

## Exercises 2-1

- List five reasons for organizing data into a frequency distribution.
- Name the three types of frequency distributions, and explain when each should be used.
- Find the class boundaries, midpoints, and widths for each class.
  - 12–18
  - 56–74
  - 695–705
  - 13.6–14.7
  - 2.15–3.93
- How many classes should frequency distributions have? Why should the class width be an odd number?
- Shown here are four frequency distributions. Each is incorrectly constructed. State the reason why.

a.

Class	Frequency
27–32	1
33–38	0
39–44	6
45–49	4
50–55	2

b.

Class	Frequency
5–9	1
9–13	2
13–17	5
17–20	6
20–24	3

c.

Class	Frequency
123–127	3
128–132	7
138–142	2
143–147	19

d.

Class	Frequency
9–13	1
14–19	6
20–25	2
26–28	5
29–32	9

- What are open-ended frequency distributions? Why are they necessary?
- Trust in Internet Information** A survey was taken on how much trust people place in the information they read on the Internet. Construct a categorical frequency distribution for the data. A = trust in everything they read, M = trust in most of what they read, H = trust in

about one-half of what they read, S = trust in a small portion of what they read. (Based on information from the *UCLA Internet Report*.)

M	M	M	A	H	M	S	M	H	M
S	M	M	M	M	A	M	M	A	M
M	M	H	M	M	M	H	M	H	M
A	M	M	M	H	M	M	M	M	M



- 8. State Gasoline Tax** The state gas tax in cents per gallon for 25 states is given below. Construct a grouped frequency distribution and a cumulative frequency distribution with 5 classes.

7.5	16	23.5	17	22
21.5	19	20	27.1	20
22	20.7	17	28	20
23	18.5	25.3	24	31
14.5	25.9	18	30	31.5

Source: *The World Almanac and Book of Facts*.



- 9. Weights of the NBA's Top 50 Players** Listed are the weights of the NBA's top 50 players. Construct a grouped frequency distribution and a cumulative frequency distribution with 8 classes. Analyze the results in terms of peaks, extreme values, etc.

240	210	220	260	250	195	230	270	325	225
165	295	205	230	250	210	220	210	230	202
250	265	230	210	240	245	225	180	175	215
215	235	245	250	215	210	195	240	240	225
260	210	190	260	230	190	210	230	185	260

Source: [www.msn.foxsports.com](http://www.msn.foxsports.com)



- 10. Stories in the World's Tallest Buildings** The number of stories in each of the world's 30 tallest buildings is listed below. Construct a grouped frequency distribution and a cumulative frequency distribution with 7 classes.

88	88	110	88	80	69	102	78	70	55
79	85	80	100	60	90	77	55	75	55
54	60	75	64	105	56	71	70	65	72

Source: *New York Times Almanac*.



- 11. GRE Scores at Top-Ranked Engineering Schools** The average quantitative GRE scores for the top 30 graduate schools of engineering are listed. Construct a grouped frequency distribution and a cumulative frequency distribution with 5 classes.

767	770	761	760	771	768	776	771	756	770
763	760	747	766	754	771	771	778	766	762
780	750	746	764	769	759	757	753	758	746

Source: *U.S. News & World Report Best Graduate Schools*.



**12. Airline Passengers** The number of passengers (in thousands) for the leading U.S. passenger airlines in 2004 is indicated below. Use the data to construct a grouped frequency distribution and a cumulative frequency distribution with a reasonable number of classes and comment on the shape of the distribution.

91,570	86,755	81,066	70,786	55,373	42,400
40,551	21,119	16,280	14,869	13,659	13,417
13,170	12,632	11,731	10,420	10,024	9,122
7,041	6,954	6,406	6,362	5,930	5,585
5,427					

Source: *The World Almanac and Book of Facts*.



**13. Ages of Declaration of Independence Signers**

The ages of the signers of the Declaration of Independence are shown. (Age is approximate since only the birth year appeared in the source, and one has been omitted since his birth year is unknown.) Construct a grouped frequency distribution and a cumulative frequency distribution for the data using 7 classes. (The data for this exercise will be used for Exercise 5 in Section 2-2 and Exercise 23 in Section 3-1.)

