the average chick weight in grams of sixteen different species of birds.

1. Which chick weight is the lightest?
2. How many of the weights are less than 10 grams?

Chick Weight (g)			
19	6	7	10
11	13	18	25
21	12	5	12
20	21	11	12

Source: upatsix.com

In a **stem-and-leaf plot**, the data are organized from least to greatest. The digits of the least place value usually form the **leaves**, and the next place value digits form the **stems**.

EXAMPLE 1 Display Data in a Stem-and-Leaf Plot

BIRDS **Display the data in the table above in a stem-and-leaf plot.**

Step 1 Choose the stems using digits in the tens place, 0, 1, and 2. The least value, 5, has 0 in the tens place. The greatest value, 25, has 2 in the tens place.

Step 2 List the stems from least to greatest in the *Stem* column. Write the leaves, the ones digits to the right of the corresponding stems.

Stem	Leaf
0	6 7 5
1	9 0 1 3 8 2 2 1 2
2	5 1 0 1

Step 3 Order the leaves and write a *key* that explains how to read the stems and leaves. Include a title.

Chick Weight (g)

Stem	Leaf
0	5 6 7
1	0 1 1 2 2 2 3 8 9
2	0 1 1 5

The tens digits of the data form the stems.

Always write each leaf even if it repeats.

The ones digits of the data form the leaves.

$1|2 = 12$ g

Include a key.

CHECK Your Progress

a. **HOMEWORK** The number of minutes the students in Mr. Blackwell's class spent doing their homework one night is shown. Display the data in a stem-and-leaf plot.

Homework Time (min)				
42	5	75	30	45
47	0	24	45	51
56	23	39	30	49
58	55	75	45	35

Online **Personal Tutor at** tx.msmath2.com

Personal Tutor

Personal Tutor for MAC

Stem-and-leaf plots are useful in analyzing data because you can see all the data values, including the greatest, least, mode, and median value.

EXAMPLE Describe Data

2 **CHESS** **The stem-and-leaf plot shows the number of chess matches won by members of the Avery Middle School Chess Team. Find the range, median, and mode of the data.**

range: greatest wins − least wins = 61 − 8 or 53

median: middle value, or 35 wins

mode: most frequent value, 40

Chess Matches Won

Stem	Leaf
0	8 8 9
1	9
2	0 0 2 4 4 8 9
3	1 1 2 4 5 5 6 6 7 7 8
4	0 0 0 3 8 9
5	2 4
6	1

3|2 = 32 wins

CHECK Your Progress

b. **BIRDS** Find the range, median, and mode of the data in Example 1.

When you analyze a set of data, you can make **inferences**. That is, you can draw conclusions based on the data.

EXAMPLE Analyze Data to Make Inferences

3 **NUTRITION** **The average amount of pasta that people in different countries consume each year is shown in the stem-and-leaf plot. Based on the data, what inferences can be made about pasta consumption?**

Amount of Pasta Consumed (lb)

Stem	Leaf
0	3 4 5 8 8 9 9
1	0 1 4 5 5 5 5 5 9
2	0 0 8
3	
4	
5	9

2|8 = 28 lb

Based on the data, you can make the following inferences about pasta consumption.

- Most of the countries consume less than 20 pounds of pasta per year.
- Of the amounts, 15 pounds of pasta per year is consumed most often.
- One country consumes much more pasta than any of the other countries.

Real-World Career . . . .

How Does a Nutritionist Use Math?

Nutritionists use statistical graphs to summarize and compare the nutritional values of various foods.

MathOnline

For more information, go to tx.msmath2.com.

CHECK Your Progress

c. **BIRDS** Based on the data in Example 1, write two inferences that can be made about the average chick weight of the sixteen different species of birds.

Matt Meadows

CHECK Your Understanding

Example 1 (p. 456)

Display each set of data in a stem-and-leaf plot.

1.

Height of Trees (ft)				
15	25	8	12	20
10	16	15	8	18

2.

Cost of Shoes ($)				
42	47	19	16	21
23	25	25	29	31
33	34	35	39	48

Examples 2, 3 (p. 457)

SCHOOL **The stem-and-leaf plot at the right shows the ages of the students in a pottery class at Lake Champion Summer Camp.**

Ages of Students

Stem	Leaf
0	9 9 9
1	0 1 1 1 1 2 2 3 3 4

1|0 = 10 yr

3. What is the range of the ages of the students?
4. Find the median and mode of the data.
5. Write two inferences that can be made about the students' ages.

Exercises

HOMEWORK HELP

For Exercises	See Examples
6–9	1
10, 11, 13, 14, 16–18	2
12, 15, 19	3

Display each set of data in a stem-and-leaf plot.

6.

Quiz Scores (%)			
70	96	72	91
80	80	79	93
76	95	73	93
90	93	77	91

7.

Low Temperatures (°F)				
15	13	28	32	38
30	31	13	36	35
38	32	38	24	20

8.

Floats at Annual Parade			
151	158	139	103
111	134	133	154
157	142	149	159

9.

School Play Attendance			
225	227	230	229
246	243	269	269
267	278	278	278

CYCLING **The number of Tour de France titles won by eleven countries as of 2005 is shown.**

Tour de France Titles Won by Eleven Countries

Stem	Leaf
0	1 1 1 2 2 4 8 9
1	0 8
2	
3	6

0|4 = 4 titles

10. Find the range of titles won.
11. Find the median and mode of the data.
12. Based on the data, write one inference that can be made about the data.

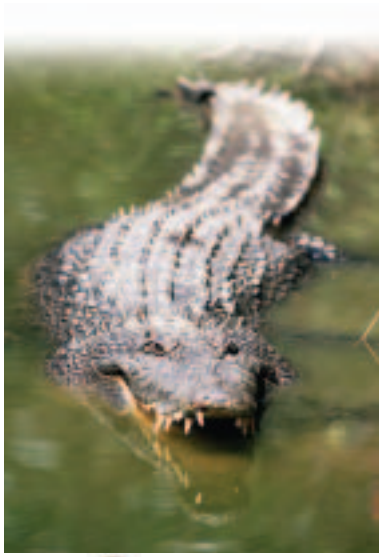
ELECTRONICS **For Exercises 13–15, use the stem-and-leaf plot that shows the costs of various DVD players at an electronics store.**

Costs of DVD Players

Stem	Leaf
8	2 5 5
9	9 9
10	0 0 2 5 6 8
11	0 0 5 5 5 9 9
12	5 7 7

11|5 = $115

13. What is the range of the prices?
14. Find the median and mode of the data.
15. Write three inferences that can be made based on the data.



Real-World Link
The saltwater crocodile is the largest living reptile. Some measuring 27–30 feet in length have been recorded in the wild.
Source: pbs.org

HISTORY For Exercises 16–19, refer to the stem-and-leaf plot below.

Ages of Signers of Declaration of Independence

Stem	Leaf
2	6 6 9
3	0 1 3 3 3 4 4 5 5 5 5 7 7 8 8 9 9
4	0 1 1 1 2 2 2 4 5 5 5 5 6 6 6 6 7 8 9
5	0 0 0 0 2 2 3 3 5 7
6	0 0 2 3 5 6
7	0

3|1 = 31 years

16. How many people signed the Declaration of Independence?
17. What was the age of the youngest signer?
18. What is the range of the ages of the signers?
19. Based on the data, can you infer that the majority of the signers were 30–49 years old? Explain your reasoning.

20. **GYMNASTICS** The scores for 10 girls in a gymnastics event are 9.3, 10.0, 9.9, 8.9, 8.7, 9.0, 8.7, 8.5, 8.8, 9.3. Analyze a stem-and-leaf plot of the data to make two inferences about the scores.

21. **REPTILES** The average lengths of certain species of crocodiles are given in the table. Analyze a stem-and-leaf plot of this data to write a convincing argument about a reasonable length for a crocodile.

Crocodile Average Lengths (ft)			
8.1	16.3	16.3	9.8
16.3	16.3	11.4	6.3
13.6	9.8	19.5	16.0

Source: Crocodilian Species List

EXTRA PRACTICE
See pages 739, 763.
MathOnline
Self-Check Quiz at tx.msmath2.com

22. **FIND THE DATA** Refer to the Texas Data File on pages 16–19. Choose some data that can be presented in a stem-and-leaf plot. Then analyze the stem-and-leaf plot to make two inferences about the data.

H.O.T. Problems

23. **FIND THE ERROR** Selena and Diana are analyzing the data in the stem-and-leaf plot at the right. Diana says half of the pieces of ribbon are between 20 and 30 inches in length. Selena says there are no pieces of ribbon more than 50 inches in length. Who is correct? Explain.

Cut Ribbon Length

Stem	Leaf
2	6 6 9
3	
4	6
5	3 6

2|6 = 26 in.

24. **CHALLENGE** Create a stem-and-leaf plot in which the median of the data is 25.

25. **WRITING IN MATH** Present the data shown at the right in a frequency table, a line plot, and a stem-and-leaf plot. Describe the similarities and differences among the representations. Which representation do you prefer to use? Explain your reasoning.

Price of Jeans ($)			
40	45	38	30
35	32	33	24
26	36	56	36
26	38	49	34
28	40	40	35

26. **COLLECT THE DATA** Collect a set of data that represents the heights in inches of the people in your math class. Then write a question that can be solved by analyzing a stem-and-leaf plot of the data. Be sure to explain how the stem-and-leaf plot would be used to solve your problem.

TEST PRACTICE

27. Denzell's science quiz scores are 11, 12, 13, 21, and 35. Which stem-and-leaf plot best represents this data?

A

Stem	Leaf
1	1
2	1
3	5

$3|5 = 35$

B

Stem	Leaf
1	3
2	1
3	5

$3|5 = 35$

C

Stem	Leaf
1	1 2 3
2	1
3	5

$3|5 = 35$

D

Stem	Leaf
1	1
2	1 1
3	5

$3|5 = 35$

28. The stem-and-leaf plot shows the points scored by the Harding Middle School basketball team.

Points Scored

Stem	Leaf
7	0 0 2 3
8	1 7 7
9	0 2 9

$9|0 = 90$

Based on the information in the stem-and-leaf plot, which of the following is a reasonable inference?

F The team scored an average of 80 points per game.

G The scores ranged from 37 points to 99 points.

H Sixty percent of the games had a score more than 80 points.

J Half of the scores were less than 80 points.

Spiral Review

Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary. (Lesson 9-2)

29. 80, 23, 55, 58, 45, 32, 40, 55, 50

30. 3.6, 2.4, 3.0, 7.9, 7.8, 2.4, 3.6, 3.9

31. Make a line plot of the test scores shown. (Lesson 9-1)

Test Scores				
83	94	78	78	85
86	88	83	82	92
90	77	83	81	89
90	88	87	88	85
84	81	83	85	91

32. **SCHOOL** The ratio of boys to girls in a school is 7 to 8. How many girls are in the school if there are 56 boys? (Lesson 7-1)

33. Write $\frac{9}{24}$ in simplest form. (Lesson 5-4)

GET READY for the Next Lesson

PREREQUISITE SKILL **Choose an appropriate interval and scale for each set of data.** (page 715)

34. 9, 0, 18, 19, 2, 9, 8, 13, 4

35. 30, 20, 60, 80, 90, 120, 40

9-4 Bar Graphs and Histograms

Main IDEA

Display and analyze data using bar graphs and histograms.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plot, line graph, **bar graph,** stem and leaf plot, circle graph, and Venn diagrams, **and justify the selection.** *Also addresses TEKS 7.11(B), 7.14(A).*

NEW Vocabulary

bar graph
histogram

GET READY for the Lesson

ANIMALS The cheetah is the fastest known land animal. The table shows its fastest speed and the top speeds of four other land animals.

Animal	Speed (mph)
cheetah	70
wildebeest	50
lion	50
elk	45
zebra	40

Source: *The World Almanac*

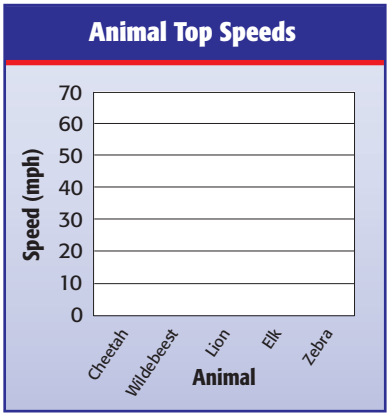
1. What are the fastest and slowest speeds in the table?
2. How can you create a visual representation to summarize the data?
3. Do any of these representations show both the animal name and its speed?

A **bar graph** is one method of comparing data by using solid bars to represent quantities.

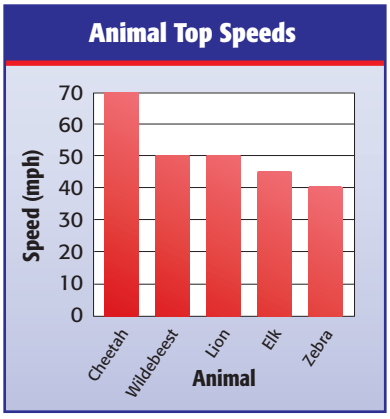
EXAMPLE 1 Display Data Using a Bar Graph

Display the data in the table above in a bar graph.

Step 1 Draw a horizontal axis and a vertical axis. Label the axes as shown. In this case, the scale on the vertical axis is chosen so that it includes all the speeds. Add a title.



Step 2 Draw a bar to represent each category. In this case, a bar is used to represent the speed of each animal.



STUDY TIP

Bar Graphs
The bars should be of equal width with equal spacing between them.

CHECK Your Progress

a. **FLOWERS** The table shows the diameters of the world's largest flowers. Display the data in a bar graph.

Flower	Maximum Size (in.)
Rafflesia	36
Sunflower	19
Giant Water Lily	18
Brazilian Dutchman	14
Magnolia	10

Source: *Book of World Records*

A special kind of bar graph, called a **histogram**, uses bars to represent the frequency of numerical data that have been organized in intervals.

EXAMPLE 2 Display Data Using a Histogram

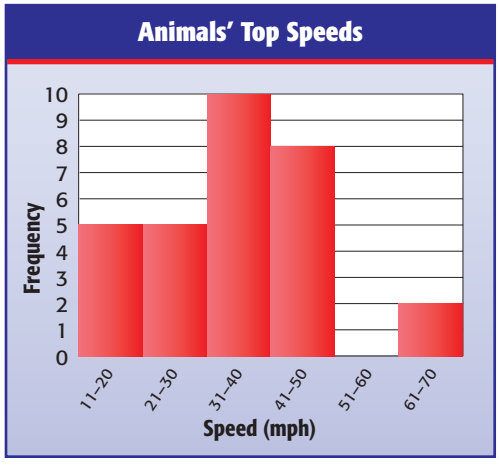
ANIMALS **The top speeds of thirty different land animals have been organized into a frequency table. Display the data in a histogram.**

Maximum Speed (mph)	Number of Animals
11–20	5
21–30	5
31–40	10
41–50	8
51–60	0
61–70	2

Source: *The World Almanac*

Step 1 Draw and label horizontal and vertical axes. Add a title.

