

- 26. President's State of Birth** The following table lists the presidents of the United States (as of October 2010) and their state of birth.

Birthplace of U.S. President					
President	State of Birth	President	State of Birth	President	State of Birth
Washington	Virginia	Lincoln	Kentucky	Hoover	Iowa
J. Adams	Massachusetts	A. Johnson	North Carolina	F. D. Roosevelt	New York
Jefferson	Virginia	Grant	Ohio	Truman	Missouri
Madison	Virginia	Hayes	Ohio	Eisenhower	Texas
Monroe	Virginia	Garfield	Ohio	Kennedy	Massachusetts
J. Q. Adams	Massachusetts	Arthur	Vermont	L. B. Johnson	Texas
Jackson	South Carolina	Cleveland	New Jersey	Nixon	California
Van Buren	New York	B. Harrison	Ohio	Ford	Nebraska
W. H. Harrison	Virginia	Cleveland	New Jersey	Carter	Georgia
Tyler	Virginia	McKinley	Ohio	Reagan	Illinois
Polk	North Carolina	T. Roosevelt	New York	George H. Bush	Massachusetts
Taylor	Virginia	Taft	Ohio	Clinton	Arkansas
Fillmore	New York	Wilson	Virginia	George W. Bush	Connecticut
Pierce	New Hampshire	Harding	Ohio	Barack Obama	Hawaii
Buchanan	Pennsylvania	Coolidge	Vermont		

- Construct a frequency bar graph for state of birth.
- Which state has yielded the most presidents?
- Explain why the answer obtained in part (b) may be misleading.

- 27. Highest Elevation** The following data represent the land area and highest elevation for each of the seven continents.

Continent	Land Area (square miles)	Highest Elevation (feet)
Africa	11,608,000	19,340
Antarctica	5,100,000	16,066
Asia	17,212,000	29,035
Australia	3,132,000	7,310
Europe	3,837,000	18,510
North America	9,449,000	20,320
South America	6,879,000	22,834

Source: www.infoplease.com

- Would it make sense to draw a pie chart for land area? Why? If so, draw a pie chart.
 - Would it make sense to draw a pie chart for the highest elevation? Why? If so, draw a pie chart.
- 28. StatCrunch Survey** Choose a qualitative variable from the Sullivan StatCrunch survey data set and summarize the variable.
- 29. StatCrunch Survey** Choose a qualitative variable from the Sullivan StatCrunch survey data set and summarize the variable by gender. What are the differences, if any, in the value of the variable for males and females?
- 30. Putting It Together: Online Homework** Keeping students engaged in the learning process greatly increases their chance

of success in a course. Traditional lecture-based math instruction has been giving way to a more student-engaged approach where students interact with the teacher in class and receive immediate feedback to their responses. The teacher presence allows students, when incorrect in a response, to be guided through a solution and then immediately be given a similar problem to attempt.

A researcher conducted a study to investigate whether an online homework system using an attempt-feedback-reattempt approach improved student learning over traditional pencil-and-paper homework. The online homework system was designed to increase student engagement outside class, something commonly missing in traditional pencil-and-paper assignments, ultimately leading to increased learning.

The study was conducted using two first-semester calculus classes taught by the researcher in a single semester. One class was assigned traditional homework and the other was assigned online homework that used the attempt-feedback-reattempt approach. The summaries on the next page are based on data from the study.

- What is the research objective?
- Is this study an observational study or experiment?
- Give an example of how the researcher attempted to control variables in the study.
- Explain why assigning homework type to entirely separate classes can confound the conclusions of the study.
- For the data in the table, (i) identify the variables, (ii) indicate whether the variables are qualitative or quantitative, and (iii) for each quantitative variable, indicate whether the variable is discrete or continuous.

27. Live Births The following data represent the number of live births in the United States in 2007 for women 15 to 49 years old.

Age	Live Births
15-19	445,045
20-24	1,082,837
25-29	1,208,405
30-34	962,179
35-39	499,916
40-44	105,071
45-49	7,349

Source: National Center for Health Statistics

28. Community College Enrollments The following data represent the fall 2009 student headcount enrollments for all public community colleges in the state of Illinois.

