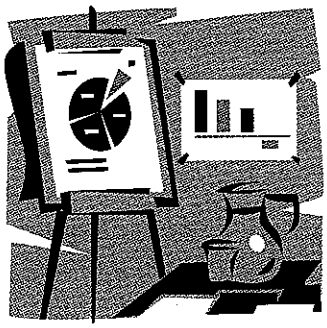
SOLUTION OF THE INITIAL PROBLEM



Suppose that you have to give a sales report showing the sales figures of each of three districts with markets that are roughly equal in size. In 2003, district A had \$135,000 in sales, district B had \$85,000 in sales, and district C had \$115,000 in sales. How might you present these data to clearly compare each district with the others?

SOLUTION Although the sales data could be presented as a bar chart, it is better to use a pie chart to show the comparisons because it will show the proportion of sales for each of the districts. To do this, we first compute the total sales:

$$\$135{,}000 + \$85{,}000 + \$115{,}000 = \$335{,}000.$$

Then, we find what portion of a circle (360°) each of the district sales represents.

$$\text{District A: } \frac{135{,}000}{335{,}000} \times 360° \approx 0.403 \times 360° = 40.3\% \times 360° \approx 145°$$

$$\text{District B: } \frac{85{,}000}{335{,}000} \times 360° \approx 0.254 \times 360° = 25.4\% \times 360° \approx 91°$$

$$\text{District C: } \frac{115{,}000}{335{,}000} \times 360° \approx 0.343 \times 360° = 34.3\% \times 360° \approx 124°$$

Sketching a circle with these angles at the center gives the pie chart in Figure 8.15.

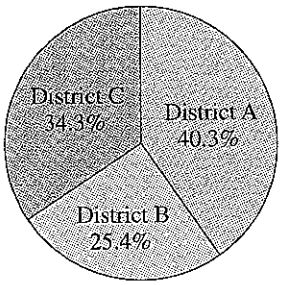
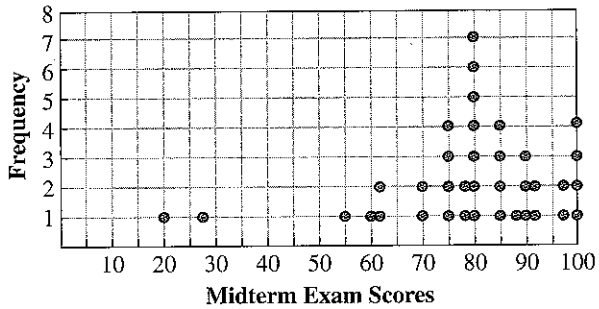


Figure 8.15

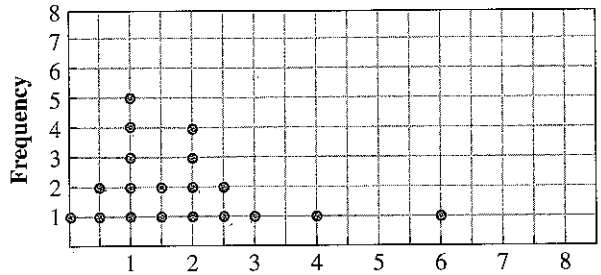
PROBLEM SET 8.1

1. Consider the following dot plot of midterm exam scores in a biology class.



a. What does the horizontal axis represent?
b. What does the vertical axis represent?
c. How many exam scores were there?
d. What was the most frequent exam score?
e. What were the high score and the low score?

2. Consider the following dot plot of the number of hours a class of second-graders spent watching television after school.



Number of Hours Spent Watching Television after School

a. What does the horizontal axis represent?
b. What does the vertical axis represent?
c. How many students were in the second-grade class?
d. What was the most frequent number of hours spent watching television?
e. What was the largest amount of time spent watching television? What was the smallest amount of time spent watching television?

3. In the 2002 Salt Lake City Winter Olympic Games, athletes or teams from different countries earned medals. The total number of medals earned by each medal-winning country is summarized in the following stem-and-leaf plot.

3	4 5
2	4
1	1 1 2 5 7 7
0	1 1 2 2 2 2 2 3 3 3 4 4 6 7 8 8

Source: www.saltlake2002.com/main.html.

a. How many countries received medals?
b. How many medals were awarded?
c. What is the largest number of medals earned by athletes from a single country?

4. The heights, in feet and inches, for the 2003–2004 Dallas Mavericks are given in the following stem-and-leaf plot.

7	0 6
6	2 3 6 6 7 8 8 9 9
5	11

Source: www.espn.com.

a. How many players were on the team roster?
b. List the height of each player.
c. How tall was the tallest player for the Dallas Mavericks? How tall was the shortest player?

5. A sample of starting salaries for recent graduates of a university's accounting program is as follows. Salaries have been rounded to the nearest hundred dollars.

$29,500	$29,500	$27,800	$27,800
$27,100	$31,000	$28,200	$25,600
$26,800	$35,400	$29,400	$26,800
$28,800	$28,200	$30,300	$30,200

a. Make a stem-and-leaf plot of the rounded salaries. Show the leaves in terms of 100s.
b. Most of the data values cluster between what two salaries?
c. Describe any gaps in the data. Do there appear to be any outliers? If so, where?

