## SECTION 2.1 EXERCISES

Understanding the Concepts

Exercises 1-4 are the Check Your Understanding exercises located within the section. Their answers are found on page 48.

5. frequency

6. relative frequency

7. Pareto chart

8. pie chart

9. False. In a frequency distribution, the sum of all frequencies <u>equals</u> the total number of observations.

10. True.

11. True

12. False. In bar graphs and Pareto charts, the <u>heights</u> of the bars represent the frequencies or relative frequencies.
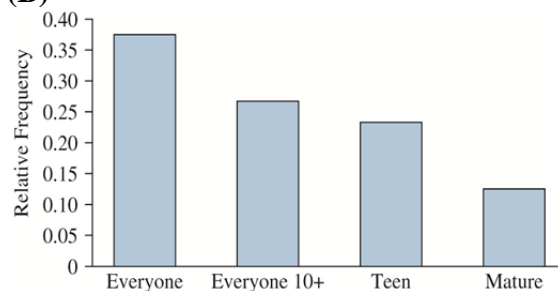
Practicing the Skills

13 (A) Meat, poultry, fish, and eggs

(B) False

(C) True

14 (A) Type O

(B) False

(C) True

15 (A)
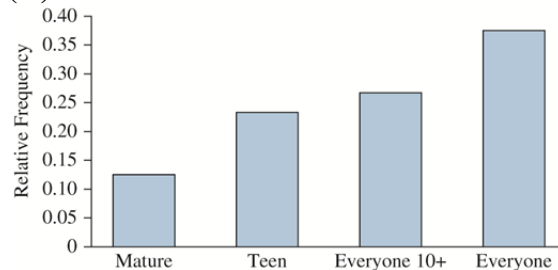
(B)

(C) Everyone

(D) False

(E) True

16 (A)

(B)
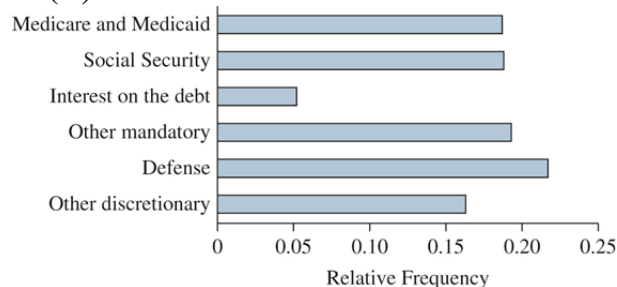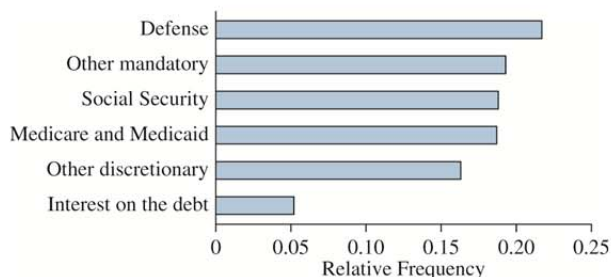
(C) Defense

(D) 62%

Working with the Concepts

17(A)

(C)

(D) True
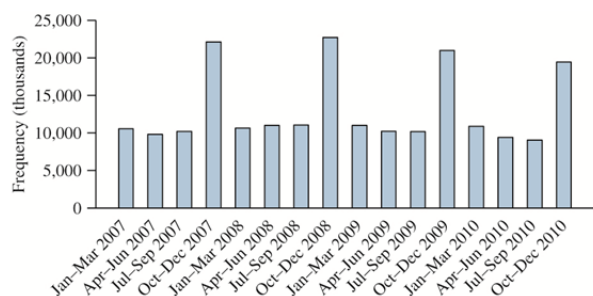
(B)

Quarter	Relative Frequency
Jan.–Mar. 2007	0.050
Apr.–Jun. 2007	0.047
Jul.–Sep. 2007	0.049
Oct.–Dec. 2007	0.106
Jan.–Mar. 2008	0.051
Apr.–Jun. 2008	0.053
Jul.–Sep. 2008	0.053
Oct.–Dec. 2008	0.109
Jan.–Mar. 2009	0.053
Apr.–Jun. 2009	0.049
Jul.–Sep. 2009	0.049
Oct.–Dec. 2009	0.100
Jan.–Mar. 2010	0.052
Apr.–Jun. 2010	0.045
Jul.–Sep. 2010	0.043
Oct.–Dec. 2010	0.093
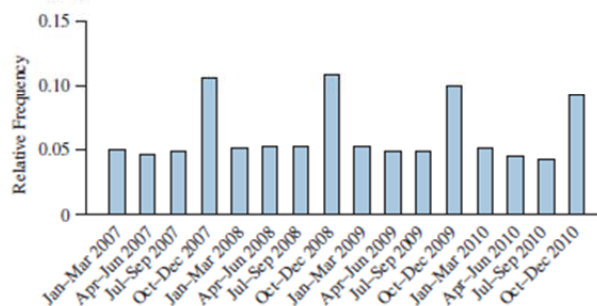
18 (A)
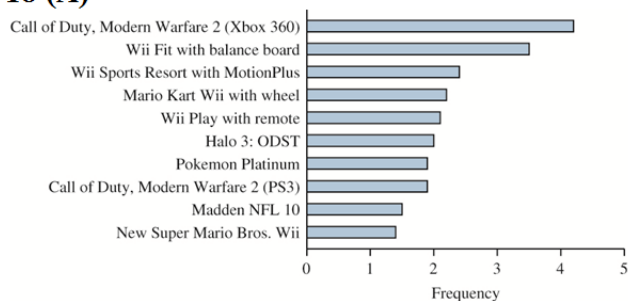
(B)

Game	Relative Frequency
Call of Duty: Modern Warfare 2 (Xbox 360)	0.182
Wii Fit with balance board	0.152
Wii Sports Resort with MotionPlus	0.104
Mario Kart Wii with wheel	0.095
Wii Play with remote	0.091
Halo 3: ODST	0.087
Pokemon Platinum	0.082
Call of Duty: Modern Warfare 2 (PS3)	0.082
Madden NFL 10	0.065
New Super Mario Bros. Wii	0.061

(C)
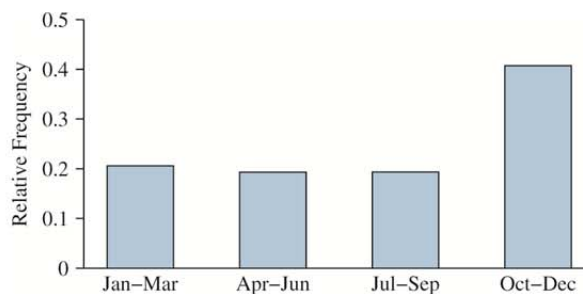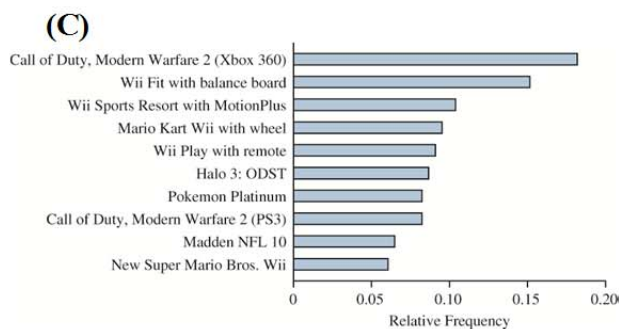
(D) True

19 (A)

Quarter	Frequency (thousands)
Jan–Mar	43,091
Apr–Jun	40,451
Jul–Sep	40,479
Oct–Dec	85,264

(B)

(C)
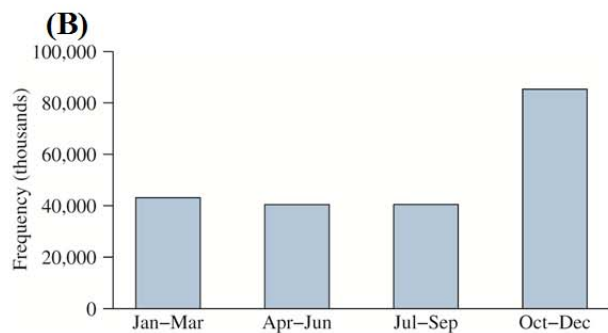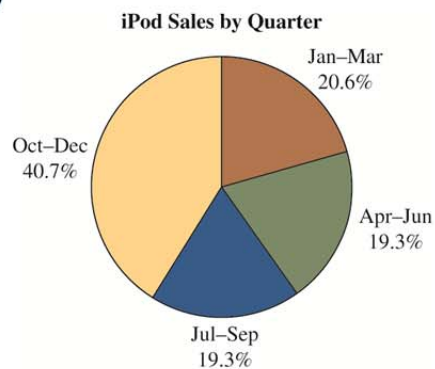
Quarter	Relative Frequency
Jan–Mar	0.206
Apr–Jun	0.193
Jul–Sep	0.193
Oct–Dec	0.407

(D)

(E)

(F) False

20 (A)

Quarter	Frequency (millions)
DS	1.9
PS3	1.9
Wii	11.6
Xbox 360	7.7

(B)

12

(C)
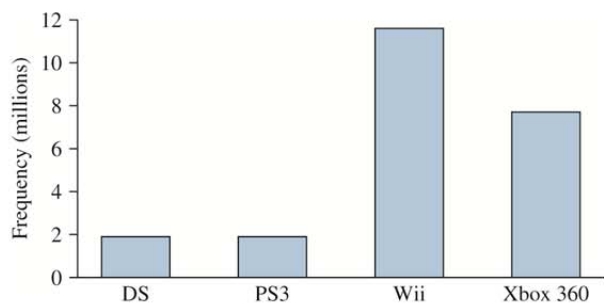
Quarter	Relative Frequency
DS	0.082
PS3	0.082
Wii	0.502
Xbox 360	0.333

Video Game Platforms

(F) True

21 (A)

(D)
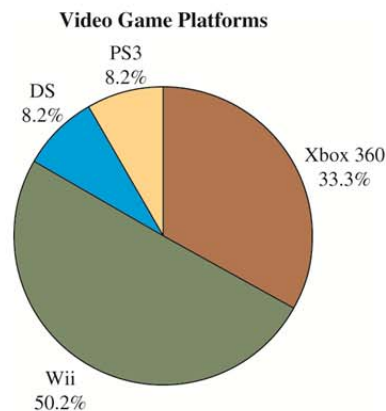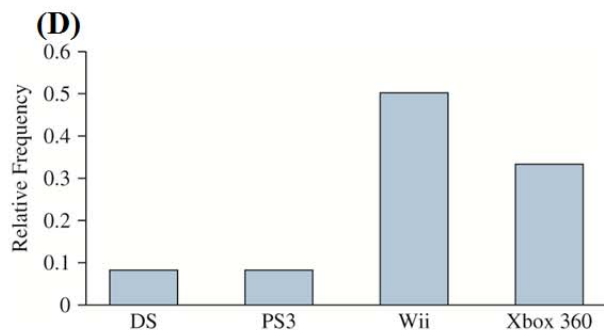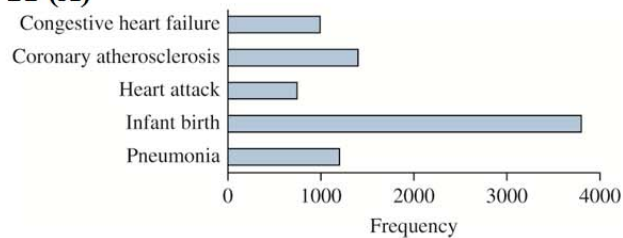
(B)

Reason	Relative Frequency
Congestive heart failure	0.122
Coronary atherosclerosis	0.172
Heart attack	0.091
Infant birth	0.467
Pneumonia	0.148

(E)

(C)

(D)

