Chapter 2 Tabular and Graphical Methods

Solutions

1.
   a.

Rating	Frequency	Relative Frequency
5	12	$12/36 = 0.333$
4	9	$9/36 = 0.250$
3	7	$7/36 = 0.194$

2	5	$5/36 = 0.139$
1	3	$3/36 = 0.083$
Total	36	0.999

b. More than a third of the patrons are very satisfied with the entrees. Overall more than half of the customers gave a top rating of either 4 or 5. Only 8.3% gave the lowest rating.

2.

   a.

Rating	Frequency	Relative Frequency
Excellent	5	$5/24 = 0.208$
Good	12	$12/24 = 0.500$
Fair	4	$4/24 = 0.167$

Poor	3	$3/24 = 0.125$
Total	24	1

b. The most common response is Good which comprises 50% of total responses. More than half of the patients reveal that they are in good or excellent health conditions.
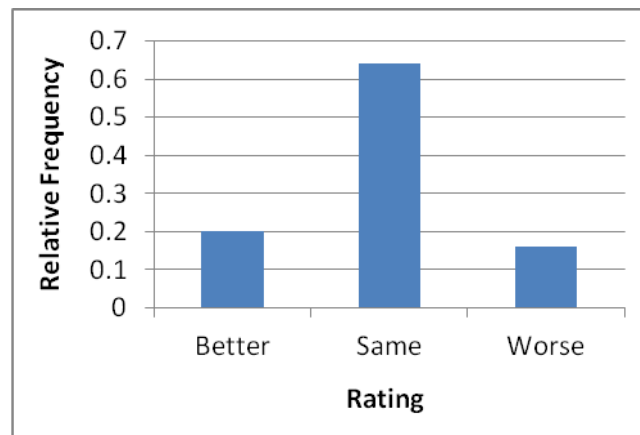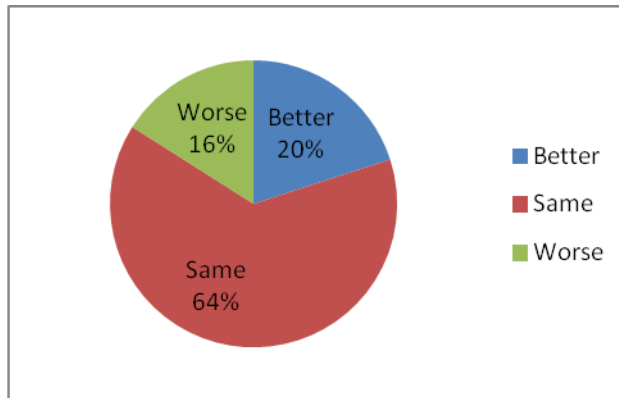
3.

a.

Expectation	Frequency	Relative Frequency
Better	5	$5/25 = 0.20$
Same	16	$16/25 = 0.64$
Worse	4	$4/25 = 0.16$

| Total | 25 | 1 |

b.

Most of the chief executives (64%) believed that the economy would be the same in the next 12 months.
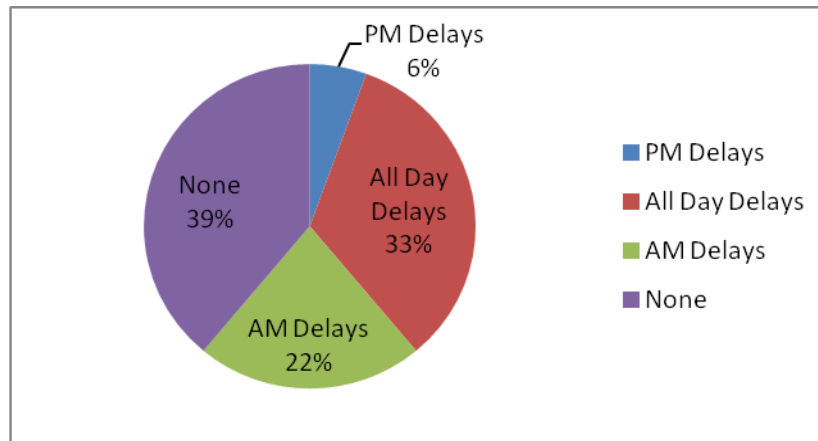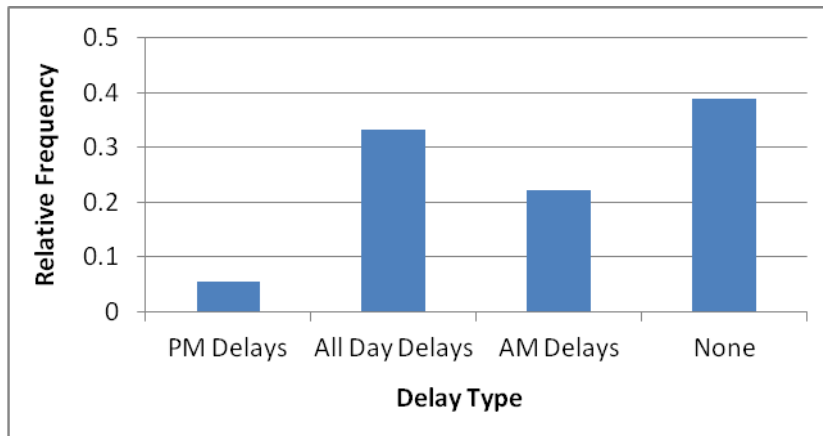
b.

4.

a.

Delays	Frequency	Relative Frequency
PM Delays	1	$1/18 = 0.056$
All Day Delays	6	$6/18 = 0.333$
AM Delays	4	$4/18 = 0.222$

None	7	$7/18 = 0.389$
Total	18	1

The most common delays were None, comprising 38.9% of all delays. The second most common were All Day Delays, comprising 33.3% of all delays.
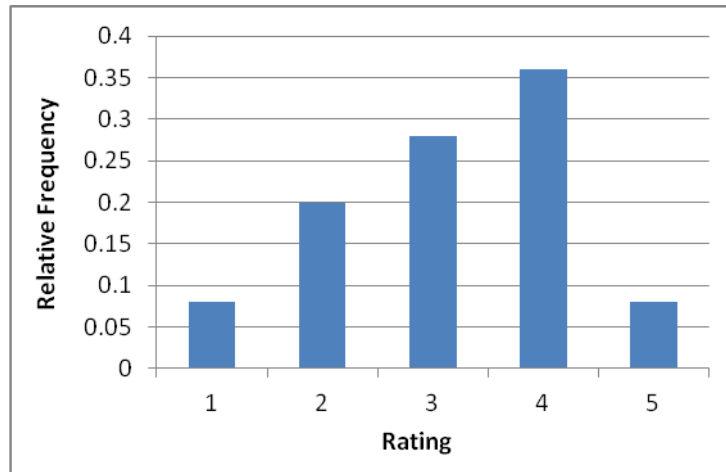
b.

5.

    a. 22 (18 + 4) out of 50 rookies received a rating of 4 or better; 14 (10 + 4) out of 50 rookies received a rating of 2 or worse.

b.

Rating	Relative Frequency
1	$4/50 = 0.08$
2	$10/50 = 0.2$
3	$14/50 = 0.28$
4	$18/50 = 0.36$
5	$4/50 = 0.08$
Total	1

8% of the rookies received a rating of 5.
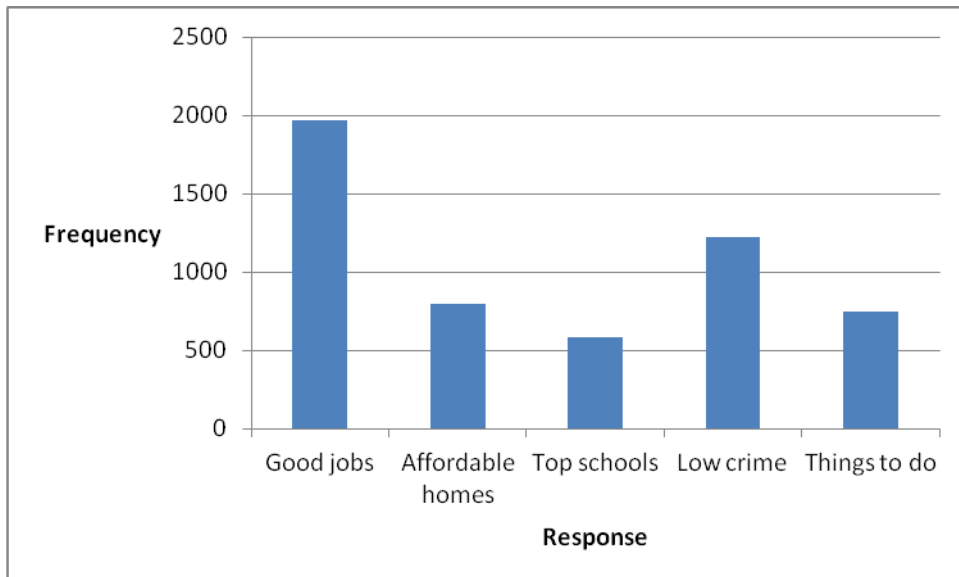
c.

6.

a.

Response	Frequency
Good Jobs	$0.37 \times 5324 = 1970$
Affordable homes	$0.15 \times 5324 = 799$
Top schools	$0.11 \times 5324 = 586$
Low crimes	$0.23 \times 5324 = 1225$
Things to do	$0.14 \times 5324 = 745$
Total	5324

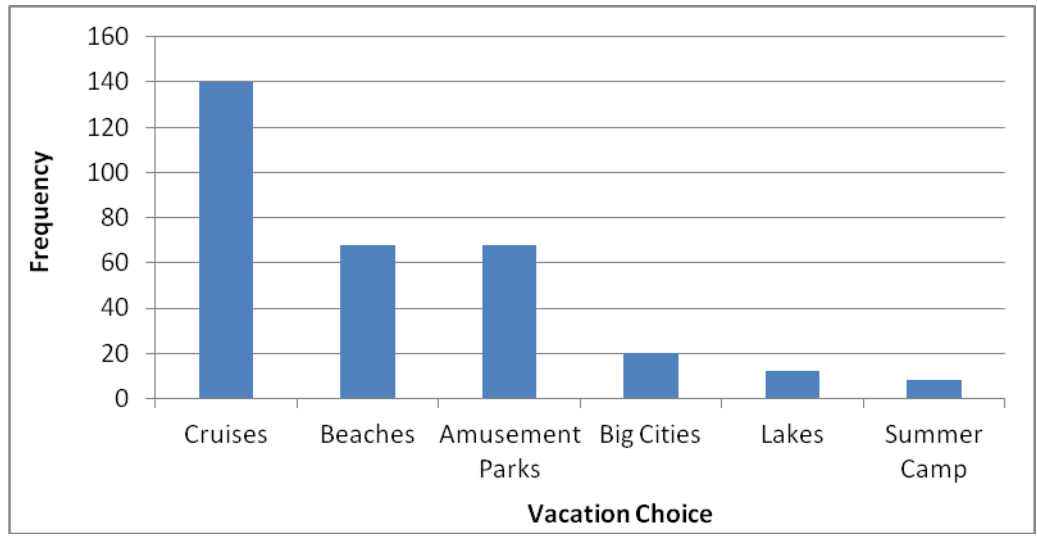1225 respondents considered 'Low crimes' as the most important criteria.

b.

7.
a.

Top Vacation Choice	Relative Frequency
Cruises	$140/316 = 0.443$
Beaches	$68/316 = 0.215$
Amusement Parks	$68/316 = 0.215$
Big Cities	$20/316 = 0.063$

Lakes	$12/316 = 0.038$
Summer Camp	$8/316 = 0.025$
Total	0.999

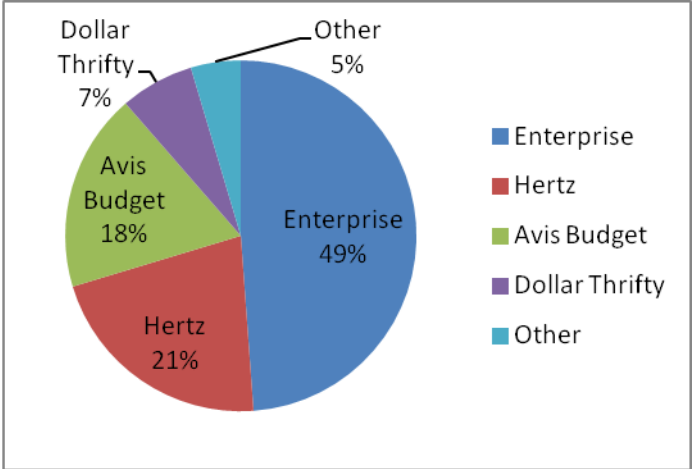44.3% of the children cited 'Cruises' as the perfect summer trip.

b.

8.

a.