6. In 1798, the English scientist Henry Cavendish measured the density of the Earth in an experiment with a torsion balance. He made 29 repeated measurements with the same instrument and obtained the following data in grams per cubic centimeter. (*Source: Annals of Statistics*, 5: 1055–1078, 1977.)

5.50	5.61	4.88	5.07
5.26	5.55	5.36	5.29
5.58	5.65	5.57	5.53
5.62	5.29	5.44	5.34
5.79	5.10	5.27	5.39
5.42	5.47	5.63	5.34
5.46	5.30	5.75	5.68
5.85			

a. Make a stem-and-leaf plot of Cavendish's experimental data. Show the leaves in terms of hundredths.
b. Most of the data values cluster between what two densities?
c. Describe any gaps in the data. Do there appear to be any outliers? If so, where?

Problems 7 and 8

A baseball player's batting average gives the ratio of hits to times at bat and is usually expressed in decimal form, rounded to three decimal places.

7. Make a stem-and-leaf plot of the following American League batting champion averages. Is there a general pattern or shape to your graph? What observations might you make about the batting averages based on your graph?

AMERICAN LEAGUE BATTING CHAMPIONS (1978–2003)		
1978	Carew	0.333
1979	Lynn	0.333
1980	Brett	0.390
1981	Lansford	0.336
1982	Wilson	0.332
1983	Boggs	0.361
1984	Mattingly	0.343
1985	Boggs	0.368
1986	Boggs	0.357
1987	Boggs	0.363
1988	Boggs	0.366
1989	Puckett	0.339
1990	Brett	0.328
1991	Franco	0.341
1992	Martinez	0.343
1993	Olerud	0.363
1994*	O'Neill	0.359
1995	Martinez	0.356
1996	Rodriguez	0.358
1997	Thomas	0.347
1998	Williams	0.339
1999	Garciaparra	0.357
2000	Garciaparra	0.372
2001	Suzuki	0.350
2002	Ramirez	0.349
2003	Mueller	0.326

*Shortened season (baseball strike)
Source: www.espn.com.

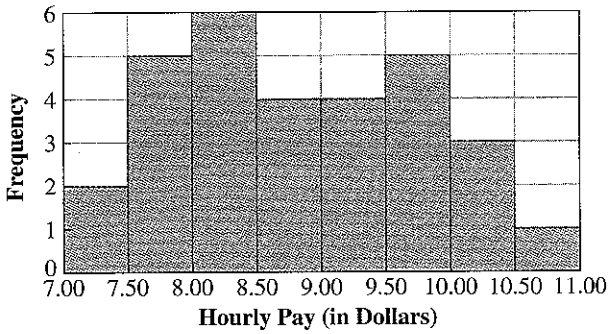
8. Make a stem-and-leaf plot of the following National League batting champion averages. Is there a general pattern or shape to your graph? What observations might you make about the batting averages based on your graph?

NATIONAL LEAGUE BATTING CHAMPIONS (1978–2003)		
1978	Parker	0.334
1979	Hernandez	0.344
1980	Buckner	0.324
1981	Madlock	0.341
1982	Oliver	0.331
1983	Madlock	0.323
1984	Gwynn	0.351
1985	McGee	0.353
1986	Raines	0.334
1987	Gwynn	0.370
1988	Gwynn	0.313
1989	Gwynn	0.336
1990	McGee	0.335
1991	Pendleton	0.319
1992	Sheffield	0.330
1993	Galarraga	0.370
1994*	Gwynn	0.394
1995	Gwynn	0.368
1996	Gwynn	0.353
1997	Gwynn	0.372
1998	Walker	0.363
1999	Walker	0.379
2000	Helton	0.372
2001	Walker	0.350
2002	Bonds	0.370
2003	Pujols	0.359

*Shortened season (baseball strike)
Source: www.espn.com.

Compare the stem-and-leaf plots you made for problems 7 and 8. Do the batting averages cluster around different values in the two graphs?

9. The following histogram shows the frequencies of hourly pay for a group of students who worked during the summer.



a. Use the histogram to make a frequency table for the hourly pay values.

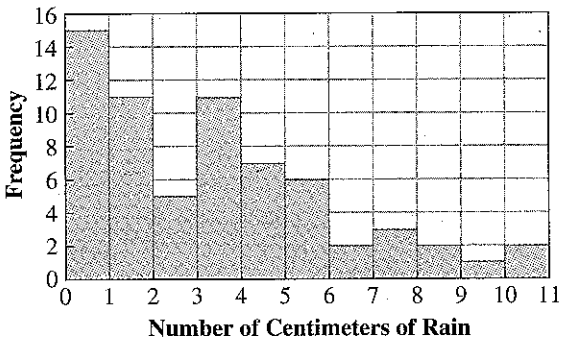
b. How many students worked during the summer?

c. What were the most frequent hourly pay range and the least frequent?

d. What percentage of students earned at least $9.00 per hour?

e. What percentage of students earned between $8.00 and $10.00?

10. The following histogram shows the number of centimeters of rain during roughly a 2-month period for a village near the equator in the rain forest.



a. Use the histogram to make a frequency table for the number of centimeters of rain.

b. For how many days was rain measured?

c. On how many days were there at least 3 centimeters but less than 4 centimeters of rain?

d. What percentage of days had at least 7 centimeters of rain?

e. What percentage of days had at least 1, but less than 5 centimeters of rain?