13
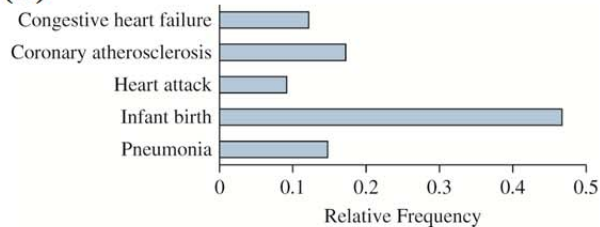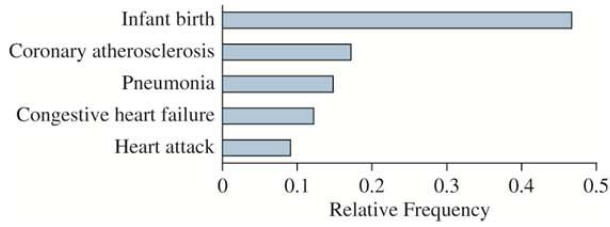
Continent	Relative Frequency
Africa	0.132
Asia	0.606
Oceania	0.005
Europe	0.120
North America	0.080
South America	0.057

(E)

Hospital Admissions

(C)

(F) True

(D)

22 (A)

(E)

Population of the Continents

(B)

(F) True

(G) False

23 (A)

(D)

Gender and Age of Video Game Players
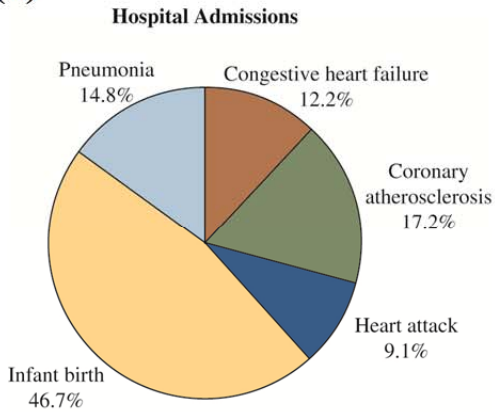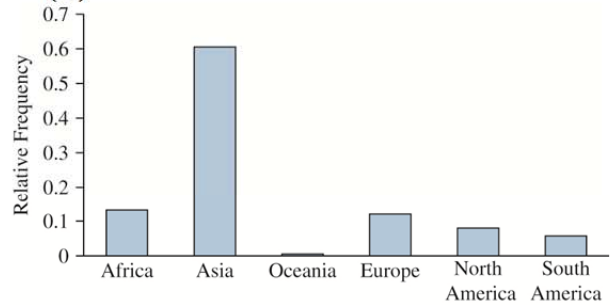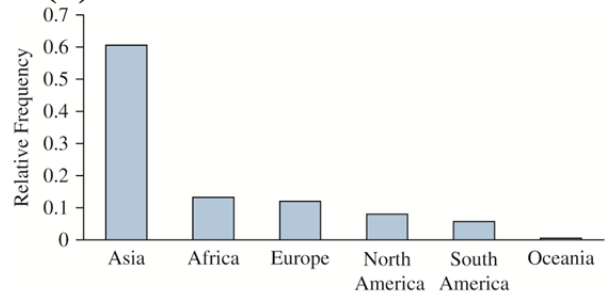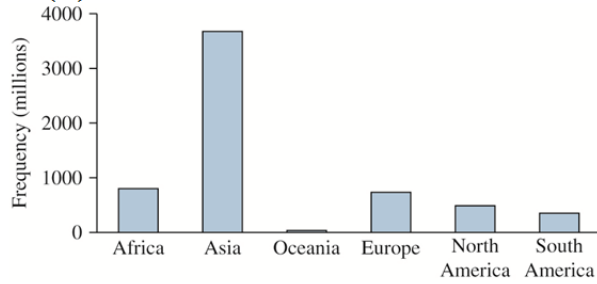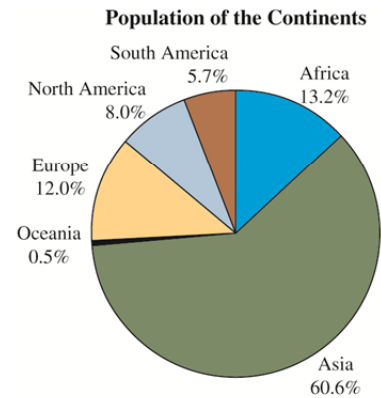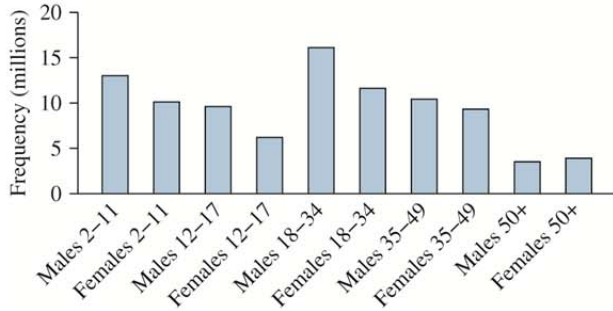
(B)

Gender and Age Group	Relative Frequency
Males 2–11	0.139
Females 2–11	0.108
Males 12–17	0.102
Females 12–17	0.066
Males 18–34	0.172
Females 18–34	0.124
Males 35–49	0.111
Females 35–49	0.099
Males 50+	0.037
Females 50+	0.042

(E) True

(F) True

(G) .289

(C)
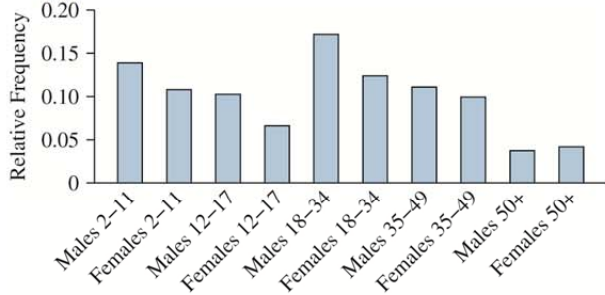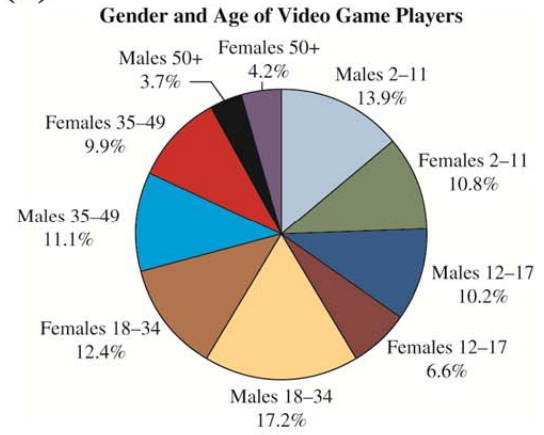
24 (A)

(B)
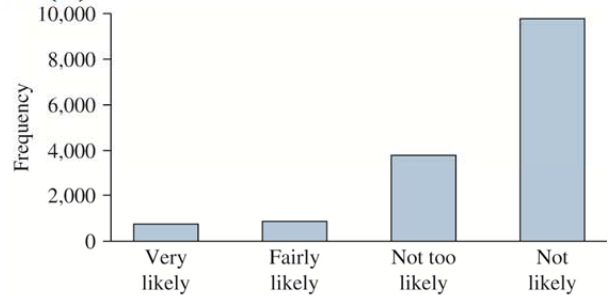
Response	Relative Frequency
Very likely	0.049
Fairly likely	0.057
Not too likely	0.250
Not likely	0.645

15

(C)

(D)

Likelihood of Losing Job

Very likely 4.9%
Fairly likely 5.7%
Not too likely 25.0%
Not likely 64.5%

(E) True

(F) .106

25 (A)

(B)
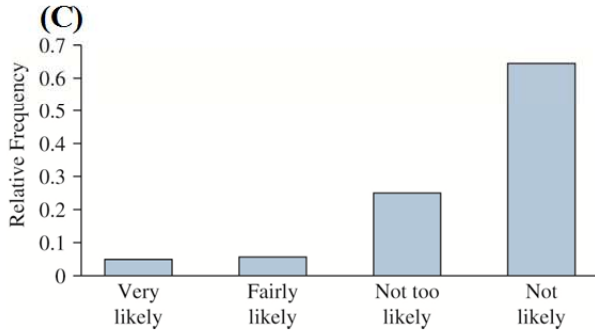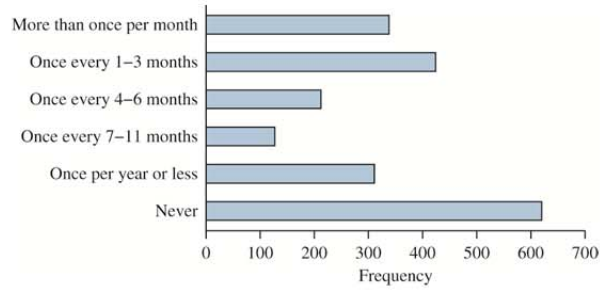
Response	Relative Frequency
More than once per month	0.166
Once every 1–3 months	0.209
Once every 4–6 months	0.104
Once every 7–11 months	0.063
Once per year or less	0.153
Never	0.305
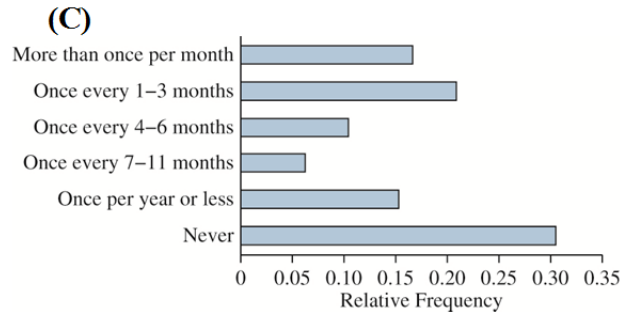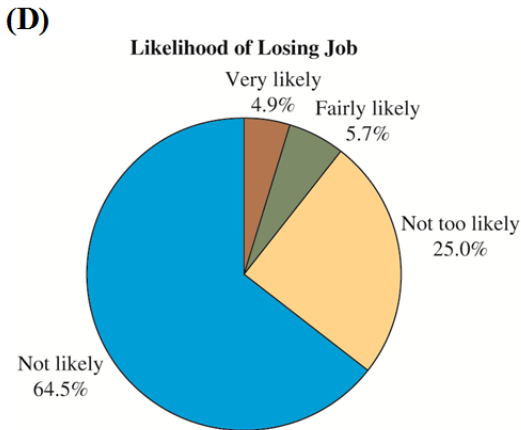
(C)

(D)

Frequency of Backups
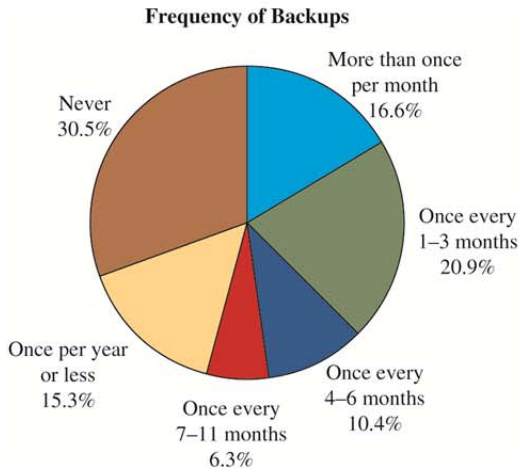
Educational Attainment	Relative Frequency
None	0.004
1–4 years	0.009
5–6 years	0.017
7–8 years	0.023
9 years	0.019
10 years	0.025
11 years	0.053
High school graduate	0.314
Some college but no degree	0.189
Associate's degree (occupational)	0.043
Associate's degree (academic)	0.039
Bachelor's degree	0.178
Master's degree	0.062
Professional degree	0.014
Doctoral degree	0.011

(E) True

(F) False

(C)

