# 11-3 Circle Graphs

**MAIN IDEA**

Construct and interpret circle graphs.

**New Vocabulary**

**circle graph**

**Math Online**

glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz

## GET READY for the Lesson

**MOVIES** The graphic shows the results of a recent survey of 1,100 U.S. movie-goers.

1. What percent of U.S. movie-goers found a ringing cell phone the most annoying behavior at a movie theater?
2. What percent of U.S. movie-goers were annoyed with some kind of noise disturbance?

**Behaviors Americans Find Most Annoying at a Movie Theater**

| | |
|---|---|
| Someone talking on a cell phone during a movie | 73% |
| A cell phone ringing during a movie | 10% |
| Someone talking to their seatmate during a movie | 10% |
| Someone saving seats in a crowded theater | 4% |
| Someone loudly eating popcorn or some other snack during a movie | 3% |

**Source:** Braun Research

3. Which behavior was reported as the most annoying?
4. Are all the behaviors surveyed accounted for in the graphic? Explain.

A circle graph can be used to compare parts of a data set to the whole set of data. The entire circle represents the whole set, so the percents in a circle graph add up to 100.

### EXAMPLE 1 Construct a Circle Graph from Percents

**MOVIES** Construct a circle graph using the information above.

**Step 1** There are 360° in a circle. So, multiply each percent written as a decimal by 360° to find the number of degrees for each section of the graph.

Talking on a cell phone: $73\% \text{ of } 360° = 0.73 \cdot 360° \approx 263°$

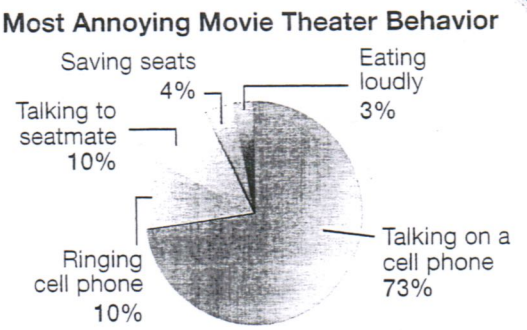
Ringing cell phone: $10\% \text{ of } 360° = 0.10 \cdot 360° \text{ or } 36°$

Talking to seatmate: $10\% \text{ of } 360° = 0.10 \cdot 360° \text{ or } 36°$

Saving seats: $4\% \text{ of } 360° = 0.04 \cdot 360° \approx 14°$

Eating loudly: $3\% \text{ of } 360° = 0.03 \cdot 360° \approx 11°$

**Step 2** Use a compass to draw a circle and a radius. Then use a protractor to draw an 11° angle. This section represents someone eating loudly. From the new radius, draw the next angle. Repeat for each of the remaining angles. Label each section. Then give the graph a title.

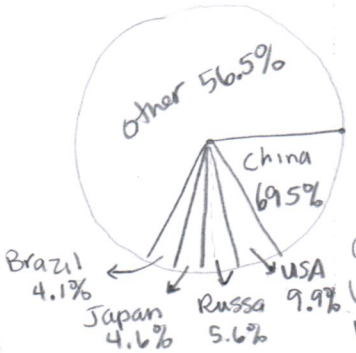



**CHECK Your Progress**

a. **CELL PHONES** The table gives the percentage share of the top five wireless-subscribing countries in the world. Construct a circle graph to represent the data.

| Global Wireless Subscribers | |
|---|---|
| **Country** | **Percentage Share** |
| China | 19.3 |
| U.S.A. | 9.9 |
| Russia | 5.6 |
| Japan | 4.6 |
| Brazil | 4.1 |
| Other | 56.5 |

**Source:** *Computer Industry Almanac*



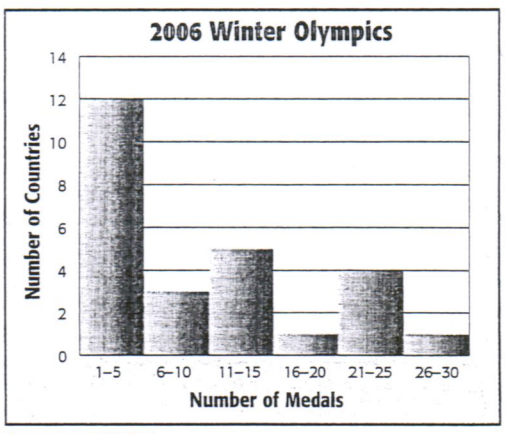

C - .193(360) = 69.5°
U - .099(360) = 35.6°
R - .056(360) = 20.2°
J - .046(360) = 16.7°
B - .041(360) = 14.8°
other 272.9°

When percents are not known, you must first determine what part of the whole each item represents.