11. Suppose students in a fifth-grade class were asked to record the number of hours of television they watch each week, with the following results: 0.5, 29.9, 25, 25.6, 24.3, 16.2, 28.5, 1, 27, 16.8, 17.8, 24.5, 24, 25.5, 26.5, 26, 15, 9.5, 14.5, 16, and 16.5. In order to create a histogram for this data, you will first need to decide how big to make the measurement classes or bins.

a. If bins have a length of 3, how many bins will be needed? Create a frequency table using bins of length 3.

b. If bins have a length of 5, how many bins will be needed? Create a frequency table using bins of length 5.

c. If bins have a length of 10, how many bins will be needed? Create a frequency table using bins of length 10.

d. Consider the frequency tables from parts (a) through (c). Which one, in your opinion, is the best display of the data? Give a reason for your choice and create a histogram from the frequency table of your choice.

12. Suppose the ages (in years) of the students in a particular third-grade class are as follows: 8.00, 8.08, 8.10, 8.13, 8.15, 8.18, 8.20, 8.23, 8.26, 8.27, 8.28, 8.29, 8.31, 8.32, 8.36, 8.38, 8.45, 8.49, 8.49, 8.50, 8.53, 8.62, 8.74, 8.87, and 8.99. In order to create a histogram for this data, you will first need to decide how big to make the measurement classes or bins.

a. If bins have a length of 0.5, how many bins will be needed? Create a frequency table using bins of length 0.5.

b. If bins have a length of 0.25, how many bins will be needed? Create a frequency table using bins of length 0.25.

c. If bins have a length of 0.10, how many bins will be needed? Create a frequency table using bins of length 0.10.

d. Consider the frequency tables from parts (a) through (c). Which one, in your opinion, is the best display of the data? Give a reason for your choice and create a histogram from the frequency table of your choice.

Problems 13 and 14

A teacher gives an 80-point test to his class, with the following scores: 30, 32, 35, 40, 44, 47, 48, 50, 51, 52, 55, 56, 57, 60, 61, 62, 62, 63, 64, 65, 66, 67, 67, 70, 72, 72,

75, and 80. The teacher carries out a data analysis of all test scores, including a frequency table and histogram. He considers two options for the bins: group the data into bins of length 10 or into bins of length 8.

13. Suppose the teacher groups the data into bins of length 10.

a. Create a frequency table.

b. Create a histogram using bins of length 10.

c. Describe any trends you observe in the data.

d. Give a reason why this choice of bin length is or is not appropriate.

14. Suppose the teacher groups the data into bins of length 8.

a. Create a frequency table.

b. Create a histogram using bins of length 8.

c. Describe any trends you observe in the data.

d. Give a reason why this choice of bin length is or is not appropriate.

Problems 15 and 16

A record number of participants ran the New York Marathon on November 2, 2003. The 26.2-mile course leads runners through the five boroughs that make up New York City. The male and female runners in the 2003 marathon fell into the following age categories.

Age in Years	Men	Women
10–19	51	35
20–29	3014	2906
30–39	8483	4612
40–49	6954	2909
50–59	3469	1050
60–69	856	170
70–79	117	22
80–89	3	0
90–99	1	0

Source: www.ingnycmarathon.org/results/topfinishers.html.

15. a. Find the percentage of male runners who were between the ages of 30 and 39.

b. Find the percentage of male runners who were age 60 or older.

c. Construct a relative frequency histogram for the ages of the male runners in the 2003 New York Marathon.

d. Most of the values cluster between what two ages?

16. a. Find the percentage of female runners who were between the ages of 30 and 39.

b. Find the percentage of female runners who were age 60 or older.

c. Construct a relative frequency histogram for the ages of the female runners in the 2003 New York Marathon.

d. Most of the values cluster between what two ages?

Problems 17 and 18

What's the state of your state's health? Some states are healthier to live in than others. A 2002 study by The United Health Foundation used data from government agencies and health organizations to rate the states on 17 statistical measures of health. Included were things such as smoking, violent-crime rates, motor-vehicle death rates per 100,000 miles driven, incidence of major infectious diseases, life expectancy at birth, and access to health care. The higher scores represent "healthier" states. (*Note:* Scores presented in the tables indicate the percentage a state is above or below the national norm. For example, a state with a score of 20 is 20 percent above the national average.)

Rank	State	Score	Rank	State	Score
1	New Hampshire	23.9	26	Wyoming	2.7
2	Minnesota	21.8	27	Ohio	1.7
3	Massachusetts	18.5	28	Maryland	0.8
4	Utah	17.9	29	Michigan	0.6
5	Connecticut	16.6	30	Alaska	0.2
6	Vermont	15.8	31	Illinois	−0.9
7	Iowa	14.5	32	New York	−2.6
7	Colorado	14.5	32	Missouri	−2.6
9	North Dakota	14.0	34	Arizona	−3.7
10	Maine	13.8	35	Delaware	−3.9
11	Washington	13.5	36	North Carolina	−5.3
11	Wisconsin	13.5	37	Texas	−5.6
13	Rhode Island	11.8	38	Nevada	−5.8
14	Hawaii	11.6	39	Kentucky	−7.6
15	Nebraska	10.5	40	Georgia	−8.8
16	South Dakota	9.7	41	West Virginia	−8.9
17	Oregon	9.3	42	New Mexico	−10.1
18	Virginia	8.7	43	Florida	−12.2
19	New Jersey	8.6	44	Tennessee	−12.3
20	Idaho	7.8	45	Alabama	−12.8
21	Kansas	6.7	46	Oklahoma	−13.3
22	Indiana	4.3	47	Arkansas	−14.9
23	Pennsylvania	3.8	48	South Carolina	−16.4
24	Montana	3.7	49	Mississippi	−22.2
24	California	3.7	50	Louisiana	−23.9

Source: America's Health: United Health Foundation State Health Rankings 2002 Edition. © 2002 United Health Foundation.