41	54	47	40	39	35	50	37	49	42	70	32
44	52	39	50	40	30	34	69	39	45	33	42
44	63	60	27	42	34	50	42	52	38	36	45
35	43	48	46	31	27	55	63	46	33	60	62
35	46	45	34	53	50	50					

Source: *The Universal Almanac*.



**14. Online Gambling** Online computer gaming has become a popular leisure time activity. Fifty-six percent of the 117 million active gamers play games online. Below are listed the numbers of players playing a free online game at various times of the day. Construct a grouped frequency distribution and a cumulative frequency distribution with 6 classes.

3907	3629	3640	3839	3446	2313	2537	2037	3194
3739	3886	3698	3898	2101	1525	2311	3344	3647

Source: [www.msn.tech.com](http://www.msn.tech.com)



**15. Presidential Vetoes** The number of total vetoes exercised by the past 20 Presidents is listed below. Use the data to construct a grouped frequency distribution and a cumulative frequency distribution with 5 classes. What is challenging about this set of data?

44	39	37	21	31	170	44	632	30	78
42	6	250	43	44	82	50	181	66	37

Source: *World Almanac and Book of Facts*.



**16. U.S. National Park Acreage** The acreage of the 39 U.S. National Parks under 900,000 acres (in thousands of acres) is shown here. Construct a grouped frequency distribution and a cumulative frequency distribution for the data using 8 classes. (The data in this exercise will be used in Exercise 11 in Section 2-2.)

41	66	233	775	169
36	338	233	236	64
183	61	13	308	77
520	77	27	217	5
650	462	106	52	52
505	94	75	265	402
196	70	132	28	220
760	143	46	539	

Source: *The Universal Almanac*.



**17. Heights of Alaskan Volcanoes** The heights (in feet above sea level) of the major active volcanoes in Alaska are given here. Construct a grouped frequency distribution and a cumulative frequency distribution for the data using 10 classes. (The data in this exercise will be used in Exercise 9 in Section 3-1 and Exercise 17 in Section 3-2.)

4,265	3,545	4,025	7,050	11,413
3,490	5,370	4,885	5,030	6,830
4,450	5,775	3,945	7,545	8,450
3,995	10,140	6,050	10,265	6,965
150	8,185	7,295	2,015	5,055
5,315	2,945	6,720	3,465	1,980
2,560	4,450	2,759	9,430	
7,985	7,540	3,540	11,070	
5,710	885	8,960	7,015	

Source: *The Universal Almanac*.



**18. Home Run Record Breakers** During the 1998 baseball season, Mark McGwire and Sammy Sosa both broke Roger Maris's home run record of 61. The distances (in feet) for each home run follow. Construct a grouped frequency distribution and a cumulative frequency distribution for each player, using 8 classes. (The information in this exercise will be used for Exercise 12 in Section 2-2, Exercise 10 in Section 3-1, and Exercise 14 in Section 3-2.)

McGwire				Sosa			
306	370	370	430	371	350	430	420
420	340	460	410	430	434	370	420
440	410	380	360	440	410	420	460
350	527	380	550	400	430	410	370
478	420	390	420	370	410	380	340
425	370	480	390	350	420	410	415
430	388	423	410	430	380	380	366
360	410	450	350	500	380	390	400
450	430	461	430	364	430	450	440
470	440	400	390	365	420	350	420
510	430	450	452	400	380	380	400
420	380	470	398	370	420	360	368
409	385	369	460	430	433	388	440
390	510	500	450	414	482	364	370
470	430	458	380	400	405	433	390
430	341	385	410	480	480	434	344
420	380	400	440	410	420		
377	370						

Source: *USA TODAY*.

## Exercises 2-2

- 1. Do Students Need Summer Development?** For 108 randomly selected college applicants, the following frequency distribution for entrance exam scores was obtained. Construct a histogram, frequency polygon, and ogive for the data. (The data for this exercise will be used for Exercise 13 in this section.)