**Real-World Link . . . .**
At the 2006 Winter Olympics, Apolo Anton Ohno of the United States won a gold medal in the men's 500-meter short track. His time was 41.935 seconds.
**Source:** MSNBC

## EXAMPLE Construct a Circle Graph from Data

**(2) OLYMPICS** Construct a circle graph of the data in the histogram at the right.




**Source:** MSNBC

**Step 1** Find the total number of countries.

$12 + 3 + 5 + 1 + 4 + 1 = 26$

**Step 2** Find the ratio that compares the number in each medal count to the total number of countries. Round to the nearest hundredth.

1 to 5: $12 \div 26 \approx 0.46$
6 to 10: $3 \div 26 \approx 0.12$
11 to 15: $5 \div 26 \approx 0.19$
16 to 20: $1 \div 26 \approx 0.04$
21 to 25: $4 \div 26 \approx 0.15$
26 to 30: $1 \div 26 \approx 0.04$

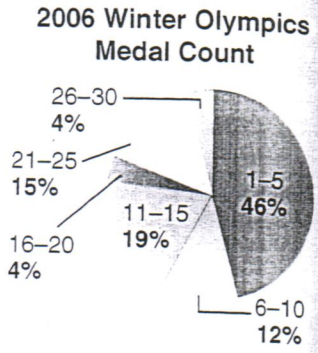
**Step 3** Use these ratios to find the number of degrees of each section. Round to the nearest degree if necessary.

1 to 5: $0.46 \cdot 360 = 165.6$ or about 166
6 to 10: $0.12 \cdot 360 = 43.2$ or about 43
11 to 15: $0.19 \cdot 360 = 68.4$ or about 69
16 to 20: $0.04 \cdot 360 = 14.4$ or about 14
21 to 25: $0.15 \cdot 360 = 54$
26 to 30: $0.04 \cdot 360 = 14.4$ or about 14

**Study Tip**

**Rounding**
In Step 3, 68.4 was rounded to 69 so that the total number of degrees would equal 360°.

**Step 4** Use a compass and a protractor to draw a circle and the appropriate sections. Label each section and give the graph a title. Write the ratios as percents.




**CHECK Your Progress**

b. **BIRTHPLACES** The table gives the region of birth and number of people living in the United States who were born in a different country. Construct a circle graph of the data.

**Foreign-Born Residents of the United States**

| Region of Birth | Number of People |
|---|---|
| Europe | 4,915,557 |
| Asia | 8,226,254 |
| Africa | 881,300 |
| Oceania | 168,046 |
| Latin America | 16,086,974 |
| North America | 829,442 |

**Source:** U.S. Census Bureau

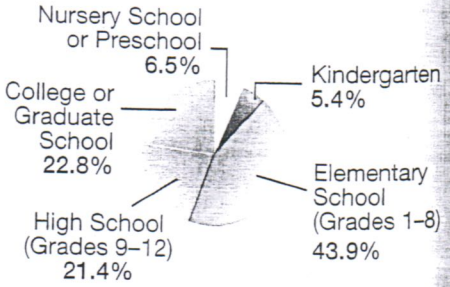
**Real-World Link . . . .**
In the academic year 2003–2004, 57% of all degrees awarded by 4-year institutions and 62% of all degrees awarded by 2-year institutions were awarded to women.
**Source:** National Center for Education Statistics

## EXAMPLE Analyze and Interpret Data

**(3) SCHOOL** **Use the circle graph at the right to describe the makeup of the school enrollment of persons 3 years or older who are enrolled in school in the United States.**

More persons were enrolled in elementary school than in any other category. More than $\frac{3}{4}$ of the total enrolled are in a preK-12 program. The number of persons enrolled in high school and the number of persons enrolled in college or graduate school are about the same.

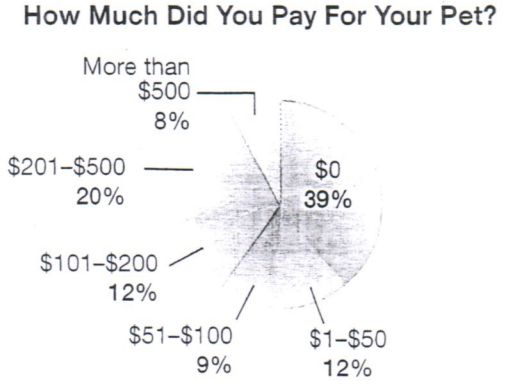
**School Enrollment of Persons 3 Years or Older Enrolled in School**




**Source:** U.S. Census Bureau

## CHECK Your Progress

c. **PETS** Use the circle graph at the right to describe the makeup of the dollar amount Americans pay for their pets.




