11. **Birth days** Births are not evenly distributed across the days of the week. Here are the average numbers of babies born on each day of the week in the United States in a recent year:[10]

Day	Births
Sunday	7374
Monday	11,704
Tuesday	13,169
Wednesday	13,038
Thursday	13,013
Friday	12,664
Saturday	8459

(a) Present these data in a well-labeled bar graph. Would it also be correct to make a pie chart?

(b) Suggest some possible reasons why there are fewer births on weekends.

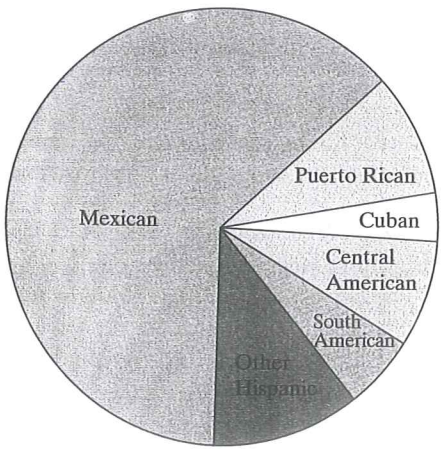
12. **Deaths among young people** Among persons aged 15 to 24 years in the United States, the leading causes of death and number of deaths in a recent year were as follows: accidents, 12,015; homicide, 4651; suicide, 4559; cancer, 1594; heart disease, 984; congenital defects, 401.[11]

(a) Make a bar graph to display these data.

(b) To make a pie chart, you need one additional piece of information. What is it?

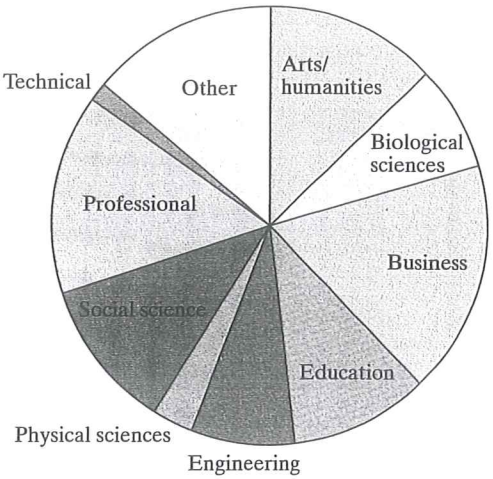
13. **Hispanic origins** Below is a pie chart prepared by the Census Bureau to show the origin of the more than 50 million Hispanics in the United States in 2010.[12] About what percent of Hispanics are Mexican? Puerto Rican?

Percent Distribution of Hispanics by Type: 2010



Comment: You see that it is hard to determine numbers from a pie chart. Bar graphs are much easier to use. (The Census Bureau did include the percents in its pie chart.)

14. **Which major?** About 1.6 million first-year students enroll in colleges and universities each year. What do they plan to study? The pie chart displays data on the percents of first-year students who plan to major in several discipline areas.[13] About what percent of first-year students plan to major in business? In social science?



15. **Buying music online** Young people are more likely than older folk to buy music online. Here are the percents of people in several age groups who bought music online in a recent year:[14]

pg 9

Age group	Bought music online
12 to 17 years	24%
18 to 24 years	21%
25 to 34 years	20%
35 to 44 years	16%
45 to 54 years	10%
55 to 64 years	3%
65 years and over	1%

(a) Explain why it is *not* correct to use a pie chart to display these data.

(b) Make a bar graph of the data. Be sure to label your axes.

16. **The audience for movies** Here are data on the percent of people in several age groups who attended a movie in the past 12 months:[15]

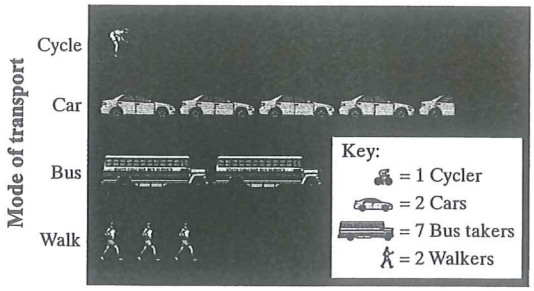
Age group	Movie attendance
18 to 24 years	83%
25 to 34 years	73%
35 to 44 years	68%
45 to 54 years	60%
55 to 64 years	47%
65 to 74 years	32%
75 years and over	20%

(a) Display these data in a bar graph. Describe what you see.

(b) Would it be correct to make a pie chart of these data? Why or why not?

(c) A movie studio wants to know what percent of the total audience for movies is 18 to 24 years old. Explain why these data do not answer this question.

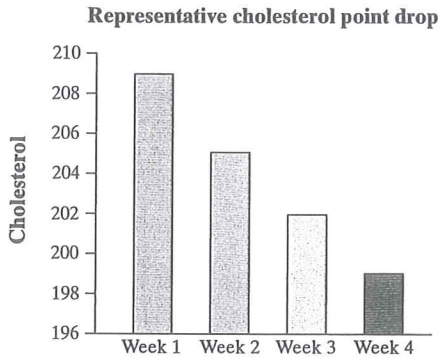
17. **Going to school** Students in a high school statistics class were given data about the main method of transportation to school for a group of 30 students. They produced the pictograph shown.