Step 2 Draw a bar to represent the frequency of each interval.



The two highest bars represent a majority of the data. From the graph, you can easily see that most of the animals have a top speed of 31–50 miles per hour.

STUDY TIP

Histograms
Because the intervals are equal, all of the bars have the same width, with no space between them. The space at 51–60 indicates that there are no data values on that interval.

CHECK Your Progress

b. **EARTHQUAKES** The magnitudes of the largest U.S. earthquakes are organized into the frequency table shown. Display the data in a histogram.

Magnitude	Frequency
7.0–7.4	4
7.5–7.9	14
8.0–8.4	5
8.5–8.9	2
9.0–9.4	1

Source: National Earthquake Information Center

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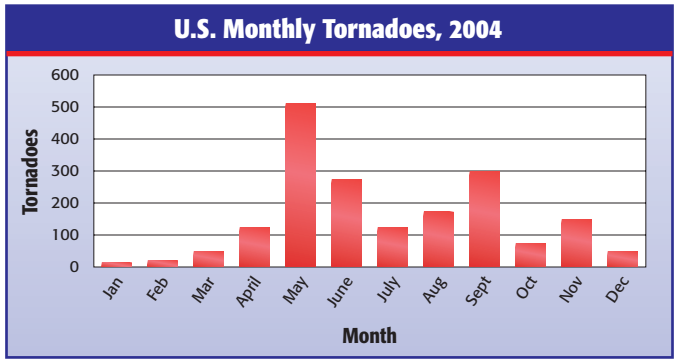
STUDY TIP

Inferences
An inference is a conclusion that can be supported by data.

EXAMPLES Analyze Data to Make Inferences

WEATHER **The bar graph shows the monthly number of tornadoes that occurred in the U.S. in 2004.**



Source: NOAA National Weather Service

3 **Which season had the least number of tornadoes? Justify your answer.**

Look for the months with the least number of tornadoes. The graph shows that close to 0 tornadoes occurred in January and February. So, the least number of tornadoes occurred in winter.

4 **Compare the number of tornadoes that occurred in May and June.**

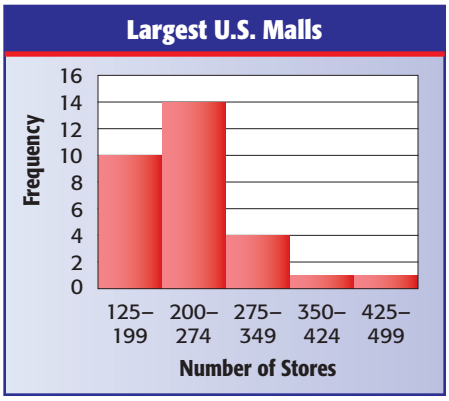
About 500 tornadoes occurred in May. About 275 tornadoes occurred in June. So, there were almost twice as many tornadoes in May than in June.

CHECK Your Progress

MALLS **The histogram shows the number of stores in the largest malls in the U.S.**

c. How many malls are represented in the histogram? Explain your reasoning.

d. Compare the number of malls with 275–349 stores to the malls with 425–499 stores.



Source: Directory of Major Malls

CHECK Your Understanding

Examples 1, 2 (pp. 461–463)

Select the appropriate graph to display each set of data: bar graph or histogram. Then display the data in the appropriate graph.

1.

State Sales Tax Rates	
Percent	**States**
2.0–2.9	1
3.0–3.9	0
4.0–4.9	12
5.0–5.9	12
6.0–6.9	16
7.0–7.9	4

Source: www.taxadmin.org

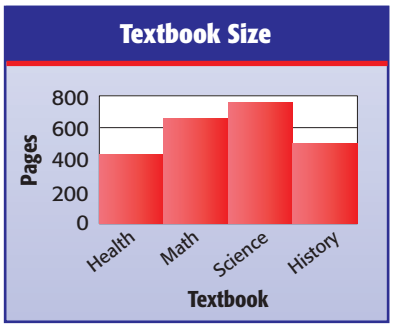
2.

Men's Grand Slam Titles	
Player	**Titles**
Pete Sampras	14
Roy Emerson	12
Bjorn Borg	11
Rod Laver	11
Andre Agassi	8

Source: *Book of World Records*

Examples 3, 4 (p. 463)

TEXTBOOKS **For Exercises 3 and 4,use the bar graph that shows the average number of pages in various textbooks.**



3. On average, which textbook has the least number of pages?

4. Is it reasonable to say that on average, a health textbook has half as many pages as a science textbook? Explain.

Exercises

HOMEWORK HELP

For Exercises	See Examples
5–8	1, 2
9–15	3

Select the appropriate graph to display each set of data: bar graph or histogram. Then display the data in the appropriate graph.

5.

Most Threatened Reptiles	
Country	**Number of Species**
Australia	38
China	31
Indonesia	28
U.S.	27
India	25

Source: *Top 10 of Everything, 2005*

6.

Home Run Leaders, 1985–2004	
Home Runs	**Frequency**
31–36	1
37–42	4
43–48	7
49–54	5
55–60	3

Source: *The World Almanac*

7.

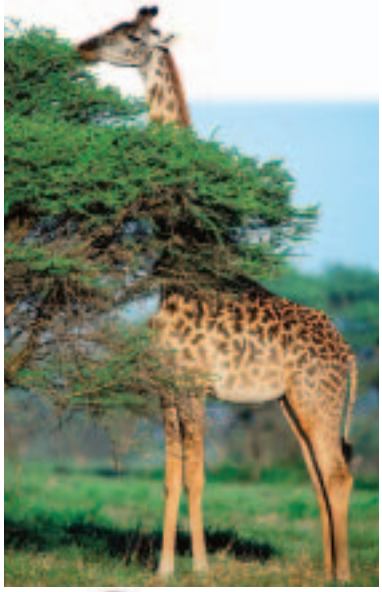
Major U.S. Rivers	
Length (mi)	**Frequency**
600–999	15
1,000–1,399	5
1,400–1,799	3
1,800–2,199	3
2,200–2,599	2

Source: *The World Almanac*

8.

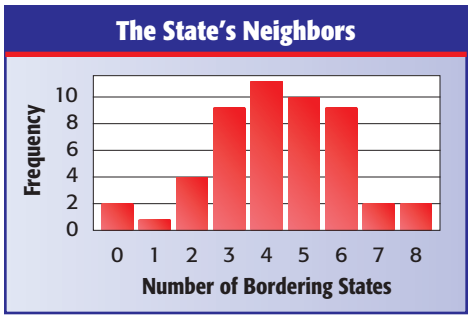
City Skyscrapers	
City	**Skyscrapers**
New York	176
Hong Kong	163
Chicago	81
Shanghai	49
Tokyo	44

Source: *Book of World Records*



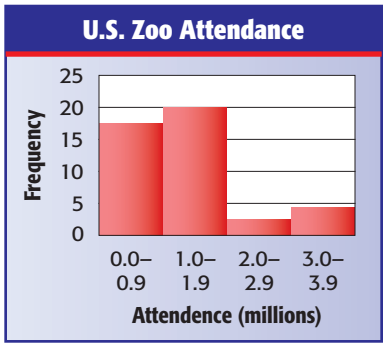
Real-World Link . . . . .
Giraffes live for 10–15 years in the wild, but average 25 years at zoos.
Source: zoo.org

GEOGRAPHY **For Exercises 9–12, use the graph that shows the number of bordering states for each of the fifty states.**



9. What is the most frequent number of states that borders another state?
10. How many states are bordered by 6 states?
11. How many states do not have any bordering states? Justify your answer.
12. **RESEARCH** Use the Internet or another source to find which states do not have any bordering states. Why do these states not have bordering states?

ZOOS **For Exercises 13–15, use the histogram that shows the attendance at the major U.S. zoos in a recent year.**



Source: The World Almanac

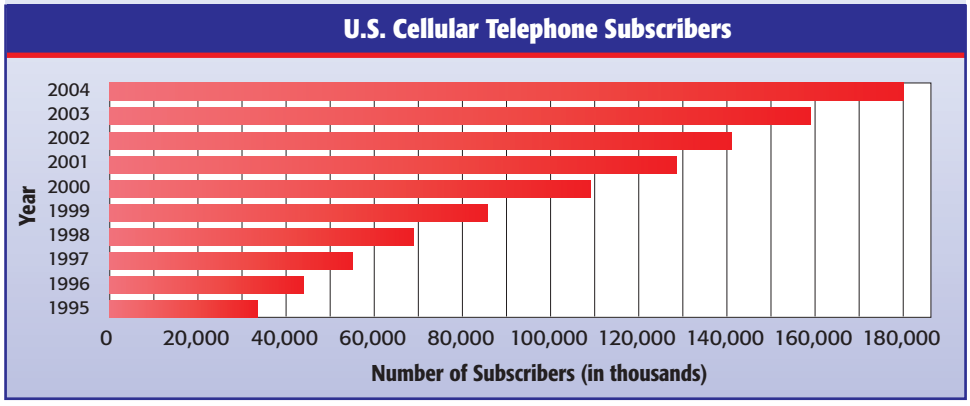
13. About how many zoos does the graph represent?
14. What is the range of attendance for most of the zoos?
15. Compare the number of zoos with 0.0–0.9 million visitors to the number of zoos with 3.0–3.9 million visitors.

Match each characteristic to the appropriate graph(s).

16. data display based upon place value
17. shows the frequency of data on a number line
18. compares data using solid bars
19. data is organized using intervals

a. line plot
b. histogram
c. stem-and-leaf plot
d. bar graph

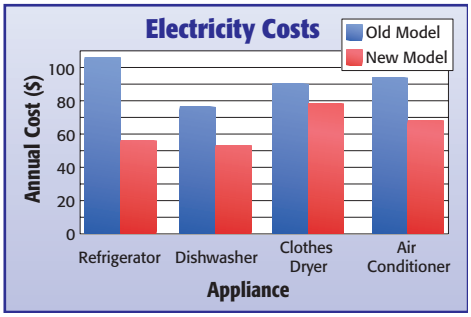
CELL PHONES **For Exercises 20 and 21, use the bar graph shown below.**



Source: *The World Almanac*

20. Describe how the number of cell phone subscribers has grown over the 10-year period.
21. Use the graph to predict the number of cell phone subscribers in 2010.

ELECTRICITY **For Exercises 22 and 23, use the multiple bar graph that compares the annual costs of using old model appliances and using equivalent new model appliances.**

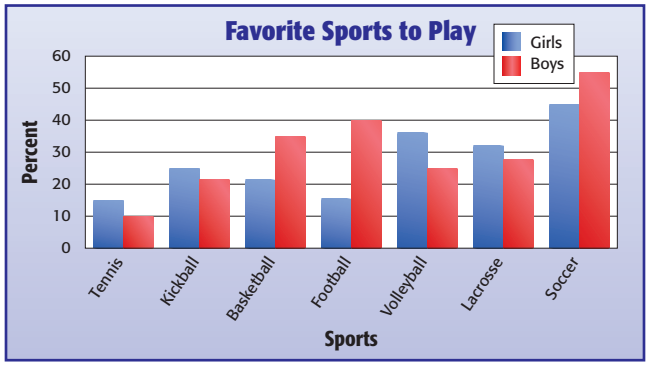


Source: *Association of Home Appliance Manufacturers*

22. For which appliance is the difference in electricity costs between the old and new model the greatest? Explain.

23. Describe an advantage of using a multiple-bar graph rather than two separate graphs to compare data.

EXERCISE **For Exercises 24–27, refer to the graph below.**



EXTRA PRACTICE
See pages 739, 763.
MathOnline
Self-Check Quiz at tx.msmath2.com

24. Which sport did the girls surveyed prefer the most?

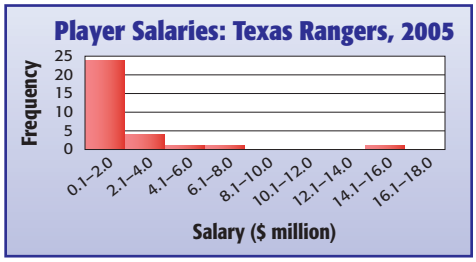
25. Which sport is the least favorite for the boys?

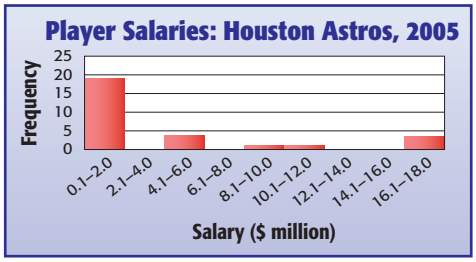
26. Based on this survey, boys prefer football 4 times more than what sport?

27. Write a convincing argument telling why you think that approximately the same number of boys and girls like to play kickball.

H.O.T. Problems

28. **CHALLENGE** The histograms show players' salaries for two major league baseball teams. Compare the salary distributions of the two teams.



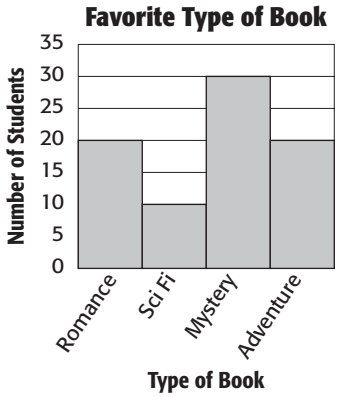


29. **DATA SENSE** Describe how to determine the number of values in a data set that is represented by a histogram.

30. **WRITING IN MATH** Can any data set be displayed using a histogram? If yes, explain why. If no, give a counterexample and explain why not.

TEST PRACTICE

31. The results of a survey are displayed in the graph.



Which statement is best supported by the data?

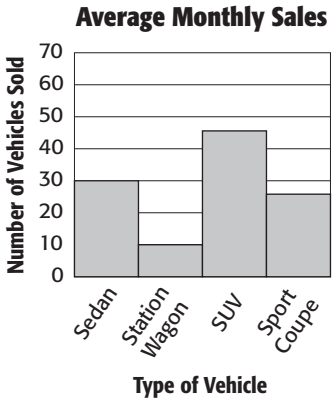
A Twice as many students enjoy reading mysteries than romance.

B Most students enjoy reading adventure books.

C Twice as many students enjoy reading romance books than science fiction.

D Half as many students enjoy reading mysteries than romance.

32. The graph shows the average car sales per month at a car dealership.



What is the best prediction for the number of station wagons the dealer sells in a year?