Number of Students Enrolled	Number of Community Colleges
0-4,999	17
5,000-9,999	18
10,000-14,999	7
15,000-19,999	5
20,000-24,999	0
25,000-29,999	1

Source: Illinois Board of Higher Education

In Problems 29-32, construct (a) a relative frequency distribution, (b) a frequency histogram, and (c) a relative frequency histogram for the given data. Then answer the questions that follow.

29. Using the data in Problem 25, what percentage of California community colleges have tuition below \$800? What percentage of California community colleges have tuition of \$850 or more?

30. Using the data in Problem 26, what percentage of earthquakes registered 4.0 to 4.9? What percentage of earthquakes registered 4.9 or less?

31. Using the data in Problem 27, what percentage of live births was to women 40 to 44 years old? What percentage of live births was to women 24 years or younger?

32. Using the data in Problem 28, what percentage of public community colleges in Illinois enrolled between 5000 and 9999 students? What percentage of public community colleges in Illinois enrolled 15,000 or more students?

NW 33. Televisions in the Household A researcher with A. C. Nielsen wanted to determine the number of televisions in households. He conducts a survey of 40 randomly selected households and obtains the following data.

1	1	4	2	3	3	5	1
1	2	2	4	1	1	0	3
1	2	2	1	3	1	1	3
2	3	2	2	1	2	3	2
1	2	2	2	2	1	3	1

Source: Based on data from the U.S. Department of Energy

- (a) Are these data discrete or continuous? Explain.
- (b) Construct a frequency distribution of the data.
- (c) Construct a relative frequency distribution of the data.
- (d) What percentage of households in the survey have 3 televisions?
- (e) What percentage of households in the survey have 4 or more televisions?
- (f) Construct a frequency histogram of the data.
- (g) Construct a relative frequency histogram of the data.
- (h) Describe the shape of the distribution.

34. Waiting The following data represent the number of customers waiting for a table at 6:00 P.M. for 40 consecutive Saturdays at Bobak's Restaurant.

11	5	11	3	6	8	6	7
4	5	13	9	6	4	14	11
13	10	9	6	8	10	9	5
10	8	7	3	8	8	7	8
7	9	10	4	8	6	11	8

- (a) Are these data discrete or continuous? Explain.
- (b) Construct a frequency distribution of the data.
- (c) Construct a relative frequency distribution of the data.
- (d) What percentage of the Saturdays had 10 or more customers waiting for a table at 6:00 P.M.?
- (e) What percentage of the Saturdays had 5 or fewer customers waiting for a table at 6:00 P.M.?
- (f) Construct a frequency histogram of the data.
- (g) Construct a relative frequency histogram of the data.
- (h) Describe the shape of the distribution.

NW 35. Average Income The following data represent the per capita (average) disposable income (income after taxes) for the 50 states and the District of Columbia in 2009.

30,103	33,096	35,507	37,916	41,344	43,874
30,875	33,725	35,667	38,081	41,411	45,705
31,632	33,786	35,676	38,503	41,552	46,957
31,799	34,004	36,484	38,578	41,751	48,285
31,883	34,025	36,745	39,530	42,009	49,875
31,946	34,089	36,751	39,578	42,325	50,313
32,219	34,453	36,822	39,817	42,603	54,397
32,935	35,268	36,935	41,003	42,831	66,000
32,992	35,381	37,780			

Source: U.S. Bureau of Economic Analysis, March 2010

With the first class having a lower class limit of 30,000 and a class width of 6000:

- (a) Construct a frequency distribution.
- (b) Construct a relative frequency distribution.
- (c) Construct a frequency histogram of the data.
- (d) Construct a relative frequency histogram of the data.
- (e) Describe the shape of the distribution.
- (f) Repeat parts (a)-(e) using a class width of 3000.
- (g) Does one frequency distribution provide a better summary of the data than the other? Explain.

36. Uninsured Rates The following data represent the percentage of people without health insurance for the 50 states and the District of Columbia in 2009.