26 (A)
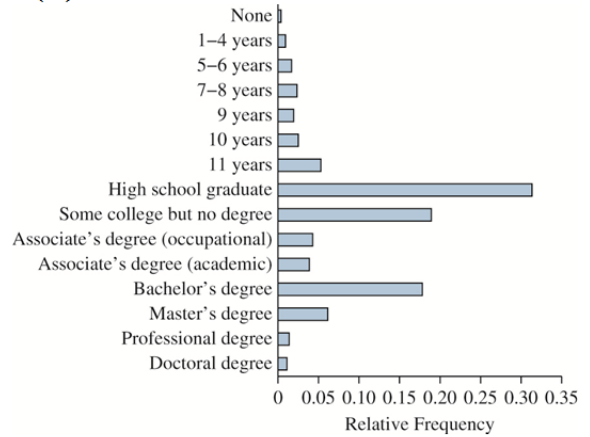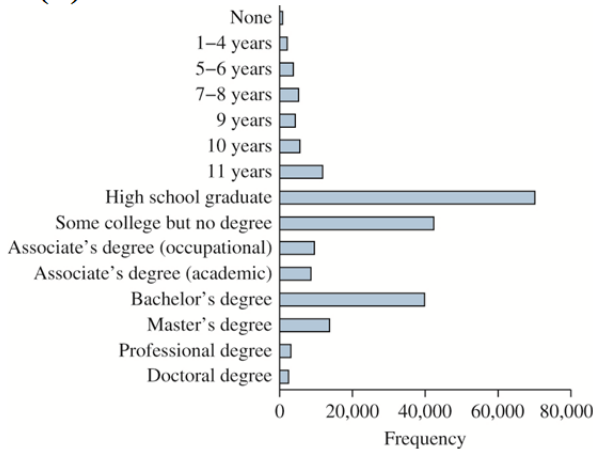
(D)

Educational Attainment	Frequency
8 years or less	11,988
9–11 years	21,750
High school graduate	70,108
Some college but no degree	42,349
College degree	58,062
Graduate degree	19,365

(B)

(E)

Educational Level
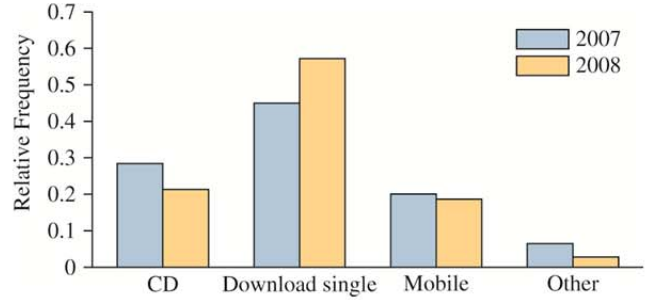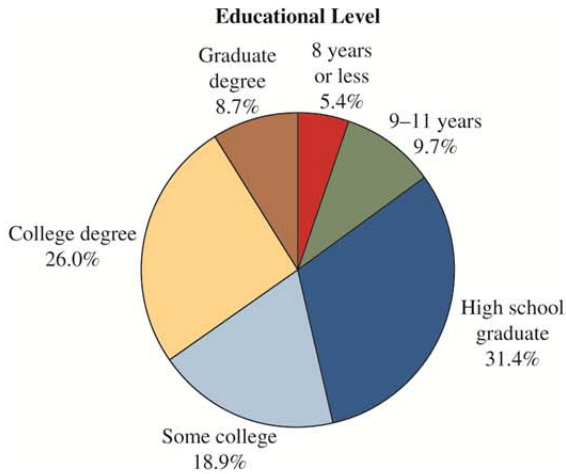
(F) .151

27 (A)

Type of Music	Relative Frequency
CD	0.284
Download single	0.450
Mobile	0.201
Other	0.065

(B)

Type of Music	Relative Frequency
CD	0.213
Download single	0.572
Mobile	0.187
Other	0.028

(C)

(D) True

28 (A)

Manufacturer	Relative Frequency
General Motors	0.231
Ford	0.187
Chrysler	0.151
Toyota	0.199
Honda	0.132
Nissan	0.100

(B)

Manufacturer	Relative Frequency
General Motors	0.221
Ford	0.210
Chrysler	0.109
Toyota	0.220
Honda	0.127
Nissan	0.112

(C)
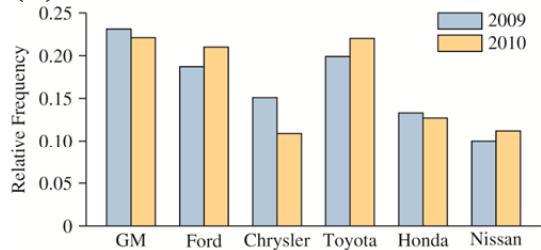
(D) False. Chrysler's went down.

29 (A)
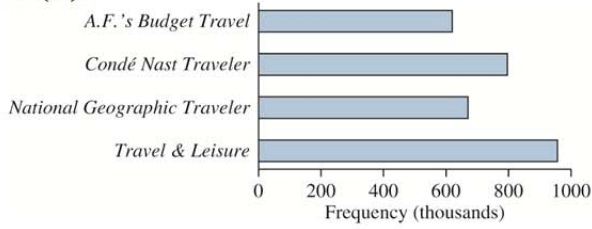
(B)

Magazine	Relative Frequency
A.F.'s Budget Travel	0.204
Condé Nast Traveler	0.262
National Geographic Traveler	0.220
Travel & Leisure	0.314

(C)

(D)

Travel Magazine Subscriptions
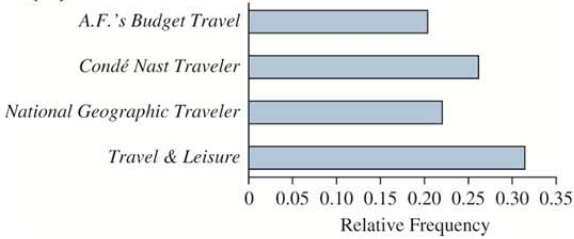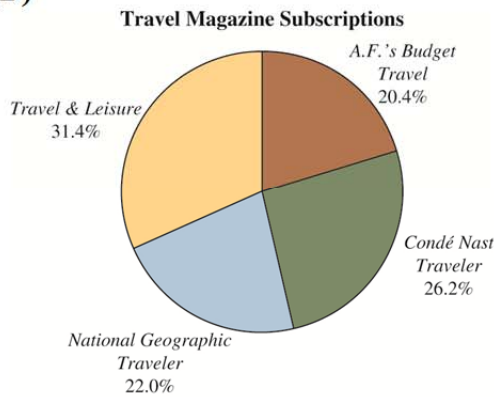
(E) .314

30 (A)

(B)

Manufacturer	Relative Frequency
Newspaper	0.477
Online only	0.332
Magazine	0.055
Local TV	0.050
Other	0.085

(C)

(D)

Online News Sites
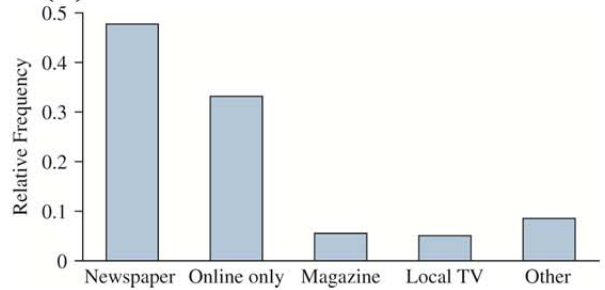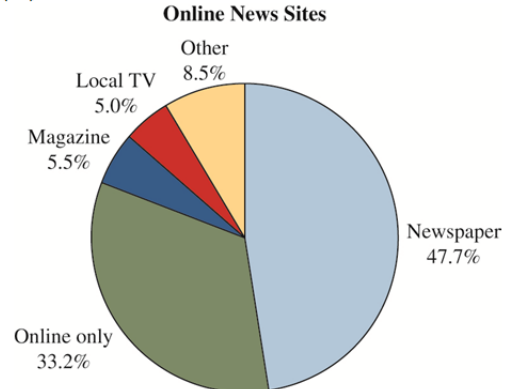
(E) .477

Extending the Concepts

31 (A)

New York

Los Angeles

(B)

Total

(C)

New York

Los Angeles

(D)
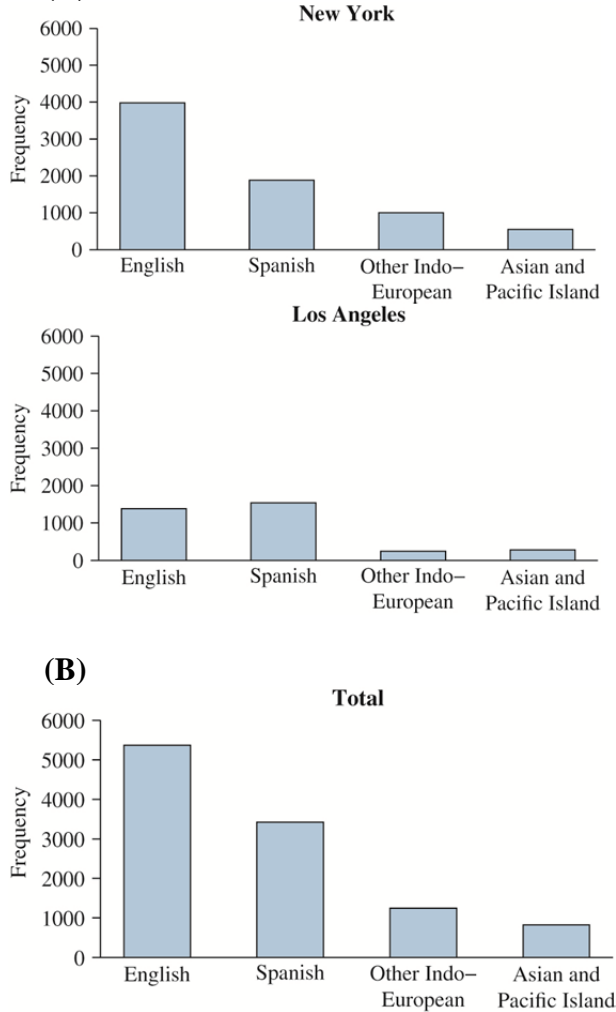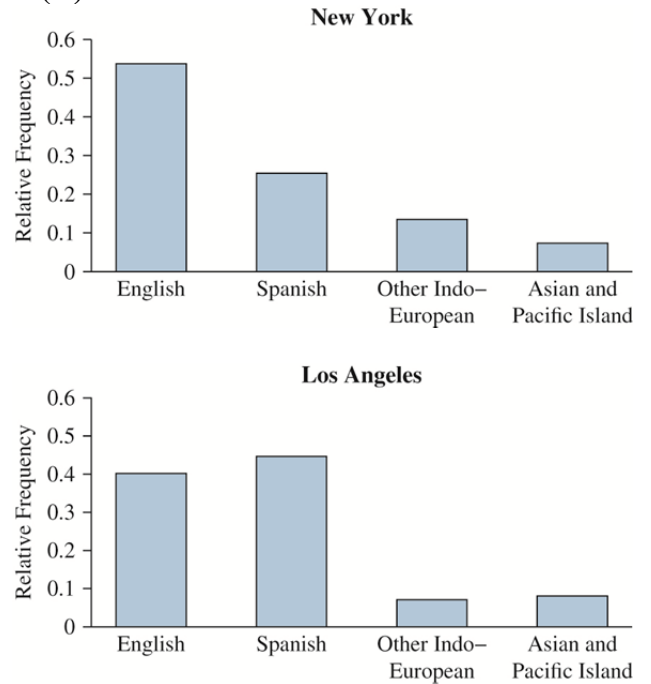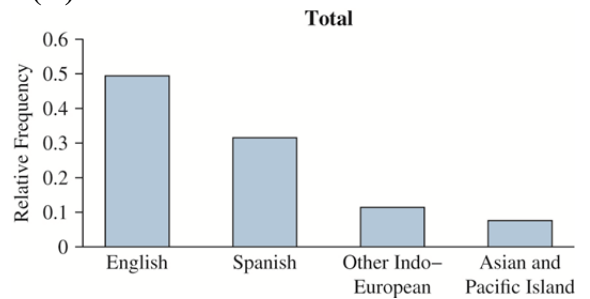
Total

(E) Because of the important concept in

mathematics that the whole is equal to the sum of its constituting parts. That is, the two cities of New York and Los Angeles make up the total of the two combined.

(F) Because each relative frequency is obtained by dividing its frequency by the sum of all the frequencies in its column. Therefore, this is <u>not</u> an application of "the whole is equal to the sum of its constituting parts."

SECTION 2.2 EXERCISES

Understanding the Concepts

Exercises 1-4 are the Check Your Understanding exercises located within the section. Their answers are found on page 63.