F 10

G 60

H 120

J 500

Spiral Review

SPORTS **For Exercises 33 and 34, refer to the data that lists the number of games won by each team in a baseball league.**

Number of Wins					
25	36	46	15	30	53
40	32	17	45	41	31
56	50	52	47	26	40
43	56	51	50	55	50
44	47	53	23	19	

33. Make a stem-and-leaf plot of the data. (Lesson 9-3)

34. What is the mean, median, and mode of the data? (Lesson 9-2)

35. **SELECT A TECHNIQUE** The video game that Neil wants to buy costs \$50. He has saved $\frac{1}{5}$ of the amount he needs. Which of the following techniques might Neil use to find how much more money he will need to buy the game? Justify your selection(s). Then use the technique(s) to solve the problem. (Lesson 6-5)

mental math | number sense | estimation

GET READY for the Next Lesson

36. **WEATHER** At 5:00 P.M., the outside temperature was 81°F. At 6:00 P.M., it was 80°F. At 7:00 P.M., it was 79°F. Use the *look for a pattern* strategy to predict the outside temperature at 8:00 P.M. (Lesson 2-6)

Extend 9-4

Spreadsheet Lab
Circle Graphs

Main IDEA

Use technology to create circle graphs.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plot, line graph, bar graph, stem and leaf plot, **circle graph,** and Venn diagrams, **and justify the selection**.

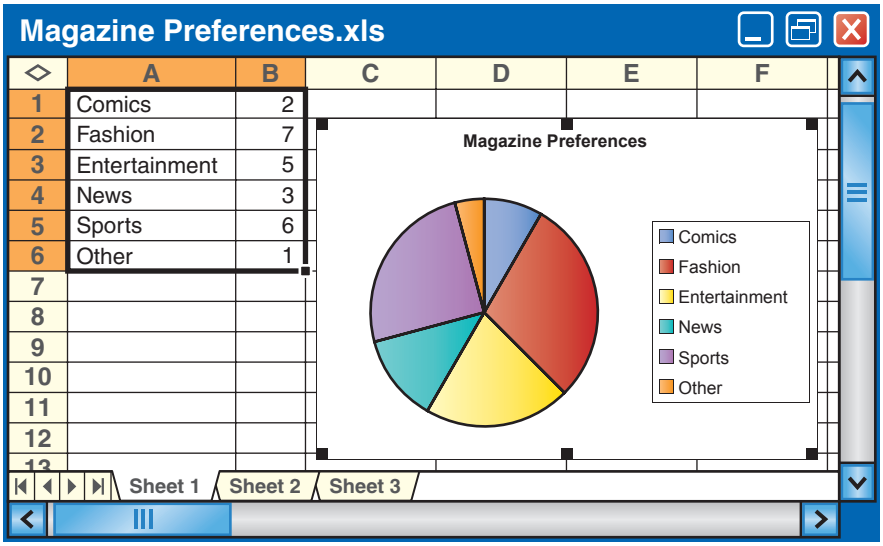
Another type of display used to compare categories of data is a *circle graph*. Circle graphs are useful when comparing parts of a whole.

ACTIVITY

MAGAZINES **The table shows the results of a survey in which students were asked to indicate their favorite type of magazine. Use a spreadsheet to make a circle graph of these data.**

Magazine Preferences	
Type	Frequency
Comics	2
Fashion	7
Entertainment	5
News	3
Sports	6
Other	1

STEP 1 Enter the data in a spreadsheet as shown.



STEP 2 Select the information in cells A1 to B6. Click on the Chart Wizard icon. Choose the Pie chart type. Click Next twice. Enter the title Magazine Preferences. Then click Next and Finish.

STUDY TIP

Bar Graphs
To create a bar graph using a spreadsheet, follow the same steps used to create a circle graph, except choose Bar for the chart type.

Analyze the Results

1. **MAKE A CONJECTURE** Use the graph to determine which types of magazines were preferred by about $\frac{1}{3}$ and 25% of the students surveyed. Explain your reasoning. Then check your answers.

2. **COLLECT THE DATA** Collect some data that can be displayed in either a circle or bar graph. Record the data in a spreadsheet. Then use the spreadsheet to make both types of displays. Which display is more appropriate? Justify your selection.

9-5 Venn Diagrams

Main IDEA

Analyze data in Venn diagrams.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plot, line graph, bar graph, stem and leaf plot, circle graph, and **Venn diagrams, and justify the selection**. *Also addresses TEKS 7.11(B).*

NEW Vocabulary

Venn diagram

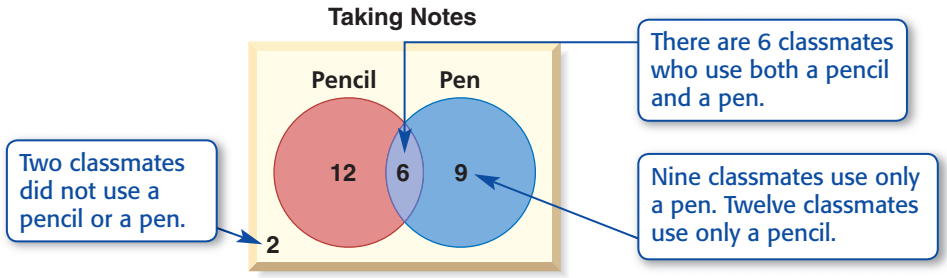
GET READY for the Lesson

SURVEYS Nicholas asked 20 of his classmates what they use when taking notes: a pencil or a pen. The results are shown.

Taking Notes	
Writing Tool	**Number of Students**
Pencil	18
Pen	15
Neither	2

1. Display the information in a bar graph.
2. If Nicholas surveyed 20 classmates, why do the numbers in the second column have a sum of 18 + 15 + 2 or 35?
3. Does the graph tell you how many people use both pencil and pen?

A **Venn diagram** is an arrangement of overlapping circles used to show how two or more sets of data are related.



EXAMPLE 1 Display Data in a Venn Diagram

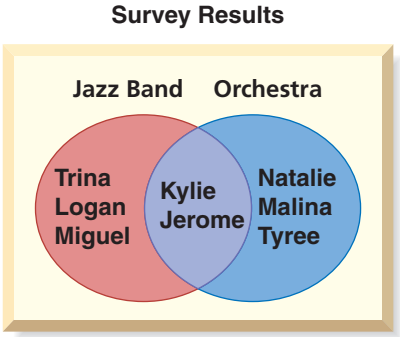
BAND Display the survey results shown at the right in a Venn diagram.

Survey Results	
Jazz Band	Trina, Jerome, Logan, Kylie, Miguel
Orchestra	Natalie, Kylie, Jerome, Malina, Tyree

First, draw two overlapping circles to represent jazz band and orchestra. Label each circle.

Since Kylie and Jerome are in both jazz band and orchestra, write their names in the overlapping region.

Write each of the other names in the appropriate region.



STUDY TIP

Shapes A Venn diagram is often two or more overlapping circles. However, other shapes can also be used.

CHECK Your Progress

a. **NUMBERS** Use a Venn diagram to show how the factors of 24 and 56 are related.

EXAMPLES Analyze a Venn Diagram

Real-World Link
An adult squirrel needs to eat about a pound of food a week.
Source: squirrels.org

ANIMALS Refer to the Venn diagram at the right.

Animal Characteristics

2 **Which animals are mammals that live in or around water?**

The area where the circle labeled *Mammal* and the circle labeled *Lines In or Around Water* overlap contains 3 animals, manatee, walrus, and polar bear.

3 **Which animals are mammals that do not live in or around water and are not white in color?**

The giraffe and bat are mammals that do not live in or around water and are not white in color.

Personal Tutor

Personal Tutor for MAC

CHECK Your Progress

b. Name the animals that are mammals that are white in color.
c. Which animals live in or around water and are not white in color?

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CHECK Your Understanding

Example 1 (p. 469)

Draw a Venn diagram to show how the sets of data are related.

1.

Odd Numbers	Prime Numbers
1, 3, 5, 7, 9, 11, 13, 15, 17, 19	2, 3, 5, 7, 11, 13, 17, 19

2.

Pet Ownership	
Dog	Morgan, Enrique, Louis, Tia
Cat	Keith, Louis, Nikki, Morgan, Enrique

Examples 2, 3 (p. 470)

BOOKS For Exercises 3–6, use the Venn diagram that shows students' book preferences.

Book Preference

3. Which student(s) prefer to read mystery and romance books?
4. Which student(s) prefer to read historical but *not* mystery books?
5. Which student(s) prefer *not* to read romance or historical books?
6. What type of book(s) does Thom prefer to read?

Exercises

HOMEWORK HELP

For Exercises	See Examples
7–10	1
11–18	2, 3

For Exercises 7–12, draw a Venn diagram to show how the sets of data are related.

7.

Dessert Eaten at a Birthday Party	
Cake	Adelina, Jin, Rashid, Aisha, Santiago
Ice Cream	Rashid, Aisha, Todd, Reiko, Suzie

8.

Multiples of 4	Multiples of 6
0, 4, 8, 12, 16, 20, 24, 28, 32, 36	0, 6, 12, 18, 24, 30, 36

9.

Vegetable	Green in Color
Broccoli	Tree
Carrot	Grass
Corn	Frog
Peas	Broccoli
Onion	Peas

10.

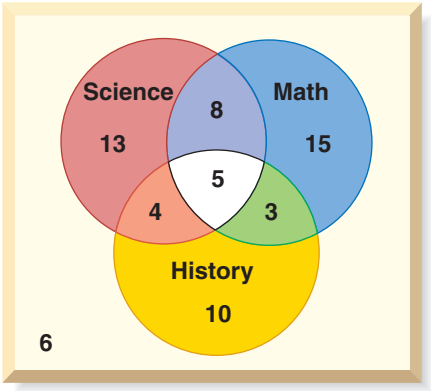
Transportation to School	
Walk	Alejandro, Malcolm, Paige, Martin, Shandra, Mateo
Car/Bus	Jacob, Lisa, Ariel, Ellie, Malcolm, Diego, Kimberly

11. **TRAVEL** Of 50 people, 20 want to travel to Italy only, 16 want to travel to Germany only, and 14 want to travel to both Italy and Germany.

12. **FOOD** Of 60 people, 25 prefer pepperoni only on a pizza, 13 prefer sausage only, and 12 prefer both pepperoni and sausage.

SCHOOL For Exercises 13–15, refer to the Venn diagram.

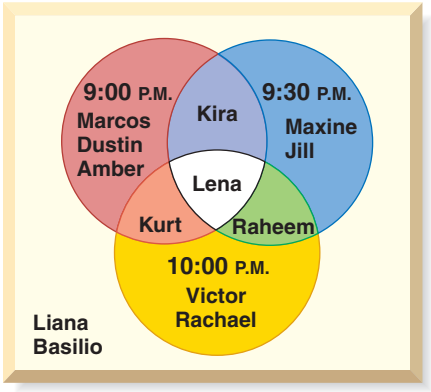
Students' Favorite Subject



13. How many prefer only math?
14. How many said they prefer science and history?
15. How many prefer history but not math?

TIME For Exercises 16–18, refer to the Venn diagram.

Bedtime on a School Night



16. Who goes to bed at exactly 10:00 P.M.?
17. How many do not go to bed at any of these times?
18. How many were surveyed?

EXTRA PRACTICE

See pages 740, 763.

Math Online

Self-Check Quiz at tx.msmath2.com

19. **MUSIC** Kristy asked 43 people which format they like to listen to music, MP3 or CD. Of those surveyed, 20 said CD and 38 said MP3. However, 15 people said both CD and MP3. Use a Venn diagram to find how many classmates prefer MP3 format only.

H.O.T. Problems

20. **OPEN ENDED** Write two sets of data with a relationship that can be shown using a Venn diagram. Be sure to draw the Venn diagram.

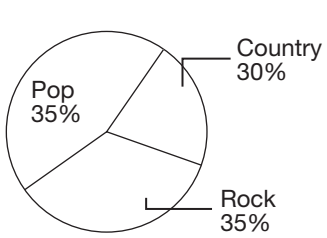
21. **WRITING IN MATH** In your own words, explain what the area marked with an X in the Venn diagram at the right represents.

22. **CHALLENGE** Draw a Venn diagram to show the relationship between the characteristics of cats and dogs.

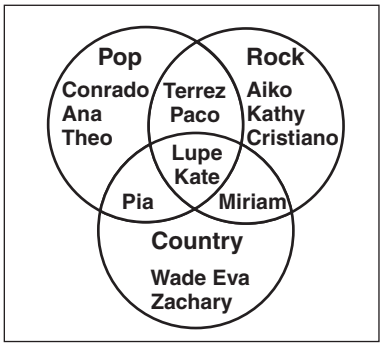
TEST PRACTICE

23. Sharon polled 15 friends to find out their music preferences. Which of the following gives the most detailed information about her friends' music preferences?

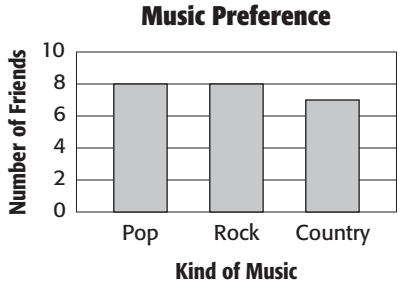
A



C



B



D

Music Preference	
Kind of Music	**Number of Friends**
Pop	8
Rock	8
Country	7

Spiral Review

24. **COLORS** Display the data at the right in a bar graph. (Lesson 9-4)

Favorite Color	
Color	**Students**
Red	13
Blue	16
Green	20
Yellow	8

Graph and label each point on a coordinate plane. (Lesson 2-3)

25. $A(-3, 2)$ 26. $N(-4, -5)$ 27. $J(1, 0)$

GET READY for the Next Lesson

28. **PREREQUISITE SKILL** Desireé bakes a pan of lasagna. She makes 3 cuts along the length of the rectangular pan and 4 cuts along the width. How many pieces of lasagna will be end pieces? Use the *make a diagram* strategy. (Lesson 7-5)

CHAPTER 9

Mid-Chapter Quiz

Lessons 9-1 through 9-5

1. **TEST PRACTICE** The table shows quiz scores of a math class. What is the range of test scores? (Lesson 9-1)

Math Scores						
89	92	67	75	95	89	82
92	88	89	80	91	79	90

A 89 C 67

B 82 D 28

For Exercises 2–4, use the data below. (Lesson 9-1)

Age Upon Receiving Driver's License									
16	17	16	16	18	21	16	16	18	18
17	25	16	17	17	17	17	16	20	16

2. Make a line plot of the data.
3. Identify any clusters, gaps, or outliers.
4. Describe how the range of data would change if 25 was not part of the data set.