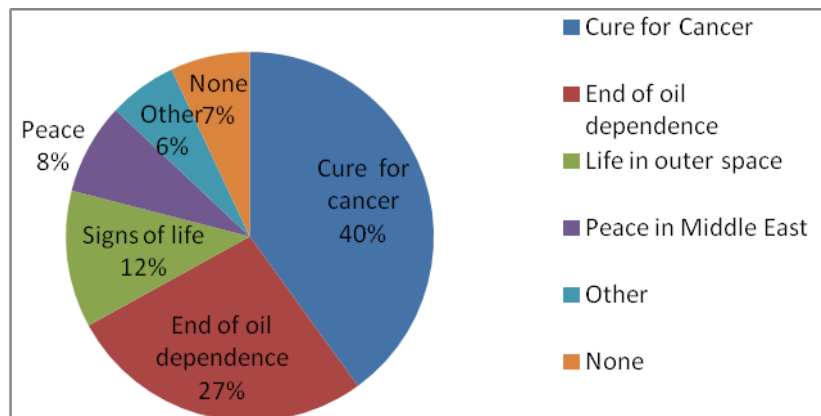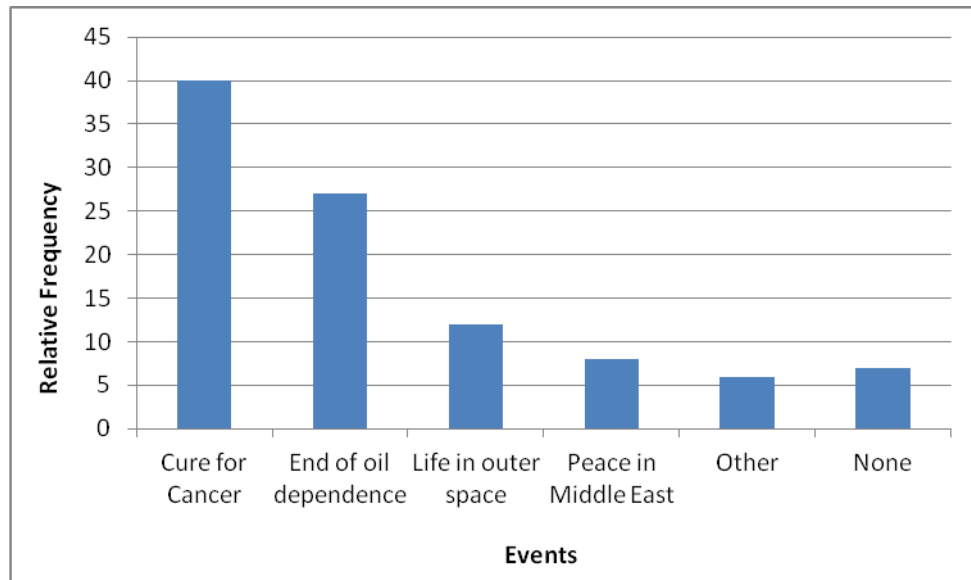| Company	Relative Frequency
Enterprise	$10.7/21.9 = 0.489$
Hertz	$4.7/21.9 = 0.215$
Avis Budget	$4/21.9 = 0.183$
Dollar Thrifty	$1.5/21.9 = 0.068$
Other	$1/21.9 = 0.046$
Total	1

b. Hertz accounted for 21.5% of sales.

c.

9.

   a.

b.   (0.4 * 829) = 332 respondents believe that a cure for cancer will be found.

10.
a. The number of responses for others is the difference between the total number of responses and the sum of responses in the table. That is, $(20825 - 15241) = 5584$.
b. The proportion of respondents that felt that the Green Bay Packers would win Super Bowl XLV is 1076/20,825 = 0.052.

c.

Relative frequencies are:

Team	Relative Frequency
Falcons	$4040/20{,}825 = 0.194$
Saints	$1880/20{,}825 = 0.090$
Texans	$1791/20{,}825 = 0.086$
Cowboys	$1631/20{,}825 = 0.078$

Vikings	$1438/20{,}825 = 0.069$
Colts	$1149/20{,}825 = 0.055$
Steelers	$1141/20{,}825 = 0.055$
Patriots	$1095/20{,}825 = 0.053$
Packers	$1076/20{,}825 = 0.052$
Others	$5584/20{,}825 = 0.268$
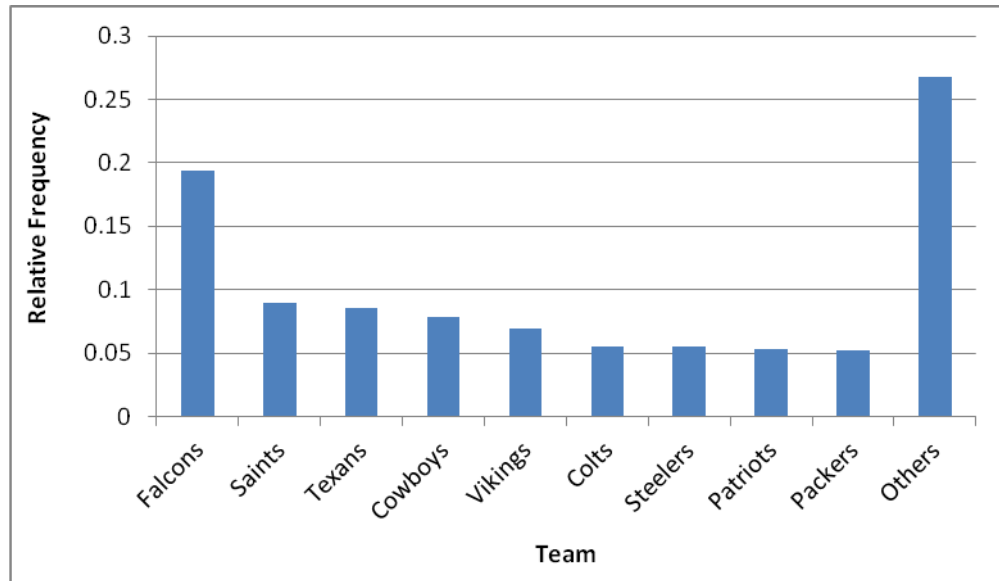
11.   This graph does not correctly depict what has happened to Caterpillar's stock price over this period. The graph has been given a high value on the vertical axis. This compresses the data so that the increase of the stock price is not as apparent as it should be.

12.   This graph does not correctly depict what has happened to sales over the most recent five-year period. The vertical axis has been stretched so that the increase in sales appears more pronounced than warranted.

13.

a.

Class	Frequency
3 up to 5	5
5 up to 7	5
7 up to 9	8
9 up to 11	4
11 up to 13	5
13 up to 15	3
	Total = 30

b.

Classes	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
3 up to 5	5/30 = 0.17	5	0.17

5 up to 7	$5/30 = 0.17$		$5 + 5 = 10$	$0.17 + 0.17 = 0.34$
7 up to 9	$8/30 = 0.27$		$5 + 5 + 8 = 18$	$0.34 + 0.27 = 0.61$
9 up to 11	$4/30 = 0.13$		$5 + 5 + 8 + 4 = 22$	$0.61 + 0.13 = 0.74$
11 up to 13	$5/30 = 0.17$		$5 + 5 + 8 + 4 + 5 = 27$	$0.74 + 0.17 = 0.91$
13 up to 15	$3/30 = 0.1$		$5 + 5 + 8 + 4 + 5 + 3 = 30$	$0.91 + 0.1 \approx 1$
	Total $= 1$			

c. 8 observations are at least 7 but less than 9; 18 observations are less than 9

d. 27% of the observations are at least 7 but less than 9; 61% are less than 9

e.
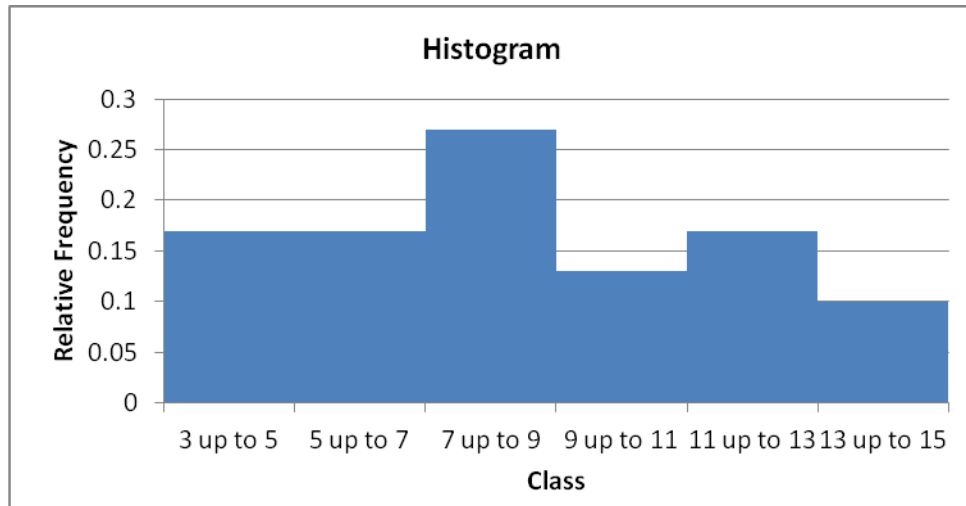
f.
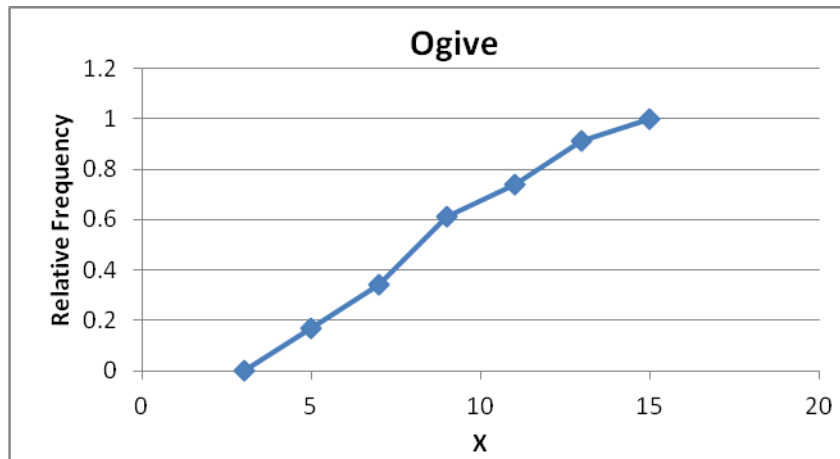
14.

a.

Classes	Frequency
-10 up to 0	9
0 up to 10	31

10 up to 20	19
20 up to 30	8
30 up to 40	3
	Total = 70

19 observations are at least 10 but less than 20.

b.

Classes	Relative Frequency	Cumulative Relative Frequency
-10 up to 0	9/70 = 0.129	0.129
0 up to 10	31/70 = 0.443	0.129 + 0.443 = 0.572
10 up to 20	19/70 = 0.271	0.129 + 0.443 + 0.271 = 0.843
20 up to 30	8/70 = 0.114	0.129 + 0.443 + 0.271 + 0.114 = 0.957
30 up to 40	3/70 = 0.043	0.129 + 0.443 + 0.271 + 0.114 + 0.043 = 1
	Total = 0.999	

27.1% of the observations are at least 10 but less than 20; 84.3% are less than 20
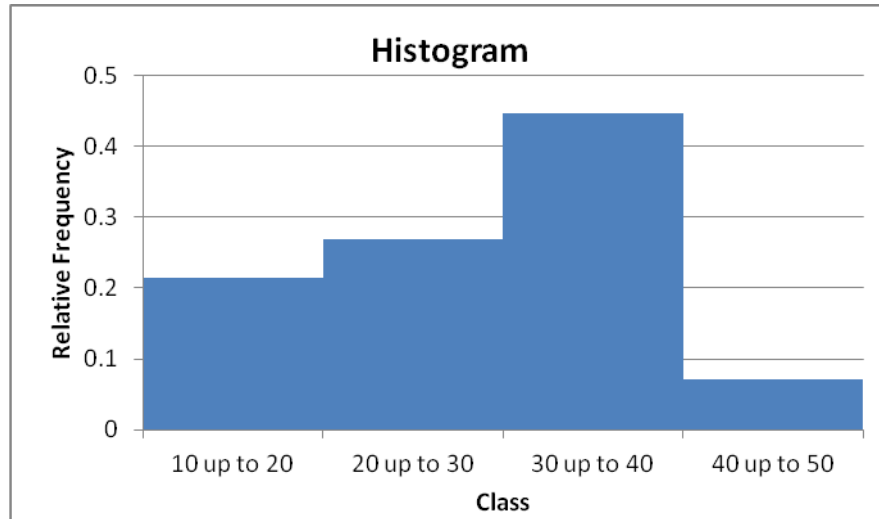
c.
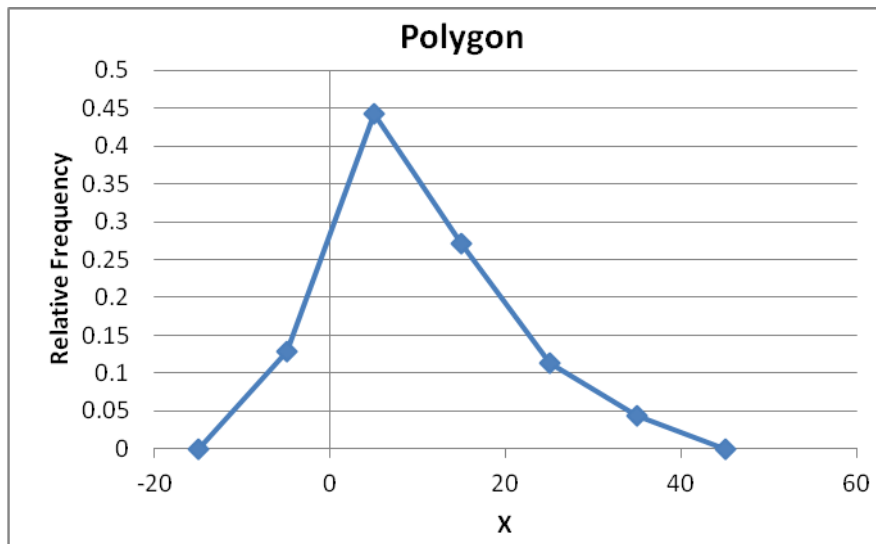
The distribution has a slight positive skew.

15.

a.

Class	Relative Frequency
10 up to 20	$12/56 = 0.214$
20 up to 30	$15/56 = 0.268$
30 up to 40	$25/56 = 0.446$
40 up to 50	$4/56 = 0.071$
	Total ≈ 1

Histogram

b.

Class	Cumulative Frequency	Cumulative Relative Frequency
10 up to 20	12	$12/56 = 0.214$
20 up to 30	$12 + 15 = 27$	$27/56 = 0.482$
30 up to 40	$12 + 15 + 25 = 52$	$52/56 = 0.928$
40 up to 50	$12 + 15 + 25 + 4 = 56$	$56/56 = 1$

c. 44.6% of the observations are at least 30 but less than 40; 92.8% are less than 40

16.

a.