(a) How is this graph misleading?

(b) Make a new graph that isn't misleading.

18. **Oatmeal and cholesterol** Does eating oatmeal reduce cholesterol? An advertisement included the following graph as evidence that the answer is "Yes."



(a) How is this graph misleading?

(b) Make a new graph that isn't misleading. What do you conclude about the relationship between eating oatmeal and cholesterol reduction?

19. **Attitudes toward recycled products** Recycling is supposed to save resources. Some people think recycled products are lower in quality than other products, a fact that makes recycling less practical. People who use a recycled product may have different opinions from those who don't use it. Here are data on attitudes toward coffee filters made of recycled paper from a sample of people who do and don't buy these filters:[16]

	Buy recycled filters?	
Think quality is	Yes	No
Higher	20	29
The same	7	25
Lower	9	43

(a) How many people does this table describe? How many of these were buyers of coffee filters made of recycled paper?

(b) Give the marginal distribution (in percents) of opinion about the quality of recycled filters. What percent of the people in the sample think the quality of the recycled product is the same or higher than the quality of other filters?

20. **Smoking by students and parents** Here are data from a survey conducted at eight high schools on smoking among students and their parents:[17]

	Neither parent smokes	One parent smokes	Both parents smoke
Student does not smoke	1168	1823	1380
Student smokes	188	416	400

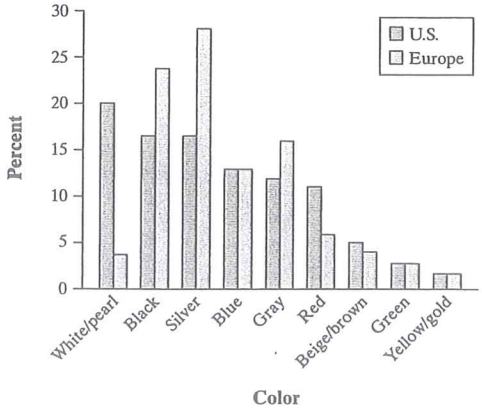
(a) How many students are described in the two-way table? What percent of these students smoke?

(b) Give the marginal distribution (in percents) of parents' smoking behavior, both in counts and in percents.

21. **Attitudes toward recycled products** Exercise 19 gives data on the opinions of people who have and have not bought coffee filters made from recycled paper. To see the relationship between opinion and experience with the product, find the conditional distributions of opinion (the response variable) for buyers and nonbuyers. What do you conclude?

22. **Smoking by students and parents** Refer to Exercise 20. Calculate three conditional distributions of students' smoking behavior: one for each of the three parental smoking categories. Describe the relationship between the smoking behaviors of students and their parents in a few sentences.

23. **Popular colors—here and there** Favorite vehicle colors may differ among countries. The side-by-side bar graph shows data on the most popular colors of cars in a recent year for the United States and Europe. Write a few sentences comparing the two distributions.



24. **Comparing car colors** Favorite vehicle colors may differ among types of vehicle. Here are data on the most popular colors in a recent year for luxury cars and for SUVs, trucks, and vans.

Color	Luxury cars (%)	SUVs, trucks, vans (%)
Black	22	13
Silver	16	16
White pearl	14	1
Gray	12	13
White	11	25
Blue	7	10
Red	7	11
Yellow/gold	6	1
Green	3	4
Beige/brown	2	6

(a) Make a graph to compare colors by vehicle type.

(b) Write a few sentences describing what you see.

25. **Snowmobiles in the park** Yellowstone National Park surveyed a random sample of 1526 winter visitors to the park. They asked each person whether they owned, rented, or had never used a snowmobile. Respondents were also asked whether they belonged to an environmental organization (like the Sierra Club). The two-way table summarizes the survey responses.

pg 17

	Environmental Club		
	No	Yes	Total
Never used	445	212	**657**
Snowmobile renter	497	77	**574**
Snowmobile owner	279	16	**295**
Total	**1221**	**305**	**1526**

Do these data suggest that there is an association between environmental club membership and snowmobile use among visitors to Yellowstone National Park? Give appropriate evidence to support your answer.

26. **Angry people and heart disease** People who get angry easily tend to have more heart disease. That's the conclusion of a study that followed a random sample of 12,986 people from three locations for about four years. All subjects were free of heart disease at the beginning of the study. The subjects took the Spielberger Trait Anger Scale test, which measures how prone a person is to sudden anger. Here are data for the 8474 people in the sample who had normal blood pressure. CHD stands for "coronary heart disease." This includes people who had heart attacks and those who needed medical treatment for heart disease.

	Low anger	Moderate anger	High anger	Total
CHD	53	110	27	**190**
No CHD	3057	4621	606	**8284**
Total	**3110**	**4731**	**633**	**8474**

Do these data support the study's conclusion about the relationship between anger and heart disease? Give appropriate evidence to support your answer.

Multiple choice: Select the best answer for Exercises 27 to 34.