17. a. Complete the following frequency table for the 50 states using the 2002 state health scores.

Interval	Frequency
−30.0 to −20.1	
−20.0 to −10.1	
−10.0 to −0.1	
0 to 9.9	
10 to 19.9	
20 to 29.9	

b. Construct a histogram.

c. How many states ranked at least 10 percent above the national average?

18. a. Complete the following frequency table for the 50 states using the 2002 state health scores.

Interval	Frequency
−30.0 to −25.1	
−25.0 to −20.1	
−20.0 to −15.1	
−15.0 to −10.1	
−10.0 to −5.1	
−5.0 to −0.1	
0 to 4.9	
5 to 9.9	
10 to 14.9	
15 to 19.9	
20 to 24.9	
25 to 29.9	

b. Construct a histogram.

c. What percentage of states ranked below the national average?

d. Compare the histogram from part (b) to the histogram created in the previous problem. Which size interval best reveals the pattern in the data? Explain.

Problems 19 and 20

Yellowstone National Park is home to over 500 geysers. Geysers are hot springs that erupt periodically. Old Faithful is a geyser that erupts more frequently than other geysers. However, it is not the largest or most regular geyser. Park rangers keep a log book of geyser activity at the Old Faithful Visitors Center. Consider the following Old Faithful eruption-duration data taken for a 3-day period in August 1998 and in August 2003.

August 1998 Eruption Durations (Minutes:Seconds)			August 2003 Eruption Durations (Minutes:Seconds)		
3:35	4:10	4:10	4:34	1:56	4:12
4:00	4:15	4:49	4:10	3:53	1:48
4:06	4:06	4:04	1:50	4:23	4:48
2:54	4:23	4:30	4:24	1:51	2:01
4:28	4:10	4:24	4:28	5:00	4:45
3:54	4:03	4:21	2:20	4:08	1:53
4:30	1:47	4:09	4:45	4:06	4:31
3:47	4:36	4:15	2:13	4:30	1:47
3:52	4:10	4:25	4:36	4:22	4:48

Source: www.geyserstudy.org/g_logs.htm.

19. Consider the eruption data from August 1998.

a. Create a histogram using measurement classes 1:00 to 1:59, 2:00 to 2:59, 3:00 to 3:59, and 4:00 to 4:59.

b. Create a histogram using measurement classes 1:30 to 1:59, 2:00 to 2:29, . . ., 4:30 to 4:59.

c. Compare the histograms created in parts (a) and (b). Which size interval best reveals the pattern in the data? Explain.

20. Consider the eruption data from August 2003.

a. Create a histogram using measurement classes 1:00 to 1:59, 2:00 to 2:59, 3:00 to 3:59, 4:00 to 4:59, and 5:00 to 5:59.

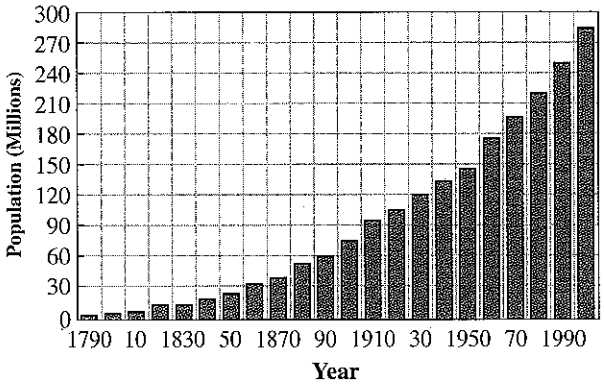
b. Create a histogram using measurement classes 1:30 to 1:59, 2:00 to 2:29, . . ., 5:00 to 5:29.

c. Compare the histograms created in parts (a) and (b). Which size interval best reveals the pattern in the data? Explain.

d. Compare the "best" histogram from part (c) to the "best" histogram from part (c) in problem 19. Describe the similarities and differences between the two graphs.

21. The following bar graph shows how the population of the United States changed from 1790 to 2000.

Population of the United States from 1790 to 2000



a. Estimate the population of the United States in 1790, 1890, 1990, and 2000.

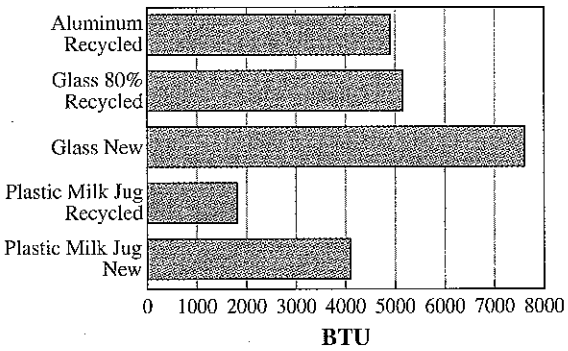
b. What was the change in population from 1790 to 1890?

c. In what year were there approximately 30 million people in the United States?

d. Between what two decades did the United States experience the greatest increase in population?

