PROBLEM SET 8.2

1. An instructor teaches two sections of chemistry. The results of an exam given to both classes are displayed in the following double stem-and-leaf plot.

Morning Class		Afternoon Class
	10	0 0
6 3	9	0 1 5 8
8 7 1	8	2 3 3 5 9 9
9 9 9 7 5 4 2 2	7	0 1 4 4 7 9
8 6 5 5 0	6	7 8
8 6 5	5	
9 7	4	
5 5	3	
	2	2
9	1	
	0	

   a. How many students took the test in each class?
   b. Give the high score and the low score for each class.
   c. Compare the results for the two classes. What conclusions can you make?

2. Two health classes measured their body fat percentages to the nearest tenth. The results are given in the following double stem-and-leaf plot.

Health Class I		Health Class II
	25	7 8 9 9
	24	4 6
	23	1 3 3
	22	
	21	6 7
8 4 3	20	0 2
8 7 6 1	19	0 8 8
8 5 0	18	2
7 6 4 3 1	17	3 9
6 4 2 2 0 0	16	4 5 7
9 9 6 2	15	1 6 8

   a. How many students measured their body fat in each class?
   b. Give the high percentage and the low percentage for each class.
   c. Compare the results for the two classes. What conclusions can you make?

3. Suppose that two fifth-grade classes take a reading test, yielding the following scores. (Scores are given in year.month equivalent form. One example is a score of 5.3, which means that the student is reading at the fifth-year, third-month level, where "year" means year in school.)

   Class 1: 5.3, 4.9, 5.2, 5.4, 5.6, 5.1, 5.8, 5.3, 4.9, 6.1, 6.2, 5.7, 5.4, 6.9, 4.3, 5.2, 5.6, 5.9, 5.3, 5.8

   Class 2: 4.7, 5.0, 5.5, 4.1. 6.8, 5.0, 4.7, 5.6, 4.9, 6.3, 7.2, 3.6, 8.1, 5.4, 4.7, 4.4, 5.6, 3.7, 6.2, 7.5

   a. Make a double stem-and-leaf plot for the test scores from the two classes.
   b. Describe any similarities and differences in the reading test results for the two classes.
   c. Do the data have any outliers or other striking features?

4. A professor scheduled two sociology classes together for a joint midterm. The scores for the two classes follow:

   Class 1: 85, 73, 84, 76, 73, 92, 64, 86, 84, 95, 66, 87, 63, 74, 84, 92, 76, 80, 86, 77, 91, 74, 76, 85

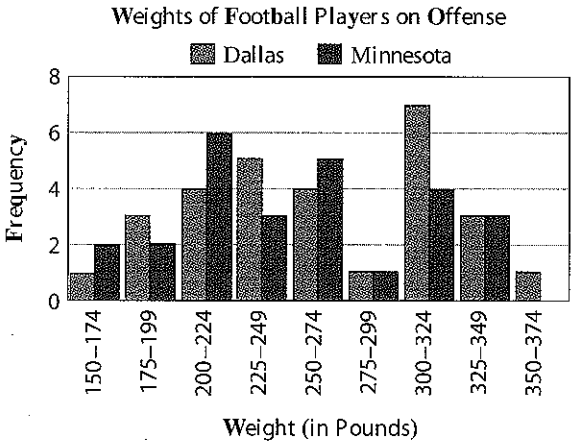
   Class 2: 66, 74, 86, 84, 54, 82, 70, 86, 94, 88, 96, 83, 73, 78, 75, 83, 80, 74, 77, 82, 85, 73, 85, 80, 84, 76, 88

   a. Make a double stem-and-leaf plot for the test scores from the two classes.
   b. Describe any similarities and differences in the midterm test results for the two classes.
   c. Do the data have any outliers or other striking features?

5. Babe Ruth was one of the greatest baseball players of all time. Among his many accomplishments were his lifetime and seasonal records for home runs. In his 15 years as a New York Yankee, Babe Ruth hit the following number of home runs per year: 54, 59, 35, 41, 46, 25, 47, 60, 54, 46, 49, 46, 41, 34, and 22. Next to Babe Ruth, the most productive home run hitter to wear a New York Yankee uniform was Mickey Mantle. In his 18 years as a Yankee, Mantle had the following home run totals: 13, 23, 21, 27, 37, 52, 34, 42, 31, 40, 54, 30, 15, 35, 19, 23, 22, and 18. Make a double stem-and-leaf plot of these data. How do Ruth and Mantle compare as hitters? (*Source:* www.baseball-reference.com.)

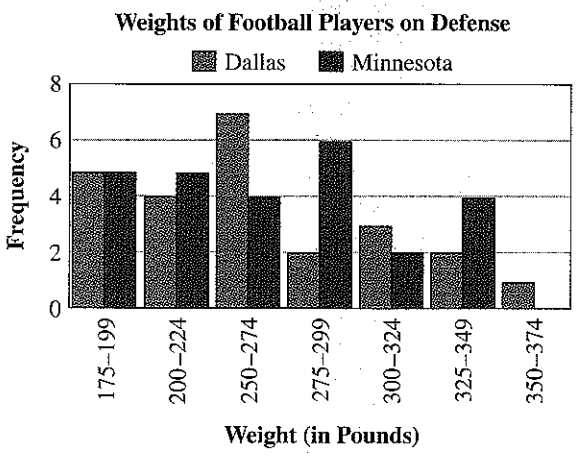
6. Seismologists use Richter-scale measurements to classify earthquakes. Earthquakes measuring less than 3.5 on the Richter scale are generally not felt, but they are recorded. On November 8, 2003, the following Richter-scale measurements were taken for earthquakes in California: 2.1, 1.3, 1.7, 2.0, 1.3, 1.1, 1.5, 2.6, 1.4, 1.0, 2.0, 2.0, 2.1, 1.7, 1.5, 0.9, 1.2, 2.9, and 0.8. On November 8, 2003, the following Richter-scale measurements were taken for earthquakes in Hawaii: 1.7, 1.5, 2.0, 3.3, 1.5, 1.7, 2.0, 2.0, 1.3, 1.4, 1.5, 1.6, 1.6, 1.4, 2.0, 1.9, 1.6, and 1.8. Make a double stem-and-leaf plot for these earthquake data. How did earthquakes compare for California and Hawaii? (*Sources:* Members of the Advanced National Seismic System, the U.S. Geological Survey, the North California Earthquake Data Center (NCEDC), and contributors to the NCEDC.)