**Source:** American Animal Hospital Association

## CHECK Your Understanding

Examples 1, 2 (pp. 582–584)

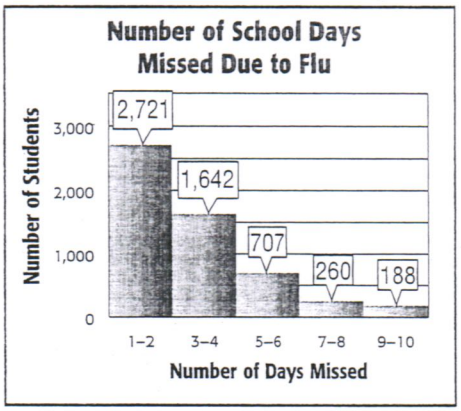
Construct a circle graph for each set of data.

1.

| Frequency of Exercise | |
|---|---|
| Several Times a Day or Once a Day | 32% |
| Several Times a Week | 33% |
| Several Times a Month or Once a Month | 15% |
| A Few Times a Year or Never | 19% |
| Not Sure | 1% |

**Source:** FOX News

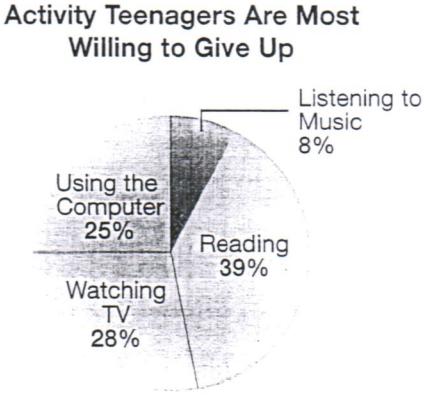
2.




**Source:** PBS Kids

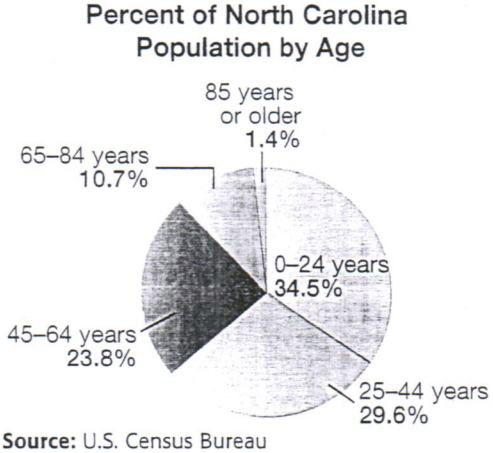
Example 3 (pp. 584–585)

3. **ACTIVITIES** Use the circle graph to describe the activities teens say they are willing to give up.




**Source:** National Education Association

4. **POPULATION** Use the circle graph to describe the population of North Carolina by age.




**Source:** U.S. Census Bureau

## Practice and Problem Solving

**HOMEWORK HELP**

| For Exercises | See Examples |
|---|---|
| 5–8 | 1 |
| 9–12 | 2 |
| 13–15 | 3 |

Construct a circle graph for each set of data.

5.

| Countries with the Most Internet Users | |
|---|---|
| United States | 45% |
| Japan | 18% |
| China | 15% |
| Germany | 8% |
| United Kingdom | 7% |
| South Korea | 7% |

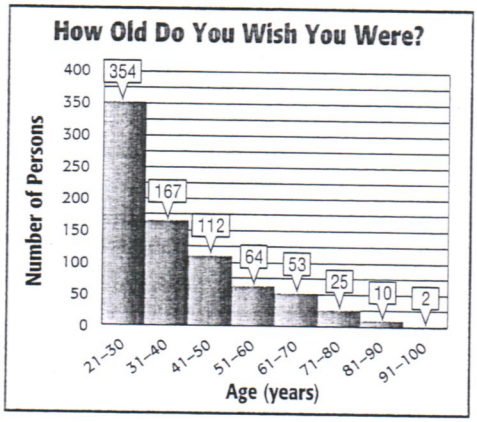
**Source:** *Time for Kids Almanac*

6.