22. The following bar graph shows the energy consumed (in BTUs) to make 1 pound of a material.

Energy Consumed to Make 1 Pound of Material



a. Use the bar graph to estimate the BTUs required to make 1 pound of each type of material.

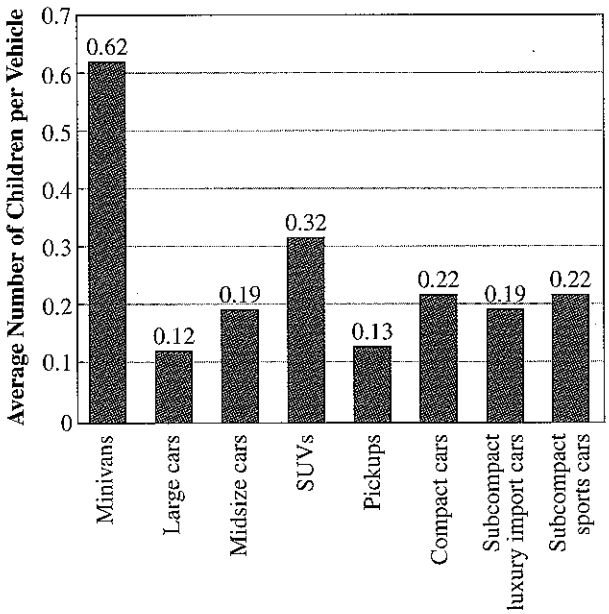
b. Approximately how many times more energy is used to make 1 pound of recycled aluminum than 1 pound of recycled plastic milk jug?

c. What percentage of energy is saved if 1 pound of glass that is 80% recycled is made rather than 1 pound of new glass?

d. What conclusions can you make about the energy required to make 1 pound of the various materials?

23. The data used in the following graph are from the Fatality Analysis Reporting System (FARS) for the years 1995 to 2001. The FARS was created in 1975 to assist in identifying traffic safety problems and motor-vehicle safety problems. The bar graph shows the average number of children per vehicle in a collision or rollover involving a fatality for eight types of 1995- to 2001-model vehicles. For a multivehicle crash involving a fatality, FARS included all the children in all the vehicles in the crash regardless of whether a fatality occurred in a vehicle containing a child. The total number of child fatalities in 1995- to 2001-model vehicles was 365 for minivans, 131 for large cars, 474 for midsize cars, 609 for SUVs, 391 for pickups, 292 for compact cars, 282 for subcompact luxury import cars, and 494 for subcompact sports cars.

Average Number of Children per Vehicle Type in an Accident Involving a Fatality, 1995 to 2001



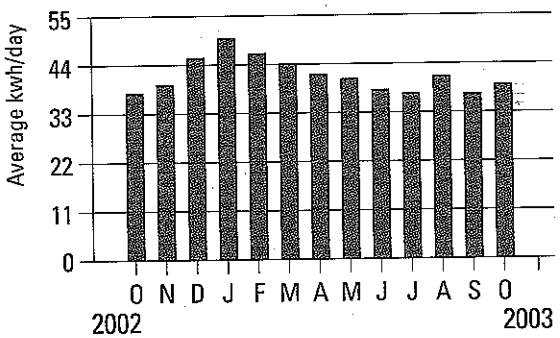
a. Which two types of vehicles carried the most children on average?

b. Which two types of vehicles were involved in the greatest total number of child fatalities?

c. Compare the average number of children in minivans to the average number of children in SUVs and subcompact sports cars. Minivans carry how many times more children, on average, than the other two vehicle types? For which type of vehicle would you expect there to be the greatest number of child fatalities?

d. Compare child fatalities for minivans to child fatalities for SUVs and subcompact sports cars. Compare your result to part (c). What do you notice?

24. PacifiCorp provides electricity to more than 1.5 million customers in the United States. In Oregon, Washington, Wyoming, and California, PacifiCorp operates as Pacific Power. The monthly bills Pacific Power sends its customers include a graph called the "Energy Usage Comparison Chart." One such chart follows. The chart gives the average kilowatt-hours used per day (kwh/day) for each month. A kilowatt-hour is a measure of electrical energy, and one kilowatt-hour is approximately the amount of energy used by one 100-watt light bulb for 10 hours.



a. What was the average kilowatt-hours per day used by this homeowner during the month of December 2002?

b. During what month and year did the homeowner use an average of 44 kwh/day?

c. If there were 29 days in the billing cycle for October 2003, approximately how many kilowatt-hours were used during the month of October?

d. In which month was the homeowner's average kilowatt-hours per day the greatest?

e. The average number of kilowatt-hours used per day fell from January 2003 through July 2003, and then suddenly increased. What might be one possible cause of the increase?

25. In 2002, the five most populous nations in the world were as follows:

China	1281 million
India	1050 million
United States	287 million
Indonesia	217 million
Brazil	174 million

Source: Population Reference Bureau.

a. Draw a bar graph to represent this information.

b. Could you create a pie chart with the population totals? Explain.