Class	Relative Frequency
1000 up to 1100	$2/16 = 0.125$
1100 up to 1200	$7/16 = 0.4375$
1200 up to 1300	$3/16 = 0.1875$
1300 up to 1400	$4/16 = 0.25$

$$\text{Total} = 1$$
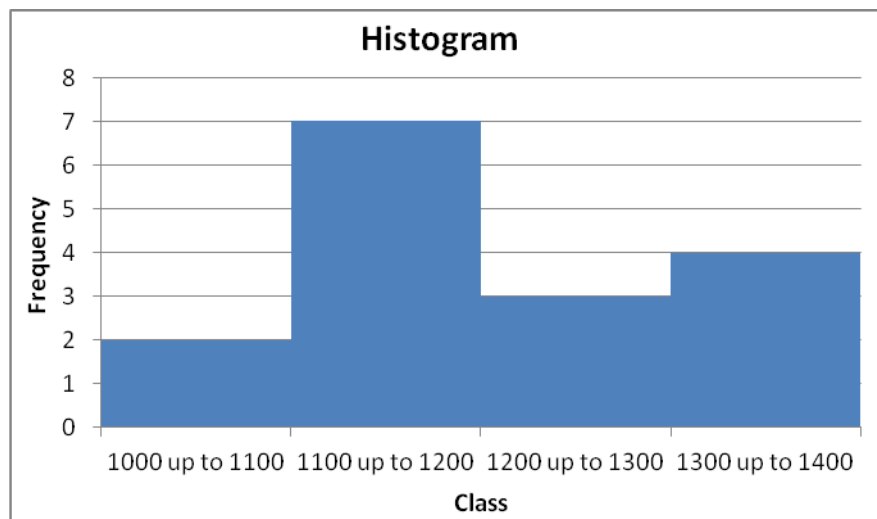
43.75% of the observations are at least 1100 but less than 1200.

b.

Class	Cumulative Frequency	Cumulative Relative Frequency
1000 up to 1100	2	$2/16 = 0.125$
1100 up to 1200	$2 + 7 = 9$	$9/16 = 0.562$
1200 up to 1300	$2 + 7 + 3 = 12$	$12/16 = 0.75$
1300 up to 1400	$2 + 7 + 3 + 4 = 16$	$16/16 = 1$

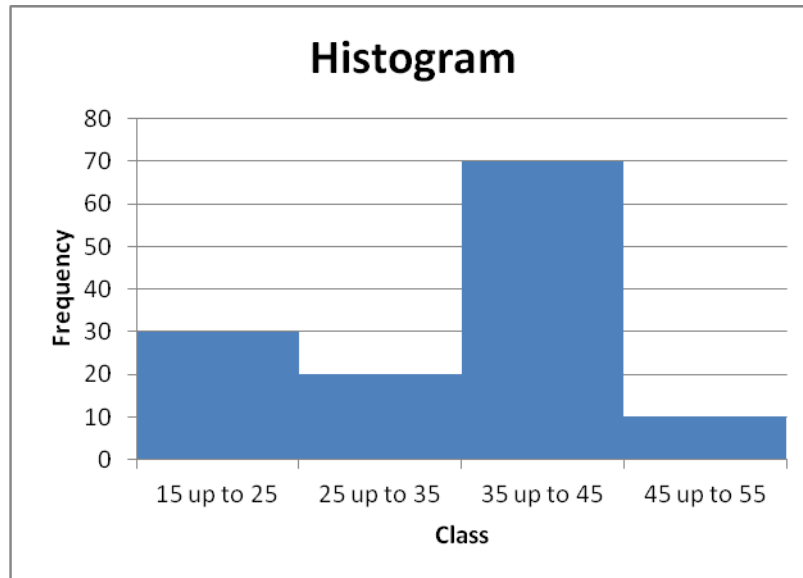12 of the observations are less than 1300.

c.

17.

a.

Class	Frequency
15 up to 25	30
25 up to 35	$50 - 30 = 20$
35 up to 45	$120 - 50 = 70$
45 up to 55	$130 - 120 = 10$

70 observations are at least 35 but less than 45.

b.

Histogram

c. $120/130 = 0.923$, so 92.3% of the observations are less than 45.

18.

a.

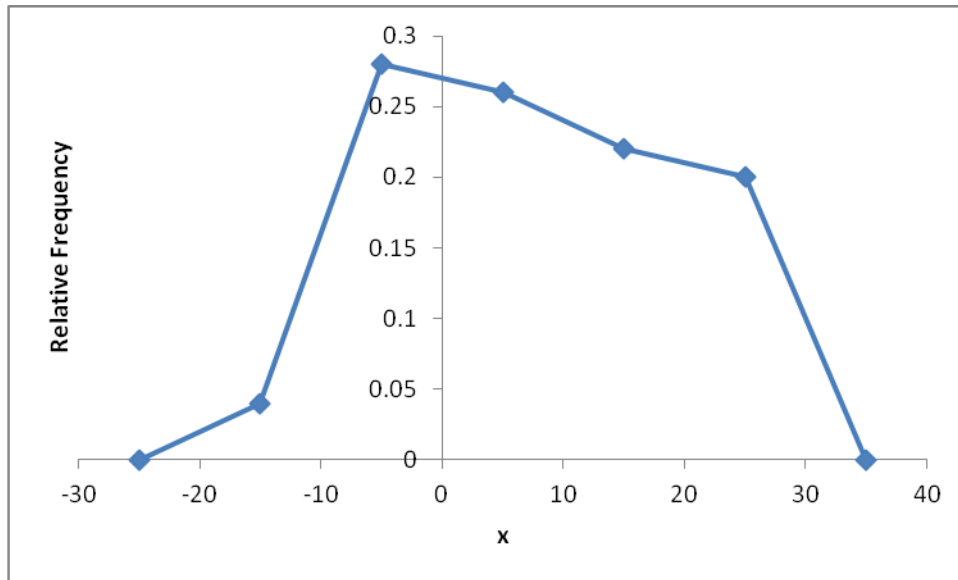| Class	Frequency
-20 up to -10	$0.04 \times 50 = 2$
-10 up to 0	$0.28 \times 50 = 14$
0 up to 10	$0.26 \times 50 = 13$
10 up to 20	$0.22 \times 50 = 11$
20 up to 30	$0.20 \times 50 = 10$
	Total $= 50$

14 observations are at least -10 but less than 0.

b.

Class	Cumulative Frequency
-20 up to -10	2
-10 up to 0	$2 + 14 = 16$
0 up to 10	$16 + 13 = 29$
10 up to 20	$29 + 11 = 40$
20 up to 30	$40 + 10 = 50$

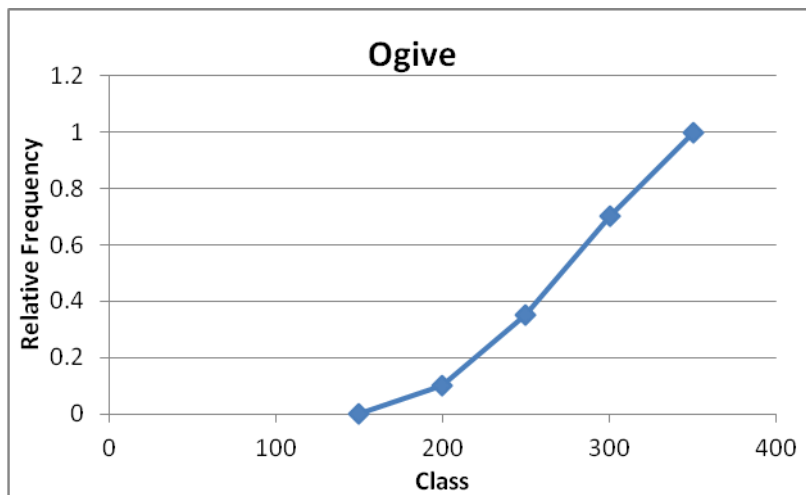40 observations are less than 20.

c.

19.

a.

Class	Relative Frequency
150 up to 200	0.10
200 up to 250	$0.35 - 0.10 = 0.25$
250 up to 300	$0.70 - 0.35 = 0.35$
300 up to 350	$1 - 0.70 = 0.30$
	Total $= 1$

35% of the observations are at least 250 but less than 300.

b.

20.

a.

Assets (in billions)	Frequency
$40 up to 70	9
70 up to 100	8
100 up to 130	2
130 up to 160	0
160 up to 190	1
	Total = 20

b.

Assets (in billions)	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
$40 up to 70	$9/20 = 0.45$	9	$9/20 = 0.45$
70 up to 100	$8/20 = 0.40$	$9 + 8 = 17$	$17/20 = 0.85$
100 up to 130	$2/20 = 0.10$	$17 + 2 = 19$	$19/20 = 0.95$
130 up to 160	$0/20 = 0$	$19 + 0 = 19$	$19/20 = 0.95$
160 up to 190	$1/20 = 0.05$	$19 + 1 = 20$	$20/20 = 1$

c. 2 funds had assets of at least $100 but less than $130 (in billions); 19 funds had assets less than $160 billion.

d. 40% of the funds had assets of at least $70 but less than $100 (in billions); 95% of the funds had assets less than $130 billion.

e.
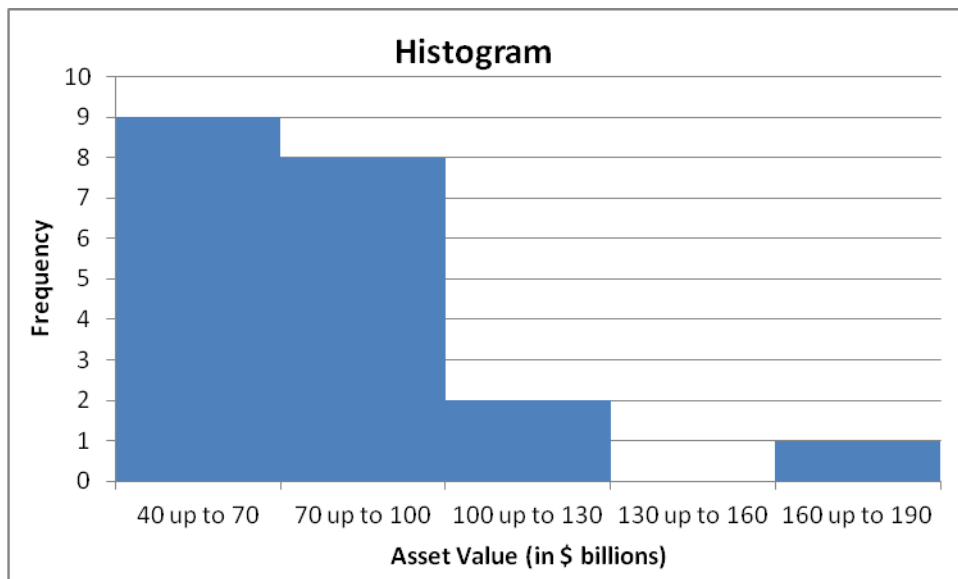
The histogram is positively skewed.
Note: The histogram could have also been made with relative frequencies. It would have had the same positive skewness.

21.

a.

Texts	Frequency
500 up to 600	4
600 up to 700	7
700 up to 800	5
800 up to 900	4
900 up to 1000	5
	Total = 25

b.

Texts	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
500 up to 600	$4/25 = 0.16$	4	$4/25 = 0.16$
600 up to 700	$7/25 = 0.28$	$4 + 7 = 11$	$11/25 = 0.44$
700 up to 800	$5/25 = 0.20$	$11 + 5 = 16$	$16/25 = 0.64$
800 up to 900	$4/25 = 0.16$	$16 + 4 = 20$	$20/25 = 0.80$
900 up to 1000	$5/25 = 0.20$	$20 + 5 = 25$	$25/25 = 1$
Total	1		

c. 7 teens sent at least 600 but less than 700 texts; 16 sent less than 800 texts.

d. 16% of the teens sent at least 500 but less than 600 texts; 44% of them sent less than 700 texts.

e.
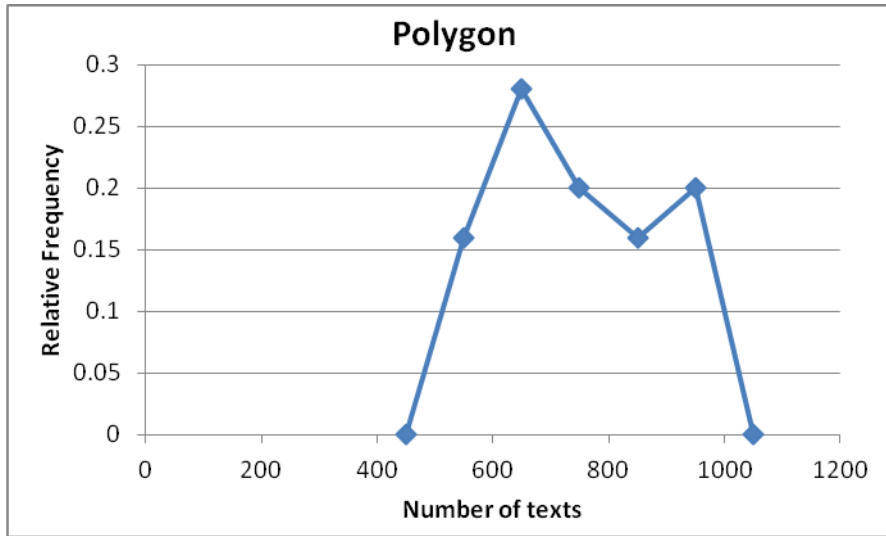
The distribution is not symmetric; it is slightly positively skewed.

22.

a.

Temperature	Frequency
60 up to 70	2
70 up to 80	7
80 up to 90	14
90 up to 100	10
	Total = 33

b.