7. The following comparison histogram displays the weights, in pounds, for offense players on the 2003 Dallas Cowboy football team and the 2003 Minnesota Viking football team.



a. Find the length of the measurement classes.
b. How many offense players play for each team?
c. What percentage of Dallas' offense players weigh at least 250 pounds?
d. What percentage of Minnesota's offense players weigh at least 250 pounds?
e. What can you conclude about the weights of the offense players who play for Dallas compared with those who play for Minnesota?

8. The following comparison histogram displays the weights, in pounds, for defense players on the 2003 Dallas Cowboy team and the 2003 Minnesota Viking team.



a. Find the length of the measurement classes.
b. How many defense players play for each team?
c. What percentage of Dallas' defense players weigh at least 250 pounds?
d. What percentage of Minnesota's defense players weigh at least 250 pounds?
e. What would you conclude about the weights of the defense players for Dallas compared with those who play for Minnesota?

9. Every year since 1928, the Academy of Motion Pictures Arts and Sciences has awarded an Oscar to the best actress in a leading role. The following list gives the ages of the actresses who received Oscars from 1928 to 1964: 22, 37, 30, 62, 32, 26, 31, 27, 26, 27, 30, 26, 29, 24, 39, 24, 29, 37, 30, 34, 34, 33, 28, 38, 45, 24, 26, 47, 41, 27, 39, 38, 28, 27, 31, 37, and 30. The following list gives the ages of the actresses who received Oscars from 1965 to 2004: 24, 34, 60, 61, 26, 35, 34, 34, 26, 37, 42, 41, 35, 31, 41, 33, 30, 74, 33, 49, 38, 61, 21, 41, 26, 81, 42, 29, 33, 35, 45, 49, 39, 34, 25, 25, 33, 33, 35, and 28. (*Source:* www.oscar.com.)

a. Create a comparison histogram for this data.
b. From 1928 to 1964, what percentage of actresses who won an Oscar for best actress in a leading role were at least 40 at the time of the award? Answer the same question for actresses who won from 1965 to 2004.
c. What might you conclude about the ages of actresses winning best actress Oscars in the past 40 years compared with over 40 years ago?

10. The following table shows monthly rainfall amounts, in inches, over an 8-year period for Friday Harbor in the San Juan Islands.

Year							
2000	1999	1998	1997	1996	1995	1994	1993
2.88	6.24	4.99	4.99	4.47	1.95	1.35	2.16
1.45	4.53	1.78	2.76	2.45	4.51	2.04	0.45
2.02	1.94	2.73	3.56	0.77	1.94	2.01	2.10
1.28	1.29	0.48	0.94	3.08	1.66	1.13	1.45
2.82	0.66	2.53	1.27	2.56	0.39	0.71	2.09
1.36	1.94	0.96	3.09	0.51	0.84	1.44	1.48
0.47	0.31	1.34	1.14	0.40	1.30	0.95	1.14
0.41	1.31	0.10	0.03	0.34	2.98	0.66	0.58
1.06	0.26	0.31	2.23	1.66	0.56	1.78	0.33
2.58	3.75	1.37	5.08	4.08	4.04	3.00	1.83
3.42	4.22	9.04	2.34	3.38	9.62	3.39	1.74
3.59	5.29	6.85	3.45	8.09	4.39	4.01	2.61

Source: www.sanjuanislander.com.

a. Create a comparison histogram for these data. Split the data into annual rainfall for the years 1993 to 1996 and annual rainfall for the years 1997 to 2000.

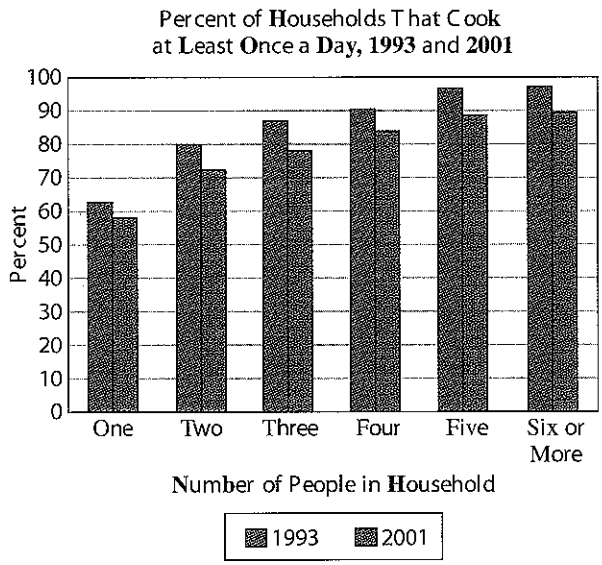
b. What percentage of months from 1997 to 2000 averaged at least 4 inches of rain? Answer the same question for the months from 1993 to 1996.

c. Compare the rainfall for each time period. What can you conclude?

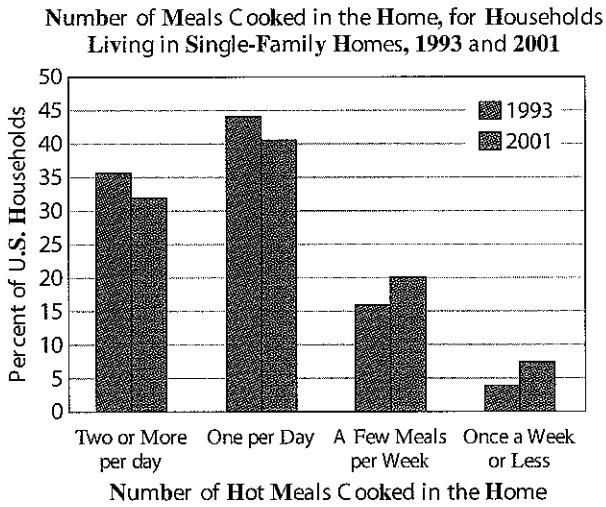
11. The Residential Energy Consumption Survey (RECS) collects data on household characteristics. The next multiple-bar graph uses survey data from 1993 and 2001 involving cooking trends and household sizes.

a. Estimate the change in the percentage of households that cook at least once a day from 1993 to 2001 for each of the household size classifications. What trend do you notice?

b. Which household size category experienced the greatest decrease in the percentage of households that cook at least once a day?