Class limits	Frequency
90–98	6
99–107	22
108–116	43
117–125	28
126–134	9

Applicants who score above 107 need not enroll in a summer developmental program. In this group, how many students do not have to enroll in the developmental program?

- 2. Number of College Faculty** The number of faculty listed for a variety of private colleges which offer only bachelor's degrees is listed below. Use these data to construct a frequency distribution with 7 classes, a histogram, a frequency polygon, and an ogive. Discuss the shape of this distribution. What proportion of schools have 180 or more faculty?

165	221	218	206	138	135	224	204
70	210	207	154	155	82	120	116
176	162	225	214	93	389	77	135
221	161	128	310				

Source: *World Almanac and Book of Facts*.

- 3. Counties, Divisions, or Parishes for 50 States** The number of counties, divisions, or parishes for each of the 50 states is given below. Use the data to construct a grouped frequency distribution with 6 classes, a histogram, a frequency polygon, and an ogive. Analyze the distribution.

67	27	15	75	58	64	8	67	159	5
102	44	92	99	105	120	64	16	23	14
83	87	82	114	56	93	16	10	21	33
62	100	53	88	77	36	67	5	46	66
95	254	29	14	95	39	55	72	23	3

Source: *World Almanac and Book of Facts*.

- 4. NFL Salaries** The salaries (in millions of dollars) for 31 NFL teams for a specific season are given in this frequency distribution.

Class limits	Frequency
39.9–42.8	2
42.9–45.8	2
45.9–48.8	5
48.9–51.8	5
51.9–54.8	12
54.9–57.8	5

Source: NFL.com

Construct a histogram, a frequency polygon, and an ogive for the data; and comment on the shape of the distribution.

- 5. Automobile Fuel Efficiency** Thirty automobiles were tested for fuel efficiency, in miles per gallon (mpg). The following frequency distribution was obtained. Construct a histogram, a frequency polygon, and an ogive for the data.

Class boundaries	Frequency
7.5–12.5	3
12.5–17.5	5
17.5–22.5	15
22.5–27.5	5
27.5–32.5	2

- 6.** Construct a frequency histogram, a frequency polygon, and an ogive for the data in Exercise 9 in Section 2-1. Analyze the results.

- 7. Air Quality Standards** The number of days that selected U.S. metropolitan areas failed to meet acceptable air quality standards is shown below for 1998 and 2003. Construct grouped frequency distributions and a histogram for each set of data, and compare your results.

1998						2003					
43	76	51	14	0	10	10	11	14	20	15	6
20	0	5	17	67	25	17	0	5	19	127	4
38	0	56	8	0	9	31	5	88	1	1	16
14	5	37	14	95	20	14	19	20	9	138	22
23	12	33	0	3	45	13	10	20	20	20	12

Source: *World Almanac*.

- 8. How Quick Are Dogs?** In a study of reaction times of dogs to a specific stimulus, an animal trainer obtained the following data, given in seconds. Construct a histogram, a frequency polygon, and an ogive for the data; analyze the results. (The histogram in this exercise will be used for Exercise 18 in this section, Exercise 16 in Section 3-1, and Exercise 26 in Section 3-2.)

Class limits	Frequency
2.3–2.9	10
3.0–3.6	12
3.7–4.3	6
4.4–5.0	8
5.1–5.7	4
5.8–6.4	2

- 9. Quality of Health Care** The scores of health care quality as calculated by a professional risk management company are listed on the next page for selected states.

Use the data to construct a frequency distribution, a histogram, a frequency polygon, and an ogive.

118.2 114.6 113.1 111.9 110.0 108.8 108.3 107.7 107.0 106.7  
105.3 103.7 103.2 102.8 101.6 99.8 98.1 96.6 95.7 93.6  
92.5 91.0 90.0 87.1 83.1


Source: *New York Times Almanac*.