5. symmetric

6. left, right

7. bimodal

8. frequency

9. False. In a frequency distribution, the class width is the difference between <u>consecutive</u> lower class limits.

10. False. The number of classes used has a <u>big</u> effect on the shape of the histogram.

11. True

12. True

Practicing the Skills

13. skewed to the left

14. skewed to the right

15. approximately symmetric

16. approximately symmetric

17. bimodal

18. unimodal

Working with the Concepts

19 (A) 11

(B) 1

(C) 70-71

(D) 9%
(E) approximately symmetric

20 (A) 3

(B) 19

(C) 3

(D) skewed to the right

21 (A) 9

(B) .020

(C) The lower class limits are 0.180, 0.200, 0.220, 0.240, 0.260, 0.280, 0.300, 0.320, and 0.340. The upper class limits are 0.199, 0.219, 0.239, 0.259, 0.279, 0.299, 0.319, 0.339, and 0.359.

(D)

21

(G) 13.4%

(H) 4.1%

22 (A)

(B)
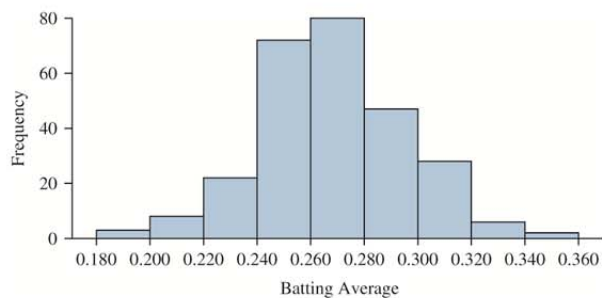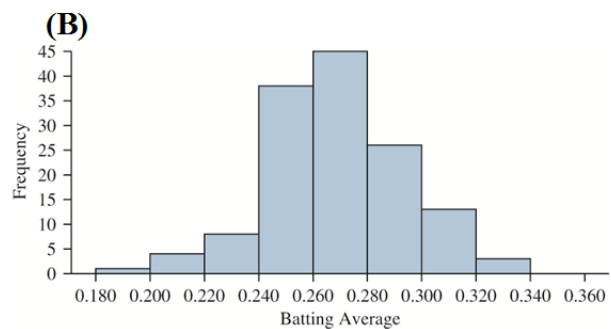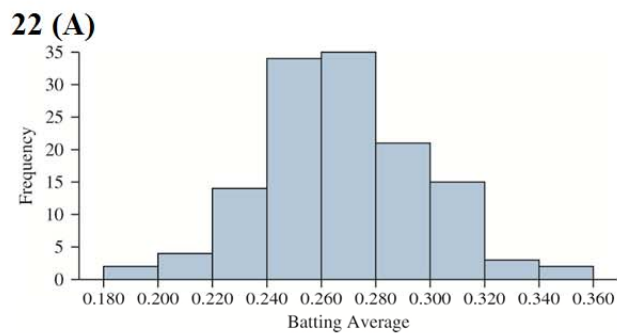
(E)

Batting Average	Relative Frequency
0.180–0.199	0.011
0.200–0.219	0.030
0.220–0.239	0.082
0.240–0.259	0.269
0.260–0.279	0.299
0.280–0.299	0.175
0.300–0.319	0.104
0.320–0.339	0.022
0.340–0.359	0.007

(C)

Batting Average	Relative Frequency
0.180–0.199	0.015
0.200–0.219	0.031
0.220–0.239	0.108
0.240–0.259	0.262
0.260–0.279	0.269
0.280–0.299	0.162
0.300–0.319	0.115
0.320–0.339	0.023
0.340–0.359	0.015

(D)

(F)
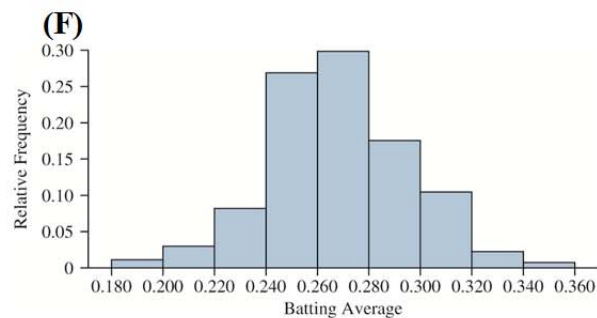
Batting Average	Relative Frequency
0.180–0.199	0.007
0.200–0.219	0.029
0.220–0.239	0.058
0.240–0.259	0.275
0.260–0.279	0.326
0.280–0.299	0.188
0.300–0.319	0.094
0.320–0.339	0.022
0.340–0.359	0.000
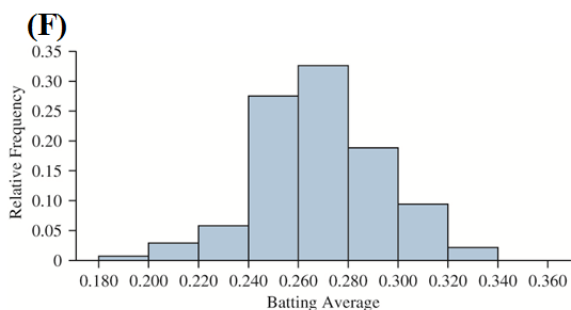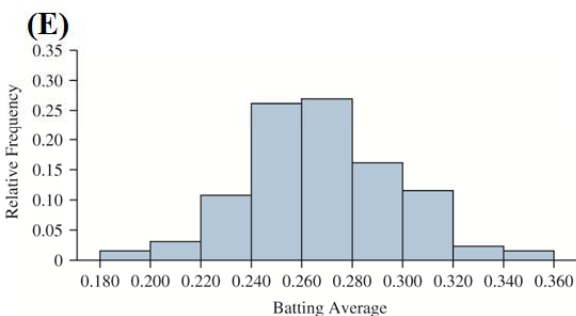
(C) The lower class limits are 1.0, 4.0, 7.0, 10.0, 13.0, 16.0, 19.0, 22.0, 25.0, and 28.0. The upper class limits are 3.9, 6.9, 9.9, 12.9, 15.9, 18.9, 21.9, 24.9, 27.9, and 30.9.

(D)

(E)
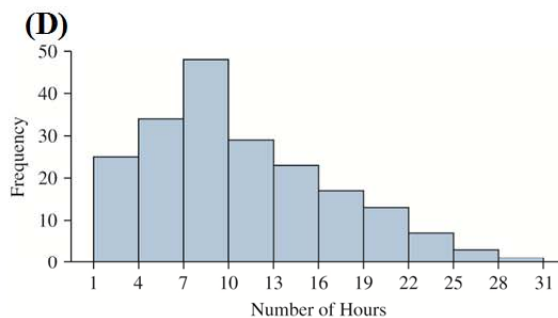
(E)

Number of Hours	Relative Frequency
1.0 – 3.9	0.125
4.0 – 6.9	0.170
7.0 – 9.9	0.240
10.0 – 12.9	0.145
13.0 – 15.9	0.115
16.0 – 18.9	0.085
19.0 – 21.9	0.065
22.0 – 24.9	0.035
25.0 – 27.9	0.015
28.0 – 30.9	0.005

(F)

(G) 15.4%

(H) 11.6%

(I) The American League data shows more players in the extremes (very low or very high averages), whereas the National League has more players with batting averages in the center.

(F)

23 (A) 10

(B) 3.0
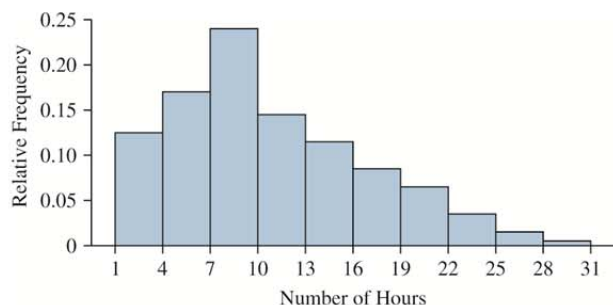
(G) 53.5%

(H) 12.0%

24 (A) 13

(B) 5

(C) The lower class limits are 0.0, 5.0, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, 45.0, 50.0, 55.0, and 60.0. The upper class limits are 4.9, 9.9, 14.9, 19.9, 24.9, 29.9, 34.9, 39.9, 44.9, 49.9, 54.9, 59.9, and 64.9.

(D)
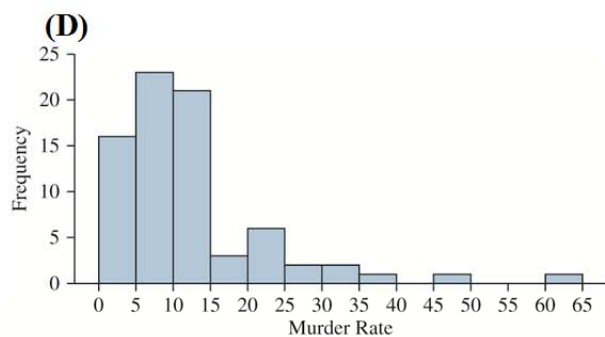
(E)

Murder Rate	Relative Frequency
0.0 – 4.9	0.211
5.0 – 9.9	0.303
10.0 – 14.9	0.276
15.0 – 19.9	0.039
20.0 – 24.9	0.079
25.0 – 29.9	0.026
30.0 – 34.9	0.026
35.0 – 39.9	0.013
40.0 – 44.9	0.000
45.0 – 49.9	0.013
50.0 – 54.9	0.000
55.0 – 59.9	0.000
60.0 – 64.9	0.013

(F)
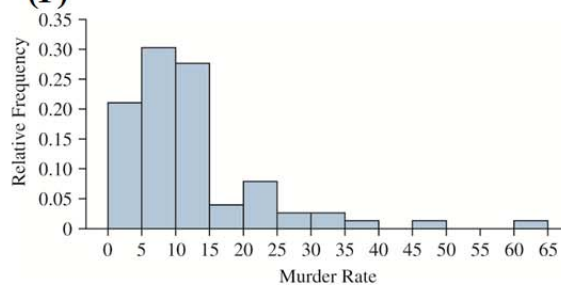
(G) 82.9%

(H) 2.6%

25 (A)

Price ($1000s)	Frequency
20.0 – 29.9	1
30.0 – 39.9	12
40.0 – 49.9	11
50.0 – 59.9	9
60.0 – 69.9	2
70.0 – 79.9	3
80.0 – 89.9	2
90.0 – 99.9	0
100.0 – 109.9	2
110.0 – 119.9	1
120.0 – 129.9	1
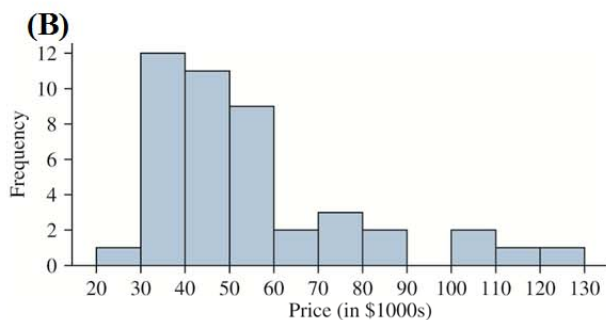
Price ($1000s)	Frequency
20 – 39.9	13
40 – 59.9	20
60 – 79.9	5
80 – 99.9	2
100 – 119.9	3
120 – 139.9	1

(B)
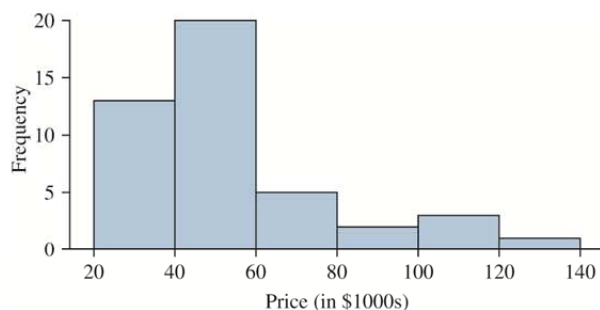
(C)

Price ($1000s)	Relative Frequency
20.0 – 29.9	0.023
30.0 – 39.9	0.273
40.0 – 49.9	0.250
50.0 – 59.9	0.205
60.0 – 69.9	0.045
70.0 – 79.9	0.068
80.0 – 89.9	0.045
90.0 – 99.9	0.000
100.0 – 109.9	0.045
110.0 – 119.9	0.023
120.0 – 129.9	0.023

Price ($1000s)	Relative Frequency
20 – 39.9	0.295
40 – 59.9	0.455
60 – 79.9	0.114
80 – 99.9	0.045
100 – 119.9	0.068
120 – 139.9	0.023
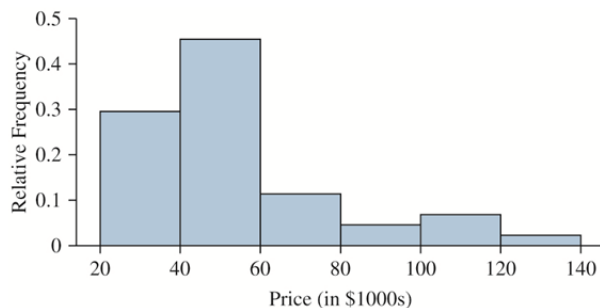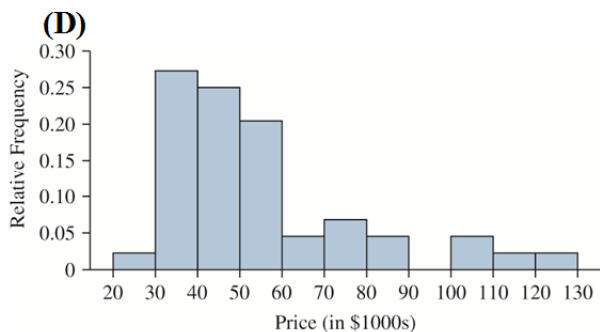
(D)

(G) Both are reasonably good choices for class widths. The number of classes are both at least 5, but less than 20. Also, neither class widths are too narrow or too wide.