Exercises 27 to 30 refer to the following setting. The National Survey of Adolescent Health interviewed several thousand teens (grades 7 to 12). One question asked was "What do you think are the chances you will be married in the next ten years?" Here is a two-way table of the responses by gender:[18]

	Female	Male
Almost no chance	119	103
Some chance, but probably not	150	171
A 50-50 chance	447	512
A good chance	735	710
Almost certain	1174	756

27. The percent of females among the respondents was

(a) 2625. (c) about 46%. (e) None of these.

(b) 4877. (d) about 54%.

28. Your percent from the previous exercise is part of

(a) the marginal distribution of females.

(b) the marginal distribution of gender.

(c) the marginal distribution of opinion about marriage.

(d) the conditional distribution of gender among adolescents with a given opinion.

(e) the conditional distribution of opinion among adolescents of a given gender.

29. What percent of females thought that they were almost certain to be married in the next ten years?

(a) About 16% (c) About 40% (e) About 61%

(b) About 24% (d) About 45%

30. Your percent from the previous exercise is part of

(a) the marginal distribution of gender.

(b) the marginal distribution of opinion about marriage.

(c) the conditional distribution of gender among adolescents with a given opinion.

(d) the conditional distribution of opinion among adolescents of a given gender.

(e) the conditional distribution of "Almost certain" among females.

31. For which of the following would it be inappropriate to display the data with a single pie chart?

(a) The distribution of car colors for vehicles purchased in the last month.

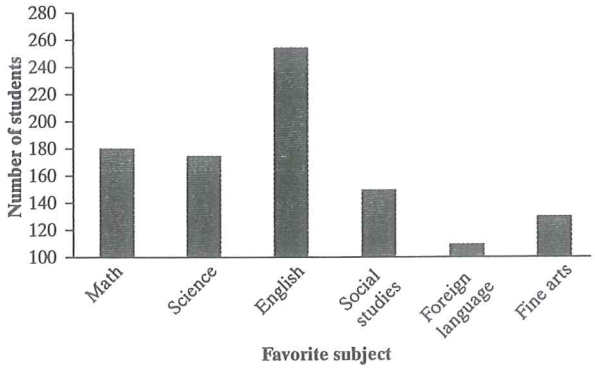
(b) The distribution of unemployment percentages for each of the 50 states.

(c) The distribution of favorite sport for a sample of 30 middle school students.

(d) The distribution of shoe type worn by shoppers at a local mall.

(e) The distribution of presidential candidate preference for voters in a state.

32. The following bar graph shows the distribution of favorite subject for a sample of 1000 students. What is the most serious problem with the graph?



(a) The subjects are not listed in the correct order.

(b) This distribution should be displayed with a pie chart.

(c) The vertical axis should show the percent of students.

(d) The vertical axis should start at 0 rather than 100.

(e) The foreign language bar should be broken up by language.

33. In the 2010–2011 season, the Dallas Mavericks won the NBA championship. The two-way table below displays the relationship between the outcome of each game in the regular season and whether the Mavericks scored at least 100 points.

	100 or more points	Fewer than 100 points	Total
Win	43	14	**57**
Loss	4	21	**25**
Total	**47**	**35**	**82**

Which of the following is the best evidence that there is an association between the outcome of a game and whether or not the Mavericks scored at least 100 points?

(a) The Mavericks won 57 games and lost only 25 games.

(b) The Mavericks scored at least 100 points in 47 games and fewer than 100 points in only 35 games.

(c) The Mavericks won 43 games when scoring at least 100 points and only 14 games when scoring fewer than 100 points.

(d) The Mavericks won a higher proportion of games when scoring at least 100 points (43/47) than when they scored fewer than 100 points (14/35).

(e) The combination of scoring 100 or more points and winning the game occurred more often (43 times) than any other combination of outcomes.

34. The following partially complete two-way table shows the marginal distributions of gender and handedness for a sample of 100 high school students.

	Male	Female	Total
Right	x		**90**
Left			**10**
Total	**40**	**60**	**100**

If there is no association between gender and handedness for the members of the sample, which of the following is the correct value of x?

(a) 20.

(b) 30.

(c) 36.

(d) 45.

(e) Impossible to determine without more information.

35. **Marginal distributions aren't the whole story** Here are the row and column totals for a two-way table with two rows and two columns:

a	b	50
c	d	50
60	40	100

Find *two different* sets of counts a, b, c, and d for the body of the table that give these same totals. This shows that the relationship between two variables cannot be obtained from the two individual distributions of the variables.

36. **Fuel economy** (Introduction) Here is a small part of a data set that describes the fuel economy (in miles per gallon) of model year 2012 motor vehicles:

Make and model	Vehicle type	Transmission type	Number of cylinders	City mpg	Highway mpg
Aston Martin Vantage	Two-seater	Manual	8	14	20
Honda Civic Hybrid	Subcompact	Automatic	4	44	44
Toyota Prius	Midsize	Automatic	4	51	48
Chevrolet Impala	Large	Automatic	6	18	30

(a) What are the individuals in this data set?

(b) What variables were measured? Identify each as categorical or quantitative.