- 10. Making the Grade** The frequency distributions shown indicate the percentages of public school students in fourth-grade reading and mathematics who performed at or above the required proficiency levels for the 50 states in the United States. Draw histograms for each, and decide if there is any difference in the performance of the students in the subjects.

Class	Reading frequency	Math frequency
17.5–22.5	7	5
22.5–27.5	6	9
27.5–32.5	14	11
32.5–37.5	19	16
37.5–42.5	3	8
42.5–47.5	1	1

Source: *National Center for Educational Statistics*.

- 11.** Construct a histogram, a frequency polygon, and an ogive for the data in Exercise 16 in Section 2–1, and analyze the results.
- 12.** For the data in Exercise 18 in Section 2–1, construct a histogram for the home run distances for each player and compare them. Are they basically the same, or are there any noticeable differences? Explain your answer.
- 13.** For the data in Exercise 1 in this section, construct a histogram, a frequency polygon, and an ogive, using relative frequencies. What proportion of the applicants needs to enroll in the summer development program?
- 14.** For the data for 2003 in Exercise 4 in this section, construct a histogram, a frequency polygon, and an ogive, using relative frequencies.

-  **15. Cereal Calories** The number of calories per serving for selected ready-to-eat cereals is listed here. Construct a frequency distribution using 7 classes. Draw

a histogram, a frequency polygon, and an ogive for the data, using relative frequencies. Describe the shape of the histogram.

130 190 140 80 100 120 220 220 110 100  
210 130 100 90 210 120 200 120 180 120  
190 210 120 200 130 180 260 270 100 160  
190 240 80 120 90 190 200 210 190 180  
115 210 110 225 190 130

Source: *The Doctor's Pocket Calorie, Fat, and Carbohydrate Counter*.



- 16. Protein Grams in Fast Food** The amount of protein (in grams) for a variety of fast-food sandwiches is reported here. Construct a frequency distribution using 6 classes. Draw a histogram, a frequency polygon, and an ogive for the data, using relative frequencies. Describe the shape of the histogram.

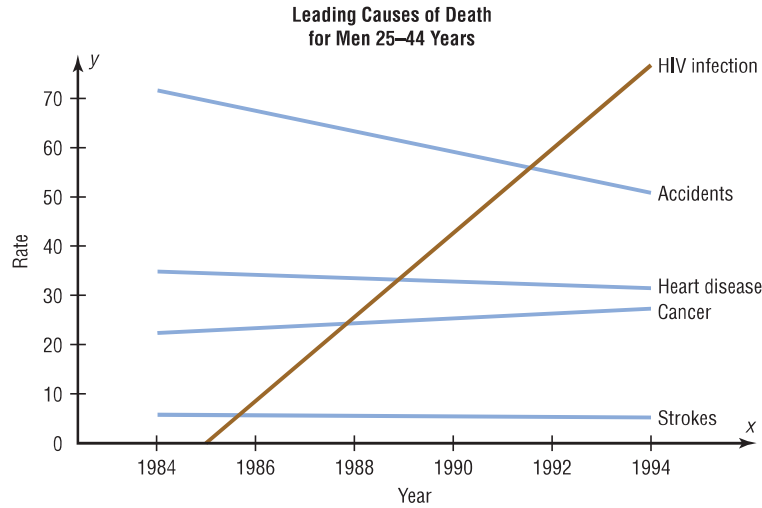
23 30 20 27 44 26 35 20 29 29  
25 15 18 27 19 22 12 26 34 15  
27 35 26 43 35 14 24 12 23 31  
40 35 38 57 22 42 24 21 27 33

Source: *The Doctor's Pocket Calorie, Fat, and Carbohydrate Counter*.

- 17.** For the data for year 2003 in Exercise 7 in this section, construct a histogram, a frequency polygon, and an ogive, using relative frequencies.
- 18. How Quick Are Older Dogs?** The animal trainer in Exercise 8 in this section selected another group of dogs who were much older than the first group and measured their reaction times to the same stimulus. Construct a histogram, a frequency polygon, and an ogive for the data.