(E) unimodal

26 (A)

(F)

25

Dormancy Period	Frequency
55 – 59.9	1
60 – 64.9	1
65 – 69.9	1
70 – 74.9	1
75 – 79.9	0
80 – 84.9	4
85 – 89.9	11
90 – 94.9	23
95 – 99.9	12
100 – 104.9	3
105 – 109.9	2
110 – 114.9	0
115 – 119.9	1
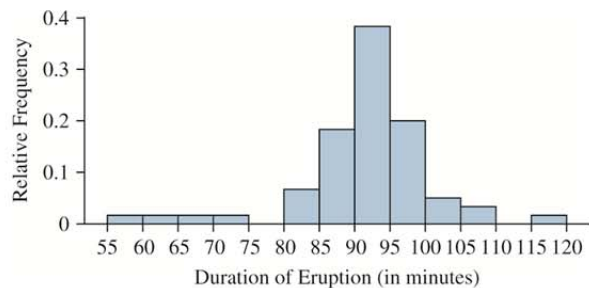
(E) skewed to the left

(F)

Dormancy Period	Frequency
50 – 59.9	1
60 – 69.9	2
70 – 79.9	1
80 – 89.9	15
90 – 99.9	35
100 – 109.9	5
110 – 119.9	1

(B)
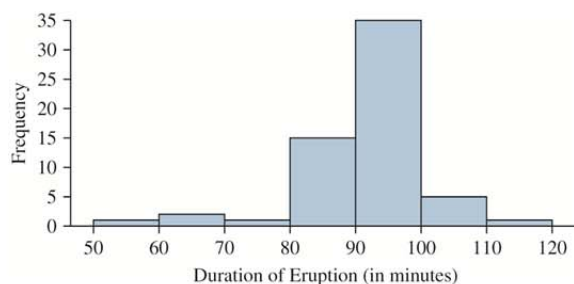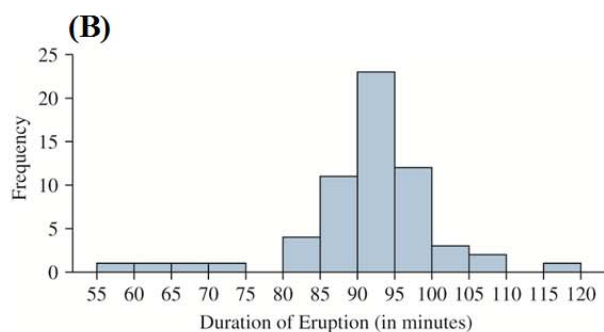
(C)

Dormancy Period	Frequency
55 – 59.9	0.017
60 – 64.9	0.017
65 – 69.9	0.017
70 – 74.9	0.017
75 – 79.9	0.000
80 – 84.9	0.067
85 – 89.9	0.183
90 – 94.9	0.383
95 – 99.9	0.200
100 – 104.9	0.050
105 – 109.9	0.033
110 – 114.9	0.000
115 – 119.9	0.017

Dormancy Period	Frequency
50 – 59.9	0.017
60 – 69.9	0.033
70 – 79.9	0.017
80 – 89.9	0.250
90 – 99.9	0.583
100 – 109.9	0.083
110 – 119.9	0.017

(D)

(G) Both are reasonably good choices for class widths. The number of classes are both at least 5, but less than 20. Also, neither class widths are too narrow or too wide.

27 (A) Answers will vary. Here is one possibility:

Number of Words	Frequency
0–1999	25
2000–3999	25
4000–5999	5
6000–7999	0
8000–9999	1
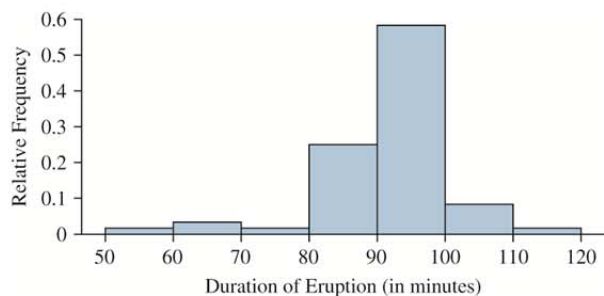
Number of Words	Relative Frequency
0–1999	0.446
2000–3999	0.446
4000–5999	0.089
6000–7999	0.000
8000–9999	0.018

(D)
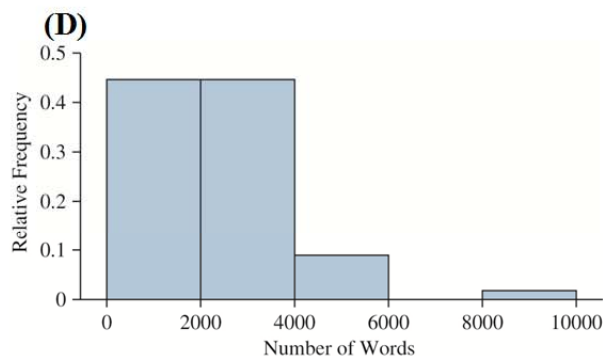
(E) skewed to the right

(F) Answers will vary. Here is one possibility:

Number of Words	Frequency
0 – 999	5
1000 – 1999	20
2000 – 2999	18
3000 – 3999	7
4000 – 4999	4
5000 – 5999	1
6000 – 6999	0
7000 – 7999	0
8000 – 8999	1

(B)
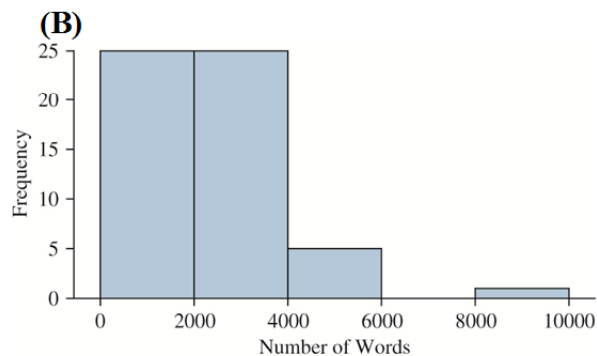
(C) Answers will vary. Here is one possibility:

(G)

27
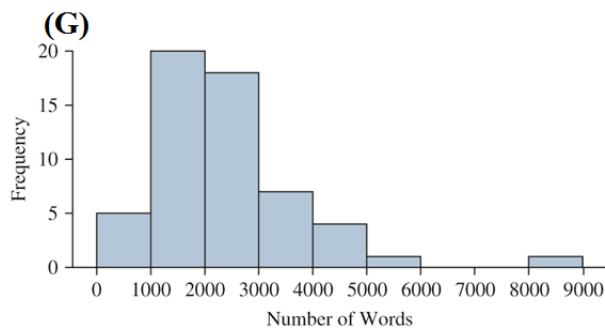
Answers will vary. Here is one possibility:

Number of Words	Relative Frequency
0 – 999	0.089
1000 – 1999	0.357
2000 – 2999	0.321
3000 – 3999	0.125
4000 – 4999	0.071
5000 – 5999	0.018
6000 – 6999	0.000
7000 – 7999	0.000
8000 – 8999	0.018

Salary	Frequency
20,000 – 39,999	5
40,000 – 59,999	7
60,000 – 79,999	3
80,000 – 99,999	4
100,000 – 119,999	2
120,000 – 139,999	4
140,000 – 159,999	1
160,000 – 179,999	1
180,000 – 199,999	1

(B)
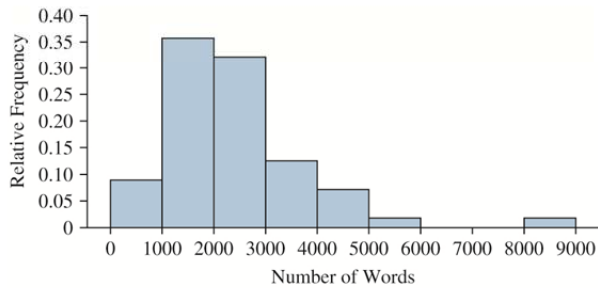
(H) The one with 9 classes is a much superior choice over the one with only 5 classes. This is because the one with only 5 classes is much too wide. Only the most basic features of the data are visible.
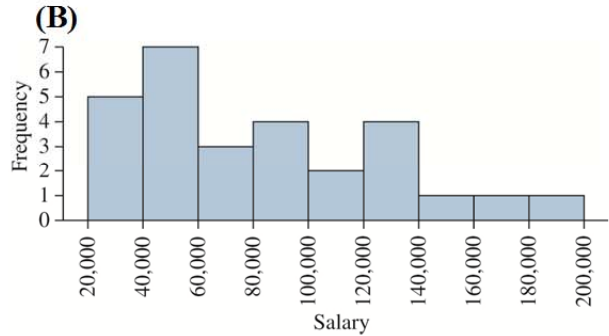
(C)

Salary	Relative Frequency
20,000 – 39,999	0.179
40,000 – 59,999	0.250
60,000 – 79,999	0.107
80,000 – 99,999	0.143
100,000 – 119,999	0.071
120,000 – 139,999	0.143
140,000 – 159,999	0.036
160,000 – 179,999	0.036
180,000 – 199,999	0.036

(D)

28 **(A)**

(E) skewed to the right

are in the graphs containing only four classes.