4.2	10.6	12.6	14.8	17.8	18.9	21.4
8.6	10.6	13.0	15.5	18.1	19.4	22.2
9.2	10.9	13.3	15.9	18.3	19.6	25.0
9.6	10.9	13.4	15.9	18.3	19.7	
9.6	11.3	13.9	16.1	18.4	20.6	
9.7	11.4	14.0	16.1	18.4	21.1	
10.2	11.6	14.3	16.1	18.6	21.2	
10.5	12.3	14.7	16.2	18.7	21.3	

Source: Gallup

With the first class having a lower class limit of 4 and a class width of 2:

- Construct a frequency distribution.
- Construct a relative frequency distribution.
- Construct a frequency histogram of the data.
- Construct a relative frequency histogram of the data.
- Describe the shape of the distribution.
- Repeat parts (a)–(e) using a class width of 4.
- Does one frequency distribution provide a better summary of the data than the other? Explain.

37. **Cigarette Tax Rates** The table shows the tax, in dollars, on a pack of cigarettes in each of the 50 states and Washington, DC, as of September 2010. **Note:** The state with the lowest tax is Virginia and the state with the highest tax is New York.

3.025	1.18	0.87	1.70	0.57
0.80	2.00	1.70	0.60	0.44
1.53	1.56	2.52	0.64	0.84
1.66	1.41	1.03	0.79	1.36
0.17	1.15	0.36	0.68	0.62
0.60	0.98	2.00	1.25	0.995
1.60	4.35	2.00	0.55	0.30
0.45	0.57	0.37	0.425	1.339
1.78	2.24	2.51	3.46	3.00
2.70	1.60	2.00	2.50	2.00
3.00				

Source: Bureau of Alcohol, Tobacco, Firearms, and Explosives

With a first class having a lower class limit of 0 and a class width of 0.50:

- Construct a frequency distribution.
- Construct a relative frequency distribution.
- Construct a frequency histogram of the data.
- Construct a relative frequency histogram of the data.
- Describe the shape of the distribution.
- Repeat parts (a)–(e) using a class width of 1.
- Does one frequency distribution provide a better summary of the data than the other? Explain.

38. **Dividend Yield** A dividend is a payment from a publicly traded company to its shareholders. The dividend yield of a stock is determined by dividing the annual dividend of a stock by its price. The following data represent the dividend yields (in percent) of a random sample of 28 publicly traded stocks of companies with a value of at least \$5 billion.

1.7	0	1.15	0.62	1.06	2.45	2.38
2.83	2.16	1.05	1.22	1.68	0.89	0
2.59	0	1.7	0.64	0.67	2.07	0.94
2.04	0	0	1.35	0	0	0.41

Source: Yahoo! Finance

With the first class having a lower class limit of 0 and a class width of 0.40:

- Construct a frequency distribution.
- Construct a relative frequency distribution.
- Construct a frequency histogram of the data.
- Construct a relative frequency histogram of the data.
- Describe the shape of the distribution.
- Repeat parts (a)–(e) using a class width of 0.8.
- Which frequency distribution seems to provide a better summary of the data?

39. **Violent Crimes** Violent crimes include murder, forcible rape, robbery, and aggravated assault. The following data represent the violent-crime rate (crimes per 100,000 population) by state plus the District of Columbia in 2009.

449.8	1345.9	400.1	281.3	384.7	670.8	296.5
633.0	612.5	258.7	491.8	404.3	185.6	257.0
408.3	426.1	620.0	253.6	200.7	667.7	228.2
517.7	274.8	119.8	281.6	332.1	490.9	
472.0	228.4	589.9	702.2	501.1	212.7	
337.8	497.2	457.1	159.6	254.7	131.4	
298.7	333.2	497.0	311.5	380.5	226.8	
636.6	279.2	243.9	619.0	252.6	331.0	

Source: Federal Bureau of Investigation

- If thirteen classes are to be formed, choose an appropriate lower class limit for the first class and a class width.
- Construct a frequency distribution.
- Construct a relative frequency distribution.
- Construct a frequency histogram of the data.
- Construct a relative frequency histogram of the data.
- Describe the shape of the distribution.

40. **Volume of Altria Group Stock** The volume of a stock is the number of shares traded on a given day. The following data, in millions, so that 6.42 represents 6,420,000 shares traded, represent the volume of Altria Group stock traded for a random sample of 35 trading days in 2010.