Class limits	Frequency
2.3–2.9	1
3.0–3.6	3
3.7–4.3	4
4.4–5.0	16
5.1–5.7	14
5.8–6.4	4

Analyze the results and compare the histogram for this group with the one obtained in Exercise 8 in this section. Are there any differences in the histograms? (The data in this exercise will be used for Exercise 16 in Section 3–1 and Exercise 26 in Section 3–2.)



1. What are the variables in the graph?
2. Are the variables qualitative or quantitative?
3. Are the variables discrete or continuous?
4. What type of graph was used to display the data?
5. Could a Pareto chart be used to display the data?
6. Could a pie chart be used to display the data?
7. List some typical uses for the Pareto chart.
8. List some typical uses for the time series chart.

See page 101 for the answers.

## Exercises 2–3

- 1. Women's Softball Champions** The NCAA Women's Softball Division 1 Champions since 1982 are listed below. Use the data to construct a Pareto chart and a vertical bar graph.

'82 UCLA	'94 Arizona
'83 Texas A&M	'95 UCLA
'84 UCLA	'96 Arizona
'85 UCLA	'97 Arizona
'86 Cal St—Fullerton	'98 Fresno State
'87 Texas A&M	'99 UCLA
'88 UCLA	'00 Oklahoma
'89 UCLA	'01 Arizona
'90 UCLA	'02 California
'91 Arizona	'03 UCLA
'92 UCLA	'04 UCLA
'93 Arizona	'05 Michigan

Source: *New York Times Almanac*.

- 2. Delegates Who Signed the Declaration of Independence** The state represented by each delegate who signed the Declaration of Independence is indicated. Organize the data in a Pareto chart and a vertical bar graph and comment on the results.

MA 5	PA 9	SC 4
NH 3	RI 2	CT 4
VA 7	NY 4	DE 3
MD 4	GA 3	
NJ 5	NC 3	

Source: *New York Times Almanac*.

- 3. Internet Connections** The following data represent the estimated number (in millions) of computers connected to the Internet worldwide. Construct a Pareto chart and a horizontal bar graph for the data. Based on the data, suggest the best place to market appropriate Internet products.

Location	Number of computers
Homes	240
Small companies	102
Large companies	148
Government agencies	33
Schools	47

Source: IDC.

- 4. Roller Coaster Mania** The World Roller Coaster Census Report lists the following number of roller

coasters on each continent. Represent the data graphically, using a Pareto chart and a horizontal bar graph.

Africa	17
Asia	315
Australia	22
Europe	413
North America	643
South America	45

Source: www.rcdb.com

- 5. World Energy Use** The following percentages indicate the source of energy used worldwide. Construct a Pareto chart and a vertical bar graph for the energy used.

Petroleum	39.8%
Coal	23.2
Dry natural gas	22.4
Hydroelectric	7.0
Nuclear	6.4
Other (wind, solar, etc.)	1.2

Source: *New York Times Almanac*.

- 6. Airline Departures** Draw a time series graph to represent the data for the number of airline departures (in millions) for the given years. Over the years, is the number of departures increasing, decreasing, or about the same?

Year	1996	1997	1998	1999	2000	2001	2002
Number of departures	7.9	9.9	10.5	10.9	11.0	9.8	10.1

Source: *The World Almanac and Book of Facts*.

- 7. Average Global Temperatures** Represent these average global temperatures in a time series graph.

1900–09	56.5	1960–69	57.1
1910–19	56.6	1970–79	57.0
1920–29	56.7	1980–89	57.4
1930–39	57.0	1990–99	57.6
1940–49	57.1		
1950–59	57.1		

Source: *World Almanac*.

- 8. Nuclear Power Reactors** Draw a time series graph for the data shown and comment on the trend. The data represent the number of active nuclear reactors.

Year	1992	1994	1996	1998	2000	2002
Number	109	109	109	104	104	104

Source: *The World Almanac and Book of Facts*.