Temperature	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
60 up to 70	$2/33 = 0.061$	2	$2/33 = 0.061$
70 up to 80	$7/33 = 0.212$	$2 + 7 = 9$	$9/33 = 0.273$
80 up to 90	$14/33 = 0.424$	$9 + 14 = 23$	$23/33 = 0.697$
90 up to 100	$10/33 = 0.303$	$23 + 10 = 33$	$33/33 = 1$
	Total = 1		

c. 9 cities had temperatures less than 80°.

d. 42.4% of the cities recorded temperatures of at least 80° but less than 90°; 69.7% of the cities had temperatures less than 90°.

e.
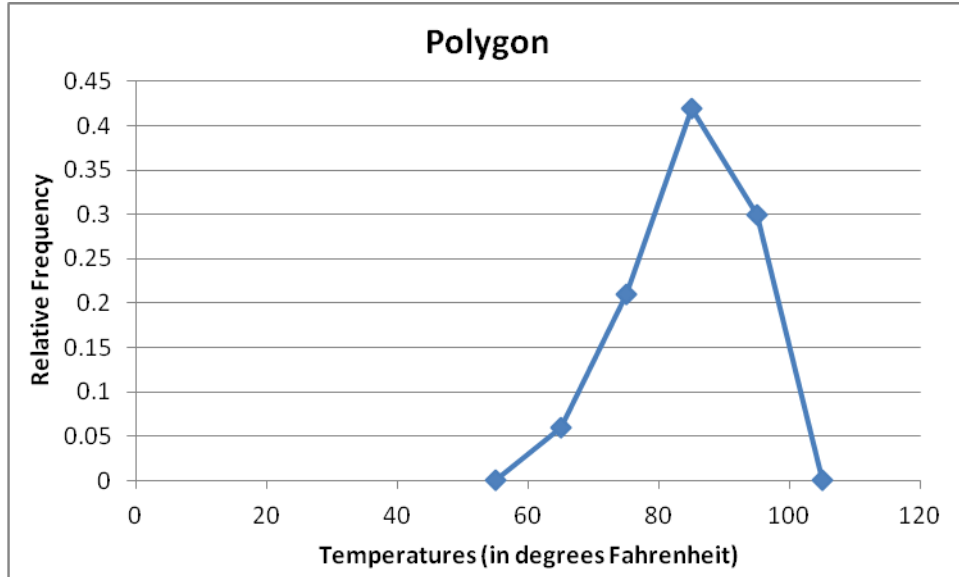
The distribution is slightly negatively skewed.

23.

a.

SAT Scores	Frequency
450 up to 500	6
501 up to 550	24
551 up to 600	15
601 up to 650	5
	Total = 50

Fifteen states had scores of at least 551 but less than 600.

b.

SAT Scores	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
450 up to 500	6/50 = 0.12	6	6/50 = 0.12
501 up to 550	24/50 = 0.48	6 + 24 = 30	30/50 = 0.60
551 up to 600	15/50 = 0.30	30 + 15 = 45	45/50 = 0.90
601 up to 650	5/50 = 0.10	45 + 5 = 50	50/50 = 1
	Total = 1		

c. 30 states had scores less than 551.
d. 30% of the states had scores between 551 and 600; 60% of the states had scores less than 551.

e.
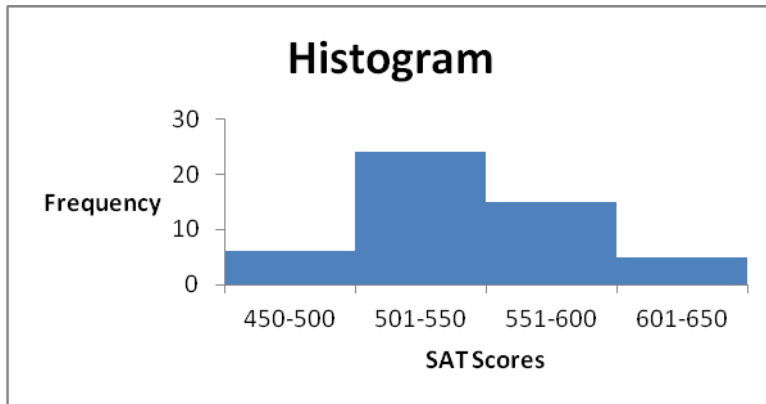

The histogram is positively skewed.

24.

a.

Vacancy Rate (%)	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
0 up to 3	$5/5 = 0.10$	5	0.10
3 up to 6	$10/50 = 0.20$	$5 + 10 = 15$	$0.10 + 0.20 = 0.30$
6 up to 9	$20/50 = 0.40$	$15 + 20 = 35$	$0.30 + 0.40 = 0.70$
9 up to 12	$10/50 = 0.20$	$35 + 10 = 45$	$0.70 + 0.20 = 0.90$
12 up to 15	$5/50 = 0.10$	$45 + 5 = 50$	$0.90 + 0.10 = 1$
	Total $= 1$		

b. 45 cities had a vacancy rate of less than 12%; 40% of the cities had a vacancy rate of at least 6% but less than 9%; 70% of the cities had a vacancy rate of less than 9%.

c.
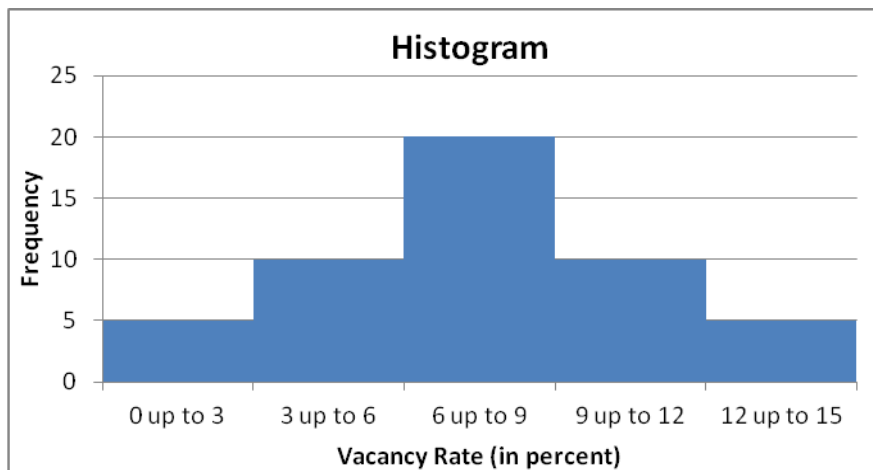
The distribution is symmetric.

25.

a.

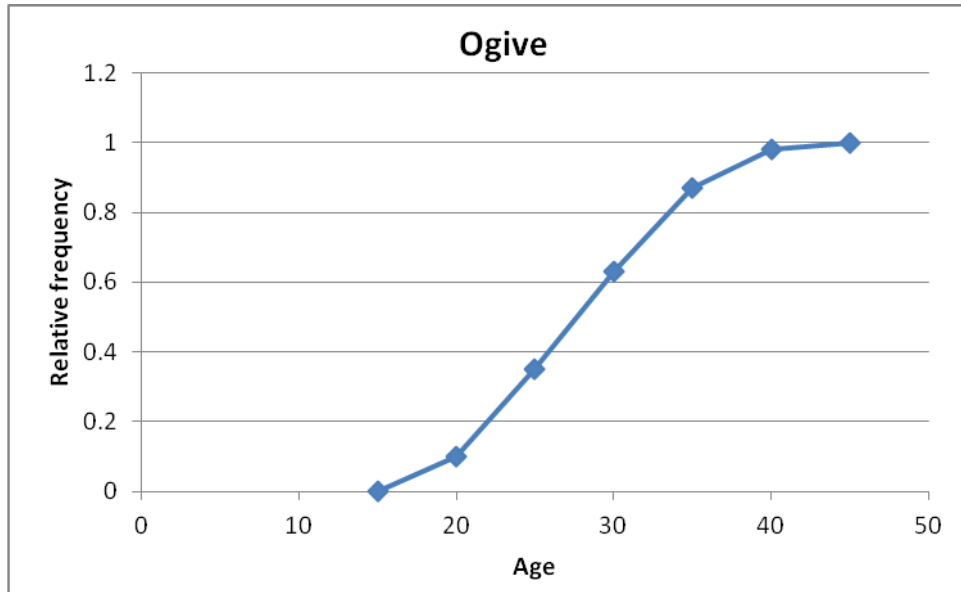| Age	Frequency	Cumulative Frequency	Cumulative Relative Frequency
15 up to 20	$0.10(2000) = 200$	200	0.10
20 up to 25	$0.25(2000) = 500$	$200 + 500 = 700$	$0.10 + 0.25 = 0.35$
25 up to 30	$0.28(2000) = 560$	$700 + 560 = 1260$	$0.35 + 0.28 = 0.63$
30 up to 35	$0.24(2000) = 480$	$1260 + 480 = 1740$	$0.63 + 0.24 = 0.87$
35 up to 40	$0.11(2000) = 220$	$1740 + 220 = 1960$	$0.87 + 0.11 = 0.98$
40 up to 45	$0.02(2000) = 40$	$1960 + 40 = 2000$	$0.98 + 0.02 = 1$
	Total $= 2000$		

b. 28% of the women were at least 25 but less than 30 years old; 87% were less than 35 years old.

c.
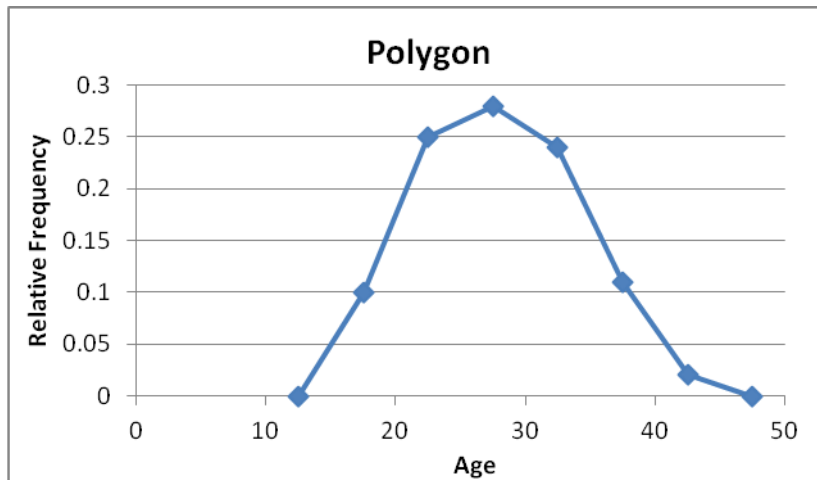
The distribution appears to be relatively symmetric with possibly a slight positive skew.

d.

If we draw a horizontal line that corresponds to the 0.5 value on the vertical axis (50% of the distribution), it will intersect the ogive at approximately 28 years old.

26.

a.

Age	Frequency	Relative Frequency	Cumulative Relative Frequency
18 up to 22	45	$45/100 = 0.45$	0.45
22 up to 26	$70 - 45 = 25$	$25/100 = 0.25$	$0.45 + 0.25 = 0.70$
26 up to 30	$85 - 70 = 15$	$15/100 = 0.15$	$0.70 + 0.15 = 0.85$
30 up to 34	$96 - 85 = 11$	$11/100 = 0.11$	$0.85 + 0.11 = 0.96$
34 up to 38	$100 - 96 = 4$	$4/100 = 0.04$	$0.96 + 0.04 = 1$
	Total $= 100$	Total $= 1$	

b. Fifteen guests were at least 26 but less than 30 years old; 25% of the guests were at least 22 but less than 26 years old; 96% of the guests were younger than 34 years old; 4% were 34 years or older.

c.
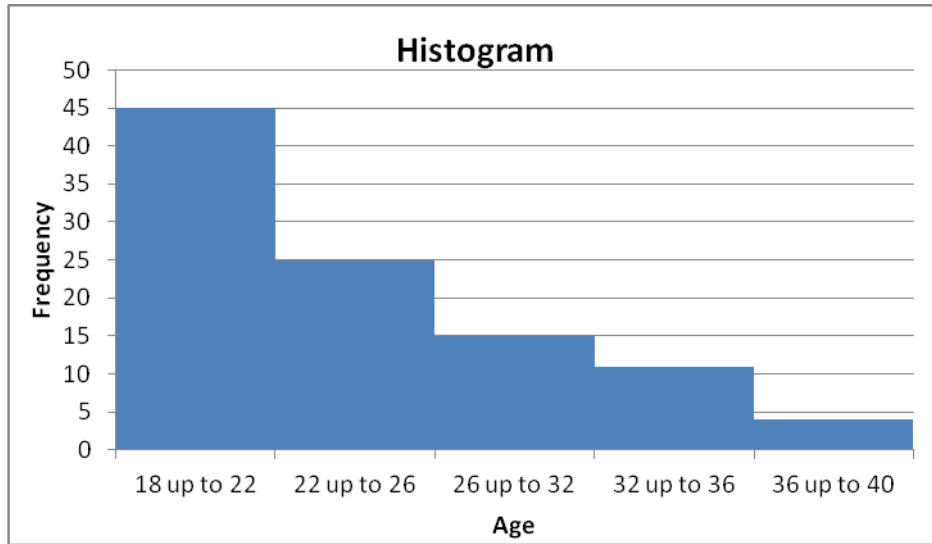
The histogram shows a positively skewed data set reflecting the relatively young age of the nightclub's guests.

27.

Stem	Leaf
2.	3 6 8
3.	0 2 2 3 4 5 6
4.	0 2 2 2 5 6 7
5.	4 5 5

This distribution is symmetric. There are the same number of observations on each end of the data, and the same number of observations in the middle.

28.

Stem	Leaf
-8	7 5 5 3 2 0 0 0
-7	9 7 5 3 3 2 1
-6	5 5 4
-5	2 0

(Keep in mind that these values are negative – thus, the ordering of values in the leaf.) The distribution is not symmetric; it is positively skewed. Most of the numbers are in the lower stems of -8 and -7.

29.

Stem	Leaf
99.	6 7 8
100.	4 5
101.	0 2 2 2 3 5 5 6
102	0 1 2 2 3 4 5

The temperatures ranged from a low of 99.6 to a high of 102.5. The distribution is not symmetric – it has negative skew. The majority of patients recorded a temperature higher than 101.

30.

Stem	Leaf
7	3 4 6 7 8 8
8	0 1 2 3 4 4 4 4 7 8
9	0 0 0 1 1 2 2 2 3 3 4 4 4 4 4 5 6 6 6 8 8 9
10	6 7

Temperatures ranged from a low of 73 to a high of 107. The distribution is not symmetric – it has negative skew. Temperatures in 90s were the most frequent.