12. The Residential Energy Consumption Survey (RECS) collects data on household characteristics. The following double-bar graph uses survey data from 1993 and 2001 involving the number of meals cooked in single-family homes.



a. For single-family homes in 1993 and 2001, find the change in the percentage of U.S. households that cook two or more meals per day. Answer the same question for each of the categories.

b. Based on the double-bar graph, what can you say about the number of meals cooked in the home in 2001 compared with the number in 1993?

13. The percentages of the U.S. population, aged 18 or over, in each of four ethnic groups who were registered to vote in 2000 and the percentages of each ethnic group who actually voted in 2000 are given in the following table.

	Asian and Pacific Islander	Hispanic	Black	White
Percentage Registered	30.7	34.9	63.6	65.6
Percentage Voted	25.4	27.5	53.5	56.4

Source: U.S. Census Bureau.

a. Create a double-bar graph to display the data.

b. Which group of registered voters had the highest voter turn out? Which group of voters had the lowest percentage registered?

c. For each ethnic group, divide the percentage who voted by the percentage who were registered. How would you interpret this value? Which group had the largest value and which group had the smallest value?

14. The U.S. energy consumption for 1998 and 2002 by energy source is given in the following table. Energy consumption is measured in quadrillion BTUs.

Energy Source	1998	2002
Coal	21.7	22.2
Natural Gas	22.9	23.1
Petroleum	36.9	38.4
Nuclear Electric Power	7.1	8.1
Renewable Energy	6.5	5.9

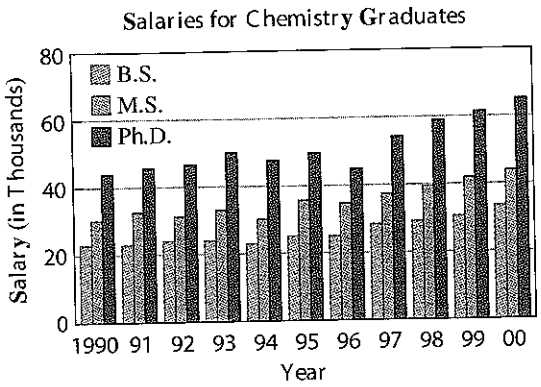
Source: www.eia.doe.gov.

a. Create a double-bar graph to display the data.

b. Find the change in energy consumption for each energy source from 1998 to 2002. Which energy source had the greatest increase? Were there any decreases?

c. For each of the energy-consumption changes you calculated in part (b), divide the change by the consumption value from 1998 and write as a percentage. How would you interpret these values? Which source had the largest value and which source had the smallest value?

15. The following graph displays the median salaries for 1990 through 2000 for new chemistry graduates who have earned a bachelor's degree (B.S.), a master's degree (M.S.), or a doctoral degree (Ph.D.). The salaries are for graduates with full-time positions and less than 1 year's technical work experience prior to graduation.



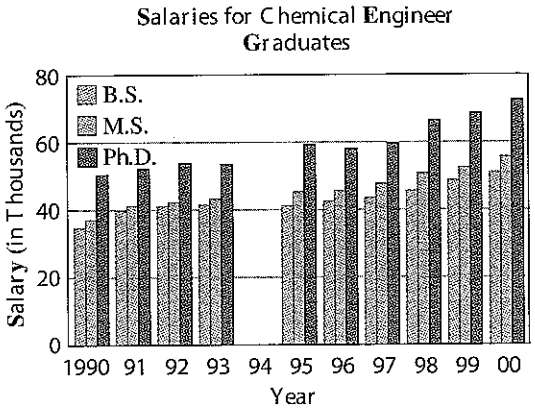
Source: Adapted from http://pubs.acs.org/cen/employment/7936/7936salarysurvey.html. Copyright 2001 American Chemical Society.

a. Estimate the salaries for chemistry graduates with a bachelor's degree in the years 1990, 1997, and 2000. What do you notice about the salaries for graduates with a bachelor's degree from 1990 through 1996?

b. Estimate the median salaries for chemistry graduates with a master's degree in the years 1990, 1995, and 2000. For each of the years given in the bar graph, find the difference between the salaries for graduates with a bachelor's degree and the salaries for graduates with a master's degree. What do you notice?

c. Estimate the median salaries for chemistry graduates with a doctoral degree in the years 1990, 1997, and 2000. During which time periods were salaries for graduates with a doctoral degree increasing?

16. The following graph displays the median salaries for new chemical engineering graduates from 1990 through 2000 who have earned a bachelor's degree (B.S.), a master's degree (M.S.), or a doctoral degree (Ph.D.). The salaries are for graduates with full-time positions and less than 1 year's technical work experience prior to graduation. (*Note:* The data from 1994 are not available.)



Source: Adapted from http://pubs.acs.org/cen/employment/7936/7936salarysurvey.html. Copyright 2001 American Chemical Society.

a. Estimate the salaries for chemical engineering graduates with a bachelor's degree in the years 1990, 1995, and 2000. Describe the trend in the salaries from 1990 through 2000. Estimate the median salary for the year 1994. Explain how you arrived at your estimate.

b. Estimate the median salaries for chemical engineering graduates with a master's degree in the years 1990, 1995, and 2000. For each of the years given in the bar graph, find the difference between the salaries for graduates with a master's degree and the salaries for graduates with a bachelor's degree. What do you notice?

c. Estimate the median salaries for chemical engineering graduates with a doctoral degree in the years 1990, 1997, and 2000. In which year did the salaries for chemical engineering graduates with a doctoral degree show the greatest increase compared with the previous year?

17. The Consumer Price Index (CPI) is prepared by the U.S. Bureau of Labor. A new CPI is released each month and provides a basis for comparing the changes in the cost of goods and services, and is often referred to as the **cost-of-living** index. As a reference point, the 1982 CPI is set to 100. The following table contains consumer price indices for three items for the months of October.

Item	1994	1997	2000	2003
Food/beverages	145.6	158.7	169.6	182.3
Apparel	135.2	134.9	132.8	121.5
Medical care	214.0	235.8	263.7	300.5

Source: www.bls.gov.

a. Create a multiple-bar graph to display the data.

b. In which 3-year period did the largest change occur in the CPI for food and beverages? Was it an increase or a decrease? Did the CPIs for other items experience their largest change in the same 3-year period?

c. How has the CPI for medical care changed over the years? Find the change in the CPI values given for medical care for each 3-year period. What do you notice?

d. Describe the changes in the CPI for apparel.