- 9. Percentage of Voters in Presidential Elections**

Listed are the percentages of voters who voted in past Presidential elections since 1964. Illustrate the data with a time series graph. The day before the 2006 election, a website published a survey where 90% of the

respondents said they voted in the 2004 election. Give possible reasons for the discrepancy.

1964	95.83	1980	76.53	1996	65.97
1968	89.65	1984	74.63	2000	67.50
1972	79.85	1988	72.48	2004	64.0
1976	77.64	1992	78.04		

Source: *New York Times Almanac*.

- 10. Reasons We Travel** The following data are based on a survey from American Travel Survey on why people travel. Construct a pie graph for the data and analyze the results.

Purpose	Number
Personal business	146
Visit friends or relatives	330
Work-related	225
Leisure	299

Source: *USA TODAY*.

- 11. Characteristics of the Population 65 and Over** Two characteristics of the population aged 65 and over are shown below for 2004. Illustrate each characteristic with a pie graph.

Marital status		Educational attainment	
Never married	3.9%	Less than ninth grade	13.9%
Married	57.2	Completed 9–12 but	
Widowed	30.8	no diploma	13.0
Divorced	8.1	H.S. graduate	36.0
		Some college/	
		associates degree	18.4
		Bachelor's/advanced	
		degree	18.7

Source: *New York Times Almanac*.

- 12. Components of the Earth's Crust** The following elements comprise the earth's crust, the outermost solid layer. Illustrate the composition of the earth's crust with a pie graph.

Oxygen	45.6%
Silicon	27.3
Aluminum	8.4
Iron	6.2
Calcium	4.7
Other	7.8

Source: *New York Times Almanac*.


- 13. Workers Switch Jobs** In a recent survey, 3 in 10 people indicated that they are likely to leave their jobs when the economy improves. Of those surveyed, 34% indicated that they would make a career change, 29% want a new job in the same industry, 21% are going to start a business, and 16% are going to retire. Make a pie chart and a Pareto chart for the data. Which chart do you think better represents the data?

Source: National Survey Institute.




14. State which graph (Pareto chart, time series graph, or pie graph) would most appropriately represent the given situation.

- The number of students enrolled at a local college for each year during the last 5 years.
- The budget for the student activities department at a certain college for each year during the last 5 years.
- The means of transportation the students use to get to school.
- The percentage of votes each of the four candidates received in the last election.
- The record temperatures of a city for the last 30 years.
- The frequency of each type of crime committed in a city during the year.


-  **15. Presidents' Ages at Inauguration** The age at inauguration for each U.S. President is shown. Construct a stem and leaf plot and analyze the data.

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


Source: *New York Times Almanac*.

-  **16. Calories in Salad Dressings** A listing of calories per one ounce of selected salad dressings (not fat-free) is given below. Construct a stem and leaf plot for the data.

100	130	130	130	110	110	120	130	140	100
140	170	160	130	160	120	150	100	145	145
145	115	120	100	120	160	140	120	180	100
160	120	140	150	190	150	180	160		

-  **17. Twenty Days of Plant Growth** The growth (in centimeters) of two varieties of plant after 20 days is shown in this table. Construct a back-to-back stem and leaf plot for the data, and compare the distributions.

Variety 1				Variety 2			
20	12	39	38	18	45	62	59
41	43	51	52	53	25	13	57
59	55	53	59	42	55	56	38
50	58	35	38	41	36	50	62
23	32	43	53	45	55		

-  **18. Math and Reading Achievement Scores** The math and reading achievement scores from the National Assessment of Educational Progress for selected states are listed below. Construct a back-to-back stem and leaf plot with the data and compare the distributions.

Math					Reading				
52	66	69	62	61	65	76	76	66	67
63	57	59	59	55	71	70	70	66	61
55	59	74	72	73	61	69	78	76	77
68	76	73			77	77	80		

Source: *World Almanac*.