31.

Stem	Leaf
6	5 5 6 7 7
7	0 0 0 1 1 2 2 3 3 3 5 5 5 8 9
8	0 0 0 1 1 2

The officers concerns are warranted. The data shows that the majority of cars exceed the 65 miles-per-hour limit.

32.

Spain

Stem	Leaf
2	1 1 1 2 3 3 4 4 5 5 5 6 7 8 9 9 9
3	0 0 2

Netherlands

| Stem	Leaf
2	2 3 3 4 5 5 5 6 6 6 7 7 7 7 9
3	0 3 5 5 9

Spain has a relatively younger team compared to Netherlands. Spain's ages range from 21 to 32, while Netherlands' ages range from 22 to 39. The majority of players in both teams are in their 20s. However, Netherlands has a couple of more players in their 30s than Spain.
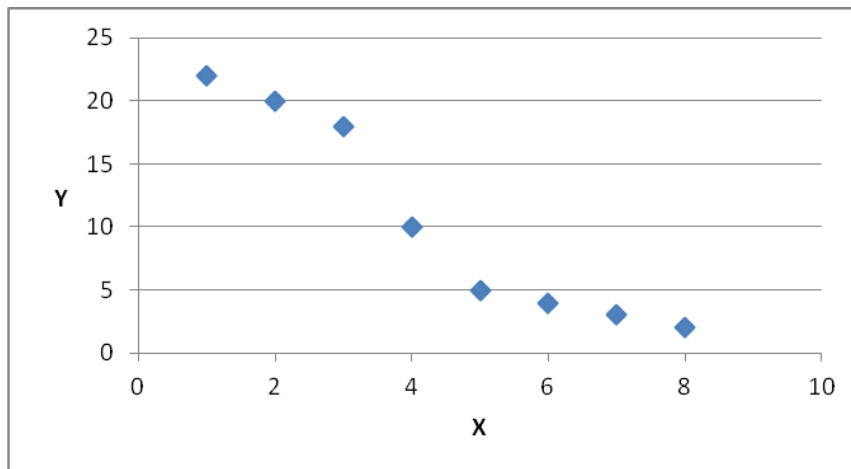
33.
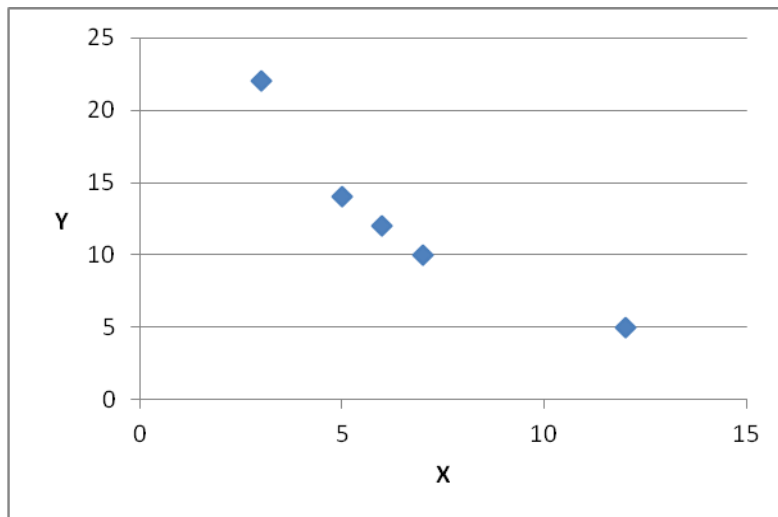
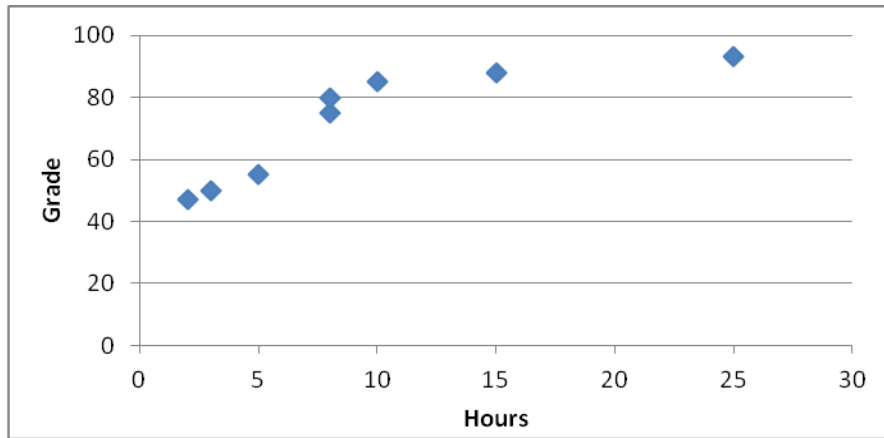There is a negative linear relationship between x and y. As x increases, y tends to decrease.

34.
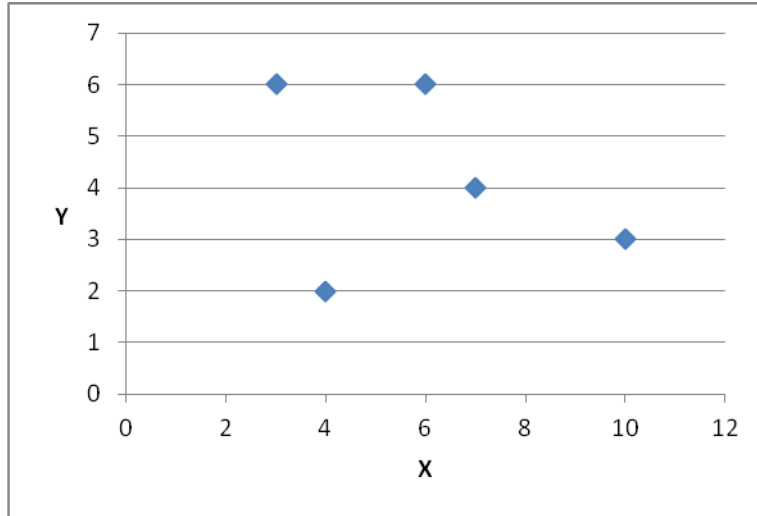
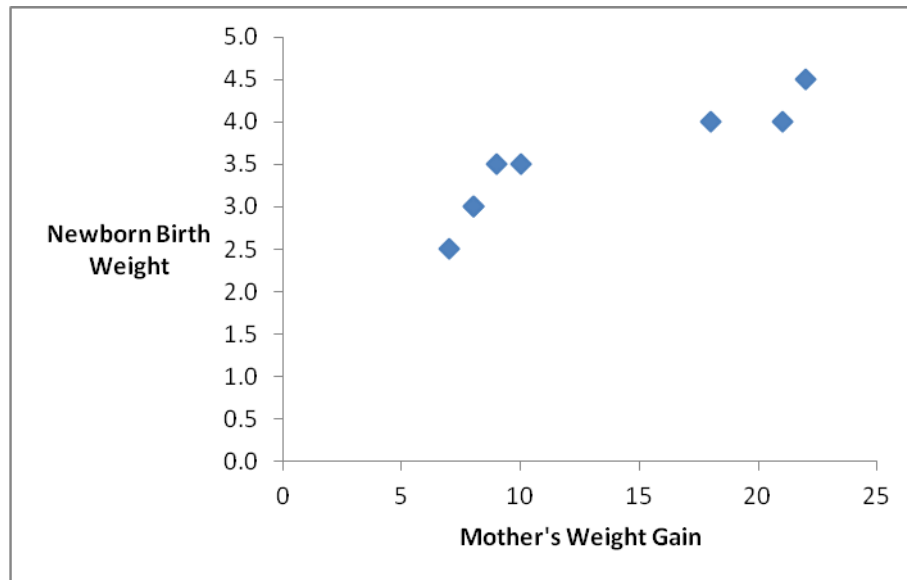There is no relationship between x and y.

35.

There is a negative relationship between x and y. As x increases, y tends to decrease.
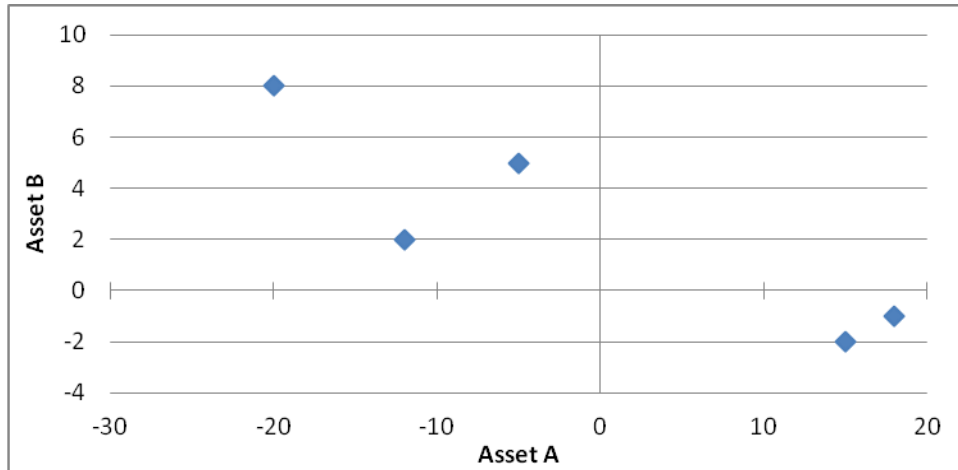
36.

There is a positive relationship between number of hours spent studying and grades. As the number of hours spent studying increases, grades tend to increase.
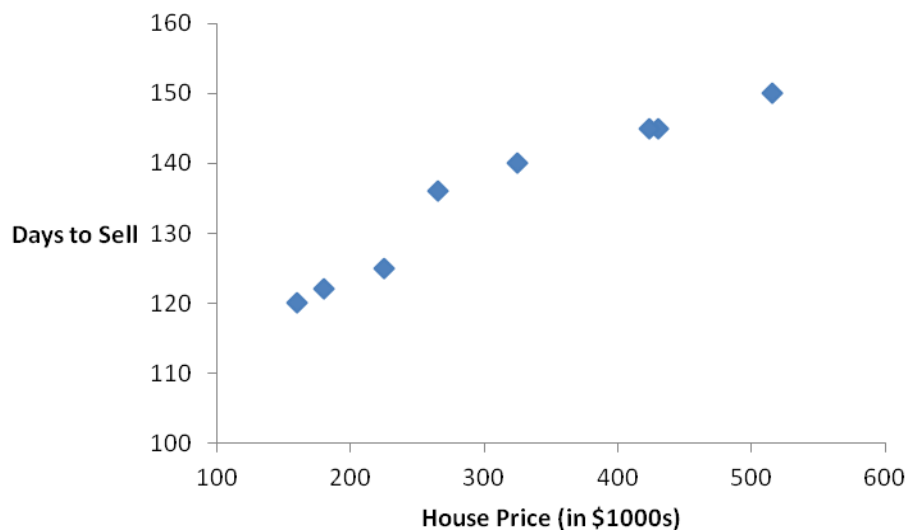
37.

The results support the finding. As a mother's weight gain increases, the newborn's birth weight tends to increase as well.

38.

There is a slightly negative relationship between the two assets. Therefore, it would be wise for the investor to include them in her portfolio.

39.

There is a positive relationship. The realtor can conclude that generally, with higher home prices, the number of days to sell the home will tend to be higher as well.
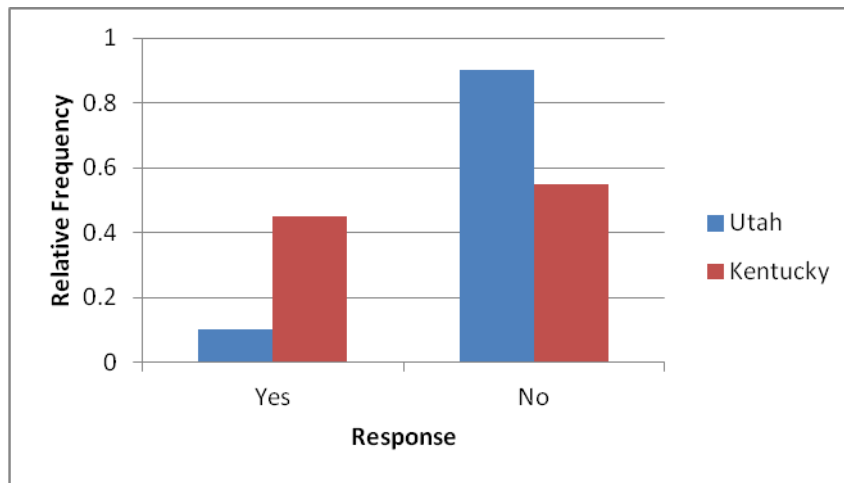
40.

a.

Responses	Utah Relative Frequency	Kentucky Relative Frequency

Yes	$2/20 = 0.10$	$9/20 = 0.45$
No	$18/20 = 0.90$	$11/20 = 0.55$
	Total $= 1$	Total $= 1$

The sample responses show the difference regarding smoking behavior in the two states. Notice that 45% of the households in Kentucky allow smoking at home whereas only 10% do so in Utah.

b.

The bar chart shows that smoking at home is much more common in Kentucky than in Utah.

41.

a.