18. In the United States in 1990, the five languages most frequently spoken at home (other than English) were Spanish, French, German, Italian, and Chinese, in that order. The following table gives the total number of speakers of each language for the population 5 years old and older in the years 1990 and 2000.

Language	Number of Speakers in 1990	Number of Speakers in 2000
Spanish	17,339,172	28,101,052
French	1,702,176	1,643,838
German	1,547,099	1,382,613
Italian	1,308,648	1,008,307
Chinese	1,249,213	2,022,143

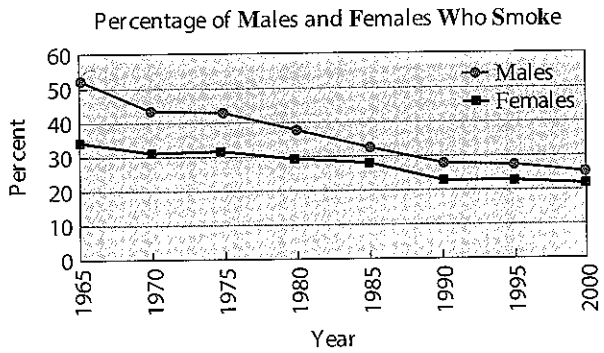
Source: www.census.gov.

a. Create a double-bar graph to display the data.

b. Which language experienced the greatest decrease in the number of speakers from 1990 to 2000? Which experienced the greatest increase?

c. How would the languages be ranked by the number of speakers in 2000?

19. In the United States in 2001, approximately 25.2 percent of men were smokers, while approximately 20.7 percent of women were smokers. The following double-line graph shows the percentage of men and women who were smokers from 1965 to 2000.

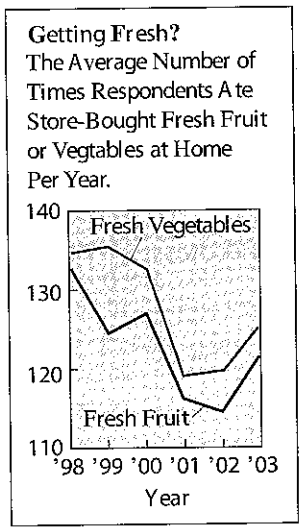


a. Describe the trend in the percentages of men and women who smoke.

b. Estimate the percentage of men who smoked in each 5-year period from 1965 to 2000. Do the same for the percentage of women who smoked.

c. During what 5-year period did the greatest decrease in the percentage of men who smoked occur? Answer the same question for women.

20. A study of the eating habits of 5000 people was conducted by the market-research firm NPD Group Inc. The following double-line graph shows the average number of times per year respondents ate store-bought fresh fruit or vegetables at home.



Source: Reprinted by permission of The Wall Street Journal, Copyright © 2003 Dow Jones & Company, Inc. All Rights Reserved Worldwide. License number 1345730455855.

a. Describe the trend in the average number of times per year store-bought fruits or vegetables were eaten at home from 1998 to 2003.

b. Estimate the average number of times per year respondents ate store-bought fresh fruit at home for each of the years from 1998 through 2003. Do the same for vegetables. Then add the average values for each year to get a total average for each year for fruits and vegetables combined.

c. Create a new line graph using the totals for each year from part (b). Compare the single-line graph with the double-line graph and explain which you prefer and why.

21. The following table contains the number of CDs and cassette tapes (in millions) sold from 1990 through 2001.

Year	CDs (in Millions)	Cassette Tapes (in Millions)
1990	286.5	442.2
1991	333.3	360.1
1992	407.5	366.4
1993	495.4	339.5
1994	662.1	345.4
1995	722.9	272.6
1996	778.9	225.3
1997	753.1	172.6
1998	847.0	158.5
1999	938.9	123.6
2000	942.5	76.0
2001	906.6	45.6

Source: Recording Industry Association of America, www.riaa.com/default.asp

a. Create a double-line graph to represent these data. Describe the trend in the numbers of CDs sold and the number of cassette tapes sold.

b. In approximately what year were total sales of CDs and cassette tapes the same?

c. Between which 2 years did CD total sales increase the most?

d. Between which 2 years did cassette tape sales decrease the most?

22. Collective bargaining agreements have set the minimum salaries for basketball players in the National Basketball Association (NBA) and the Women's National Basketball Association (WNBA), depending on the number of years of service. The following table contains the salary minimums for the 2003–2004 season.

Years of Service	WNBA Minimum Salary	NBA Minimum Salary
0	$30,000	$367,000
1	$30,000	$564,000
2	$30,000	$639,000
3	$30,000	$689,000
4	$42,000	$751,000
5	$42,000	$814,000
6	$42,000	$876,000

Source: www.nba.com and womensbasketballonline.com.

a. Create a double-line graph to represent these data. Describe the trend in the minimum salaries for the WNBA and for the NBA.

b. Between which 2 years do WNBA minimum salaries increase the most?

c. Between which 2 years do NBA minimum salaries increase the most?

23. The following table gives the median age at first marriage for females and males from 1890 through 1960.

MEDIAN AGE AT FIRST MARRIAGE		
Year	Females	Males
1890	22.9	26.1
1900	21.9	25.9
1910	21.6	25.1
1920	21.2	24.6
1930	21.3	24.3
1940	21.5	24.3
1950	20.3	22.8
1960	20.3	22.8

Source: U.S. Census Bureau.

a. Represent the data with a double-line graph.

b. Describe the trend in the median age at first marriage for females. Describe the trend in the median age at first marriage for males.

24. The following table gives the median age at first marriage for females and males from 1970 through 2000.

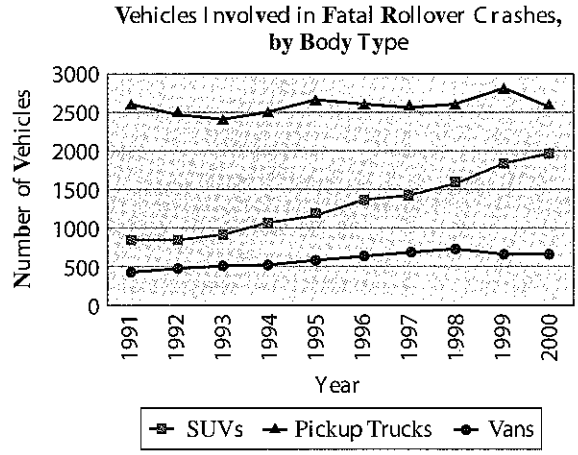
MEDIAN AGE AT FIRST MARRIAGE		
Year	Females	Males
1970	20.8	23.2
1980	22.0	24.7
1990	23.9	26.1
2000	25.1	26.8

Source: U.S. Census Bureau.

a. Combine these data with the data from the previous problem, and represent the data for 1890 to 2000 with a double-line graph.

b. Describe the trend in the median age at the first marriage for females for the time period 1890 to 2000. Describe the trend in the median age at first marriage for males for the time period 1890 to 2000.