6.42	23.59	18.91	7.85	7.76
8.51	9.05	14.83	14.43	8.55
6.37	10.30	10.16	10.90	11.20
13.57	9.13	7.83	15.32	14.05
7.84	7.88	17.10	16.58	7.68
7.69	10.22	10.49	8.41	7.85
10.94	20.15	8.97	15.39	8.32

Source: TD Ameritrade

- (a) If six classes are to be formed, choose an appropriate lower class limit for the first class and a class width.
- (b) Construct a frequency distribution.
- (c) Construct a relative frequency distribution.
- (d) Construct a frequency histogram of the data.
- (e) Construct a relative frequency histogram of the data.
- (f) Describe the shape of the distribution.

In Problems 41–44, (a) construct a stem-and-leaf plot and (b) describe the shape of the distribution.

41. Age at Inauguration The following data represent the ages of the presidents of the United States (from George Washington through Barack Obama) on their first days in office.

Note: President Cleveland's age is listed twice, 47 and 55, because he is historically counted as two different presidents, numbers 22 and 24, since his terms were not consecutive.

42	47	50	52	54	55	57	61	64
43	48	51	52	54	56	57	61	65
46	49	51	54	55	56	57	61	68
46	49	51	54	55	56	58	62	69
47	50	51	54	55	57	60	64	

Source: factmonster.com

42. Divorce Rates The following data represent the divorce rate (per 1000 population) for most states in the United States in the year 2006.

Note: The list includes the District of Columbia, but excludes California, Georgia, Hawaii, Indiana, Louisiana, and Oklahoma because of failure to report.

4.8	4.5	3.3	4.7	3.0	5.3	4.3	4.7
4.4	2.1	5.1	3.9	4.3	3.9	3.3	2.9
3.9	4.9	3.6	3.6	2.9	2.2	3.8	5.4
5.7	5.1	3.0	3.5	4.1	2.9	3.5	
4.4	2.5	2.3	6.7	2.6	3.0	4.1	
2.8	2.7	3.5	4.0	3.6	3.2	3.8	

Source: U.S. Census Bureau

43. Grams of Fat in a McDonald's Breakfast The following data represent the number of grams of fat in breakfast meals offered at McDonald's.

12	22	27	3	25	30
32	37	27	31	11	16
21	32	22	46	51	55
59	16	36	30	9	24

Source: McDonald's Corporation, *McDonald's USA Nutrition Facts*, November 2007.

44. Gasoline Mileages The following data represent the number of miles per gallon achieved on the highway for small cars for the model year 2011.

35	34	35	34	36	35	38	37	40
35	34	34	36	29	36	43	36	34
36	34	36	35	33	33	29	28	25
35	36	37	36	35	30	36	34	36
34	32	32	31	31	33	33	33	33
31	30	25	23	22	34	31	30	28
34	34	31	33	32	31	31	33	33
27	26	25	23	35	34	32	33	32
30	36	35	33	31	42	42	34	31
33	29	29	30					

Source: fueleconomy.gov

45. Electric Rates The following data represent the average retail prices for electricity (cents/kWh) in 2010 for the 50 states plus the District of Columbia.

17.33	10.48	8.68	9.41	8.83	6.69	6.52
12.29	9.58	8.86	13.12	8.81	7.47	15.39
14.46	7.47	8.11	8.63	7.84	10.23	25.33
14.63	10.42	7.70	8.58	7.62	8.96	
14.56	9.35	8.14	8.78	8.07	7.58	
13.17	9.97	12.34	7.14	9.77	6.12	
15.65	7.81	13.89	9.17	10.52	14.41	
17.15	8.62	10.72	6.87	9.98	7.69	

Source: Energy Information Administration

- (a) Round each observation to the nearest tenth of a cent and draw a stem-and-leaf plot.
- (b) Describe the shape of the distribution.
- (c) Hawaii has the highest retail price for electricity. What is Hawaii's average retail price for electricity? Why might Hawaii's rate be so much higher than the others?

46. Home Appreciation The following data represent the price appreciation in home values between the first quarter of 1991 and the second quarter of 2010 for homes in each of the 50 states plus the District of Columbia. **Note:** The best price appreciation was in the District of Columbia and the worst was in Nevada.