19. The sales of recorded music in 2004 by genre are listed below. Represent the data with an appropriate graph.

Rock	23.9	Jazz	2.7
Country	13.0	Classical	2.0
Rap/hip-hop	12.1	Oldies	1.4
R&B/urban	11.3	Soundtracks	1.1
Pop	10.0	New age	1.0
Religious	6.0	Other	8.9
Children's	2.8		

Source: *World Almanac*.

## Extending the Concepts

20. **Successful Space Launches** The number of successful space launches by the United States and Japan for the years 1993–1997 is shown here. Construct a compound time series graph for the data. What comparison can be made regarding the launches?

Year	1993	1994	1995	1996	1997
United States	29	27	24	32	37
Japan	1	4	2	1	2

Source: *The World Almanac and Book of Facts*.

21. **Meat Production** Meat production for veal and lamb for the years 1960–2000 is shown here. (Data are in millions of pounds.) Construct a compound time series graph for the data. What comparison can be made regarding meat production?

Year	1960	1970	1980	1990	2000
Veal	1109	588	400	327	225
Lamb	769	551	318	358	234

Source: *The World Almanac and Book of Facts*.

22. **Top 10 Airlines** The top 10 airlines with the most aircraft are listed. Represent these data with an appropriate graph.

American	714	Continental	364
United	603	Southwest	327
Delta	600	British Airways	268
Northwest	424	American Eagle	245
U.S. Airways	384	Lufthansa (Ger.)	233

Source: *Top 10 of Everything*.

## Important Formulas

Formula for the percentage of values in each class:

$$\% = \frac{f}{n} \cdot 100\%$$

where

$f$  = frequency of the class

$n$  = total number of values

Formula for the range:

$$R = \text{highest value} - \text{lowest value}$$

Formula for the class width:

$$\text{Class width} = \text{upper boundary} - \text{lower boundary}$$

Formula for the class midpoint:

$$X_m = \frac{\text{lower boundary} + \text{upper boundary}}{2}$$

or

$$X_m = \frac{\text{lower limit} + \text{upper limit}}{2}$$

Formula for the degrees for each section of a pie graph:

$$\text{Degrees} = \frac{f}{n} \cdot 360^\circ$$

## Review Exercises


- 1. How People Get Their News** The Brunswick Research Organization surveyed 50 randomly selected individuals and asked them the primary way they received the daily news. Their choices were via newspaper (N), television (T), radio (R), or Internet (I). Construct a categorical frequency distribution for the data and interpret the results. The data in this exercise will be used for Exercise 2 in this section.

N	N	T	T	T	I	R	R	I	T
I	N	R	R	I	N	N	I	T	N
I	R	T	T	T	T	N	R	R	I
R	R	I	N	T	R	T	I	I	T
T	I	N	T	T	I	R	N	R	T

- 2.** Construct a pie graph for the data in Exercise 1, and analyze the results.
- 3. Ball Sales** A sporting goods store kept a record of sales of five items for one randomly selected hour during a recent sale. Construct a frequency distribution for the data (B = baseballs, G = golf balls, T = tennis balls, S = soccer balls, F = footballs). (The data for this exercise will be used for Exercise 4 in this section.)

F	B	B	B	G	T	F
G	G	F	S	G	T	
F	T	T	T	S	T	
F	S	S	G	S	B	

- 4.** Draw a pie graph for the data in Exercise 3 showing the sales of each item, and analyze the results.

-  **5. BUN Count** The blood urea nitrogen (BUN) count of 20 randomly selected patients is given here in

milligrams per deciliter (mg/dl). Construct an ungrouped frequency distribution for the data. (The data for this exercise will be used for Exercise 6.)

17	18	13	14
12	17	11	20
13	18	19	17
14	16	17	12
16	15	19	22

- 6.** Construct a histogram, a frequency polygon, and an ogive for the data in Exercise 5 in this section, and analyze the results.
- 7.** The percentage (rounded to the nearest whole percent) of persons from each state completing 4 years or more of college is listed below. Organize the data into a grouped frequency distribution with 5 classes.