25. On December 20, 2002, a $51.5 million settlement was reached with Ford Motor Company over allegations of deceptive trade practices relating to sales and advertising of the Ford Explorer and other SUVs. It was claimed that Ford's deceptive ads led consumers to believe that SUVs could be steered and handled like cars even in emergency situations, when the truth was that rollover crashes were more likely with SUVs. The next multiple-line graph shows the number of vehicles involved in fatal rollover crashes by body type.



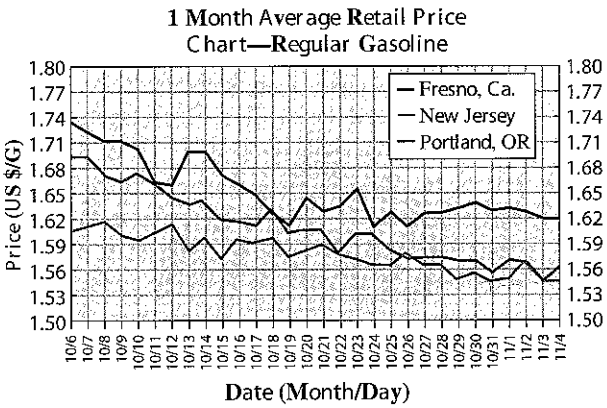
a. Estimate the number of pickup trucks involved in fatal rollover crashes in 1991, 1994, 1997, and 2000. Make the same estimates for SUVs and vans.

b. For each vehicle type, estimate the difference between the largest number of fatal rollover crashes in a year and the smallest number of fatal rollover crashes in a year.

c. Describe the general trend in the number of fatal rollover crashes for each type of vehicle.

d. Give one other reason, besides deceptive advertising, that could help explain the trend in fatal rollover crashes for SUVs.

26. In 2003, Oregon and New Jersey were the only two states that did not allow self-service gasoline stations. Supporters of self-service gas stations argued that pumping your own gas would result in lower prices. Compare the gasoline prices from October 6, 2003, through November 4, 2003, for New Jersey, Oregon, and California.



Source: Adapted from www.gasbuddy.com

a. Describe the general trend in regular gasoline prices from October 6, 2003, through November 4, 2003. How do prices compare for Oregon and New Jersey, where there is a ban on self-service gas stations, and Fresno, California, where consumers may pump their own gas?

b. Which location experienced the greatest drop in regular gasoline prices over the time period?

c. On what day did Fresno, California, experience the lowest price for regular gasoline? Answer the same question for Portland, Oregon, and New Jersey.

d. On what day(s) did Fresno, California, and Portland, Oregon sell regular gasoline for the same price?

e. On what day(s) did New Jersey and Portland, Oregon, sell regular gasoline for approximately the same price?

Problems 27 and 28

The following problems involve the calculation of a percentage change in a quantity. To find a percentage change, whether it is an increase or a decrease, find the difference between the new value and the original value, divide the difference by the original value, and multiply by 100%.

$$\text{percentage change} = \frac{\text{new value} - \text{original value}}{\text{original value}} \times 100\%.$$

27. Per-capita personal incomes for Alabama, California, and Oklahoma are given in the following table for the years 1998 through 2002. Per-capita personal income is the total personal income divided by the total midyear population. Midyear population estimates are from the Bureau of the Census.

State	1998	1999	2000	2001	2002
Alabama	22,054	22,972	23,521	24,477	25,128
California	28,163	29,856	32,149	32,655	32,996
Oklahoma	21,960	22,958	23,650	24,945	25,575

Source: U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.doc.gov/bea/regional/spi/.

a. Create a multiple-line graph to depict the per-capita personal incomes for 1998 through 2002.

b. Find the percentage increase in per-capita personal income from 1998 to 2002 for each of the three states. Which state experienced the largest percentage increase in per-capita personal income? Which state experienced the smallest percentage increase?

c. During which year(s) did the per-capita personal income for Oklahoma residents exceed that of Alabama residents?

d. Find the percentage increase from 1999 to 2000, from 2000 to 2001, and from 2001 to 2002 for both Oklahoma and Alabama. Describe the trend in the percentage increases. Based on your observations, do you think the per-capita income for Alabama residents will exceed that of Oklahoma residents in the future? Explain.

28. Per-capita personal incomes for Pennsylvania, Nevada, and the United States are given in the following table for the years 1998 through 2002. Per-capita personal income is the total personal income divided by the total midyear population. Midyear population estimates are from the Bureau of the Census.

State	1998	1999	2000	2001	2002
Pennsylvania	27,469	28,619	29,504	30,752	31,727
Nevada	29,200	31,004	29,506	30,128	30,180
United States	27,203	28,546	29,469	30,413	30,941

Source: U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.doc.gov/bea/regional/spi/.

a. Create a multiple-line graph to depict the per-capita personal incomes for 1998 through 2002.

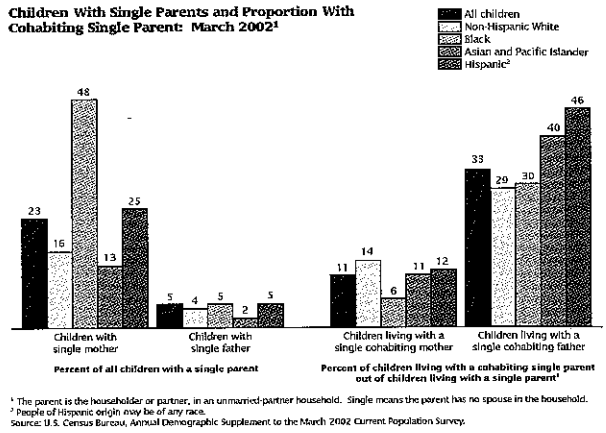
b. Find the percentage increase in per-capita personal income from 1998 to 2002 for Pennsylvania and Nevada. Which state experienced the larger percentage increase? Which state experienced the smaller percentage increase?

c. Which state's per-capita personal income most closely resembled the per-capita personal income for the United States from 1998 to 2002? For this state and the United States, find the difference in the per-capita personal income for each of the 5 years. Describe the trend.

d. Find the percentage increase or decrease from 1998 to 1999, from 1999 to 2000, from 2000 to 2001, and from 2001 to 2002 for Pennsylvania and Nevada. What do you observe?