5. **TEST PRACTICE** The table shows the average monthly rainfall for Amarillo. Which measure of data is represented by 1.2 inches? (Lesson 9-2)

Average Rain (in.)					
0.5	0.6	1.0	1.0	2.5	3.7
2.6	3.3	2.0	1.4	0.7	0.4

Source: countrystudies.us

F Mean H Range

G Median J Mode

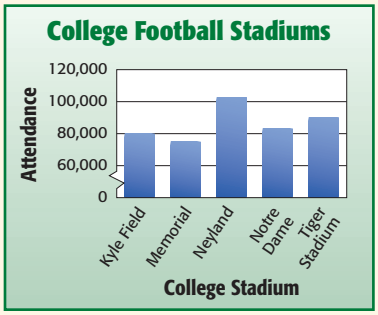
Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary. (Lesson 9-2)

6. Jersey prices ($): 27, 32, 18, 24, 32, 39, 41
7. Tree heights (m): 7.6, 6.8, 6.5, 7.0, 7.9, 6.8, 7.0, 7.0, 6.8, 8.1

8. **SPEED** Display the data shown in a stem-and-leaf plot and write one inference based on the data. (Lesson 9-3)

Car Highway Speeds				
65	72	76	68	65
59	70	69	71	74
68	65	71	74	69

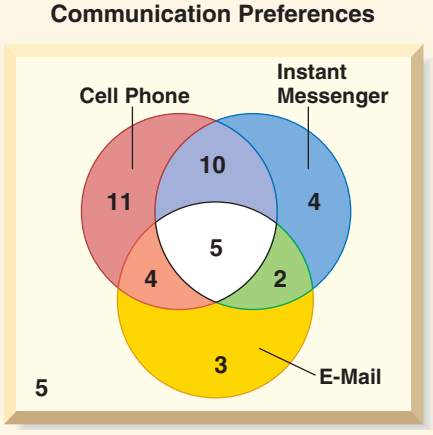
ATTENDANCE **For Exercises 9 and 10, refer to the graph.** (Lesson 9-4)



Source: msnbc.com

9. About how many people does the graph represent?
10. Which two stadiums house about the same number of people?

COMMUNICATION **For Exercises 11 and 12, refer to the Venn diagram.** (Lesson 9-5)



11. How many students prefer only instant messenger?
12. How many students prefer cell phones, but not e-mail?

9-6 Problem-Solving Investigation

MAIN IDEA: Solve problems by using a graph.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(B) make inferences** and convincing arguments **based on an analysis of given** or collected **data**.

P.S.I. TEAM +

e-Mail: USE A GRAPH

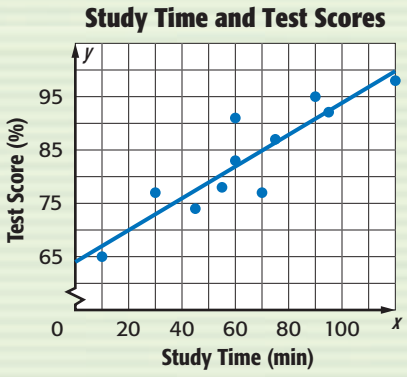
YOUR MISSION: Use a graph to solve the problem.

THE PROBLEM: The table shows the study times and test scores of 13 students in Mrs. Collins' English class?

Yolanda: Based on this data, what would be the test score of a student who studied for 75 minutes?

Study Time and Test Scores											
Study Time (min)	120	30	60	95	70	55	90	45	75	60	10
Test Score (%)	98	77	91	93	77	78	95	74	87	83	65

EXPLORE	You know the number of minutes studied. You need to predict the test score.
PLAN	Organize the data in a graph so you can easily see any trends.
SOLVE	The graph shows that as the study times progress, the test scores increase. You can predict that the test score of a student who studied for 75 minutes is about 87%.
CHECK	Draw a line that is close to as many of the points as possible, as shown. The estimate is close to the line so the prediction is reasonable.



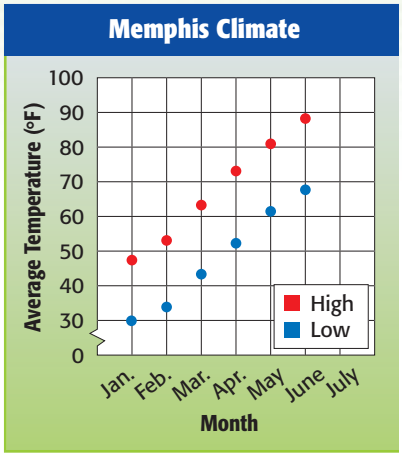
Analyze The Strategy

1. Explain why analyzing a graph is a useful way to quickly make conclusions about a set of data.
2. WRITING IN MATH Write a problem in which using a graph would be a useful way to check a solution.

Mixed Problem Solving

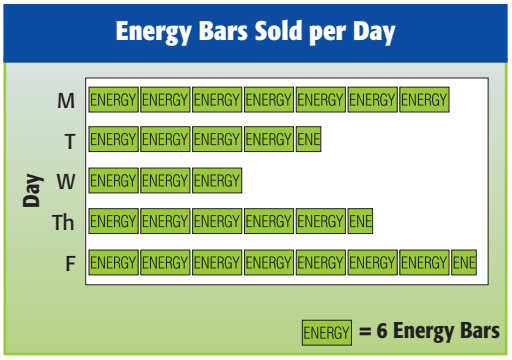
For Exercises 3 and 4, solve by using a graph.

3. **SCIENCE** Refer to the graph. Suppose the trends continue. Predict the average high temperature for the month of July.



Source: weather.com

4. **SCHOOL** The graph shows the number of energy bars sold in the cafeteria. On which day did the cafeteria sell about half as many bars as it did on Friday?



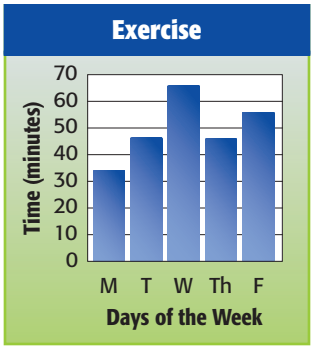
Use any strategy to solve Exercises 5–8. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
- Guess and check.
- Look for a pattern.
- Use a graph.

5. **PATTERN** What are the next two numbers in the pattern 8, 18, 38, 78, ...?

6. **READING** Maya read 10 pages of a 150-page book on Monday and plans to read twice as many pages each day than she did the previous day. On what day will she finish the book?

7. **EXERCISE** The graph shows the number of minutes Jacob exercised during one week. According to the graph, which two days did he exercise about the same amount of time?



8. **NUMBER THEORY** Find two numbers with a sum of 56 and with a product of 783.

Select the Operation

For Exercises 9 and 10, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

9. **SAFETY** An elevator sign reads *Do not exceed 2,500 pounds*. How many people, each weighing about 150 pounds, can be in the elevator at the same time?

10. **BOWLING** Tariq and three of his friends are going bowling, and they have a total of $70 to spend. Suppose they buy a large pizza, four beverages, and each rent bowling shoes. How many games can they bowl if they all bowl the same number of games?

Bowling Costs	
Item	**Price**
large pizza	$15.75
beverage	$1.50
shoe rental	$3.50
game	$4.00

9-7 Line Graphs and Scatter Plots

Main IDEA

Analyze line graphs and scatter plots to make predictions and inferences.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plot, **line graph,** bar graph, stem and leaf plot, circle graph, and Venn diagrams, **and justify the selection.** *Also addresses TEKS 7.11(B).*

MINI Lab

- Pour 1 cup of water into the drinking glass.
- Measure the height of the water, and record it in a table like the one shown.
- Place 5 marbles in the glass. Measure the height of the water. Record.
- Continue adding marbles, 5 at a time, until there are 20 marbles in the glass. After each time, measure and record the height of the water.

Number of Marbles	Height of Water (cm)
0	
5	
10	
15	
20	

1. By how much did the water's height change after each addition of marbles?
2. Predict the height of the water when 30 marbles are in the drinking glass. Explain how you made your prediction.
3. Test your prediction by placing 10 more marbles in the glass.
4. Draw a graph of the data that you recorded in the table.

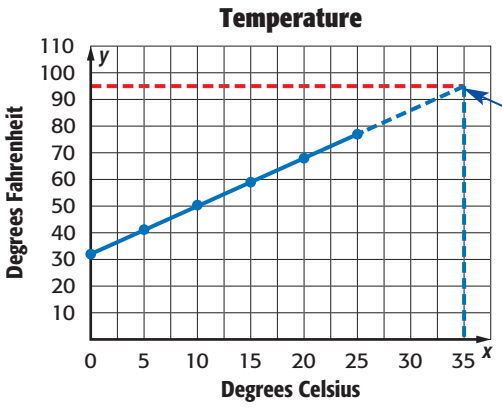
NEW Vocabulary

line graph
scatter plot

You created a line graph in the Mini Lab. **Line graphs** can be useful in predicting future events because they show trends over time or relationships.

EXAMPLES Use a Line Graph to Predict

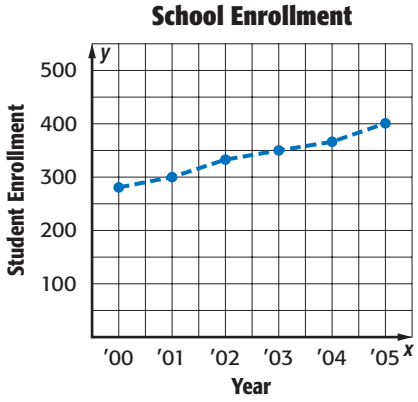
1 **TEMPERATURE** **The relationship between temperature readings in °C and °F is shown below. Use the line graph to predict the temperature reading 35°C in °F.**



Continue the graph with a dotted line in the same direction until you align vertically with 35°C. Graph a point. Find what value in °F corresponds with the point.

The temperature reading 35°C is equivalent to 95°F.

2 **SCHOOL** **The graph shows the student enrollment at McDaniel Middle School for the past several years. If the trend continues, what will be the enrollment in 2010?**



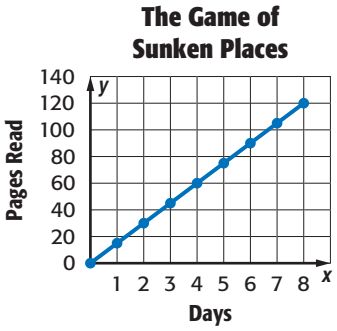
If the trend continues, the enrollment in 2010 will be about 525 students.

STUDY TIP

Broken Lines In Example 2, there are no data points between the points that represent enrollment. So, a broken line was used to help you easily see trends in the data.

CHECK Your Progress

a. **READING** Kerry is reading *The Game of Sunken Places* over summer break. The graph shows the time it has taken her to read the book so far. Predict the time it will take her to read 150 pages.



b. **JUICE BOXES** The table shows the number of juice boxes a cafeteria sold in a five-week period. Display the data in a line graph. If the trend continues, how many juice boxes will be sold in week 8?

Juice Box Sales	
Week	Number Sold
1	50
2	52
3	56
4	60
5	62

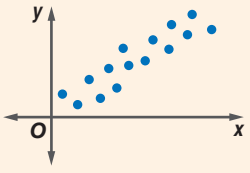
A **scatter plot** displays two sets of data on the same graph. Like line graphs, scatter plots are useful for making predictions because they show trends in data. If the points on a scatter plot come close to lying on a straight line, the two sets of data are related.

STUDY TIP

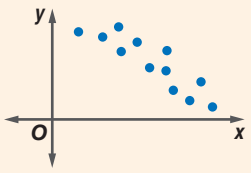
Scatter Plots In a positive relationship, as the value of x increases, so does the value of y. In a negative relationship, as the value of x increases, the value of y decreases.

CONCEPT Summary — Types of Relationships

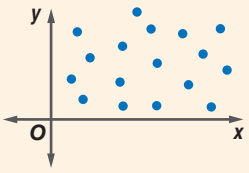
Positive Relationship



Negative Relationship



No Relationship

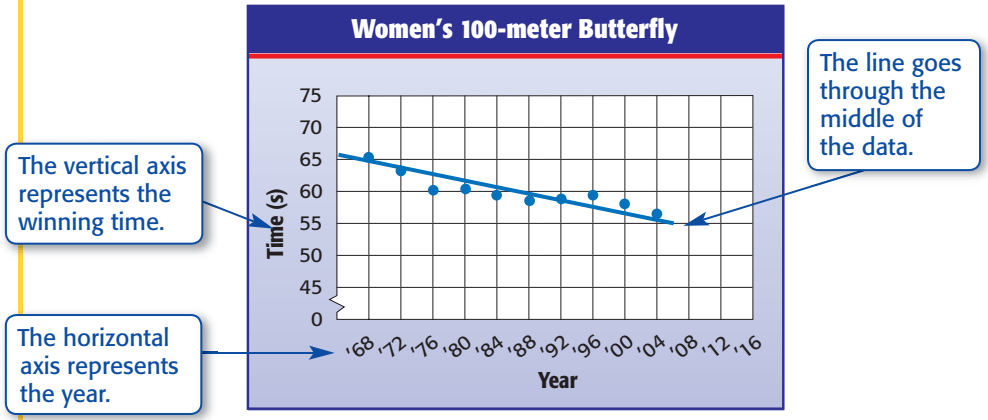


READING Math

Scatter Plots Another name for scatter plot is *scattergram*.

EXAMPLE 3 Use a Scatter Plot to Predict

SWIMMING The scatter plot shows the winning times for the women's 100-meter butterfly event at the Summer Olympics from 1968 to 2004. Predict a winning time for this event at the 2012 Olympics.



Source: *The World Almanac*

By looking at the pattern, we can predict that the winning time at the 2012 Olympics will be about 54 seconds.

CHECK Your Progress

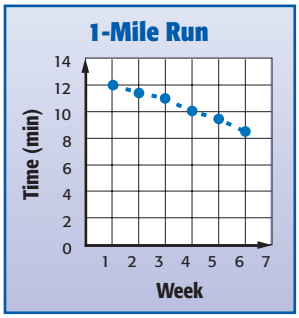
c. **SWIMMING** Use the scatter plot above to predict a winning time for the Women's 100-meter Butterfly event at the 2016 Olympics.

Online Personal Tutor at tx.msmath2.com

CHECK Your Understanding

Examples 1, 2 (pp. 476–477)

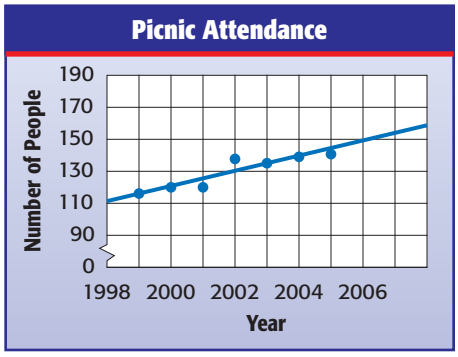
TRACK Sierra is training for cross-country try-outs. To make the team, she needs to be able to run 1 mile in under 8 minutes. The graph charts her progress.



1. Describe the relationship between the two sets of data.
2. If the trend continues, will Sierra make the team? Explain.

Example 3 (p. 478)

3. **PICNICS** The scatter plot shows the number of people who attended a neighborhood picnic each year. How many people should be expected to attend the picnic in 2007?