26. The Arizona State Legislature established the Homeless Youth Intervention Program, which began on January 1, 2000. In June 2003, the homeless youth population in Arizona had the following composition. (*Source:* www.azchildren.org.)

45% Anglo

33% Hispanic

12% African American

4% Native American

a. Draw a bar graph to represent this information.

b. Could you create a pie chart with the youth population percentages? Explain.

27. According to the Food Marketing Institute, the average weekly grocery cost per person in the United States is as follows. Make a bar graph to illustrate this relationship.

Size of Household	Average Weekly Cost per Person (in Dollars)
1 person	52
2 people	40
3 or 4 people	30
5 or more people	24

Source: Food Marketing Institute.

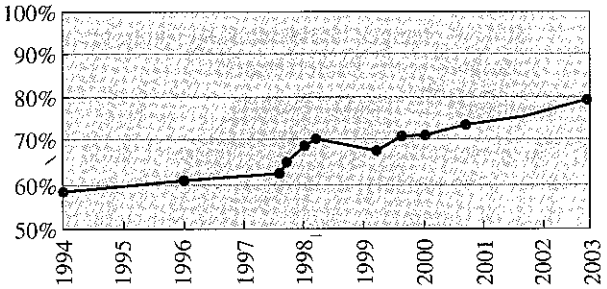
28. The Centers for Disease Control and Prevention reported the use of cigarettes in the year 2002 as follows. Make a bar graph to illustrate this relationship.

Age	Cigarette Use (Percent of Population)
12–13 years	3.2
14–15 years	11.2
16–17 years	24.9
18–25 years	40.8
26–34 years	32.7
35 years and over	23.4

Source: www.cdc.gov.

29. According to the National Center for Statistics and Analysis (NCSA), seat-belt use nationwide has generally increased from 1994 to 2003, as shown in the following line graph.

Seat Belt Use 1994–2003



a. Estimate the percentage of people nationwide who used their seat belt during each of the years from 1994 to 2003.

b. During which year did the largest increase in seat-belt use occur?

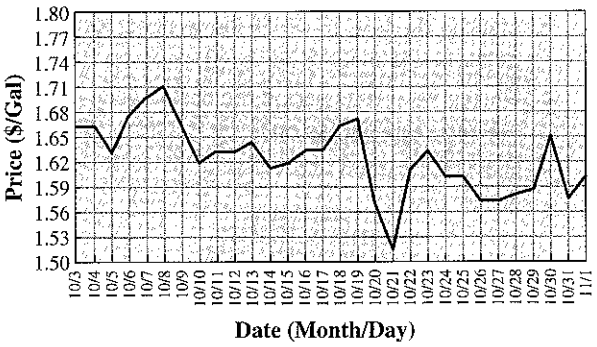
c. During which year(s) did the use of seat-belts decrease?

d. Find the change in the percentage of seat-belt use from 1994 to 2003.

e. In which year(s) did approximately 75% of nationwide use their seat belts?

30. Regular gasoline prices fluctuate daily. The following line graph shows the price in dollars per gallon for regular gasoline in Providence, Rhode Island, from October 3 to November 1, 2003.

1 Month Average Retail Price Chart–Regular Gasoline
Providence, Rhode Island



a. What was the greatest price charged for regular gasoline, and on what day did it occur?

b. What was the smallest price charged for regular gasoline, and on what day did it occur?

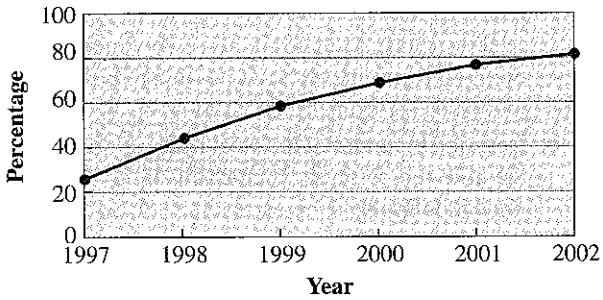
c. Between which 2 days did the greatest increase in price occur?

d. Between which 2 days did the greatest decrease in price occur?

e. On which day(s) did regular gasoline cost $1.66 per gallon?

31. The varicella vaccine was licensed on March 17, 1995, by the U.S. Food and Drug Administration. Varicella is a common, contagious illness; it is also known as chickenpox. Before the vaccine was available, the 4 million annual cases of varicella caused 10,000 hospitalizations and 100 deaths. The following line graph shows the percentage of children aged 19 to 35 months in the United States who were vaccinated with the varicella vaccine from 1997 to 2002.

Percentage of Children Vaccinated for Varicella

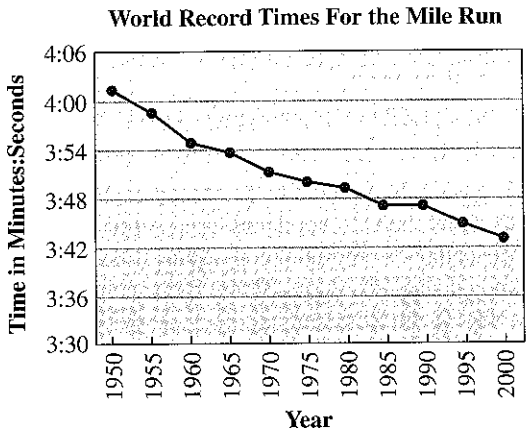


a. Estimate the percentage of children aged 19 to 35 months who were vaccinated with the varicella vaccine each year.

b. Estimate the increase in the percentage of children vaccinated with the varicella vaccine for each pair of consecutive years. What do you notice?

c. Describe the trend in the percentage of children immunized. Discuss whether this trend can continue indefinitely.