Rating	Frequency	Relative Frequency
Outstanding	0	$0/28 = 0$
Good	8	$8/28 = 0.286$
Ok	7	$7/28 = 0.250$
Please Get Help	13	$13/28 = 0.464$
	Total $= 28$	Total $= 1$

From the relative frequency distribution, we can conclude that the majority of the evaluations were either "OK" or "Please Get Help". Notice that none of the responses included "Outstanding". Therefore, it is necessary for the owner of the restaurant to improve the service and/or experience provided.
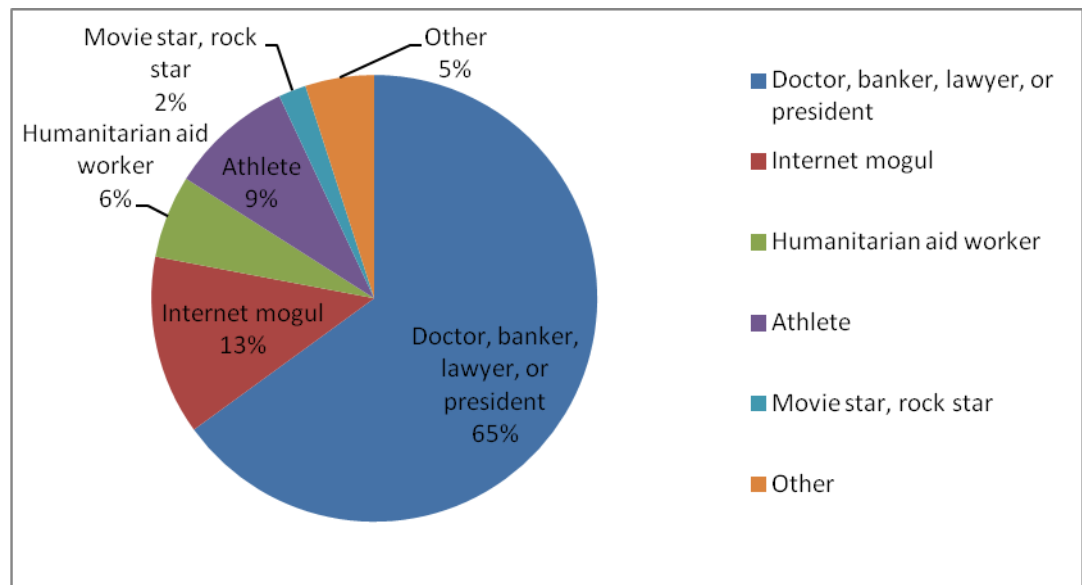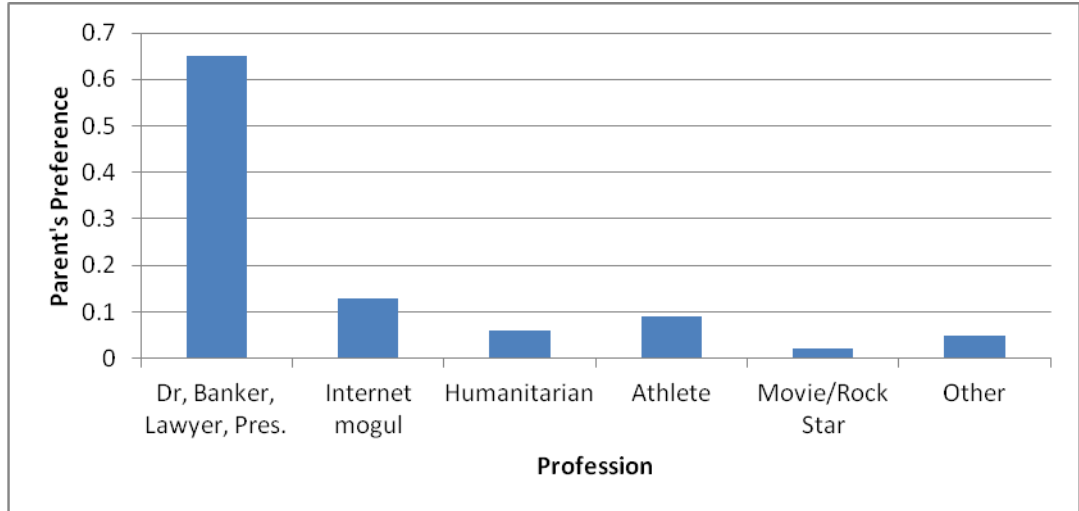
b.
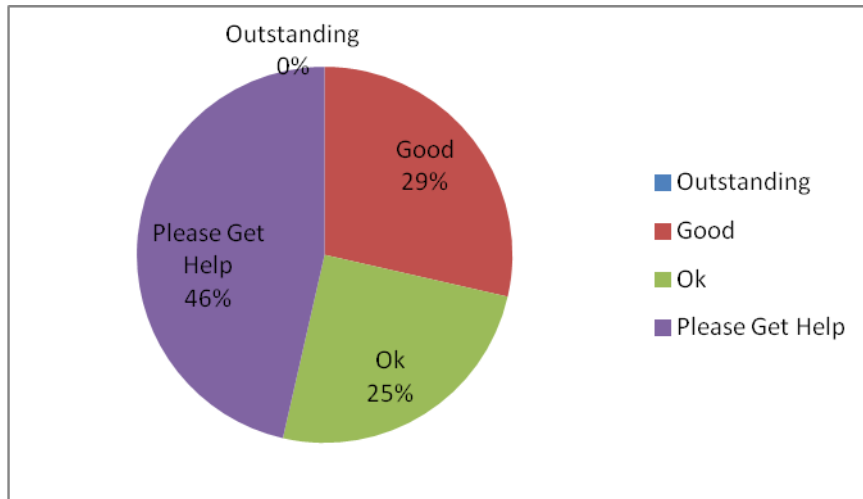
The pie chart which depicts categorical data in percentage values demonstrates the poor evaluations received.
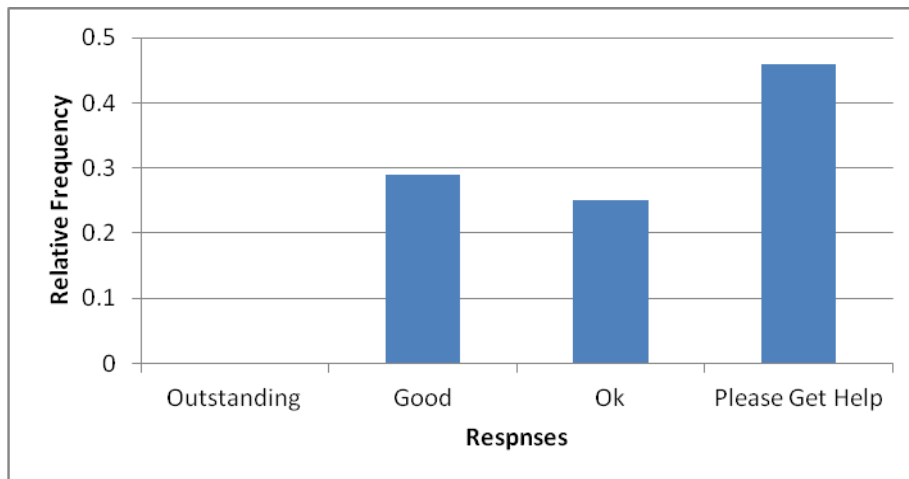
The bar chart is another way to depict categorical data effectively. We notice that the highest bar is the last category "Please Get Help" and that there are no responses given for "Outstanding."

42.
   a.

The charts reveal parent preferences. Sixty-five percent of parents want their children to have a profession such as a doctor, lawyer, banker or president. Less preferable are other professions such humanitarian-aid worker or a movie star.

b. Since 9% of parents want their children to become an athlete, $550 \times 0.09 \approx 50$. Therefore, among 550 parents approximately 50 parents want their kids to become an athlete.

43.

a.

Classes	Frequency

-20 up to -10	4
-10 up to 0	7
0 up 10	9
10 up 20	3
20 up to 30	1
	Total $= 24$

b.

Classes (in %)	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
-20 up to -10	$4/24 = 0.167$	4	$4/24 = 0.167$
-10 up to 0	$4/24 = 0.292$	$4 + 7 = 11$	$11/24 = 0.458$
0 up 10	$9/24 = 0.375$	$11 + 9 = 20$	$20/24 = 0.833$
10 up 20	$3/24 = 0.125$	$20 + 3 = 23$	$23/24 = 0.958$
20 up to 30	$1/24 = 0.042$	$23 + 1 = 24$	$24/24 = 1$
	Total ≈ 1		

c. Nine funds had returns of at least 0% but less than 10%; there were 4 funds with returns of 10% or more.

d. 12.5% of the funds had a return of at least 10% but not greater than 20%; 95.8% of the funds had returns less than 20%.
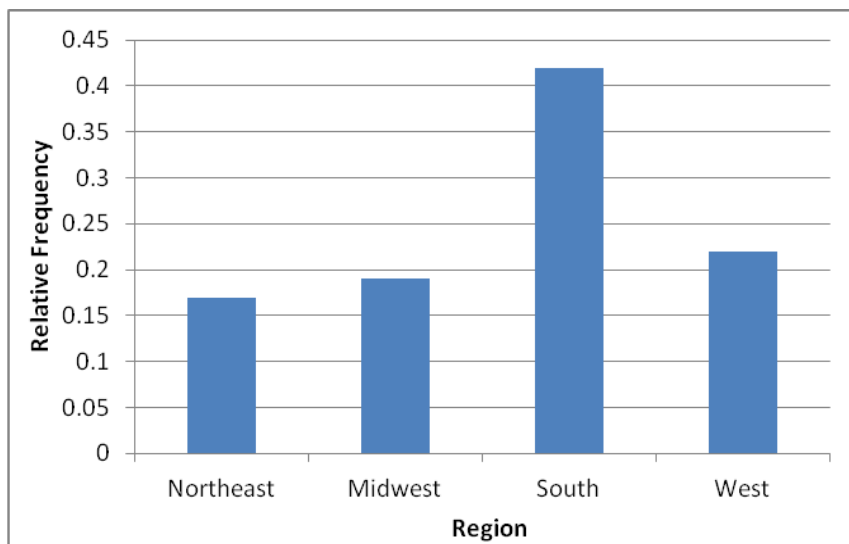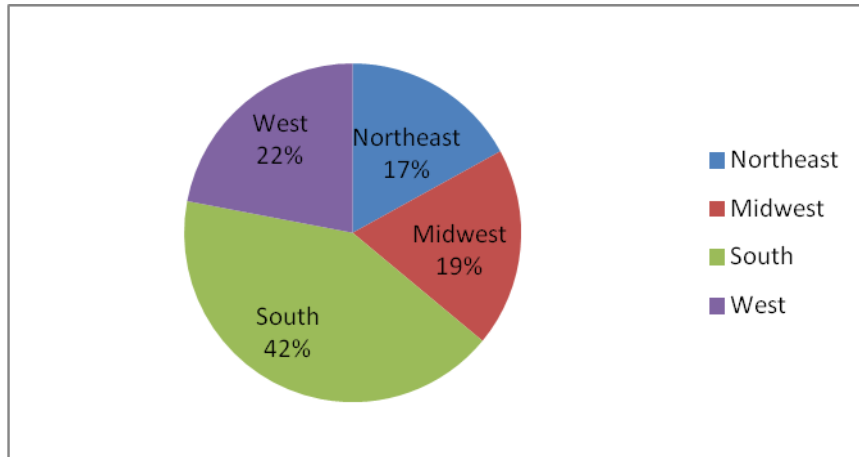
44.

a.

Region	Relative Frequency
Northeast	$6,166/37,276 = 0.165$
Midwest	$7,237/37,276 = 0.194$
South	$15,501/37,276 = 0.416$
West	$8,372/37,276 = 0.225$
	Total $= 1$

19.4% of people living below the poverty level live in the Midwest region.

b.

These charts show that the region with the highest percentage of people who live below the poverty level live in the South, and the lowest percentage is in the Northeast.
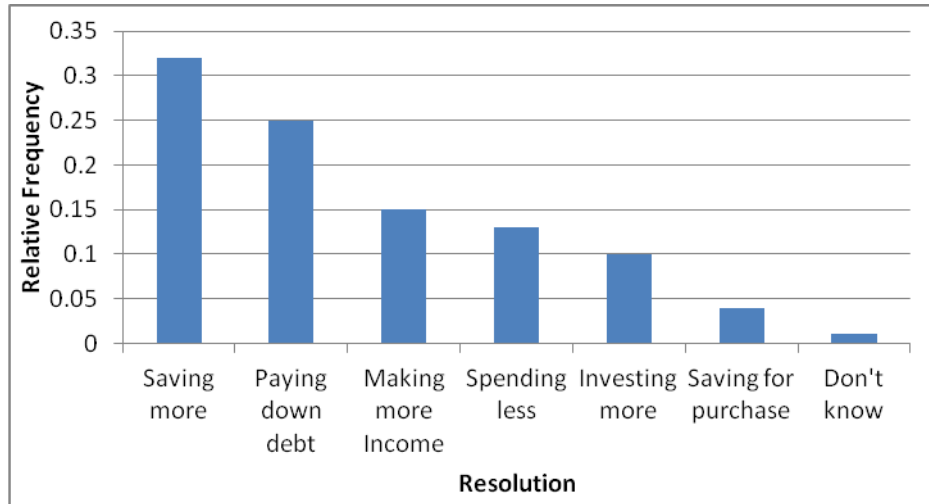
45.

   a.

Resolution	Relative Frequency
Saving more	$328/1026 = 0.320$
Paying down debt	$257/1026 = 0.250$
Making more income	$154/1026 = 0.150$
Spending less	$133/1026 = 0.130$
Investing more	$103/1026 = 0.100$
Saving for large purchase	$41/1026 = 0.040$
Don't know	$10/1026 = 0.010$
	Total $= 1$

25% of the sample said paying down debt was the top financial resolution.

b.

The bar chart shows that saving more in general is the top financial resolution, followed by paying down debt. Only a small portion of the sample didn't know their financial resolution.
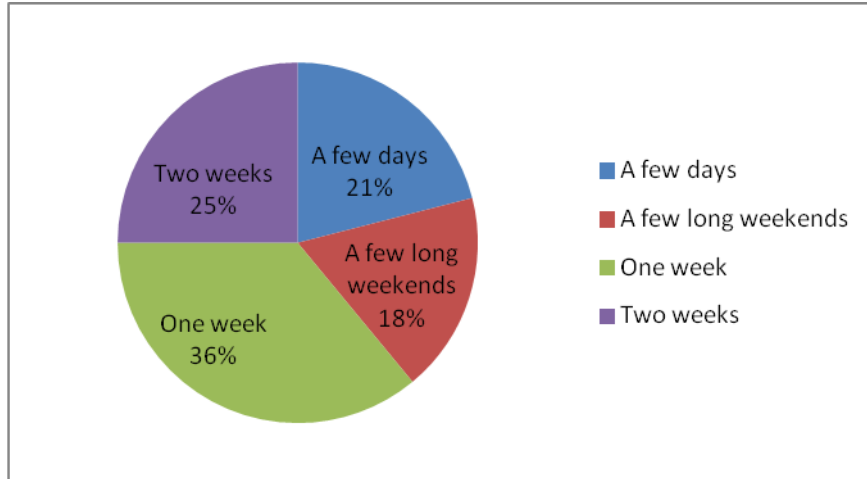
46.

a.