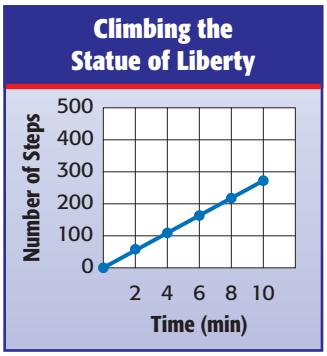


Exercises

HOMEWORK HELP	
For Exercises	See Examples
4–5	1, 2
6–7	3

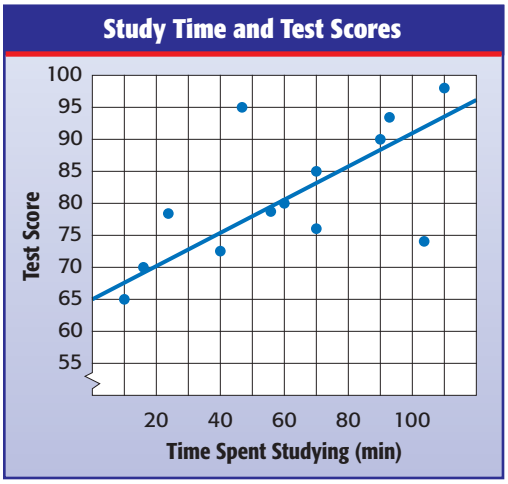
MONUMENTS **For Exercises 4 and 5, use the graph that shows the time it takes Ciro to climb the Statue of Liberty.**

4. Predict the time it will take Ciro to climb 354 steps to reach the top.
5. How many steps will he have climbed after 14 minutes?



SCHOOL **For Exercises 6 and 7, use the graph that shows the time students spent studying for a test and their test score.**

6. What score should a student who studies for 1 hour be expected to earn?
7. If a student scored 90 on the test, about how much time can you assume the student spent studying?



SAFETY **For Exercises 8–10, use the table that shows the relationship between the speed of a vehicle and the distance required to stop.**

Speed (mph)	Stopping Distance (ft)
55	273
60	312
65	355
70	400
75	447

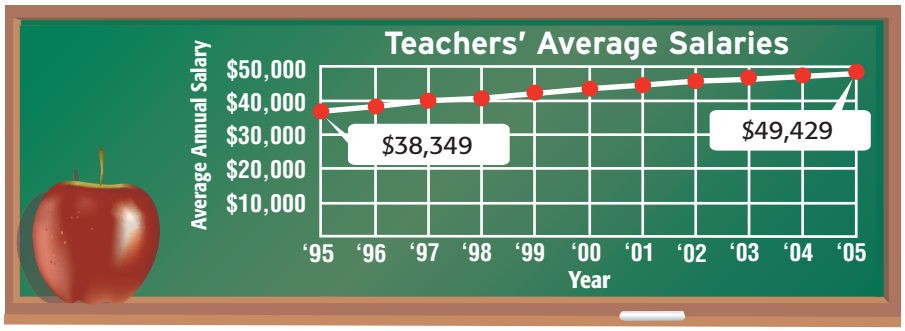
8. Make a scatter plot of the data. Use the speed on the horizontal axis and the stopping distance on the vertical axis.
9. Describe the relationship, if any, between the two sets of data.
10. Predict the stopping distance for a car traveling 45 miles per hour.

OLYMPICS **For Exercises 11–13, use the table that shows the number of nations that participated in the Summer Olympics from 1936 to 2004.**

11. Display the data in a scatter plot.
12. Predict the number of nations that will participate in the 2012 Summer Olympics.
13. Describe the trend in the data.

Year	Number of Nations	Year	Number of Nations
1936	49	1976	92
1948	59	1980	80
1952	69	1984	140
1956	72	1988	159
1960	83	1992	169
1964	93	1996	197
1968	112	2000	199
1972	121	2004	201

SCHOOLS For Exercises 14 and 15, use the graphic that shows public school teachers' average salaries for the past few years.

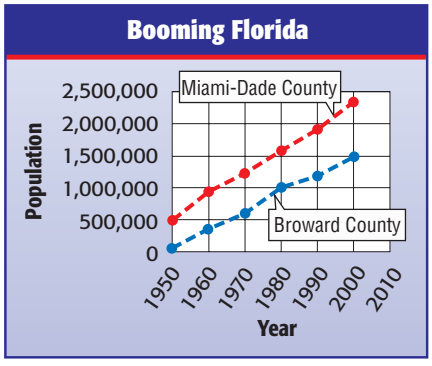


Source: nea.org

14. Describe the relationship, if any, between the two sets of data.
15. If the trend continues, what will be the average annual salary in 2009?

16. **RESEARCH** Use the Internet or another source to find a real-world example of a scatter plot. Write a description of what the graph displays and extend the graph to show where the data will be in the future.

17. **POPULATION** The *multiple line graph* at the right shows the population of Miami-Dade and Broward Counties in Florida from 1950 to 2000. Do you think that the population of Broward County will catch up to the population of Miami-Dade County in the next census in 2010? Write a convincing argument as to why or why not.



Source: U.S. Census Bureau

EXTRA PRACTICE
See pages 740, 763.
MathOnline
Self-Check Quiz at tx.msmath2.com

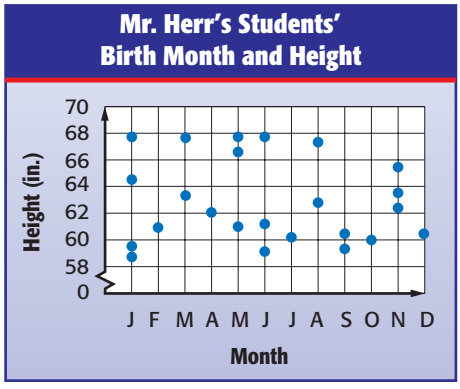
H.O.T. Problems

18. **OPEN ENDED** Name two sets of data that can be graphed on a scatter plot.

19. **Which One Doesn't Belong?** Identify the term that does not have the same characteristic as the other three. Explain your reasoning.

line plot	mode	bar graph	scatter plot

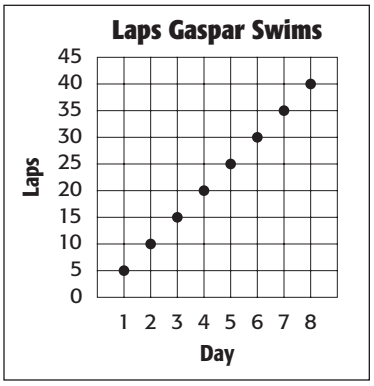
20. **CHALLENGE** What can you conclude about the relationship between birth month and height shown in the scatter plot at the right?



21. **WRITING IN MATH** Explain how a graph can be used to make predictions.

TEST PRACTICE

22. The number of laps Gaspar has been swimming each day is shown.



If the trend shown in the graph continues, what is the best prediction for the number of laps he will swim on day 10?

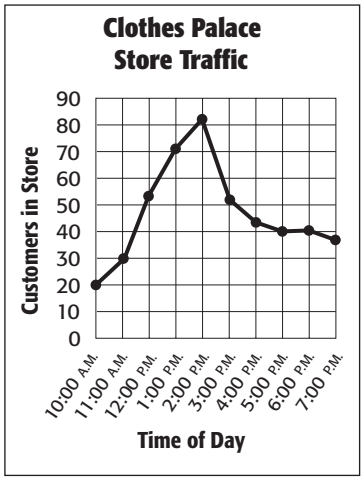
A 50

B 65

C 75

D 100

23. The number of customers at Clothes Palace at different times during the day is shown.



If extra workers are needed when the number of customers exceeds 50, between which hours is extra help needed?

F 12:00 P.M.–3:00 P.M.

G 11:00 A.M.–4:00 P.M.

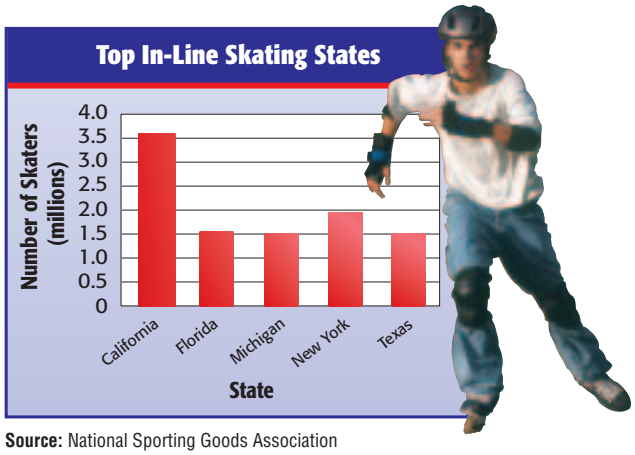
H 1:00 P.M.–4:00 P.M.

J 1:00 P.M.–3:00 P.M.

Spiral Review

24. **SKATING** Use the *use a graph* strategy to compare the number of people who skate in California to the number of people who skate in Texas. (Lesson 9-6)

25. **FOOD** Of 77 students, 40 like pasta only, 15 like chicken only, and 22 like both pasta and chicken. Draw a Venn diagram to show how the sets of data are related. (Lesson 9-5)



Source: National Sporting Goods Association

GET READY for the Next Lesson

PREREQUISITE SKILL **Find the mean and median for each set of data.** (Lesson 9-2)

26. 89 ft, 90 ft, 74 ft, 81 ft, 68 ft

27. 76°, 90°, 88°, 84°, 82°, 78°

Extend 9-7

Spreadsheet Lab
Multiple-Line and -Bar Graphs

Main IDEA

Use a spreadsheet to make a multiple-line graph and a multiple-bar graph.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plot, **line graph, bar graph,** stem and leaf plot, circle graph, and Venn diagrams, **and justify the selection.**

In Lessons 9-4 and 9-7, you interpreted data in a multiple-bar graph and in a multiple-line graph, respectively. You can use a Microsoft® Excel® spreadsheet to make these two types of graphs.

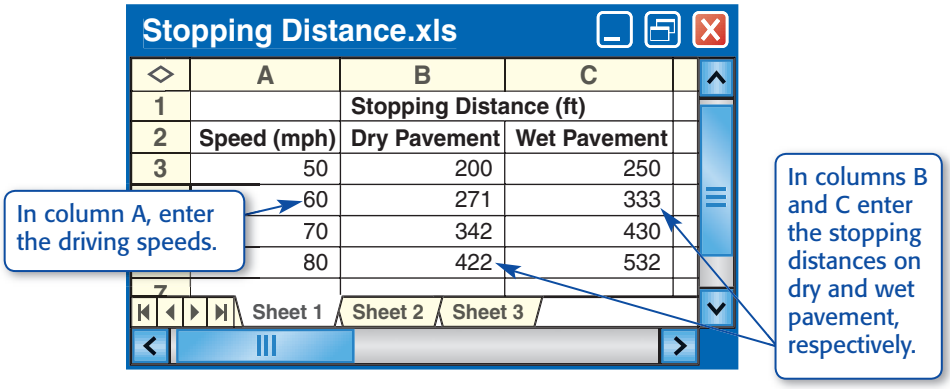
ACTIVITY

1 The stopping distances for a car on dry pavement and on wet pavement are shown in the table at the right.

Speed (mph)	Stopping Distance (ft)	
	Dry Pavement	Wet Pavement
50	200	250
60	271	333
70	342	430
80	422	532

Source: *Continental Teves*

Set up a spreadsheet like the one shown below.

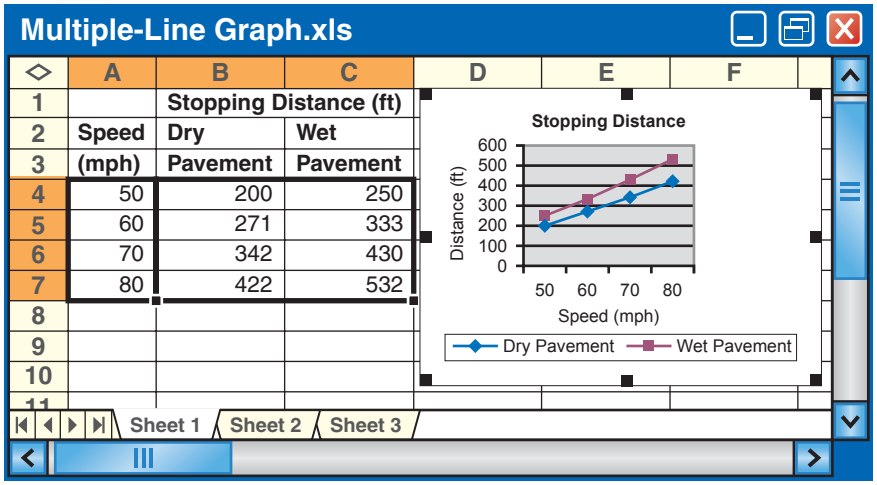


The next step is to "tell" the spreadsheet to make a double-line graph for the data.

1. Highlight the data in columns B and C, from B2 through C6.
2. Click on the Chart Wizard icon.
3. Choose the line graph and click Next.
4. To set the *x*-axis, choose the Series tab and press the icon next to the Category (X) axis labels.

This tells the spreadsheet to read the data in columns B and C.

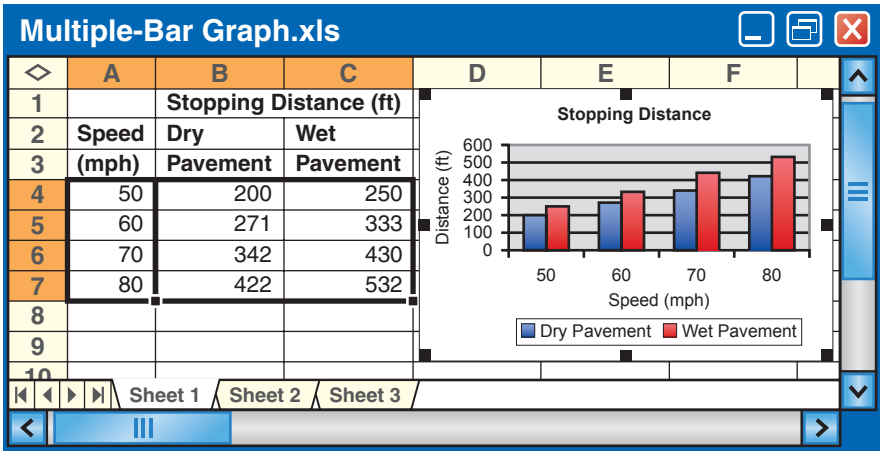
5. On the spreadsheet, highlight the data in column A, from A3 through A6.
6. Press the icon on the bottom of the Chart Wizard box to automatically paste the information.
7. Click Next and enter the chart title and labels for the *x*- and *y*-axes.
8. Click Next and then Finish.



ACTIVITY

2 Use the same data to make a multiple-bar graph.

- Highlight the data in columns B and C, from B2 through C6.
- Click on the Chart Wizard icon.
- Click on Column and Next to choose the vertical bar graph.
- Complete steps 4–8 from Activity 1.