Problems 29 and 30

The welfare of children is a concern to parents and to society in general. Based on current population surveys, the U.S. Census Bureau has produced a population report for 2002. In March 2002, approximately 72 million children under the age of 18 were living in the United States. The following multiple-bar graph, which shows where many of these children lived, was included in the Bureau's report.



Source: U.S. Census Bureau, Children's Living Arrangements and Characteristics: March 2002.

29. Consider the two multiple-bar graphs for the "Percent of all children with a single parent."

a. Can you redraw the bar graphs using two pie charts? Explain why or why not.

b. What do the numbers at the top of each bar represent?

c. For which ethnic group did the largest percentage of children live with a single mother? For which ethnic group did the smallest percentage of children live with a single mother?

d. For the two ethnic groups from part (c), create two comparison pie charts. Note that each pie chart will have three sectors. One sector will correspond to the percentage of children of that ethnic group who live with a single mother. Another will correspond to the percentage of children of that ethnic group who live with a single father. How will the third sector be labeled?

30. Consider the two multiple-bar graphs for the "Percent of children living with a cohabiting single parent out of children living with a single parent."

a. Can you redraw the two bar graphs using two pie charts? Explain why or why not.

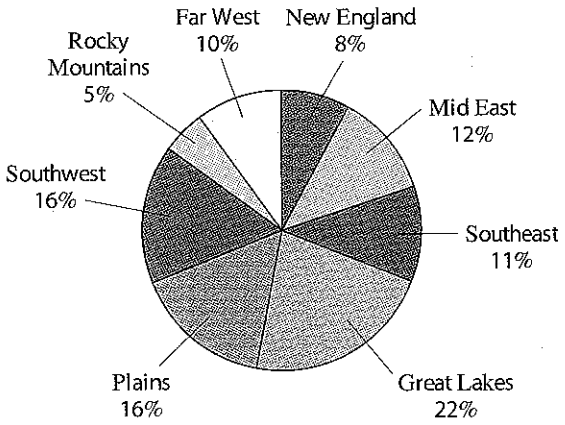
b. What do the numbers at the top of each bar represent?

c. For which ethnic group did the largest percentage of children live with a single cohabiting father? For which ethnic group did the smallest percentage of children live with a single cohabiting father?

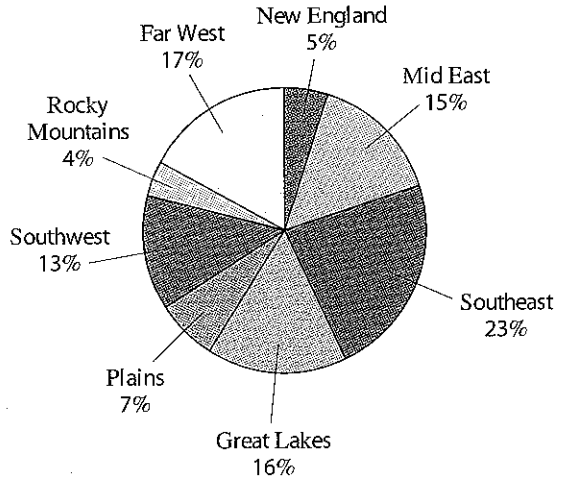
d. For the two ethnic groups from part (c), create two comparison pie charts. Note that each pie chart will have three sectors. One sector will correspond to the percentage of children of that ethnic group

who live with a single cohabiting father. Another will correspond to the percentage of children of that ethnic group who live with a single cohabiting mother. How will the third sector be labeled?

Percentage of School Districts by Region 2002–2003



Percentage of Student Enrolled Per Region 2002–2003



31. The percentage of school districts by region and the percentage of students enrolled in public school by region are given in the preceding pie charts.

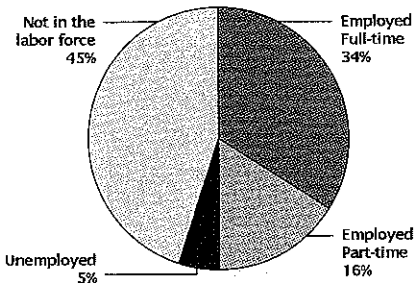
a. If there were 15,215 operating school districts in the United States in the 2002–2003 school year, then approximately how many school districts were there in each region? Round your answers to the nearest whole number.

b. If there were 47,792,369 students enrolled in school in the United States in the 2002–2003 school year, then approximately how many students were enrolled in each region? Round your answers to the nearest whole number.

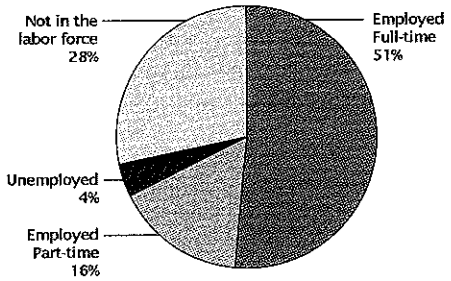
c. Compare the two pie charts. Which regions have a larger percentage of districts and a smaller percentage of students enrolled? Which regions have a smaller percentage of districts and a larger percentage of students enrolled?

32. The following pie charts summarize the labor-force participation of mothers, aged 15 to 44, with infants and without infants.

Mothers with an infant



Mothers without an infant



Source: U.S. Census Bureau, Current Population Survey, June 2002.

a. If there were 3,766,000 mothers with an infant in June 2002, then how many mothers were there in each employment category?

b. If there were 30,905,000 mothers without an infant in June 2002, then how many mothers were there in each employment category?

c. Compare the two pie charts. What can you conclude?