32. The following line graph displays the world-record times for the mile run over a 49-year period. The current world-record holder is Hicham El Guerrouj of Morocco. His time of 3 minutes and 43.13 seconds was set in 1999 and is unbroken today.



a. Estimate the world record time for the mile run in 1950, 1970, and 1990.

b. The world-record time for the mile run was reduced by how many seconds in the decade from 1950 to 1960? After 1960, how many more years did it take to achieve the same time reduction as in the decade from 1950 to 1960?

c. Describe the trend in the world-record times for the mile run. Discuss whether this trend can continue indefinitely.

33. The approximate number of immigrants admitted to the United States in each of the years from 1990 to 2002 is given in the following table.

Year	Number of Immigrants
1990	1,536,000
1991	1,827,000
1992	974,000
1993	904,000
1994	804,000
1995	720,000
1996	916,000
1997	798,000
1998	654,000
1999	647,000
2000	850,000
2001	1,064,000
2002	1,064,000

Source: U.S. Immigration and Naturalization Service, Statistical Yearbook.

a. Make a line graph to represent these data.

b. Identify the year in which the largest increase in admitted immigrants occurred, compared to the previous year, and the year in which the largest decrease occurred.

c. Identify the time period(s) that experienced significant changes in the number of immigrants admitted to the United States.

d. Discuss the trend in the data.

34. The per-capita personal income in the United States from 1991 to 2001, according to the U.S. Department of Commerce, is given in the following table.

Year	Per-Capita Personal Income
1991	20,023
1992	20,960
1993	21,539
1994	22,340
1995	23,255
1996	24,270
1997	25,412
1998	26,893
1999	27,880
2000	29,760
2001	30,413

Source: www.bea.doc.gov.

a. Make a line graph to represent these data.

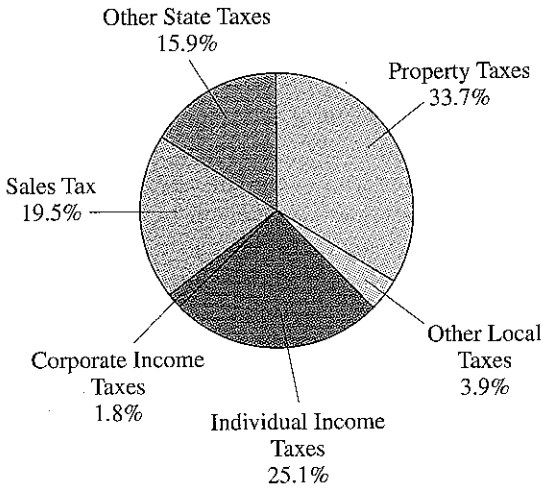
b. Identify the year in which the smallest increase in per-capita income occurred.

c. During what time period did per-capita personal income grow the fastest?

d. Discuss the trend in the data.

35. According to the Office of Fiscal and Program Review in the Maine State Legislature, 2002 state and local taxes in Maine came from six sources, as indicated in the following pie chart.

Maine State and Local Tax Mix



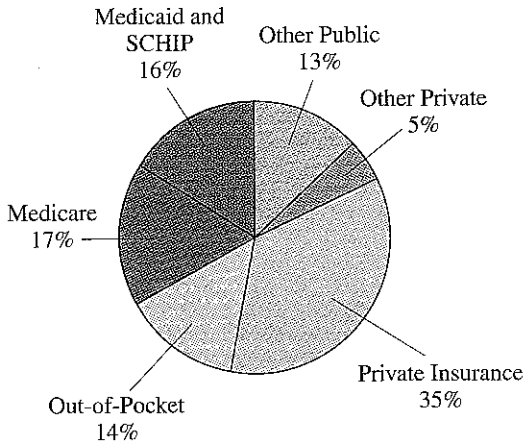
a. If the state and local taxes in 2002 totaled $4,277,900,000, find the dollar amount of taxes that came from each source.

b. According to the pie chart, what are the two main sources of state and local taxes? What source contributed the least to state and local taxes?

c. Find the degree measure of each sector in the pie chart. Round to the nearest tenth of a degree.

36. The Centers for Medicare and Medicaid Services have determined that the nation's health-care dollars in 2001 came from six sources, as shown in the following pie chart. (SCHIP is State Children's Health Insurance Program.)

Sources for the Nation's Health-Care Dollars



a. Use the pie chart to determine how many health-care dollars out of every million came from each of the six sources.

b. According to the pie chart, what is the main source of health-care funding?

c. Find the degree measure of each sector in the pie chart. Round to the nearest tenth of a degree.