Analyze the Results

1. Explain the steps you would take to make a multiple-line graph of the stopping distances that include the speeds 55, 65, and 75.
2. **COLLECT THE DATA** Collect two sets of data that represent the number of boys and the number of girls in your class born in the Spring, Summer, Fall, and Winter. Use a spreadsheet to make a multiple-line or -bar graph of the data. Justify your selection.

9-8 Select an Appropriate Display

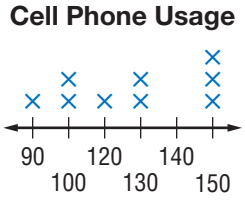
Main IDEA

Select an appropriate display for a set of data.

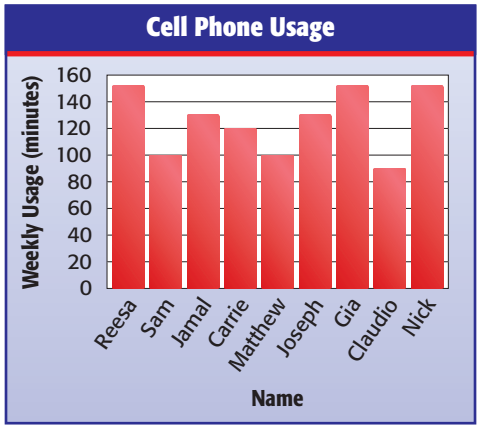
Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including line plot, line graph, bar graph, stem and leaf plot, circle graph, and Venn diagrams, and justify the selection.**

GET READY for the Lesson

CELL PHONES The displays at the right show the results of a survey in which teenagers were asked how many minutes they use their cell phone in one week.



1. Which display shows who uses 150 minutes weekly?
2. Which display allows you to easily find the range?
3. Does either display show the percent of those surveyed who use 130 minutes? If not, which display could you use to display this data?



Some displays are more appropriate than others.

EXAMPLE 1 Select an Appropriate Display

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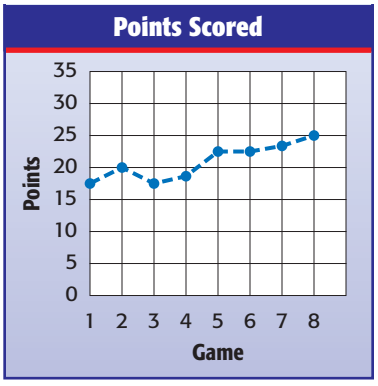
SPORTS Which display allows you to easily see that the number of points scored by a volleyball team has been increasing?

Points Scored

Stem	Leaf
1	7 8 9
2	0 2 2 3 5

1 | 7 = 17 points

The line graph clearly shows that the number of points scored from game to game has been increasing.



CHECK Your Progress

a. **SPORTS** Which display allows you to easily see the greatest number of points scored?

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Some ways of displaying data are more appropriate than others. When deciding on what type of display to use, ask the following questions.

- What type of data do you want to display?
- What should the graph or display show?

CONCEPT Summary — Statistical Displays

Display	Use
Bar Graph	shows the number of items in specific categories
Circle Graph	compares parts of the data to the whole
Histogram	shows frequency of data divided into equal intervals
Line Graph	shows change over a period of time
Line Plot	shows how many times each number occurs in the data
Stem-and-Leaf Plot	lists all individual numerical data in a condensed form
Venn Diagram	shows how two or more sets of data are related

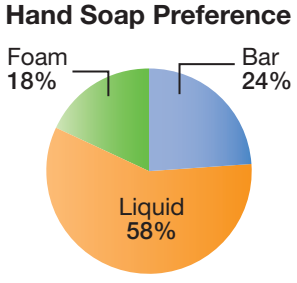
Real-World Link
The U.S. soap, bath and shower market totaled some $1.6 billion in 2004.
Source: *Mintel International Group*

EXAMPLE 2 Select an Appropriate Display

MARKETING **A marketing company conducted a survey to determine what percent of those surveyed prefer bar soap to other types of hand soap. The table shows the results. Select an appropriate display for the data. Then make the display.**

Favorite Type of Hand Soap	
Type of Soap	Responses
Bar	12
Liquid	29
Foam	9

If the company wants to show the specific numbers, a bar graph would be appropriate. However, the company wants to show how each part is related to the whole. So, a circle graph is best.



CHECK Your Progress

Select an appropriate display for each set of data. Then make the display.

b.

Hair Stylist's Daily Clients	
Clients per hour	Frequency
1–2	12
3–4	8
5–6	1

c.

Science Report Scores			
80	89	95	91
79	92	95	80
89	90	87	85

CHECK Your Understanding

Example 1 (p. 484)

1. Select an appropriate display for the number of siblings for each student in a classroom.

Examples 2 (p. 485)

Select an appropriate display for each set of data. Then make the display.

2.

Monthly Car Sales	
Month	Number Sold
January	10
February	8
March	12
April	25
May	31

3.

Decorating a Parade Float	
Number of Volunteers	Completion Time (h)
75	2
68	3
60	4
53	5

Exercises

HOMEWORK HELP

For Exercises	See Examples
4–5	1
6–9	1, 2

Select an appropriate display for each situation.

4. the favorite dinner food of the seventh grade students
5. the portions of a piece of farm land used for planting various types of crops

Select an appropriate display for each situation. Then make the display.

6.

Ice Cream Cone Sales					
25	35	30	45	29	36
20	40	22	44	20	40
23	50	26	42	31	42
27	28	29	40	34	38
26	29	30	30	35	33

7.

Student Characteristics	
Name Begins with B	Birthday in April
Bret	Ashanti
Breanne	Blake
Bianca	Bret
Blake	Judie

8.

Daily Low Temperatures	
Day	Temp. (°F)
Monday	55
Tuesday	58
Wednesday	60
Thursday	58
Friday	65

9.

Favorite Color	
Color	Number of Students
Blue	18
Red	22
Green	14
Yellow	20

EXTRA PRACTICE

See pages 741, 763.

Math Online

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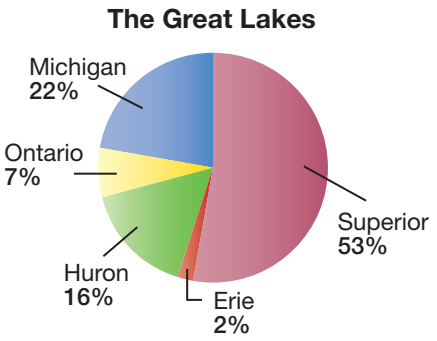
10. **LAKES** The circle graph shows the approximate percent of the total volume each of the Great Lakes holds. Display the data using another type of display. Then write a convincing argument telling which display is most appropriate.



H.O.T. Problems

11. **OPEN ENDED** Give an example of a data set that would be best represented in a line graph.

12. **CHALLENGE** Which display(s) allows you to easily determine the range of the data set? Explain your reasoning.

13. **WRITING IN MATH** Explain when you would use a bar graph to display a set of data and when you would use a line graph.

TEST PRACTICE

14. Which type of display would allow you to easily see the relationship between the data in the table?

Fiction	Missy, Fran, Dwayne, Robin, Julie, Alma, Lakita
Mystery	Dwayne, Andrea, Alonso, Robin, Lakita, Fran, Takara

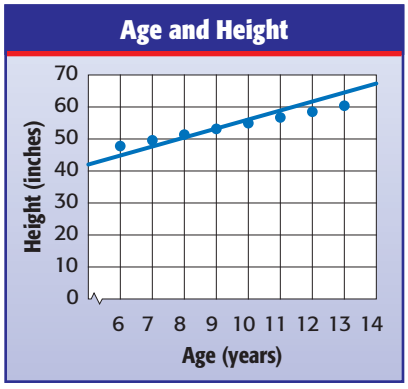
A line graph
B Venn diagram
C bar graph
D scatter plot

15. Which of the following situations involve data that are best displayed in a bar graph?

F A store's profit over the past month
G The test scores of 30 students in Mr. Thomas' math class.
H The size in square miles of each of the world's oceans.
J How much time students study for a test and their respective test scores.

Spiral Review

16. **HEALTH** Use the scatter plot at the right to predict the height of a 16-year-old. (Lesson 9-7)



Draw a Venn diagram that represents each situation. (Lesson 9-5)

17. The factors of 20 are 1, 2, 4, 5, 10, and 20. The factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, and 36.

18. Of 16 flowers, 8 are yellow only, 5 are red only, and 3 are both yellow and red.

Find the percent of each number. (Lesson 8-1)

19. 30% of 80

20. 17% of 100

21. 75% of 120

GET READY for the Next Lesson

PREREQUISITE SKILL **Determine whether each statement is *true* or *false*.** (Lesson 9-7)

22. The vertical scale on a line graph must have equal intervals.

23. You do not need to label the axes of a line graph.

9-9 Misleading Statistics

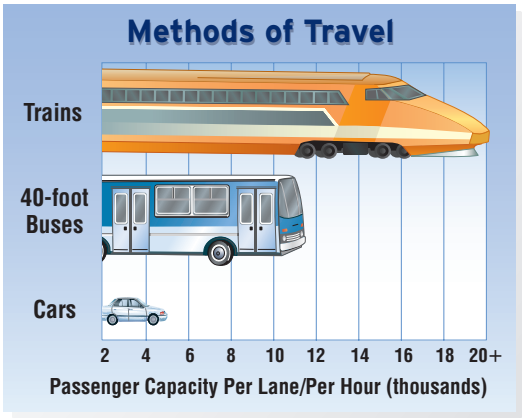
Main IDEA

Recognize when statistics and graphs are misleading.

Targeted TEKS 7.11 The student understands that the way a set of data is displayed influences its interpretation. **(B) make inferences and convincing arguments based on an analysis of given or collected data.** *Also addresses TEKS 7.12(B), 7.13(A).*

GET READY for the Lesson

TRANSPORTATION A graph like the one at the right appeared in a brochure describing various modes of transportation.



1. About how many more passengers per lane can a 40-foot bus transport in an hour than a car can transport?
2. Is the bus on the graph twice as large as the car? Explain.
3. Do you think the graph appeared in a brochure for a train/bus transit company or for a car company? What makes you think so?

Graphs let readers analyze and interpret data easily, but are sometimes drawn to influence conclusions by misrepresenting the data.

EXAMPLE 1 Drawing Conclusions from Graphs

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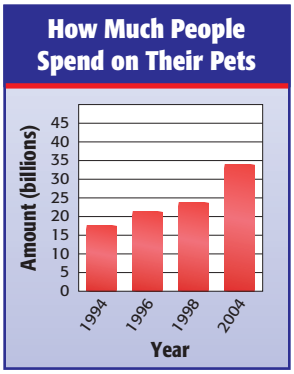
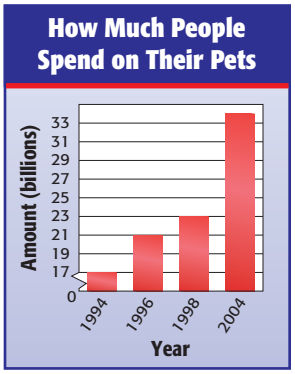
PETS **Which graph below suggests that, in 2004, people spent more than twice the amount they spent in 1998? Is this a valid conclusion? Explain.**

Graph A



Graph B



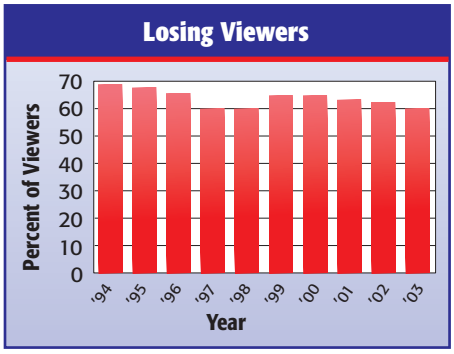
In Graph B, the lengths of the bars indicate that, in 2004, people spent more than twice the amount they spent in 1998. However, the amount spent in 2004, $34 billion, is not more than twice the amount spent in 1998, $23 billion.

A break in the scale in Graph B is a reminder that the scale had been compressed.

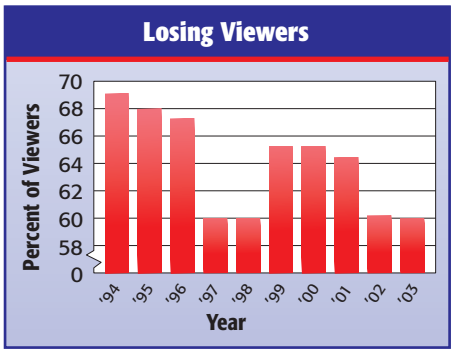
CHECK Your Progress

a. **TELEVISION** Both bar graphs show the percent of viewers that watch network television. Which graph makes it appear that the number of viewers is decreasing rapidly? Is this a valid conclusion? Explain.

Graph A



Graph B



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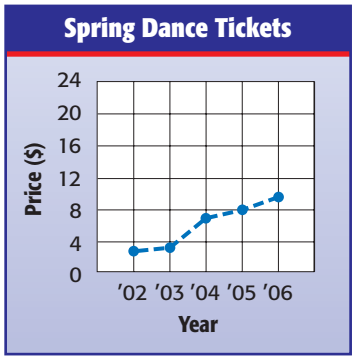
The use of different scales can influence conclusions drawn from graphs.

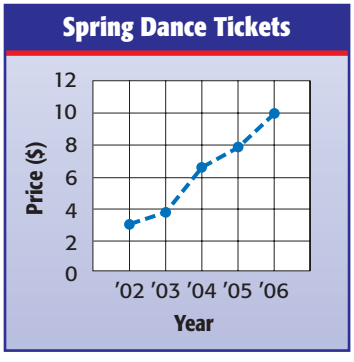
EXAMPLE Changing the Interval of Graphs

2 **SCHOOL DANCES** **The graphs show how the price of spring dance tickets increased.**

Graph A



Graph B



Do the graphs show the same data? If so, explain how they differ.
The graphs show the same data. However, the graphs differ in that, on the vertical axis, Graph A uses an interval of 4, and Graph B uses an interval of 2.

Which graph makes it appear that the prices increased more rapidly?
Graph B makes it appear that the prices increased more rapidly even though the price increase is the same.

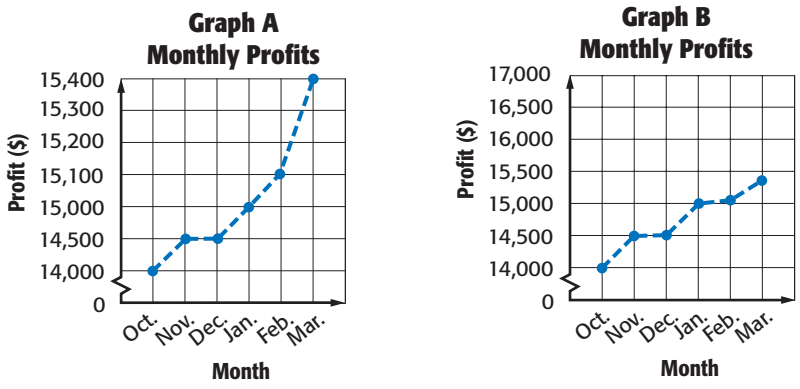
Which graph might the student council use to show that while ticket prices have risen, the increase is not significant? Explain.
They might use Graph A. The scale used on the vertical axis of this graph makes the increase appear less significant.