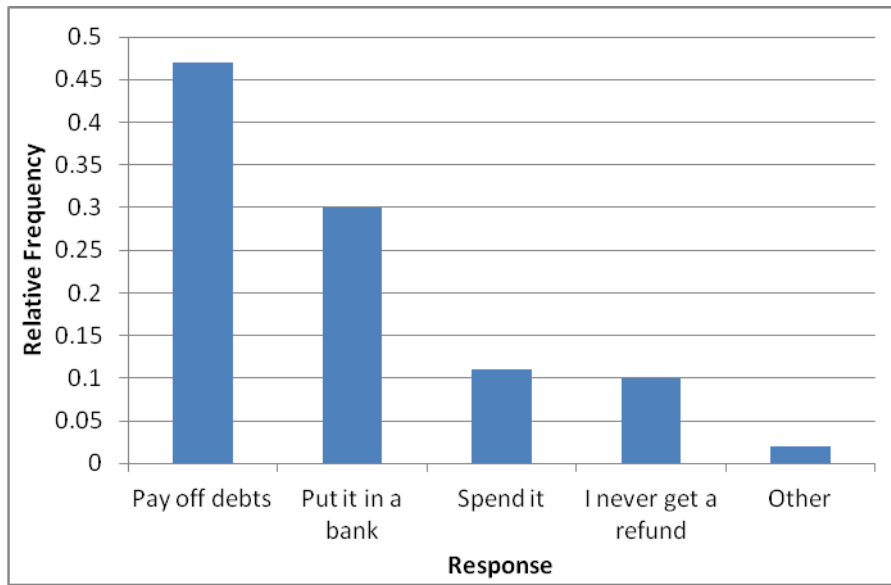| Response	Frequency
A few days	$0.21(3057) = 642$
A few long weekends	$0.18(3057) = 550$
One week	$0.36(3057) = 1101$
Two weeks	$0.25(3057) = 764$
	Total $= 3057$

Approximately 1101 people are going to take a one week vacation.

b.

47.

a.

Notice that the most frequent responses were regards to paying off debts or putting it in the bank.

b. Since 11% of 1026 respondents said they would spend the refund, $0.11(1026) \approx 113$. Therefore, approximately 113 of the respondents would spend the tax refund.
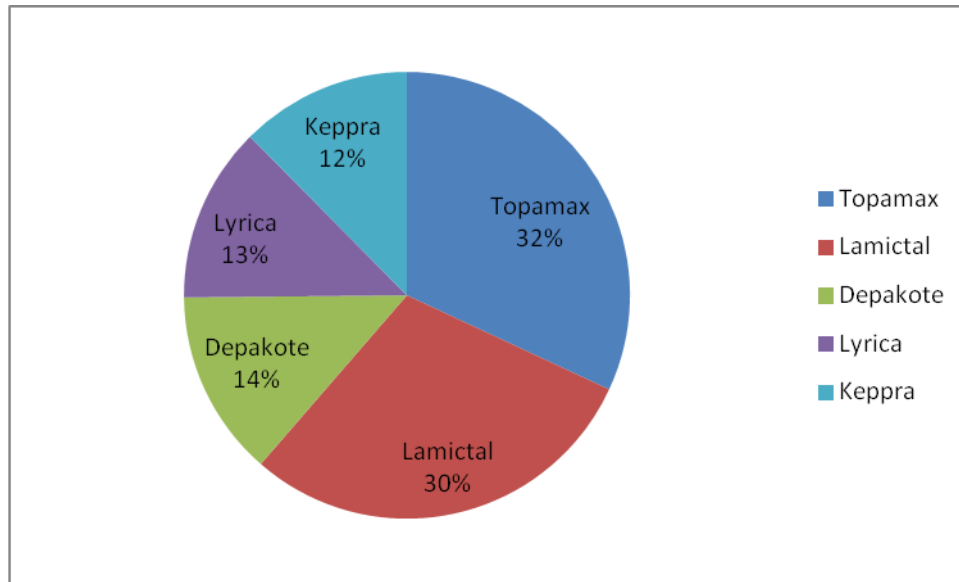
48.

a.

Drug	Relative Frequency

| Topomax	$1825.4/5718.4 = 0.319$
Lamictal	$1684.3/5718.4 = 0.295$
Depakote	$770.4/5718.4 = 0.135$
Lyrica	$727.8/5718.4 = 0.127$
Keppra	$710.5/5718.4 = 0.124$
	Total $= 1$

b. Lamictal accounted for 29.5% of the sales.

c.

49.

a.

Attendance	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
1000 up to 1250	$5/60 = 0.083$	5	0.083
1250 up to 1500	$6/60 = 0.10$	$5+6 = 11$	$0.083+0.10 = 0.183$
1500 up to 1750	$10/60 = 0.167$	$11+10 = 21$	$0.183 + 0.167 = 0.35$
1750 up to 2000	$20/60 = 0.333$	$21+20 = 41$	$0.35 + 0.333 = 0.683$
2000 up to 2250	$15/60 = 0.25$	$41+15 = 56$	$0.683 + 0.25 = 0.933$
2250 up to 2500	$4/60 = 0.067$	$56+4 = 60$	$0.933 + 0.067 = 1$
	Total $= 1$		

b. The most likely attendance range is from 1,750 up to 2,000 with a 33% frequency; there were 41 times out of 60 that attendance was less than 2,000.

c. Attendance was at least 1,750 but less than 2,000 33.3% of the time; Attendance was less than 1,750 people 35% of the time; Therefore, attendance was 1,750 or more (1 − 0.35 = 0.65), 65% of the time.

d.
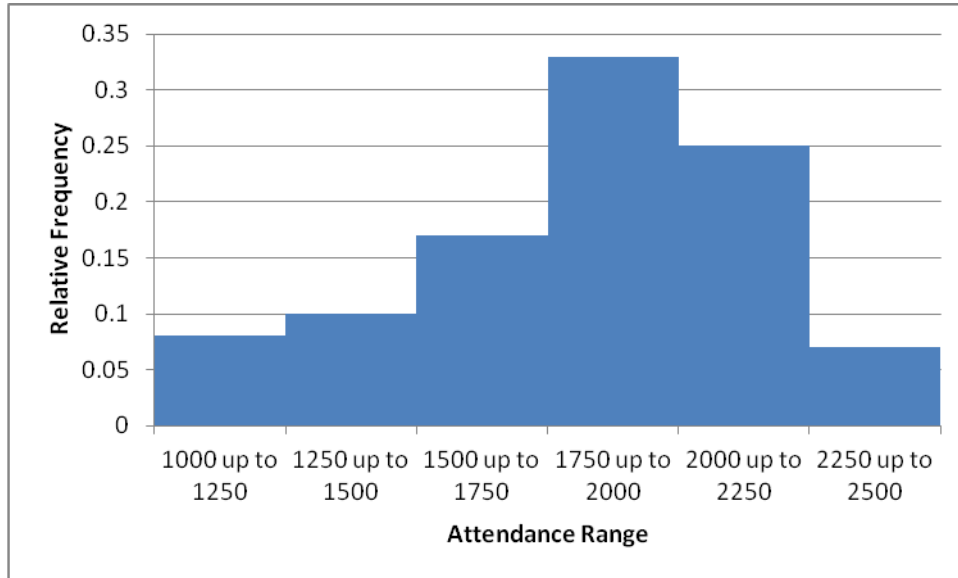
The histogram is not symmetric; it is negatively skewed.

50.

a.

Average MPG	Relative frequency	Cumulative Frequency	Cumulative Relative Frequency
15 up to 20	$15/80 = 0.1875$	15	0.1875
20 up to 25	$30/80 = 0.375$	$15 + 30 = 45$	$45/80 = 0.5625$
25 up to 30	$15/80 = 0.1875$	$45 + 15 = 60$	$60/80 = 0.75$
30 up to 35	$10/80 = 0.125$	$60 + 10 = 70$	$70/80 = 0.875$
35 up to 40	$7/80 = 0.0875$	$70 + 7 = 77$	$77/80 = 0.9625$
40 up to 45	$3/80 = 0.0375$	$77 + 3 = 80$	$80/80 = 1$
	Total $= 1$		

      b.   60 cars got less
than 30 mpg; 37.5% of the cars got at least 20 but less than 25 mpg; 87.5% of the
cars got less than 35 mpg; Since 87.5% got less than 35 mpg, (1 - 0.875 = 0.125),
12.5% of the cars got 35 mpg or more.

      c.

The histogram is not symmetric; it is positively skewed.

51.
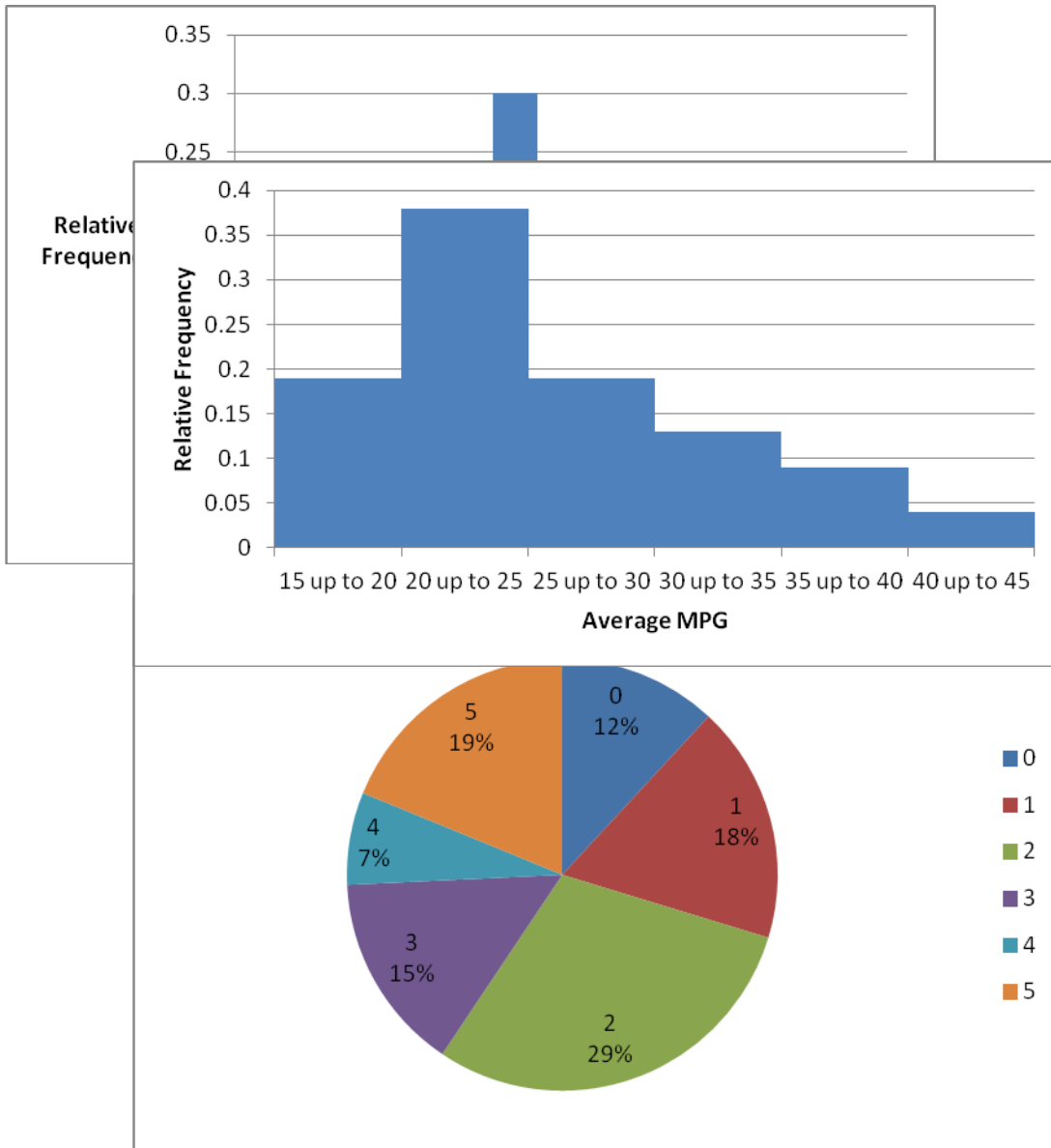
52.

d.   There were 4 people out of 25 with a net worth greater than $20 billion. Therefore, $4/25 = 0.16$, so 16% of the wealthiest people had net worth greater than $20 billion.

e.   Two people had a net worth less than $10 billion, which is $2/25 = 0.08$, or 8%. From the previous question, we know that 16% had a net worth greater than $20 billion. Therefore, $16\% + 8\% = 24\%$ *did not* have a net worth between $10 and $20 billion. Therefore, $(1 – 0.24) = 0.76$, so 76% had net worth between $10 billion and $20 billion.

f.

| Steam	Leaf
3	6 6
4	4 7
5	3 3 4 6
6	0 1 5 5 6 7 7 9
7	0 1 3 3 3 7 8 9 9

The distribution is not symmetric – it is negatively skewed. The majority of ages range from the 60s to 70s. Table 2.16 shows the majority of ages to be in the 50s and 60s. Further, this diagram shows ages ranging from 36 to 79, whereas Table 2.16 has ages ranging from 36 to 90.

51.

Steam	Leaf
0.	8 8 9 9
1.	0 0 1 1 2 2 2 2 3 3 4 4 5 6 6 8 8 9 9 9
2.	0 0 9 9
3.	0 7

The vast majority of the PEG ratios fall in the 1 range. The diagram is somewhat positively skewed; there are a few firms with relatively high PEG ratios.