37. According to the Progressive Grocer, April 2003, consumers in grocery stores spend $100 in the following way.

HOW $100 IS SPENT	
Perishables	$50.42
Beverages	$10.71
Misc. grocery	$ 5.34
Nonfood grocery	$ 9.03
Snack foods	$ 6.25
Main meal items	$ 8.25
Health & beauty care	$ 3.96
General merchandise	$ 3.39
Pharmacy/unclassified	$ 2.65

Source: www.progressivegrocer.com

a. Find the percentage of $100 spent in each category.

b. If each category will be represented by a sector in a circle, find the degree measure of each sector. Round to the nearest tenth of a degree.

c. Construct a pie chart to illustrate how the typical U.S. consumer spends $100 at the grocery store.

38. The following table shows the main causes of death for people aged 25 to 40 in the United States in 2001.

Causes	Number of Deaths
Unintentional injuries	27,784
Malignant neoplasms	20,563
Diseases of the heart	16,486
Suicide	11,705
Homicide	9472
Human immunodeficiency virus (HIV)	7968
Liver diseases	3723
Diabetes mellitus	2553
Influenza and pneumonia	1322
Other	31,781
Total	133,357

Source: Centers for Disease Control and Prevention, Atlanta, GA.

a. Find the percentage of deaths attributed to each cause.

b. If each category will be represented by a sector in a circle, find the degree measure of each sector. Round to the nearest tenth of a degree.

c. Construct a pie chart to illustrate the main causes of death graphically.

39. People are fired for many reasons. According to one source, the reasons can be broken down as shown in the following table. Create a pie chart to depict this data.

REASONS FOR BEING FIRED	
Incompetence	39%
Inability to get along with others	17%
Dishonesty or lying	12%
Negative attitude	10%
Lack of motivation	7%
Failure to follow instructions	7%
Other reasons	8%

Source: Robert Half International, Menlo Park, CA.

40. The American Dietetic Association reported that children aged 8 to 12 years old said their top role models were as follows: mother (23%), father (17.4%), unsure or no role model (13.2%), and sports celebrity (8.3%). Create a pie chart to represent these data. Notice that the percentages provided do not add to 100%. Create a fifth category labeled "other" for the remaining percentage.
Source: www.eatright.org/Public/index.cfm.

41. In the year 2000, there were approximately 221.1 million people aged 15 and older in the United States. Of those, 120.2 million were married; 41 million were widowed, divorced, or separated; and 59.9 million had never been married. (*Source:* www.census.gov.) For each of the following, if the graph would be an appropriate display for these data, create the graph. If not, explain why.

a. histogram

b. bar graph

c. line graph

d. pie chart

42. In a July 2002 report by the U.S. Department of Labor, the average hourly earnings for selected occupations were as follows: engineers ($32.73), physicians ($51.66), dentists ($35.51), elementary-school teachers ($30.75), secretaries ($14.77), food-service workers ($7.41), and registered nurses ($24.57). (*Source:* www.bls.gov.) For each of the following, if the graph would be an appropriate display for these data, create the graph. If not, explain why.

a. histogram

b. bar graph

c. line graph

d. pie chart

43. The following table gives the number of live births per 1000 people in the United States from January 2002 through December 2002. For each of the following, if the graph would be an appropriate display for these data, create the graph. If not, explain why.

Month	Births per 1000 People
January	13.6
February	13.8
March	13.6
April	13.8
May	13.9
June	13.9
July	14.6
August	14.7
September	14.7
October	14.1
November	13.4
December	13.4

Source: National Vital Statistics Reports, Vol. 52, No. 5, September 29, 2003.

a. histogram **b.** bar graph
c. line graph **d.** pie chart

44. The Bureau of Labor Statistics sponsors an annual demographic survey. The numbers of families earning less than $25,000 in 2001 are listed in the following table.

Total 2001 Income	Number of Families
Under $2500	1,268,000
$2500–$4999	637,000
$5000–$7499	893,000
$7500–$9999	1,176,000
$10,000–$12,499	1,561,000
$12,500–$14,999	1,629,000
$15,000–$17,499	2,133,000
$17,500–$19,999	1,913,000
$20,000–$22,499	2,365,000
$22,500–$24,999	1,992,000

Source: U.S. Census Bureau.

For each of the following, if the graph would be an appropriate display for these data, create the graph. If not, explain why.

a. histogram **b.** bar graph
c. line graph **d.** pie chart

45. Each year, the U.S. Department of Justice reports the total number of victimizations per 1000 people aged 12 and over. The following table contains the totals for the years from 1991 through 2001. Decide what type of graph would convey this information in a visual way most effectively, and create the graph. Write a paragraph that summarizes the information and describes important features of the graph.

Year	Number of Victimizations per 1000 people Aged 12 and over
1991	48.4
1992	47.9
1993	49.1
1994	51.2
1995	46.1
1996	41.6
1997	38.8
1998	36.0
1999	32.1
2000	27.4
2001	24.7

Source: U.S. Department of Justice.

46. The Center on Hunger and Poverty reported that as of August 2002, the 10 states with the largest hunger rates were those shown in the following table. The hunger rate is defined as the percentage of households that were in a "state of hunger," that often felt pain because of lack of food. Decide what type of graph would convey this information most effectively in a visual way, and create the graph. Write a paragraph that summarizes the information and describes important features of the graph.

State	Hunger Rate
Oregon	6.2
Washington	5
New Mexico	4.6
Utah	4.4
Texas	4.4
Idaho	4.3
Alaska	4.3
Florida	4
Oklahoma	3.9
Tennessee	3.9

Source: Salem Statesman Journal, August 16, 2002.