STUDY TIP

Changing Scales
To emphasize a change over time, reduce the scale interval on the vertical axis.

CHECK Your Progress

b. **BUSINESS** The line graphs show monthly profits of a company from October to March. Which graph suggests that the business is extremely profitable? Is this a valid conclusion? Explain.



Statistics can also be used to influence conclusions.

EXAMPLE Misleading Statistics

3 **MARKETING** **An amusement park boasts that the average height of their roller coasters is 170 feet. Explain how this is misleading.**

Park Rollercoaster Heights	
Coaster	Height (ft)
Viper	109
Monster	135
Red Zip	115
Tornado	365
Riptide	126

mean: $\frac{109 + 135 + 115 + 365 + 126}{5} = \frac{850}{5}$

$= 170$

median: 109, 115, 126, 135, 365

mode: none

The average used by the park was the mean. This measure is much greater than most of the heights listed because of the outlier, 365 feet. So, it is misleading to use this measure to attract visitors.

A more appropriate measure to describe the data would be the median, 126 feet, which is closer to the height of most of the coasters.

Real-World Link . . . . .
The tallest roller coaster in the world is the Kingda Ka in Jackson, New Jersey, with a height of 456 feet.
Source: ultimaterollercoaster.com

CHECK Your Progress

c. **SALARY** ABC Corporation claims the average salary for its employees is more than $60,000, while the average salary at XYZ Incorporated is only $25,000. Use the table to explain their reasoning and determine where you would prefer to work.

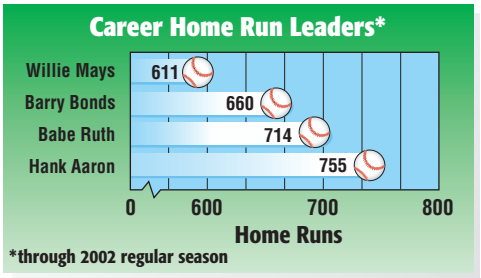
Position	Salary ($)	
	ABC Corp.	XYZ Inc.
President	500,000	120,000
1st Vice President	400,000	85,000
2nd Vice President	240,000	75,000
Sales Staff (5)	20,000	40,000
Supporting Staff (2)	15,000	25,000
Catalog Staff (7)	9,000	22,500

CHECK Your Understanding

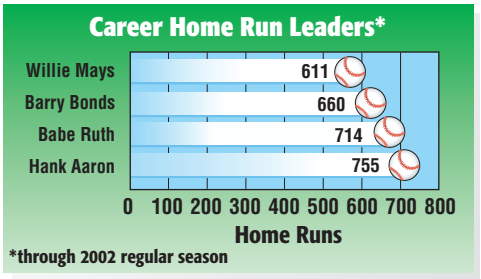
Examples 1, 2 (pp. 488–490)

1. **BASEBALL** Refer to the graphs below. Which graph suggests that Hank Aaron hit four times as many home runs as Willie Mayes? Is this a valid conclusion? Explain.

Graph A



Graph B



Example 3 (p. 490)

2. **TUNNELS** The table lists the five largest land vehicle tunnels in the U.S. Write a convincing argument for which measure of central tendency you would use to emphasize the average length of the tunnels.

U.S. Vehicle Tunnels on Land

Name	Length (ft)
Anton Anderson Memorial	13,300
E. Johnson Memorial	8,959
Eisenhower Memorial	8,941
Allegheny	6,072
Liberty Tubes	5,920

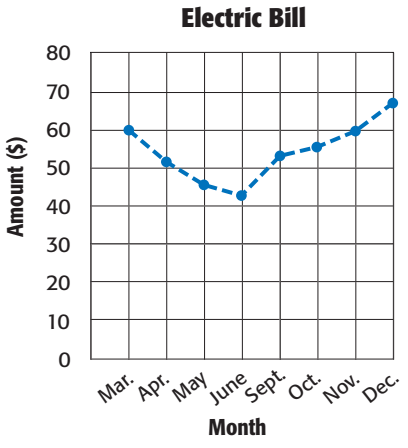
Source: Federal Highway Association

Exercises

HOMEWORK HELP

For Exercises	See Examples
3, 6–9	1, 2
4–5	3

3. **UTILITIES** The line graph shows the monthly electric bill for the condominium that Toshiko is interested in renting. Why is the graph misleading?



TRAVEL **For Exercises 4 and 5, use the table.**

4. Find the mean, median, and mode of the data. Which measure might be misleading in describing the average annual number of visitors that visit these sights? Explain.
5. Which measure would be best if you wanted a value close to the most number of visitors? Explain.

Annual Sight-Seeing Visitors

Sight	Visitors*
Cape Cod	4,600,000
Grand Canyon	4,500,000
Lincoln Memorial	4,000,000
Castle Clinton	4,600,000
Smoky Mountains	10,200,000

Source: *The World Almamac*
*Approximation

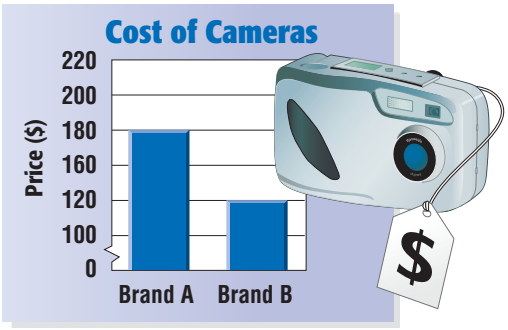
6. **STOCK** The graphs below show the increases and decreases in the monthly closing prices of Skateboard Depot's stock.

Graph A

Graph B

Suppose you are a stockbroker and want to show a customer that the price of the stock has been fairly stable since January. Write a convincing argument as to which graph you should show the customer.

MONEY For Exercises 7–9, use the graph that shows the cost of two cameras.



7. Based on the size of the bars, compare the costs of Brand A and Brand B.
8. Explain how this graph may be misleading.
9. Redraw the graph to show that Brand A and Brand B cost about the same.

GEOGRAPHY For Exercises 10–13, use the table that shows the sizes of the Caribbean Islands.

Caribbean Islands

Island	Area (sq mi)	Island	Area (sq mi)
Antigua	108	Martinique	425
Aruba	75	Puerto Rico	3,339
Barbados	166	Tobago	116
Curacao	171	Virgin Islands, UK	59
Dominica	290	Virgin Islands, U.S.	134

Source: U.S. Census Bureau

10. Find the mean, mode, and median of the data.
11. Which average would be misleading in describing the size of the islands? Explain your reasoning.
12. Which average would most accurately describe the data?
13. A travel agent tells you that most of the Caribbean islands are about 490 square miles in size. Which average is the agent using and is this average misleading? Explain your reasoning.

EXTRA PRACTICE
See pages 741, 763.
MathOnline
Self-Check Quiz at tx.msmath2.com

H.O.T. Problems

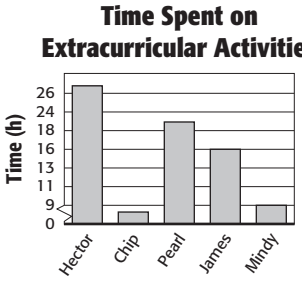
14. **CHALLENGE** Does adding values that are much greater or much less than the other values in a set of data affect the median of the set? Give an example to support your answer.

15. **OPEN ENDED** Create a misleading graph given the following bowling scores. game 1: 134, game 2: 125, game 3: 150, and game 4: 160.

16. **WRITING IN MATH** Describe at least two ways in which the presentation of data can be misleading.

TEST PRACTICE

17. The bar graph shows the average number of hours each week that a group of students attend an extracurricular activity after school.



Which statement best tells why the graph may be misleading if you want to use the graph to compare the number of hours the students attend an extracurricular activity?

A The vertical scale should show days instead of hours.

B The graph does not show which activity each person attended.

C The intervals on the vertical scale are inconsistent.

D The graph's title is misleading.

18. A department store surveyed 100 teenagers about their preferred style of jeans. The table shows the results.

Survey Results	
Style of Jeans	Number of Teenagers
Boot Cut	22
Low Rise	45
Slouch	28
Relaxed	5

The store uses these survey results to order jeans. Which conclusion best reflects the data collected?

F Less than half of the order should be low rise jeans.

G About one fifth of the order should be relaxed fit jeans.

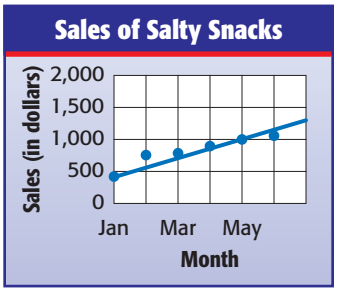
H Forty percent of the jeans ordered should be slouch jeans.

J About half of the jeans ordered should be boot cut jeans.

Spiral Review

19. Which graph would you use to display data that show change over a period of time? (Lesson 9-8)

20. **SNACKS** Refer to the graph that shows a grocery store's sales of salty snacks like potato chips and pretzels. If the trend continues, about what will be the sales in September? (Lesson 9-7)



CHAPTER 9

Study Guide and Review

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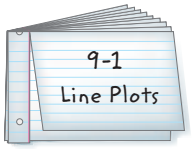
FOLDABLES Study Organizer

GET READY to Study

Be sure the following Key Concepts are noted in your Foldable.



Key Concepts

Mean (Lesson 9-2)
- The mean of a set of data is the sum of the data divided by the number of items in a data set.

Median (Lesson 9-2)
- The median of a set of data is the middle number of the ordered data, or the mean of the middle two numbers.

Mode (Lesson 9-2)
- The mode or modes of a set of data is the number or numbers that occur most often.

Statistical Displays (Lessons 9-1, 9-3 through 9-9)
- Line plots show how many times each number occurs in a data set.
- Stem-and-leaf plots list all individual numerical data in a condensed form.
- Bar graphs show the number of items in specific categories.
- Histograms show the frequency of data divided into smaller intervals.
- Venn diagrams show how two or more sets of data are related.
- Circle graphs compare parts of the data to the whole.
- Line graphs show change over a period of time.
- Scatter plots determine if there is a relationship between two sets of data.

Key Vocabulary

analyze (p. 443)
bar graph (p. 461)
cluster (p. 443)
data (p. 442)
histogram (p. 462)
inferences (p. 457)
leaf (p. 456)
line graph (p. 476)
line plot (p. 442)
mean (p. 448)
measures of central tendency (p. 448)
median (p. 449)
mode (p. 449)
outlier (p. 443)
range (p. 443)
scatter plot (p. 477)
statistics (p. 442)
stem (p. 456)
stem-and-leaf plot (p. 456)
Venn diagram (p. 469)

Vocabulary Check

State whether each sentence is *true* or *false*. If *false*, replace the underlined word or number to make a true sentence.

1. The range is the difference between the greatest and the least values in a set of data.
2. The mode divides a set of data in half.
3. A graph that uses bars to make comparisons is a bar graph.
4. A scatter plot shows two sets of related data.
5. The median is a data value that is quite separated from the rest of the data.
6. The mean is the arithmetic average of a set of data.
7. The number or item that appears most often in a set of data is the mode.
8. The range is the middle number in a set of ordered data, or the mean of the middle two numbers.

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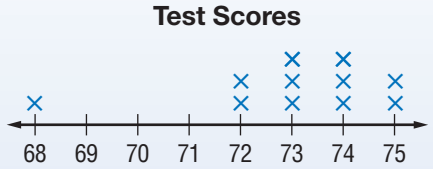
Lesson-by-Lesson Review

9-1 Line Plots (pp. 442–447)

Display each set of data in a line plot. Identify any clusters, gaps, or outliers.

9. 10°, 12°, 10°, 8°, 13°, 10°, 8°, 12°.
10. 7 ft, 8 ft, 8 ft , 9 ft, 14 ft, 9 ft, 8 ft, 7 ft
11. Number of Calories: 43, 41, 42, 45, 43, 42, 43, 46, 44, 44

Example 1 **Display the test scores 72, 75, 72, 74, 73, 68, 73, 74, 74, 75, and 73 in a line plot. Identify any clusters, gaps, or outliers.**



There is a cluster from 72 to 75, a gap between 68 and 72, and an outlier at 68.

9-2 Measures of Central Tendency and Range (pp. 448–454)

Find the mean, median, and mode. Round to the nearest tenth if necessary.

12. Number of siblings: 2, 3, 4, 3, 4, 3, 8, 7, 2
13. 89°, 76°, 93°, 100°, 72°, 86°, 74°
14. **MONEY** Which measure, mean, median, mode, or range best represents the amount of money students spent on clothing?

Money Spent ($)			
125	108	172	136
121	112	218	172

Example 2 **Find the mean, median, and mode for the following college students' ages: 23, 22, 19, 19, and 20.**

mean: $\frac{23 + 22 + 19 + 19 + 20}{5}$ or 20.6 years

median: 20, the middle value of the ordered set

mode: 19, the data value that occurs most often

9-3 Stem-and-Leaf Plots (pp. 456–460)

Display each set of data using a stem-and-leaf plot.

15. Hours worked: 29, 54, 31, 26, 38, 46, 23, 21, 32, 37
16. Number of points: 75, 83, 78, 85, 87, 92, 78, 53, 87, 89, 91
17. Birthdates: 9, 5, 12, 21, 18, 7, 16, 24, 11, 10, 3, 14

Example 3 **Display the number of pages read 12, 15, 17, 20, 22, 22, 23, 25, 27, and 35 in a stem-and-leaf plot.**

The tens digits form the stems, and the ones digits form the leaves.

Pages Read

Stem	Leaf
1	2 5 7
2	0 2 2 3 5 7
3	5

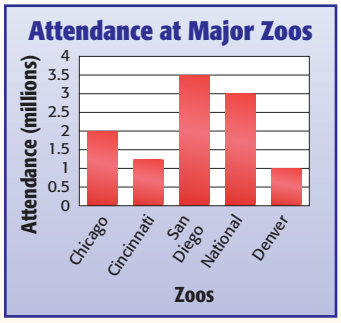
2|3 = 23 pages

CHAPTER 9

Study Guide and Review

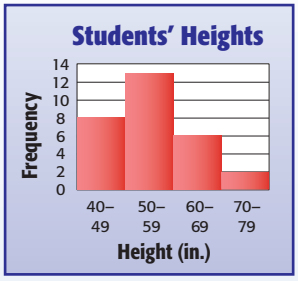
9-4 Bar Graphs and Histograms (pp. 461–467)

ATTENDANCE For Exercises 18–20, refer to the graph.