(F) Answers will vary. Here is one possibility:

Salary	Frequency
0 – 49,999	8
50,000 – 99,999	11
100,000 – 149,999	6
150,000 – 199,999	3

(G)
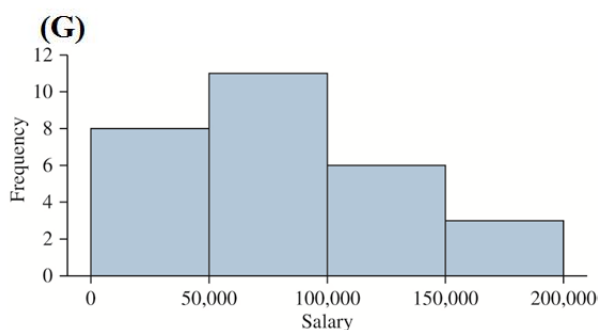
Salary	Frequency
0 – 49,999	0.286
50,000 – 99,999	0.393
100,000 – 149,999	0.214
150,000 – 199,999	0.107
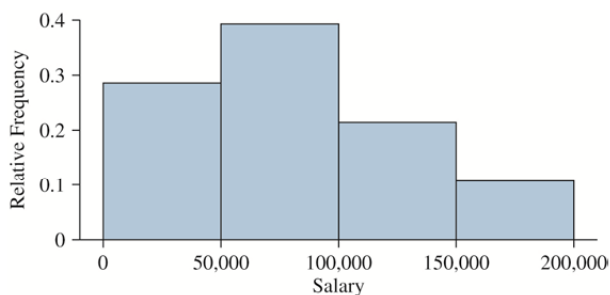
(H) The graphs with nine classes are much better than those with only 4 classes. This is because only the most basic features of the data are visible, when the class widths are too wide, as they

29 (A)

(B)

(C) skewed to the right

30 (A)

(B)

29

Number of Pets
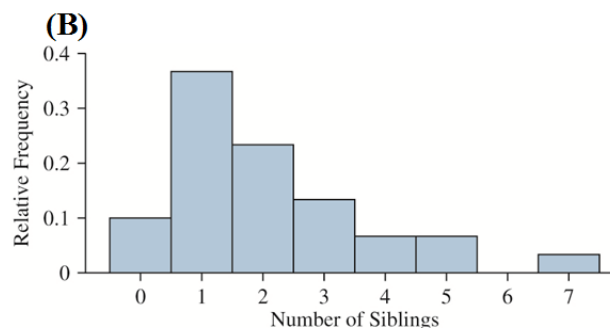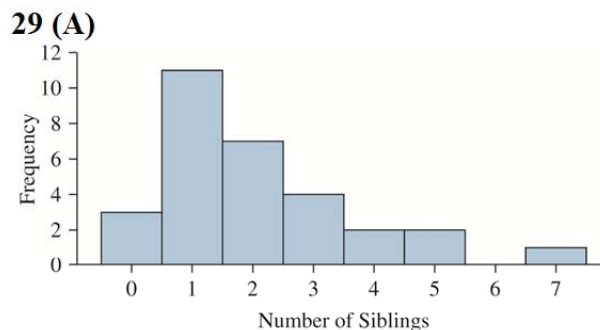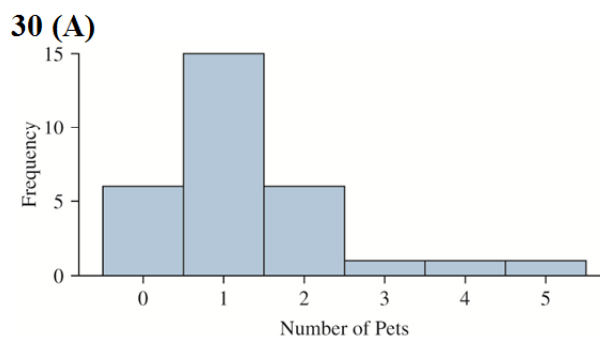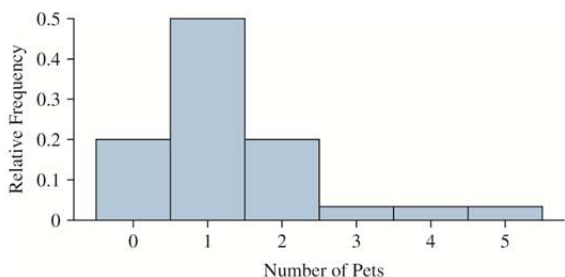
(C) skewed to the right

the data has one mode and is skewed to the right.

(C)

Class	Relative Frequency	Density
0.00–0.99	0.138	0.138
1.00–1.49	0.292	0.584
1.50–1.99	0.108	0.216
2.00–2.99	0.169	0.169
3.00–3.99	0.200	0.200
4.00–6.99	0.092	0.031

31. Because the 30 or more represents an open ended class.

32. Yes. The last class would become 30-34.9.

Extending the Concepts

33. We need to solve the following equation:
$.2 + .3 + .15 + x + .1 + .1 = 1$ Answer: $x = .15$

34 (A) The respective class widths are 1, .5, .5, 1, 1, and 3.

(B)
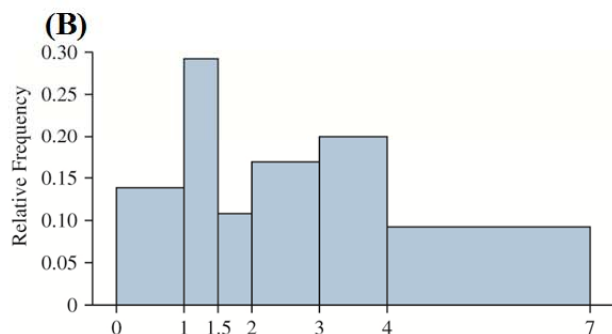
This histogram gives a distorted picture of the data because it makes it look like this is a bimodal distribution, when in reality, Figure 2.6 shows that

(D)
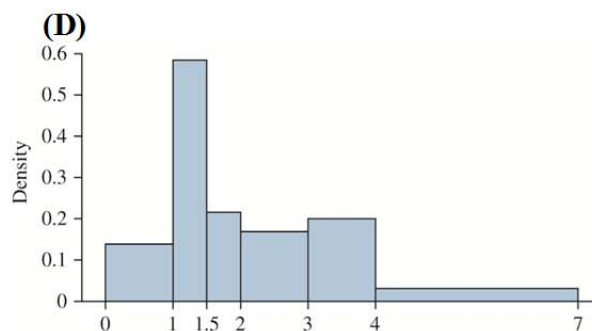
(E) The density histogram in part (D) also has only one mode and is skewed to the right, just like the histogram in Figure 2.6. The differing class widths in a density histogram do not distort the data because dividing the relative frequency by the class width puts the proportionality back into the respective classes.

SECTION 2.3 EXERCISES

Understanding the Concepts

Exercises 1 and 2 are the Check Your Understanding exercises located within the section. Their answers are found on page 74.

30

3. leaf

4. stems

5. time-series plot

6. time

7. true

8. False. In a stem-and-leaf plot, each leaf must be a single digit.

9. true

10. False. In a time-series plot, the horizontal axis represents time.

15.2 15.2 15.4 15.5 15.7 15.7 15.8
16.0 16.1 16.1 16.1 16.2 16.3 16.7
16.7 16.9 18.2 18.3 18.8

15.

16.

Practicing the Skills

11.

```
1 | 1225566
2 | 0012779
3 | 19
4 | 556
5 | 02578
```

12.

```
48 | 019
49 | 12445999
50 | 13345
51 | 047799
52 | 2455
```

13. The list is: 30 30 31 32 35 36 37 37
    39 42 43 44 45 46 47 47 47 47 48
    48 49 50 51 51 51 52 52 52 52 54
    56 57 58 58 59 61 63

14. The list is: 14.4 14.6 14.8 14.9 15.1

Working with the Concepts

17 (A)

```
 2 | 9
 3 | 335556677999
 4 | 111334567
 5 | 00022344579
 6 | 35
 7 | 77
 8 | 044
 9 |
10 | 06
11 | 5
12 | 4
```

(B)

31

```
 2
 2   9
 3   33
 3   5556677999
 4   111334
 4   567
 5   00022344
 5   579
 6   3
 6   5
 7
 7   77
 8   044
 8
 9
 9
10   0
10   6
11
11   5
12   4
12
```

(C) The one in part (A) does, because the one in part (B) has too many stems with no leaves. The stem-and-leaf plot in part (A) shows that the bulk of the prices are in the 30's, 40's, and 50's, and that the data is skewed to the right.

18 (A)

```
3   89
4   1222334556677788999
5   00001122444466788888999
6   00033337889
7   01123
```

(B)

```
 3
 3   89
 4   1222334
 4   556677788999
 5   00001122444
 5   66788888999
 6   0003333
 6   7889
 7   01123
 7
```

(C) The one in part **(B)** does, because most of the leaves are on three stems (temperatures in the 40's, 50's, and 60's). For this reason, the stem-and-leaf plot in part **(A)** does not reveal much detail about the data.

19 (A)

```
0   3
0   55669999
1   01111112222333344
1   555666889
2   11124
2   556777
3   0111334
3   555678
4   02
4   6
5
5   9
6
6   66
```

(B) Both plots show that more leaves are on stem 1, by far, over all other stems. However, the advantage to the split stem-and-leaf plot in part **(A)** is that it much better shows how the emissions data is skewed to the right.

20.

```
2  | 458
3  | 67
4  | 56
5  | 00179
6  | 1
7  | 01
8  |
9  | 2889
10 | 8
11 | 9
12 | 4
13 | 017
14 |
15 | 7
16 | 5
17 |
18 | 2
```

represent the tenth of an hour in length.

```
   PG or PG-13  |    |  R
           100  |  9 | 6
          8862  | 10 | 01557
            30  | 11 | 011258
         98100  | 12 | 5
                | 13 | 6
                | 14 | 9
                | 15 |
             2  | 16 |
```

23. Yes, there are some gaps in the dotplot below for the Macon, GA temperature data.

21 (A)

```
        Wimbledon            |   | Master's
                             | 1 |
                          87 | 1 |
4444433332222222222211111110 | 2 | 33
               99877776665555 | 2 | 566777888899
                         110 | 3 | 0111122222233333
                             | 3 | 5567888999
                             | 4 | 123
                             | 4 | 6
```

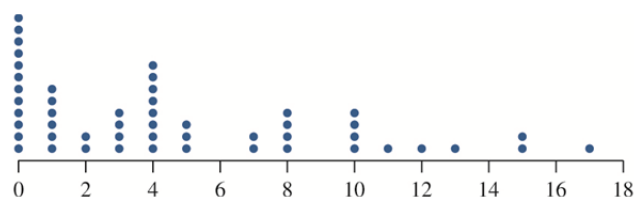**24.** This dotplot shows that the data is skewed to the right.

(B) Leaf 1 represents the ages of the Wimbledon winners and Leaf 2 represents the ages of the winners of the Master's. From this back-to-back split stem-and-leaf plot, we clearly see that the Wimbledon champions are younger.

22 (A) In the following back-to-back split stem-and-leaf plot, Leaf 1 displays the lengths of time of the PG movies and Leaf 2 does so for the R rated movies. The data is rounded to the nearest one-tenth of an hour, so a 90 minute movie is 1.5 hours long. The stem represents the whole hour and the leaves
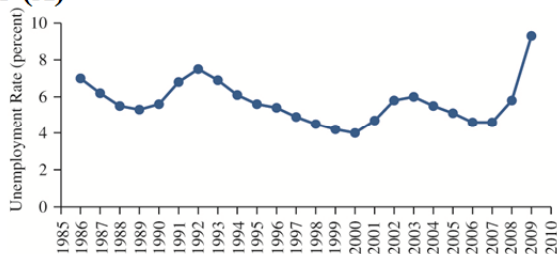
25 (A)

(B) Increasing: 89-92, 00-03, and 07-09
Decreasing: 86-89, 92-00, and 03-07
(06 ≈ 07)

33

26 (A)
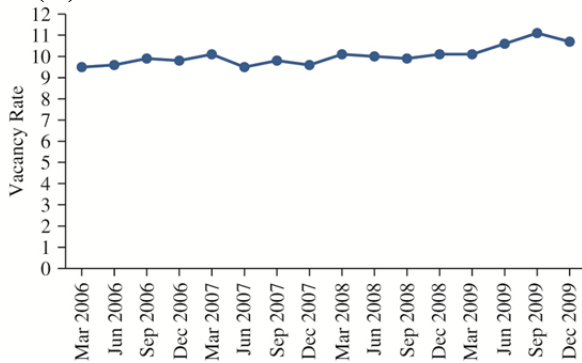
(B) Increasing over that period.

27 (A)
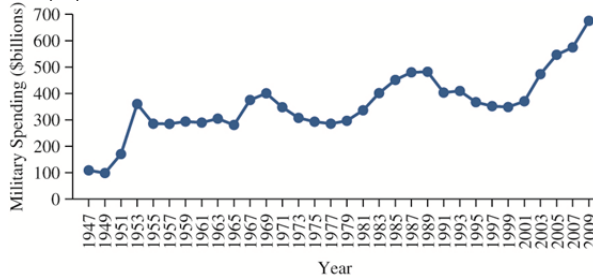
(B) It increased in the 50's, 60's, 80's, and 00's. It decreased in the 70's and 90's.
(C) It caused a big increase.

(D) It increased from 1965 to 1969, and then decreased from 1969 to 1975.