### Percentage of persons completing 4 years of college

23	25	24	34	22	24	27	37	33	24
26	23	38	24	24	17	28	23	30	25
30	22	33	24	28	36	24	19	25	31
34	31	27	24	29	28	21	25	26	15
26	22	27	21	25	28	24	21	25	26

Source: *New York Times Almanac*.

- 8.** Using the data in Exercise 7, construct a histogram, a frequency polygon, and an ogive.



- 9. NFL Franchise Values** The data shown (in millions of dollars) are the values of the 30 National Football League franchises. Construct a frequency distribution for the data using 8 classes. (The data for



this exercise will be used for Exercises 10 and 12 in this section.)

170	191	171	235	173	187	181	191
200	218	243	200	182	320	184	239
186	199	186	210	209	240	204	193
211	186	197	204	188	242		

Source: *Pittsburgh Post-Gazette*.

10. Construct a histogram, a frequency polygon, and an ogive for the data in Exercise 9 in this section, and analyze the results.



**11. Ages of the Vice Presidents at the Time of Their Death** The ages of the Vice Presidents of the United States at the time of their death are listed below. Use the data to construct a frequency distribution, histogram, frequency polygon, and ogive, using relative frequencies. Use 6 classes.

90	83	80	73	70	51	68	79	70	71
72	74	67	54	81	66	62	63	68	57
66	96	78	55	60	66	57	71	60	85
76	98	77	88	78	81	64	66	77	70

Source: *New York Times Almanac*.

12. Construct a histogram, frequency polygon, and ogive by using relative frequencies for the data in Exercise 9 in this section.

13. **NBA Champions** The NBA Champions from 1985 on are listed below. Use the data to construct a Pareto chart and a vertical bar graph.

1985 Los Angeles	1996 Chicago
1986 Boston	1997 Chicago
1987 Los Angeles	1998 Chicago
1988 Detroit	1999 San Antonio
1989 Detroit	2000 Los Angeles
1990 Detroit	2001 Los Angeles
1991 Chicago	2002 Los Angeles
1992 Chicago	2003 San Antonio
1993 Chicago	2004 Detroit
1994 Houston	2005 San Antonio
1995 Houston	

Source: *World Almanac*.

14. **Trial-Ready Cases** Construct a Pareto chart and a horizontal bar graph for the number of trial-ready civil action and equity cases decided in less than 6 months for the selected counties in southwestern Pennsylvania.

County	Number of cases
Westmoreland	427
Washington	298
Green	151
Fayette	106
Somerset	87

Source: *Pittsburgh Tribune-Review*.

15. **Minimum Wage** The given data represent the federal minimum hourly wage in the years shown. Draw a

time series graph to represent the data and analyze the results.

Year	Wage
1960	\$1.00
1965	1.25
1970	1.60
1975	2.10
1980	3.10
1985	3.35
1990	3.80
1995	4.25
2000	5.15
2005	5.15

Source: *The World Almanac and Book of Facts*.

16. **Farm Data** Construct a time series graph for each set of data and analyze the results.

Year	No. of farms (millions)	Avg. size (acres)
1940	6.35	174
1950	5.65	213
1960	3.96	297
1970	2.95	374
1980	2.44	426
1990	2.15	460
2000	2.17	436

Source: *World Almanac*.

17. **Presidential Debates** The data show the number (in millions) of viewers who watched the first and second Presidential debates. Construct two time series graphs and compare the results.

Year	1992	1996	2000	2004
First debate	62.4	36.1	46.6	62.5
Second debate	69.9	36.3	37.6	46.7

Source: *Nielson Media Research*.

18. **Working Women** In a study of 100 women, the numbers shown here indicate the major reason why each woman surveyed worked outside the home. Construct a pie graph for the data and analyze the results.

Reason	Number of women
To support self/family	62
For extra money	18
For something different to do	12
Other	8

19. **Career Changes** A survey asked if people would like to spend the rest of their careers with their present employers. The results are shown. Construct a pie graph for the data and analyze the results.

Answer	Number of people
Yes	660
No	260
Undecided	80