18. Which zoo did the most people attend?
19. About what was the total attendance for all five zoos?
20. Write a statement comparing the attendance at the National Zoo to the attendance at the Denver Zoo.

Example 4 The histogram below shows the heights of students in a classroom.



How many students are 50–59 inches tall?

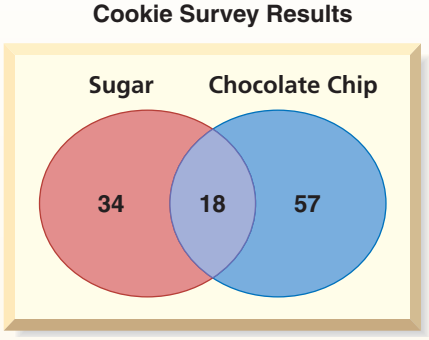
13 students

Write a statement comparing the 70–79 interval to the 60–69 interval.

The 60–69 interval is three times larger than the 70–70 interval.

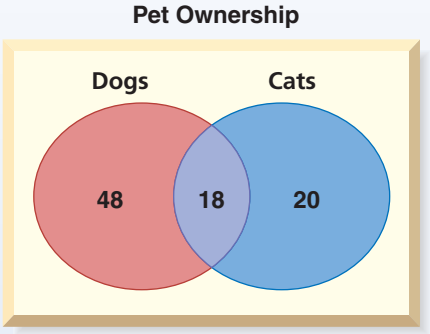
9-5 Venn Diagrams (pp. 469–472)

For Exercises 21 and 22, use the Venn diagram that shows students' favorite type of cookies.



21. How many students only prefer chocolate chip cookies?
22. How many students were surveyed?

Example 5 Logan's Pet Store surveyed 120 residents. The results showed that 38 residents were cat owners, 66 residents were dog owners, and 18 residents owned both types of pets. How many residents owned neither a cat nor a dog?



only dogs: $66 - 18 = 48$

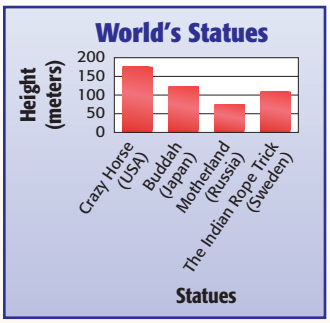
only cats: $38 - 18 = 20$

neither dog nor cat: $120 - 48 - 20 - 18 = 34$

So, 34 residents owned neither type of pet.

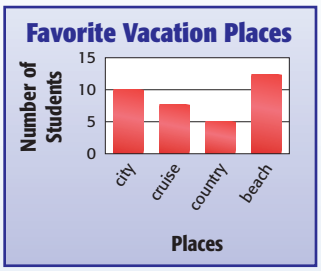
9-6 PSI: Use a Graph (pp. 474–475)

STATUES For Exercises 23 and 24, use the graph that shows the heights of free-standing statues in the world.



23. Which statue is the tallest?
24. Compare the height of the *Motherland* statue to the height of the *Crazy Horse* statue.

Example 6 The graph shows the results of a survey about favorite vacation places.

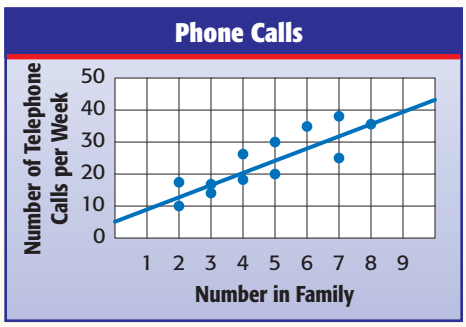


Which place was favored by most students?

The beach was favored by 12 students, which was the greatest number.

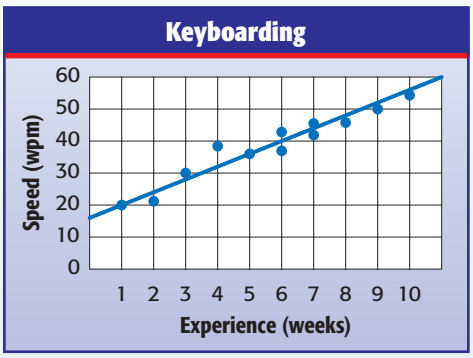
9-7 Line Graphs and Scatter Plots (pp. 476–481)

PHONE CALLS For Exercises 25 and 26, use the graph showing the number of people in a family and the number of weekly calls.



25. Describe the relationship between the two sets of data.
26. Predict the number of weekly phone calls for a family of 10.

Example 7 The scatter plot below shows the keyboarding speeds in words per minute of 12 students.



Describe the relationship between the two sets of data.

The graph shows a positive relationship. That is, as the weeks pass, speed increases.

CHAPTER 9

Study Guide and Review

9-8 Select an Appropriate Display (pp. 484–487)

Select an appropriate display for each situation.

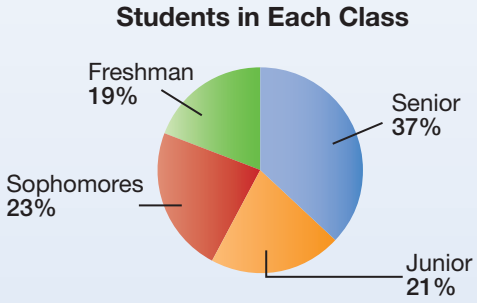
27. the attendance at a theme park over 20 years
28. the parts of a family budget
29. a list of scores on an English test
30. the ticket prices of the top 20 money earning concerts arranged by intervals
31. **FRIENDS** Michelle surveyed her friends to find out their interests. Select and make an appropriate display.

Friends' Interests			
Favorite Color is Blue		Favorite Sport is Hockey	
J.T.	Colleen	Roger	Jessie
Miko	Gustavo	John	Shawnel
Julie	John	J.T.	Pam
Pam	Mara	Julie	Jean

Example 8 **Use the table to show the parts of the entire student body in each class. Select and make an appropriate display.**

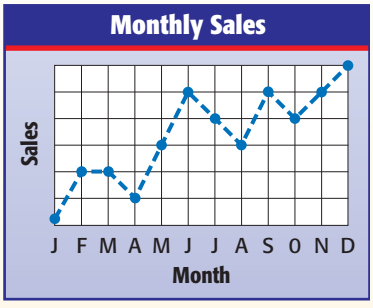
Students in Each Class	
Seniors	185
Juniors	105
Sophomores	115
Freshman	95

You need to compare one class of students to the entire student body. So, use a circle graph.

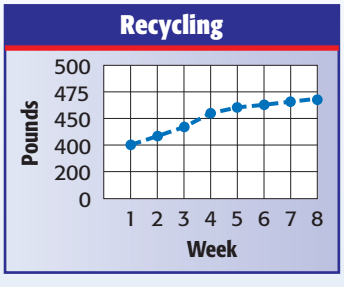


9-9 Misleading Statistics (pp. 488–493)

32. **SALES** The graph below shows the monthly CD sales for one year at the Music Madness Warehouse. Why might the graph be misleading?



Example 9 **The graph shows the pounds of cans recycled in eight weeks. Why might this graph be misleading?**

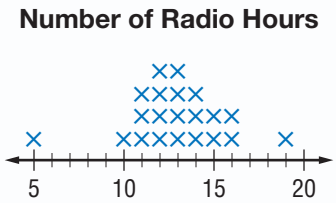


The scale is not divided into equal intervals. It has intervals of 200, 50, and 25.

CHAPTER 9

Practice Test

For Exercises 1 and 2, use the line plot that shows the number of hours students spend listening to the radio per week.



1. Identify any clusters, gaps or outliers.
2. Describe how the range of data would change if 5 was not part of the data set.

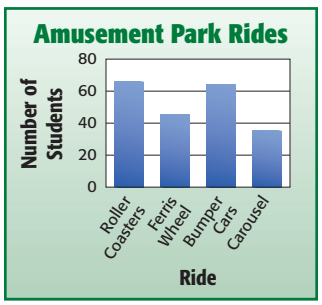
Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

3. 12.4 in., 17.9 in., 16.5 in., 10.2 in.
4. $10, $12, $18, $14, $12

Display each data set in a stem-and-leaf plot.

5. 37°, 59°, 26°, 42°, 57°, 53°, 31°, 58°
6. $461, $422, $430, $425, $425, $467, $429

7. **TEST PRACTICE** The graph below shows the type of amusement park rides students enjoy. Which statement is best supported by the data?



A Twice as many students enjoy riding roller coasters than the carousel.
B The Ferris wheel is liked least.
C Most students enjoy the bumper cars.
D About 50 students like the carousel.

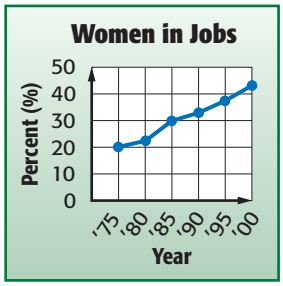
8. **GRADES** Make a histogram for the following French test grades: 95, 76, 82, 90, 83, 76, 79, 82, 95, 85, 93, 81, and 63.

For Exercises 9 and 10, use the table.

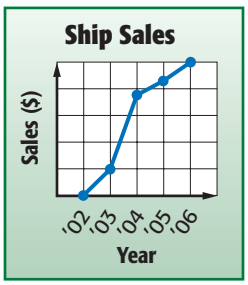
Factors of 12	Factors of 18
1, 2, 3, 4, 6, 12	1, 2, 3, 6, 9, 18

9. Draw a Venn diagram of the factors. What are the total number of factors?
10. List the factors that are shared.

11. **EMPLOYMENT** The line graph show the percent of women who had jobs outside the home from 1975 to 2000. Use the graph to predict the number of women who will have jobs outside the home in 2010.



12. **TEST PRACTICE** The line graph shows ship sales at Marvin's Marina in thousands of dollars. Which statement best tells why the graph is misleading?



F The graph's title is misleading.
G The intervals on the horizontal scale are inconsistent.
H The graph does not show any data.
J The vertical axis is not labeled.

CHAPTER 9

Texas Test Practice
Cumulative, Chapters 1–9

Read each question. Then fill in the correct answer on the answer document provided by your teacher or on a sheet of paper.

1. Mr. Ed's Used Car Lot bought 5 used cars for $32,000. The business later bought another used car for $4,600. What was the mean cost of all of the used cars?

   A $3,200.00

   B $4,600.00

   C $6,100.00

   D $8,500.00

2. A fitness club charges a membership fee of $50 plus $25 each month you belong to the club. Which expression could be used to find the total cost of belonging to the club for 10 months?

   F $50(10) + 25$

   G $50 - 25(10)$

   H $50 + 25(10)$

   J $50(10) + 25(10)$

3. **GRIDDABLE** Sierra had 11.5 yards of fabric. She wants to use 20% of the fabric to make a flag. Determine the amount of fabric in yards she wants to use.

4. Ms. Thompson made 17 liters of punch for a party. The punch contained 5 liters of orange juice. Which equation could be used to find y, the percent of orange juice in the punch?

   A $\frac{17}{5} = \frac{y}{100}$

   B $\frac{5}{17} = \frac{y}{100}$

   C $\frac{5}{17} = \frac{100}{y}$

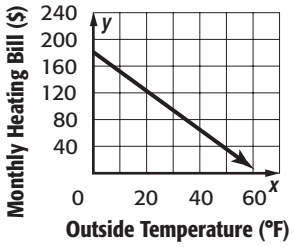
   D $\frac{17}{y} = \frac{100}{5}$

5. The table shows the relationship between the outside temperature, x, and a monthly heating bill, y.

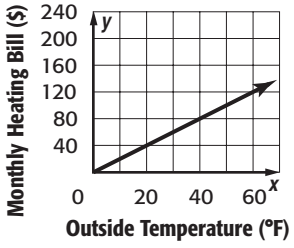
Temperature, x (°F)	Heating Bill, y (dollars)
40	65
32	92
20	121
8	145

Which graph best represents the data?

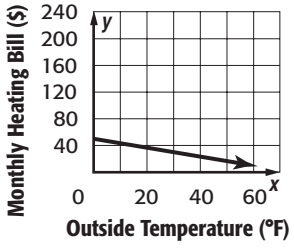
F



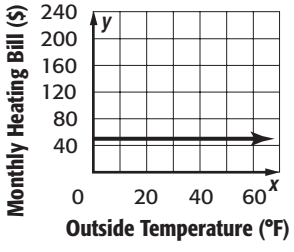
G



H



J



6. A football team scored 20, 32, 28, 21, and 24 points in their first five games. How many points should they score in the next game so that the median and mode scores are equal?

   A 32 **C** 21

   B 24 **D** 20

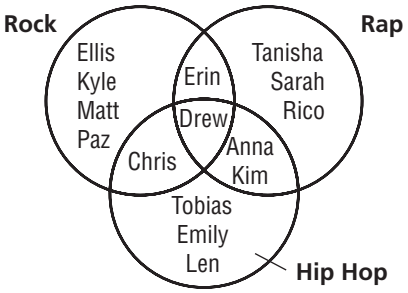
7. Which of the following displays gives the most detailed information about each of Kevin's friends and their music preferences?

F

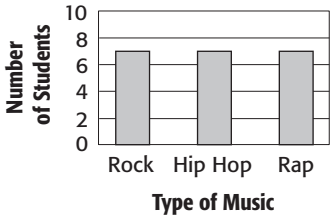
Music Preferences	
Music	**Number of Students**
Rock	7
Rap	7
Hip Hop	7

G **Music Preferences**

H **Music Preferences**



J **Music Preferences**



8. Taylor spends between $125 and $200 per month on food. Which is the best estimate of how much she spends on food in 6 months?

   A From $1,500 to $2,400

   B From $750 to $1,200

   C From $250 to $400

   D From $125 to $200

9. A store has 2,545 CDs. On Saturday, the store sold $12\frac{1}{2}\%$ of the CDs. What fraction of the CDs were sold on Saturday?

   F $\frac{1}{8}$ **H** $\frac{2}{9}$

   G $\frac{3}{25}$ **J** $\frac{2}{17}$

TEST-TAKING TIP

Question 10 If you find that you cannot answer every part of an open-ended question, do as much as you can. You may earn partial credit.

Pre-AP

Record your answers on a sheet of paper. Show your work.

10. The table shows how values of a painting increased over ten years.

Year	Value	Year	Value
1997	$350	2002	$1,851
1998	$650	2003	$2,151
1999	$950	2004	$2,451
2000	$1,200	2005	$2,752
2001	$1,551	2006	$3,052

   a. Make a line graph of the data.

   b. Use the graph to predict what the value of the painting will be in 2010.

NEED EXTRA HELP?										
If You Missed Question...	1	2	3	4	5	6	7	8	9	10
Go to Lesson...	9-2	1-6	8-1	8-2	9-7	9-2	9-8	1-1	5-6	9-7
For Help with Test Objective...	5	6	2	6	6	5	5	1	1	5