28 (A)
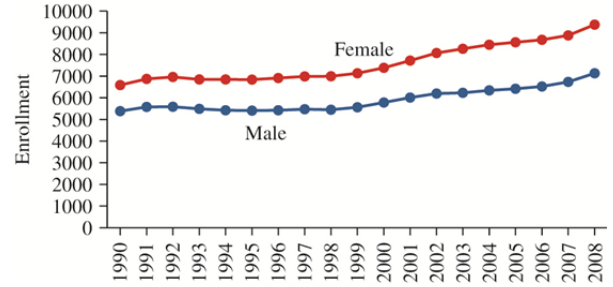
(B) Female enrollment is growing faster.

29 (A) $600 billion

(B) $300 billion

(C) true

(D) true

30 (A) 1980

(B) 85

(C) Staying about the same.

31 (A) 115 inches

(B) 1910

(C) less than

(D) true

(E) false

32 (A) 1992

(B) The two events decreased their average salaries.

34

Extending the Concepts

33 (A)

```
0 | 3333333344444
0 | 5555566677777788999
1 | 0000111123
1 | 5557
2 | 11
2 | 7
3 | 1
3 | 4
4 |
4 |
5 |
5 | 5
```

(B)

Electoral Votes
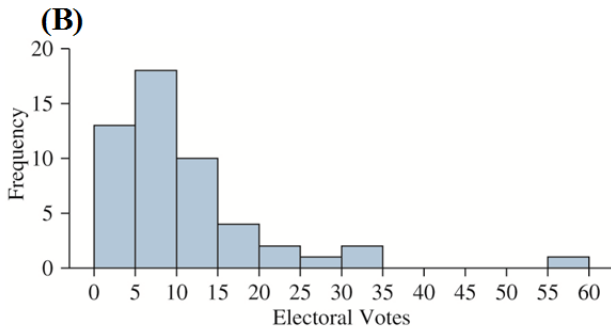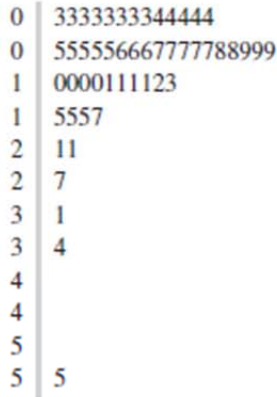
(C) They both have the same shape
(skewed to the right), because the class
width in the histogram is 5, as is each
line for each stem 5. The number of
leaves in each stem is the frequency of
occurrence, which is also the height of
the bars in the histogram.

SECTION 2.4 EXERCISES

Understanding the Concepts

Exercises 1 and 2 are the Check Your
Understanding exercises located within the
section. Their answers are found on page 80.

3. 0

4. proportional

5. Option (i) is correct, because the baseline
is at 0. Option (ii) exaggerates the rate of
the decline.

6. The bar graph does, because its baseline is
correctly placed at o. The time-series plot
exaggerates the rate of the increase.

7. The bar graph is more accurate. The
pictures of the dollars make the difference
appear much larger than the correctly
drawn bar graph does. The reason is that
both the height and length of the dollar has
been increased.

8. B does. The areas of the images are
proportional to the increase.

9. The bar graph is an accurate depiction.

10. It is misleading because the baseline is
not placed at zero.

11 (A) It is misleading because you can see
the tops of the bars in the three-
dimensional graph. This often causes
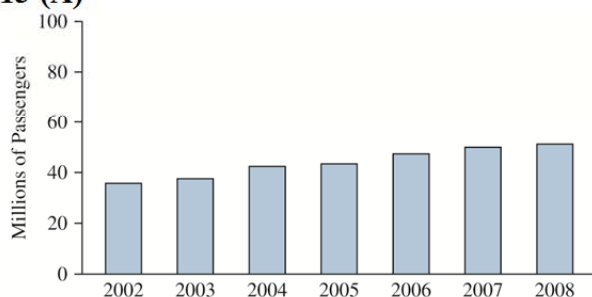them to look shorter than they really
are.

(B)

35
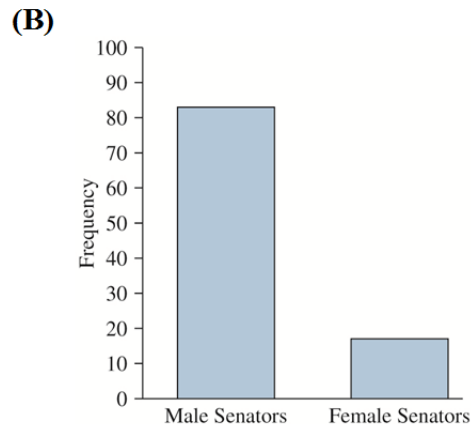
12. Option (ii) is the correct one, because it correspondingly matches up with graph (A) which is the correct one. Graph (B) does not have a baseline value of zero, so it gives the incorrect description of option (I).
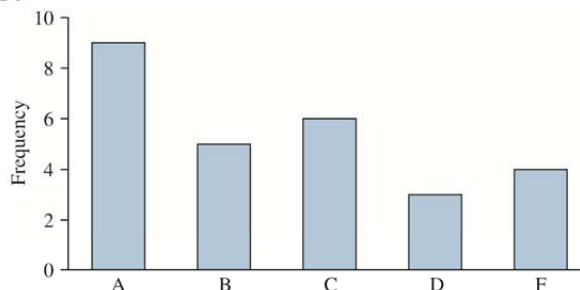
Extending the Concepts

13 (A)

(B) Yes

(C) Figure 2.23 does. It has a baseline of zero (unlike Figure 2.24), with a more accurate depiction of the range of data values than the graph in part **(A)** above.
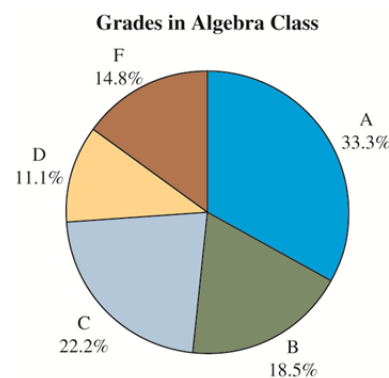
Chapter Quiz

1.

Grade	Frequency
A	9
B	5
C	6
D	3
F	4

2.

Grade	Relative Frequency
A	0.333
B	0.185
C	0.222
D	0.111
F	0.148

3.

4.

Grades in Algebra Class

5. The classes are: 5.0-7.9, 8.0-10.9, 11.0-13.9, 14.0- 16.9, and 17.0-19.9. The class width is 3.

6. True

7.
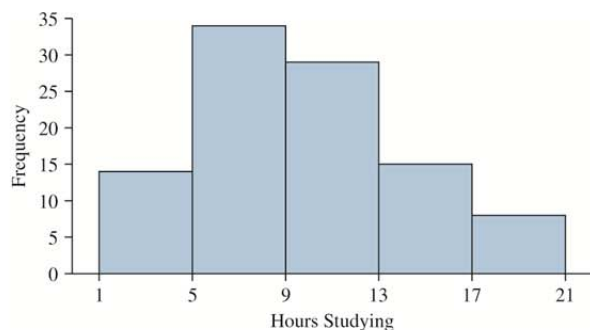
Espresso Makers		Coffee Makers
	1	9
5	2	22889
10	3	579
0	4	1
600	5	
5	6	8
70	7	
	8	
99	9	

8.
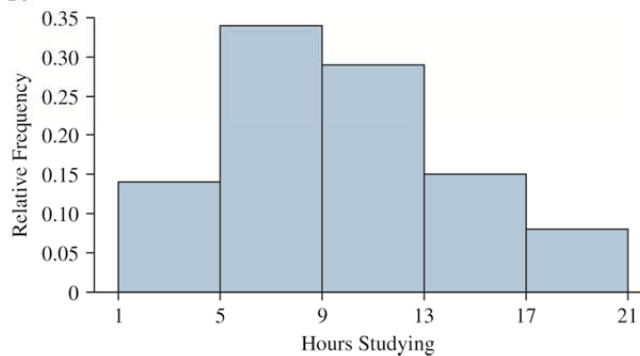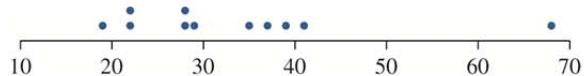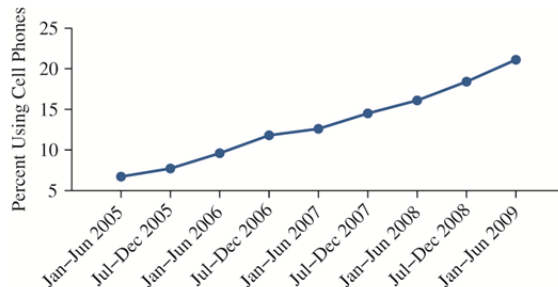
9. 11 11 15 15 19 19 19 22 22 23 25
27 28 30 30 38 44 45 47 48 50 51
53 53 55 56 58

10.

1	9
2	22889
3	579
4	1
5	
6	8

11.

2	5
3	01
4	0
5	006
6	5
7	07
8	
9	99

12.

13.

14.

15. twice

Review Exercises

1 (A) Somewhat

(B) True

(C) False

(D) True

2 (A)

37
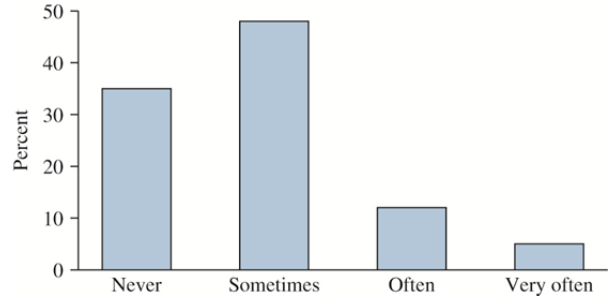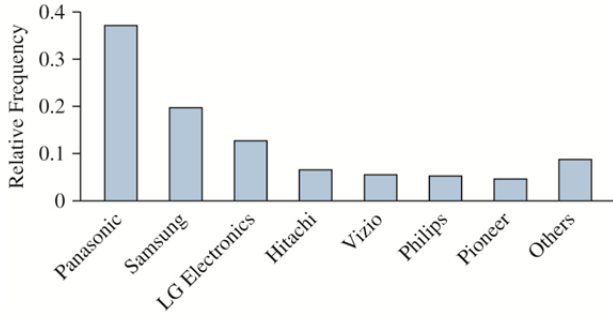
(B)

Market Share for TV Vendors

(C) True

3 (A)

(B) True

(C) Adams

4 (A)
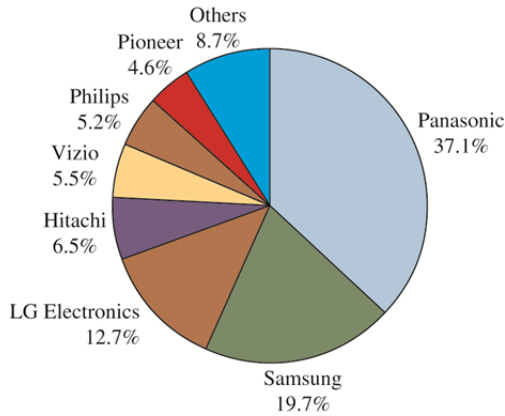
(B)

Failure to Complete Assignments
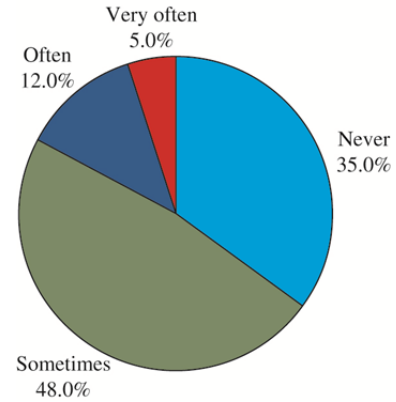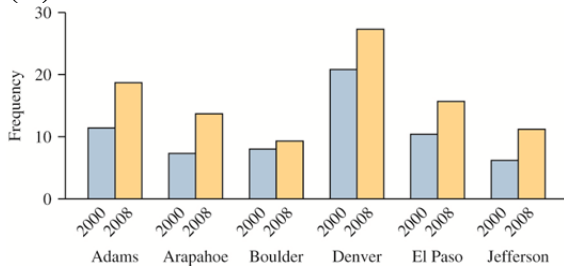
(C) False

5 (A) 7

(B) 10

(C) 10%

(D) Unimodal

6 (A) 8

(B) 20

(C) The lower class limit are 20, 40, 60, 80, 100, 120, 140, and 160. The upper class limits are 39, 59, 79, 99, 119, 139, 159, and 179.