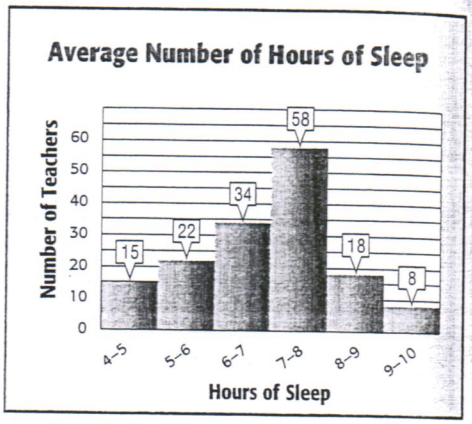
| Where Is the Best Place to Go Clothes Shopping? | |
|---|---|
| Malls | 79% |
| Other | 8% |
| Online | 6% |
| Flea Markets | 4% |
| Vintage Stores | 3% |

**Source:** PBS Kids

7.

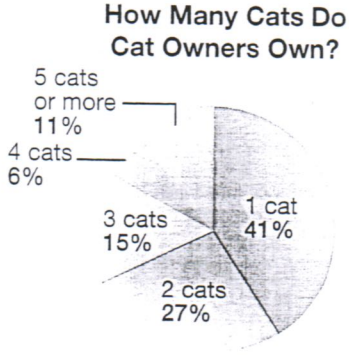



8.



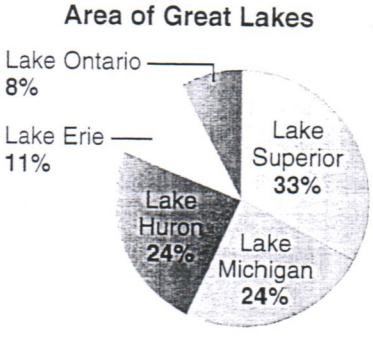

Describe the data in each circle graph.

9.




**Source:** American Animal Hospital Association

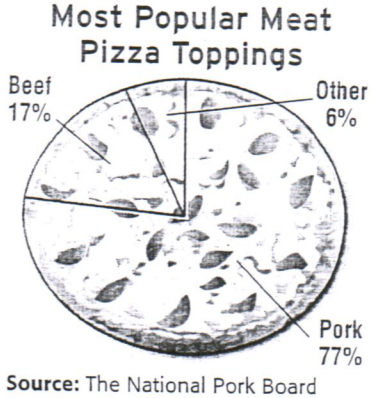
10.




**Source:** *The World Almanac*

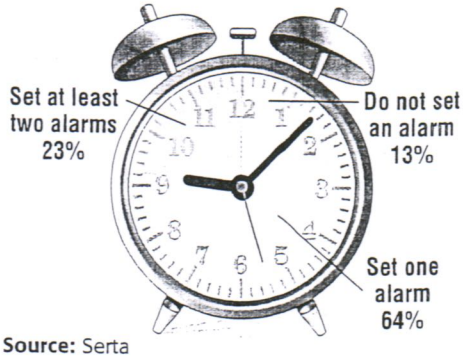
**Real-World Link . . . .**
Americans eat about 100 acres of pizza daily, which averages to about 350 slices per second.

11.




**Source:** The National Pork Board

12.

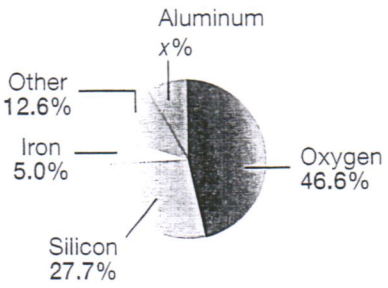



**Source:** Serta

**Real-World Link**
The Eastern Hemisphere includes Asia, Africa, Europe, and Oceania while the Western Hemisphere includes North and South America.

13. **EARTH SCIENCE** Use the circle graph at the right to determine the percent of aluminum in Earth's crust. Then find the measure in degrees of the angle of the aluminum section of the circle graph.

**Elements in Earth's Crust**

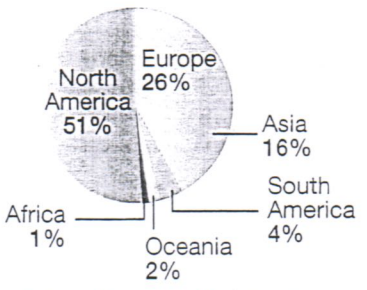



**Source:** Texas A&M University

14. **COLLECT THE DATA** Conduct a survey of your classmates to determine the number of hours they watch TV in a particular week. Construct a histogram of the data. Then construct a circle graph of the data.

15. **TOURISM** Use the information at the left and the circle graph at the right to determine the percent of foreign visitors to the United States from the Eastern Hemisphere. Then find the number of visitors from the Eastern Hemisphere if there was a total of 50 million foreign visitors to the United States.