68.46	99.81	93.50	221.93	120.72	121.22	96.94
118.06	85.59	96.32	130.62	94.11	111.69	169.79
90.98	89.35	87.32	122.58	192.78	80.10	92.51
58.80	91.65	124.09	126.33	58.76	202.46	87.13
117.69	118.64	74.86	70.56	90.17	88.89	112.50
180.13	79.53	108.43	137.86	85.78	161.76	85.30
119.34	97.87	48.66	106.23	84.64	33.36	90.50
89.36	111.39					

Source: Federal Housing Finance Agency

- (a) Round each observation to the nearest whole number and draw a stem-and-leaf plot.

54. **Waiting** Draw a dot plot of the waiting data from Problem 34.

NW 55. **Walt Disney Company** The following data represent the stock price for the Walt Disney Company at the end of each month in 2010. Construct a time-series plot and comment on any trends. What was the percent change in the stock price of Disney from January 2010 to December 2010?

Date	Closing Price	Date	Closing Price
1/10	28.71	7/10	30.72
2/10	28.99	8/10	31.55
3/10	31.34	9/10	32.68
4/10	35.01	10/10	36.13
5/10	31.00	11/10	36.51
6/10	31.36	12/10	37.51

Source: TD Ameritrade

56. **Google, Inc.** The following data represent the closing stock price for Google, Inc. at the end of each year since it first went public in 2004 until the end of 2010. Construct a time-series plot and comment on any trends. What was the percent change in Google stock from 2009 to 2010?

Date	Closing Price	Date	Closing Price
2004	192.79	2008	307.65
2005	414.86	2009	619.98
2006	460.48	2010	593.97
2007	691.48		

Source: TD Ameritrade

57. Federal Debt The following data represent the percentage of total federal debt as a percentage of gross domestic product (GDP). The GDP of a country is the total value of all goods and services produced within the country in a given year. Construct a time-series plot and comment on any trends.

Year	Debt as % of GDP	Year	Debt as % of GDP
1991	61.17	2001	56.46
1992	64.09	2002	58.52
1993	66.17	2003	60.88
1994	66.23	2004	62.18
1995	67.08	2005	62.77
1996	66.66	2006	63.49
1997	64.97	2007	63.99
1998	62.84	2008	69.15
1999	60.47	2009	83.29
2000	57.02	2010	94.27

Source: http://www.usgovernmentspending.com/federal_debt_chart.html

58. College Enrollment The data in the next column represent the percentage of 18- to 24-year-olds enrolled in college. Construct a time-series plot and comment on any trends.

Year	Percent Enrolled	Year	Percent Enrolled
1991	33.3	2000	35.5
1992	34.4	2001	36.3
1993	34.0	2002	36.7
1994	34.6	2003	37.8
1995	34.3	2004	38.0
1996	35.5	2005	38.9
1997	36.8	2006	37.3
1998	36.5	2007	38.8
1999	35.6	2008	39.6

Source: U.S. Center for Education Statistics

59. Putting It Together: Time Viewing a Web Page Nielsen/NetRatings is an Internet media and market research firm. One variable they measure is the amount of time an individual spends viewing a specific Web page. The following data represent the amount of time, in seconds, a random sample of 40 surfers spent viewing a Web page. Decide on an appropriate graphical summary and create the graphical summary. Write a few sentences that describe the data. Be sure to include in your description any interesting features the data may exhibit.

19	86	27	42	11	12	13	5
27	20	83	4	69	10	12	65
15	26	75	27	19	31	23	14
111	185	51	51	156	48	16	81
9	73	45	27	104	257	40	114

Source: Based on information provided by Nielsen/NetRatings

60. Putting It Together: Which Graphical Summary? Suppose you just obtained data from a survey in which you learned the following information about 50 individuals: age, income, marital status, number of vehicles in household. For each variable, explain the type of graphical summary you might be able to draw to provide a visual summary of the data.

61. Putting It Together: Shark! The following two graphics represent the number of reported shark attacks worldwide since 1900 and the worldwide fatality rate of shark attacks since 1900. Write a report about the trends in the graphs. In your report discuss the apparent contradiction between the increase in shark attacks, but the decrease in fatality rate.

Unprovoked Shark Attacks Worldwide