Problems 33 and 34

The week before Special Prosecutor Kenneth Starr testified before the House Judiciary Committee, which acted to impeach President Clinton in early 1999, a public opinion poll sought to determine how the American public would react. Presented in the following two problems are the results of a number of questions asked in a CNN/USA Today/Gallup Poll survey. Results are based on telephone interviews conducted November 13–15, 1998, with 1039 adults nationwide. The margin of error is plus or minus 3 percentage points.

33. The following three questions were posed in the survey. Create pie charts to display the results for each question. What might you conclude?

Question: Do you approve or disapprove of the way Bill Clinton is handling his job as president?

Approve	66%
Disapprove	31%
No opinion	3%

Question: What would you want your member of the House of Representatives to do?

Vote to impeach	31%
Vote not to impeach	66%
No opinion	3%

Question: If the House does vote to impeach President Clinton and sends the case to the Senate for trial, what would you want your senators to do?

Vote in favor of convicting	30%
Vote against convicting	68%
No opinion	2%

34. The following two questions were also posed in the survey. Create pie charts to display the results for each question. What might you conclude?

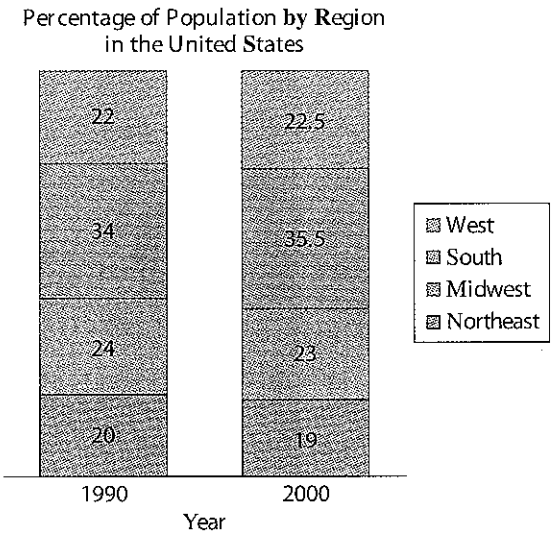
Question: Which would you prefer?

Continue hearings	26%
Censure and stop hearings	35%
Drop altogether	39%

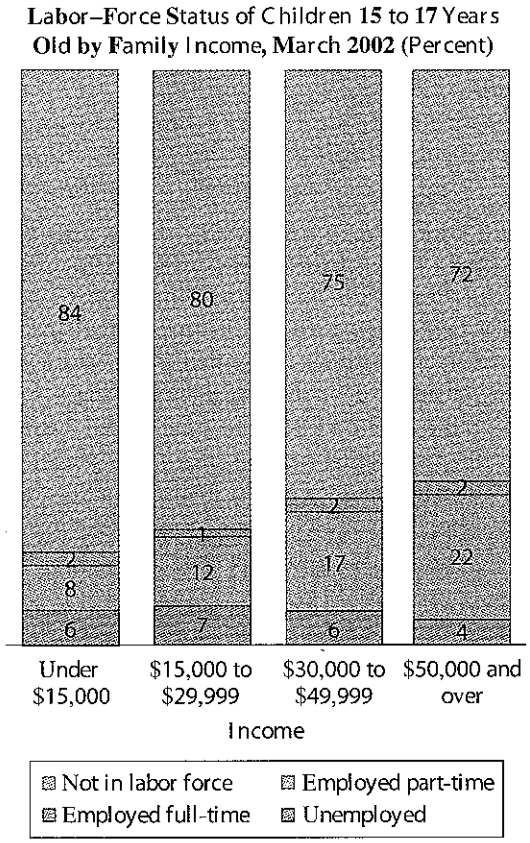
Question: Do you approve of the decision to hold these hearings?

Strongly approve	22%
Moderately approve	18%
Moderately disapprove	24%
Strongly disapprove	35%
No opinion	1%

35. The next proportional bar graph gives the population distribution for the United States by region for 1990 and 2000. What conclusion would you make about the percentage of the population living in each region in 1990 and in 2000?

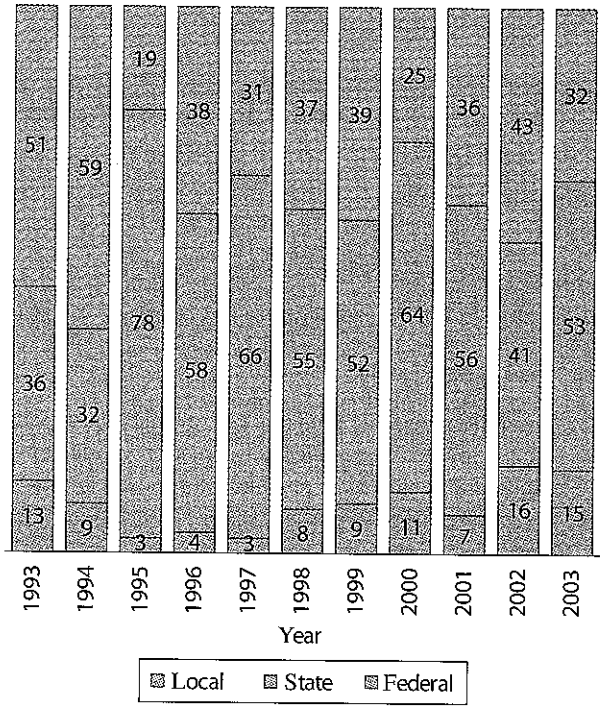


36. The labor-force status of children, 15 to 17 years old, for four family-income categories is given in the following proportional bar graph. What conclusion can you make about 15- to 17-year-old children who work in relation to the different family income levels?



37. According to the National Education Association, one indicator of support for improvement in education is an increase in new funding each year. The following proportional bar graph gives the percentage of federal, state, and local revenue that contributes to the *increase* in funding compared to the previous year.

Percentage of the **Revenue Increase by Source, 1993–2003**



a. Of the three sources that contribute to the revenue increase each year, which source contributes the least, on average? Which source contributes the most?

b. Which of the three sources is the most stable; that is, which source fluctuates the least?