8 (A)

Age	Frequency
10–19	2
20–29	1
30–39	3
40–49	10
50–59	9
60–69	9
70–79	4
80–89	2

(D)

(B)

(E)

Number of Freshmen	Relative Frequency
20 – 39	0.040
40 – 59	0.260
60 – 79	0.200
80 – 99	0.260
100 – 119	0.140
120 – 139	0.060
140 – 159	0.020
160 – 179	0.020

(C)
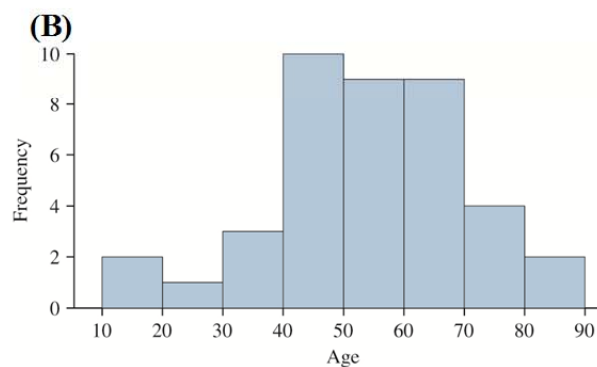
Age	Relative Frequency
10–19	0.050
20–29	0.025
30–39	0.075
40–49	0.250
50–59	0.225
60–69	0.225
70–79	0.100
80–89	0.050

(F)

(D)

7 (A) 24%

(B) 30%

(B)
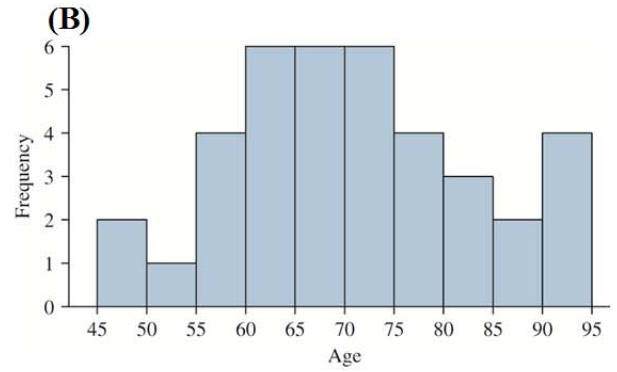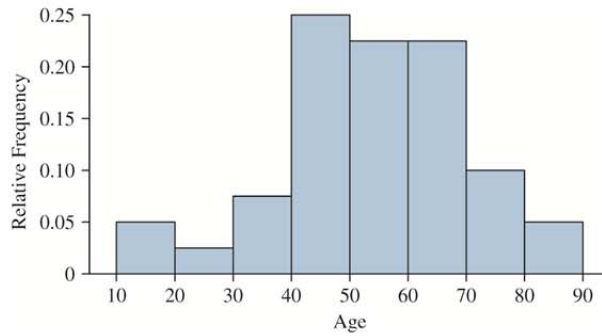
9.

```
1 | 25
2 | 8
3 | 235
4 | 0012368999
5 | 124566889
6 | 457777889
7 | 0167
8 | 11
```

(C)

Age	Relative Frequency
45–49	0.053
50–54	0.026
55–59	0.105
60–64	0.158
65–69	0.158
70–74	0.158
75–79	0.105
80–84	0.079
85–89	0.053
90–94	0.105

10 (A)

Age	Frequency
45–49	2
50–54	1
55–59	4
60–64	6
65–69	6
70–74	6
75–79	4
80–84	3
85–89	2
90–94	4

(D)

40
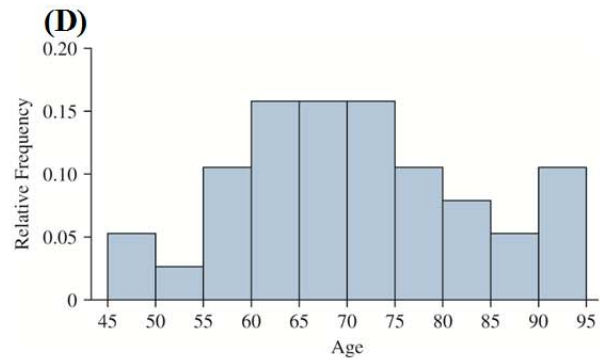
11 (A)

Presidents		Monarchs
	1	25
	2	8
	3	235
96	4	0012368999
87763	5	124566889
877765443300	6	457777889
9887432110	7	0167
85310	8	11
3300	9	

(B)

Presidents		Monarchs
	1	2
	1	5
	2	
	2	8
	3	23
	3	5
	4	00123
96	4	68999
3	5	124
8776	5	566889
443300	6	4
877765	6	57777889
432110	7	01
9887	7	67
310	8	11
85	8	
3300	9	
	9	

(C) The one with split stems in part **(B)**.

12.
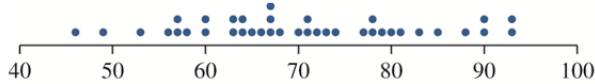
13 (A)
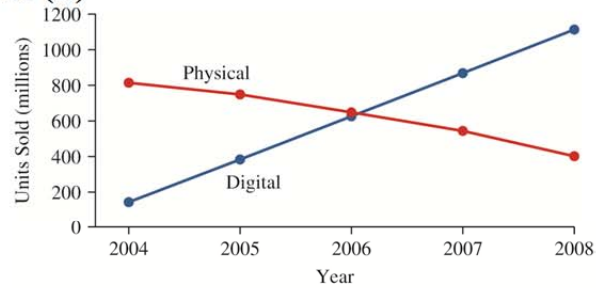
(B) They are inversely related. That is, as digital sales increase, physical sales decrease.

14 (A)
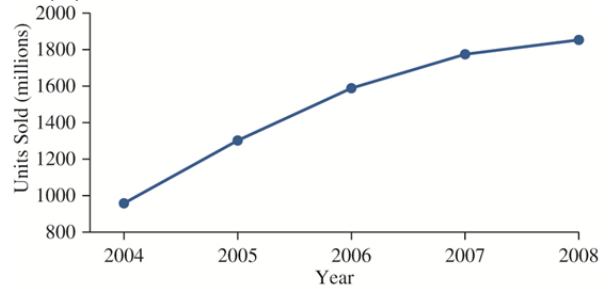
(B)
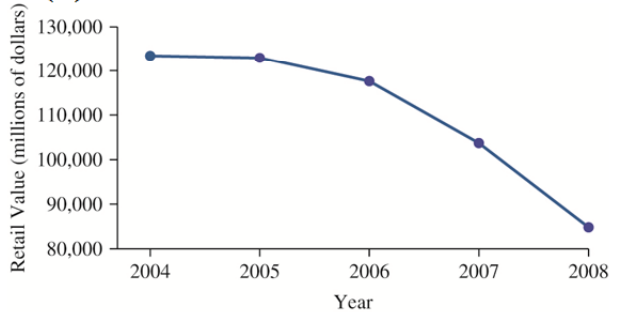
(C) The total units sold has been increasing, but the total retail value has been decreasing, because the total sold

is going up due to increased units sold
of the much cheaper format
(digital).

15. Option (ii) is the correct statement,
because the first graph is misleading, due
to the fact that its baseline does not start at
zero.

Write About It

1. A frequency bar graph and the relative
frequency bar graph for the same data
are identical except for the scale on the
vertical axis. This is because the
relative frequency bar graph just
converts the actual frequency numbers
over to their corresponding
proportional equivalents.

2. The main difference between the two,
is that unlike frequency distributions
for qualitative data, there are no
natural categories for frequency
distributions for quantitative data. In
the latter, the data must be divided into
classes, which could vary depending
on the individual creating them.

3. Answers will vary.

4. Answers will vary.

5. Answers will vary.

**Case Study: Do Late-Model Cars Get
Better Gas Mileage?**

1.

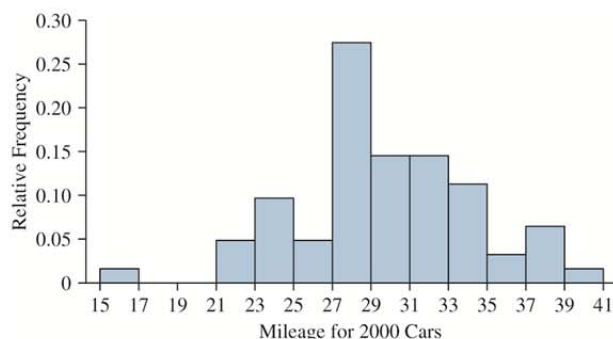| Mileage	Frequency
16.0–16.9	1
17.0–17.9	0
18.0–18.9	0
19.0–19.9	0
20.0–20.9	0
21.0–21.9	3
22.0–22.9	0
23.0–23.9	3
24.0–24.9	3
25.0–25.9	0
26.0–26.9	3
27.0–27.9	9
28.0–28.9	8
29.0–29.9	3
30.0–30.9	6
31.0–31.9	6
32.0–32.9	3
33.0–33.9	4
34.0–34.9	3
35.0–35.9	1
36.0–36.9	1
37.0–37.9	1
38.0–38.9	3
39.0–39.9	0
40.0–40.9	1

2. A class width of one is too narrow for this

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data because there are lots of classes with 0 or 1 cars in them.

3.

Mileage	Frequency	Relative Frequency
15.0–16.9	1	0.016
17.0–18.9	0	0.000
19.0–20.9	0	0.000
21.0–22.9	3	0.048
23.0–24.9	6	0.097
25.0–26.9	3	0.048
27.0–28.9	17	0.274
29.0–30.9	9	0.145
31.0–32.9	9	0.145
33.0–34.9	7	0.113
35.0–36.9	2	0.032
37.0–38.9	4	0.065
39.0–40.9	1	0.016

**4.** We can see from the relative frequency histogram below, that it is unimodal, with very little skew.

Mileage for 2000 Cars

5.

Mileage	Relative Frequency
14.0–15.9	2
16.0–17.9	3
18.0–19.9	5
20.0–21.9	2
22.0–23.9	1
24.0–25.9	10
26.0–27.9	9
28.0–29.9	9
30.0–31.9	7
32.0–33.9	2
34.0–35.9	5

6.

Mileage	Relative Frequency
14.0–15.9	0.036
16.0–17.9	0.055
18.0–19.9	0.091
20.0–21.9	0.036
22.0–23.9	0.018
24.0–25.9	0.182
26.0–27.9	0.164
28.0–29.9	0.164
30.0–31.9	0.127
32.0–33.9	0.036
34.0–35.9	0.091

7. We can see from the relative frequency histogram below, that it is unimodal, with slight skew to the left.

Mileage for 2009 Cars
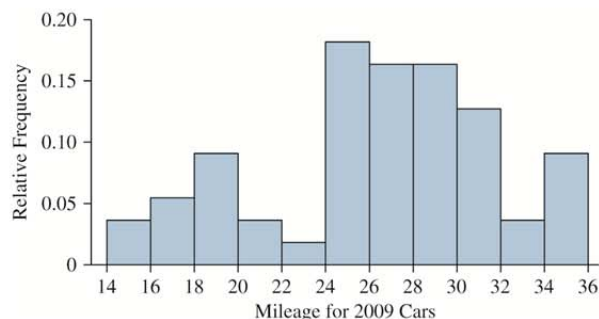
8. 2000 cars tend to have the higher MPG's.

9. The back-to-back stem-and-leaf plot (displayed immediately below) illustrates the comparison better than the histograms (displayed above) do. This is because all of the data in the comparison is right there in one plot, as opposed to having to look between two different histograms.

Chapter 2: Graphical Summaries of Data

```
           2000 Cars      2009 Cars
                        1 | 4
                     6  1 | 577788889
            444333111  2 | 112
999888888887777777777666  2 | 55555555556666666677888899999
4443333222111111000000  3 | 00000013344
              888765  3 | 555
                    0  4 |
```

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