**Place of Origin for Foreign Visitors to the U.S.**




**Source:** Office of Travel and Tourism Industries

**SPRING BREAK** For Exercises 16–18, use the table below.

16. Construct a circle graph of the data.

17. Conduct a survey of your classmates to determine their favorite activity during Spring Break. Then construct a circle graph of the data.

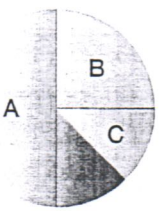
18. Describe any similarities and differences between the two circle graphs you made.

| Favorite Activity During Spring Break | |
|---|---|
| Outdoor Activities | 27% |
| Shopping | 22.5% |
| Traveling | 14% |
| Playing Video Games | 13.2% |
| Watching Movies/TV | 12% |

**EXTRA PRACTICE**
See pages 697, 710.

## H.O.T. Problems

19. **NUMBER SENSE** What percent of the circle graph at the right is represented by Section A? by Section B? by Section C?




20. **OPEN ENDED** Construct a circle graph with five categories showing how you spend 24 hours in a typical weekday.

21. **REASONING** Explain why a circle graph could *not* be made of the data in the table at the right.

22. **WRITING IN MATH** Write a word problem about a real-world situation in which you could construct a circle graph to solve the problem. Explain why the circle graph would be helpful.

| Most Popular Newspaper Section Read by Teens | |
|---|---|
| Comics | 56% |
| Entertainment | 51% |
| Sports | 45% |
| Advertising | 42% |
| Local News | 35% |
| Classifieds | 28% |

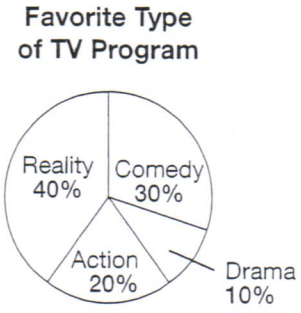
**Source:** Newspaper Association of America

## TEST PRACTICE

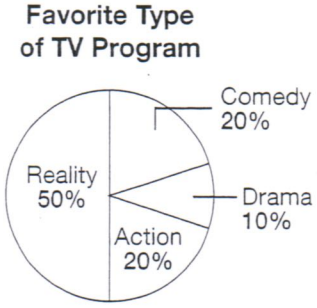
23. Ms. Horace surveyed the students in the 8th grade about their favorite type of television program. The table shows the results of the survey. Which circle graph best represents the data in the table?

| Type of Program | Number of Students |
|---|---|
| Comedy | 120 |
| Drama | 180 |
| Reality | 240 |
| Action | 60 |

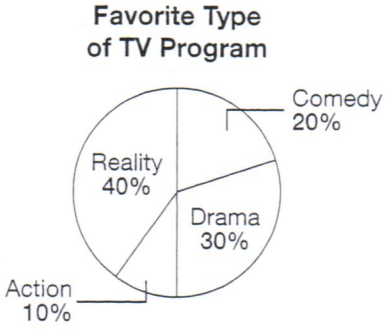
A




C




B

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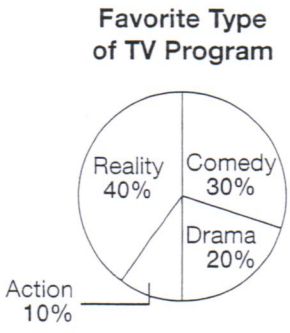


## Spiral Review

24. **ANIMALS** The number of years various types of animals are expected to live are listed below. Construct a histogram of the data. (Lesson 11-2)

1, 3, 5, 5, 6, 7, 8, 8, 10, 10, 10, 12, 12, 12, 12, 15, 15, 15, 15, 16, 18, 20, 20, 25, 35

25. Find the length of a side of a square with an area of $36x^2y^6$. (Lesson 10-8)

26. **SKYDIVING** The distance $d$ a skydiver falls in $t$ seconds is given by the function $d = 16t^2$. Graph this function and estimate how far a skydiver will fall in 5.5 seconds. (Lesson 10-2)

**Find the volume of each prism or cylinder. Round to the nearest tenth, if necessary.** (Lesson 7-5)

27. rectangular prism: length 4 cm, width 8 cm, height 2 cm

28. cylinder: diameter 1.6 in., height 5 in.

## GET READY for the Next Lesson

**PREREQUISITE SKILL** Evaluate each expression.

29. $\frac{57 + 25 + 32 + 46}{4}$

30. $\frac{14(107) + 342 + 10(13)}{3}$

31. $\frac{500 - 125 + 205 - 20}{8}$