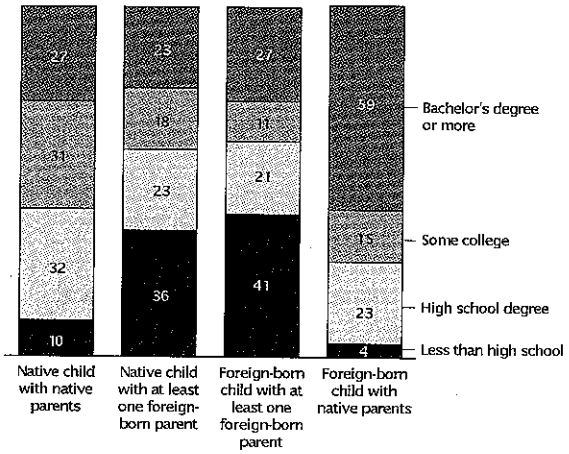
c. In which year was the percentage contributed by the local source the smallest?

d. Between which 2 years did the percentage contributed by the state change the most? Was it an increase or a decrease?

38. The foreign-born population of the United States has increased significantly since the 1970s. Approximately 12 million native children (born in the United States.) lived with at least one foreign-born parent in 2002. For children living with at least one parent in the United States, the following proportional bar graph summarizes the children's and parents' nativity (place of birth) classified according to the parent's education.

Children's and Parents' Nativity by Parent's Education for Children Living With At Least One Parent: March 2002[1]

(In percent)



[1] Children with any foreign-born parents are included with foreign-born parent, children with native parents only are with native parents.
Education is the mother's, if not available, the father's is used.
Source: U.S. Census Bureau, Annual Demographic Supplement to the March 2002 Current Population Survey.

Source: www.census.gov, Children's Living Arrangements and Characteristics: March 2002.

a. What is the most striking difference between foreign-born parents and native parents when education is considered?

b. In which category is a child most likely to be living with educated parents, that is, with parents with at least a high-school degree?

c. What conclusion can be made about education in the United States for native parents?

39. Several of the leading causes of death for people in the United States aged 65 and over for the years 1980 and 2001 are listed in the following table.

Cause of Death	1980	2001
Heart diseases	44.4	32.4
Pneumonia and influenza	3.4	3.0
Malignant neoplasms	19.3	21.7
Diabetes mellitus	1.9	3.0
Cerebrovascular diseases	11.0	8.0
Other	20.0	31.9

Source: www.cdc.gov.

a. Present these data using a proportional bar graph.
b. Present these data using pie charts.
c. Summarize the changes in the leading causes of death between 1980 and 2001.
d. Which type of graph, created in parts (a) and (b), best demonstrates the important features of the data? Explain.

40. The highest level of education attained by U.S. citizens by gender in the year 2000 is given in the next table.

a. Present these data using a proportional bar graph.
b. Present these data using pie charts.
c. Summarize the differences in the highest level of education attained for males and females in 2000.
d. Which type of graph, created in parts (a) and (b), best demonstrates the important features of the data? Explain.

Highest Level of Education	Male	Female
Less than high school	28.6	21.8
High-school graduate or equivalent	30.2	26.9
Some college or associate degree	34.9	42.0
Bachelor's degree or higher	6.3	9.3

Source: www.census.gov.

41. The following table contains tax revenue per capita for 11 Southeastern states and the tax revenue per capita that would have resulted if proposed tax increases had been in place in 2000.

a. Study the table and comment on the current tax revenue per capita versus the tax revenue per capita that would have resulted from the proposed tax increase.
b. Create a graph to emphasize what you noticed from part (a). Give a reason why you selected the type of graph you created.

State	Current Tax Revenue per Capita (in Dollars)	State	Proposed Tax Revenue per Capita (in Dollars)
Georgia	2841	Georgia	2841
North Carolina	2664	North Carolina	2664
Florida	2624	Florida	2624
Kentucky	2517	Kentucky	2517
Louisiana	2436	Louisiana	2436
West Virginia	2413	West Virginia	2413
South Carolina	2379	Alabama	2387
Arkansas	2230	South Carolina	2379
Mississippi	2214	Tennessee	2359*
Tennessee	2185	Arkansas	2230
Alabama	2117	Mississippi	2214

*Includes revenue from a tax increase passed by Tennessee in 2002
Source: Public Affairs Research Council of Alabama.

Ethnic Group	Percent Distribution of People 55 Years and Over			
	55 to 64	65 to 74	75 to 84	85 and Over
White	42.1	30.1	21.6	6.2
Black	46.7	33.0	16.1	4.3
American Indian and Alaska Native	51.7	30.0	14.6	3.6
Asian and Pacific Islander	51.1	30.0	16.1	2.9
Hispanic	50.6	30.6	14.7	4.1

Source: www.census.gov.

42. The preceding table contains the percentages of people aged 55 years and over by ethnic group.

a. Study the table and comment on the similarities and differences.

b. Create a graph to emphasize what you noticed from part (a). Give a reason why you selected the type of graph you created.

43. Dollar stores are attracting more shoppers these days. The following table contains the percentages of households that shopped in dollar stores by income level in 2000 and in 2002.

Household Income in Dollars	Percentage of Households That Shop in Dollar Stores	
	2000	2002
At least $70,000	37	45
$50,000 to $69,999	48	58
$40,000 to $49,999	54	64
$30,000 to $39,999	57	67
$20,000 to $29,999	62	71
Less than $20,000	67	74

Source: www.acnielson.com.

a. Create two different displays of these data. Which graphical representation seems to best illustrate the data, and why?

b. Summarize the pattern in the percentage of shoppers shopping in dollar stores.

44. Turkey exports are increasingly important to turkey producers in the United States. The following table shows United States' turkey exports, in millions of pounds, from the years 1991 through 2002.

Year	Whole Body	Parts and Cut-Up
1991	16.6	105.4
1992	20.3	181.5
1993	19.5	224.2
1994	24.1	256.3
1995	24.8	323.2
1996	34.7	403.3
1997	40.8	565.1
1998	36.6	409.6
1999	41.9	337.1
2000	33.3	412.0
2001	20.3	466.6
2002	15.2	423.3

Source: www.eatturkey.com.

a. Create two different displays of this data. Which graphical representation seems to best illustrate the data, and why?

b. Summarize the trends in turkey exports.

Extended Problems

45. Collect as many examples as you can find of comparison histograms, multiple-bar graphs, multiple-line graphs, multiple pie charts, and proportional bar graphs. Look in newspapers, magazines, and political fliers. From the graphs you find, select three different types and write a paragraph explaining what the graph illustrates. Evaluate the appropriateness of the form of the graph. If you think the data would have been more effectively represented by a different form of graph, create a new graph and explain why your graph is an improvement over the one you found.