52.

a.
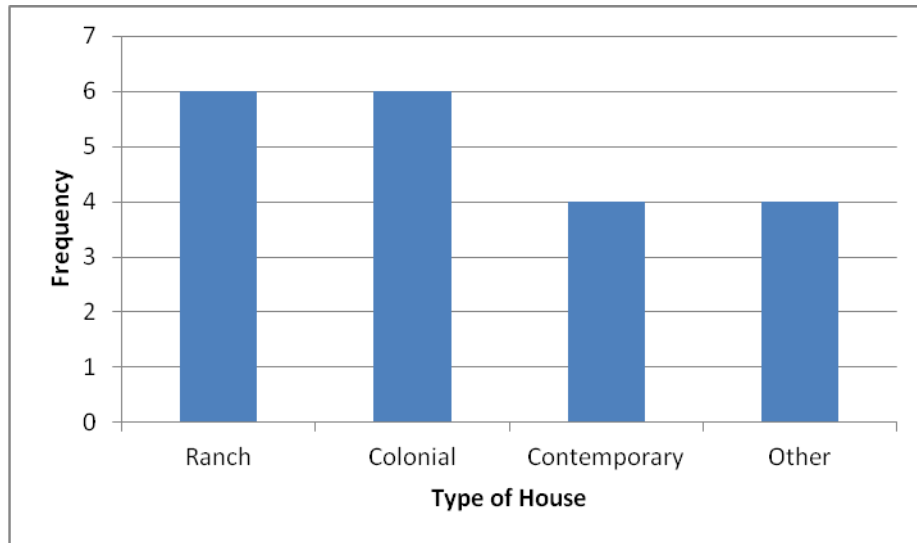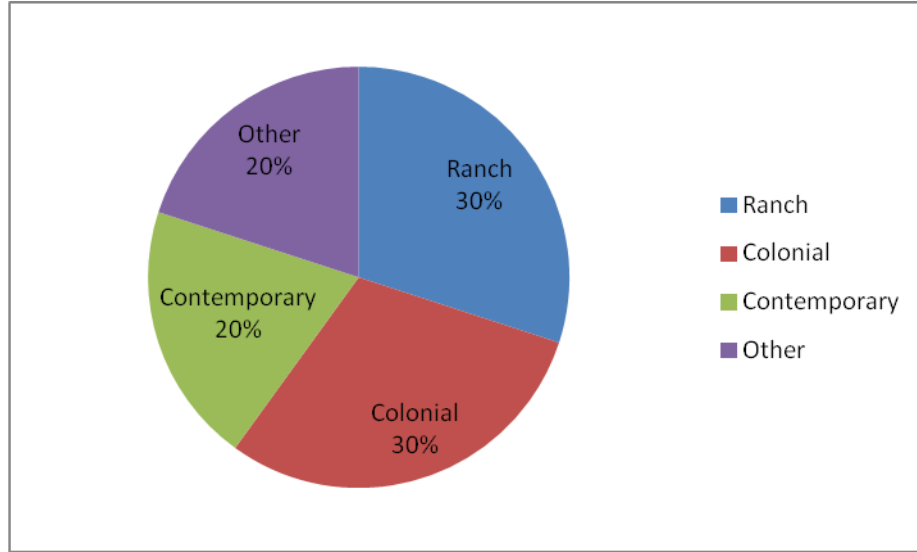
These charts show that the majority (60%) of houses were either Ranch or Colonial, but also 40% were either Contemporary or some other type.

b.   To figure out how wide to make the classes, find the highest price and subtract the lowest price to get the range. That is $568,000 - $300,000 = $268,000. Then since we want 7 classes, divide the range by 7: 268,000/7 = $38,386. However, for ease of interpretation, round to the most sensible number: $50,000. Therefore, our classes will have a width of $50,000, starting at $300,000.
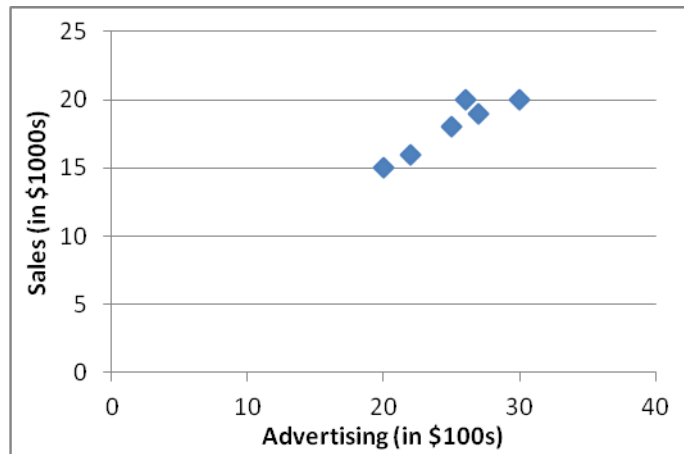
Classes	Frequency
300,000 up to 350,000	4

|	
350,000 up to 400,000	6
400,000 up to 450,000	4
450,000 up to 500,000	2
500,000 up to 550,000	3
550,000 up to 600,000	1
	Total = 20

c.
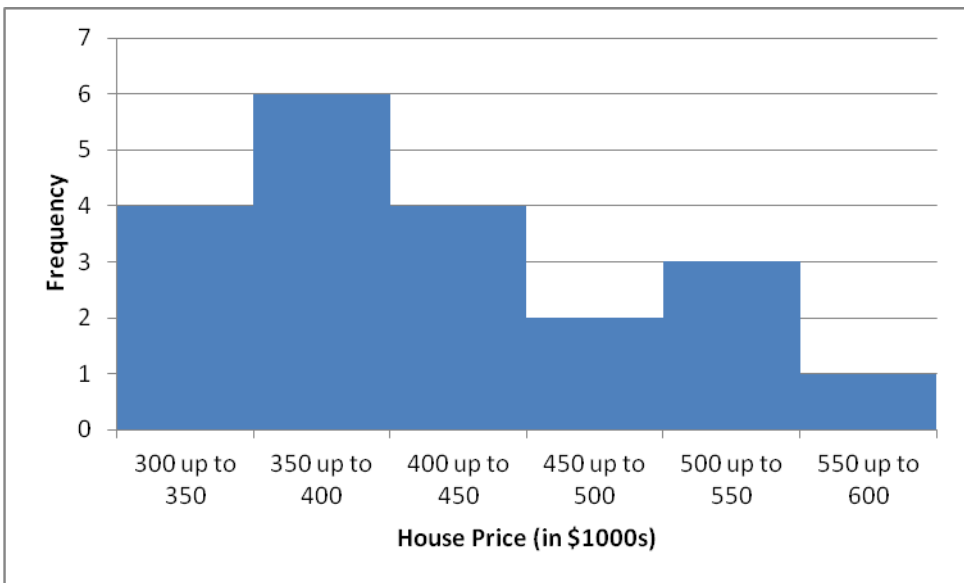
The histogram shows that the most frequent house price is in the $350,000 up to $400,000 range. The ogive shows that the middle price (with a frequency of 10/20 or 50%) is about $400,000.

53.

The scatter plot shows that the relation between Advertising and Sales is positive. The positive trend demonstrates that an increase in advertising will tend to increase sales.

54.
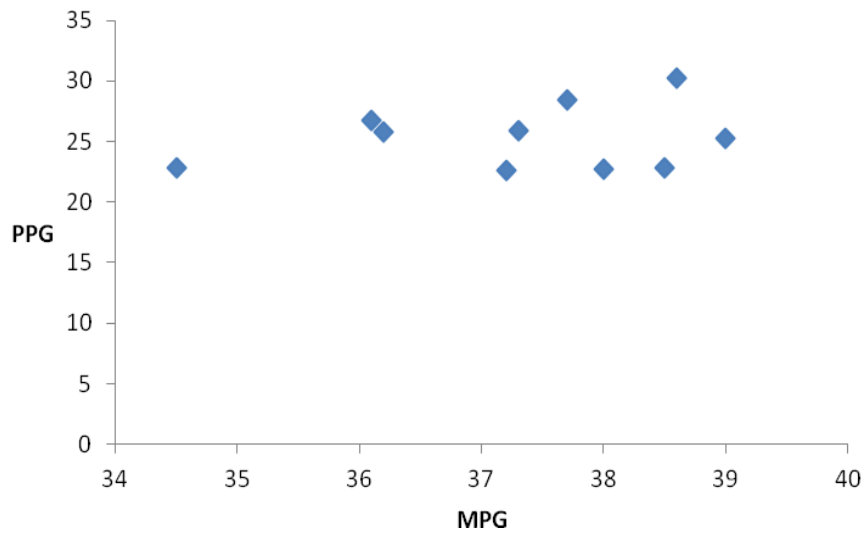
The scatterplot reveals no clear relationship between PPG and MPG.

Case Study 2.1

Proportion of Nike's Net Sales by Region:

	2000	2009
US Region	4732.1/8588.3 = 0.551	6542.9/16661.8 = 0.392

|		
EMEA Region	$2350.9/8588.3 = 0.274$	$5512.2/16661.8 = 0.331$
Asia Pacific Region	$955.1/8588.3 = 0.111$	$3322/16661.8 = 0.199$
Americas Region	$550.2/8588.3 = 0.064$	$1284.7/16661.8 = 0.077$
	Total $= 1$	Total ≈ 1

**Proportion of Adidas' Net Sales by Region (From Table 2.6):**

	2000	2009
Europe	0.492	0.423
North America	0.328	0.228
Asia	0.151	0.252
Latin America	0.029	0.097
	Total $= 1$	Total $= 1$

Case Study 2.2

- The net profit margin is a firm's net profit after taxes to revenue. It is measured in percentage, showing the percentage of net income per dollar in sales or other operating income.

| Net Profit Margin	Frequency	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
-10% up to -5%	1	$1/32 = 0.031$	1	$1/32 = 0.031$
-5 up to 0	6	$6/32 = 0.188$	7	$7/32 = 0.219$
0 up to 5	10	$10/32 = 0.313$	17	$17/32 = 0.531$
5 up to 10	11	$11/32 = 0.344$	28	$28/32 = 0.875$
10 up to 15	2	$2/32 = 0.063$	30	$30/32 = 0.938$
15 up to 20	2	$2/32 = 0.063$	32	$32/32 = 1$
	Total $= 32$	Total ≈ 1		
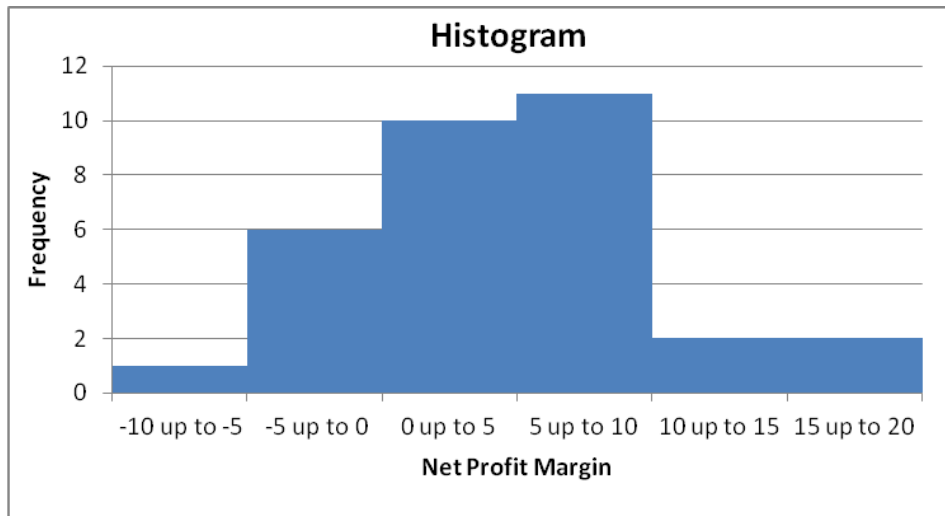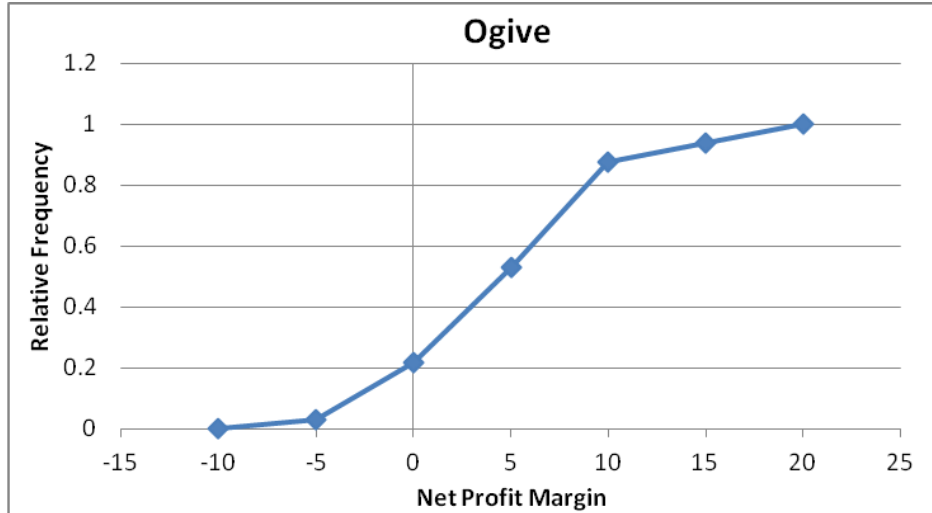
- The data tends to cluster between 0% and 10%, as shown in the histogram. The net profit margins range from -5.19% to 19.95%. Approximately 53% of the Firms have a net profit margin below 5%.

Case Study 2.3

Median Housing Price (in $1000s)	Frequency	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
$0 up to $100	6	0.12	6	0.12
$100 up to $200	29	0.58	35	0.7
$200 up to $300	11	0.22	46	0.92
$300 up to $400	2	0.04	48	0.96
$400 up to $500	2	0.04	50	1
	Total = 50	Total =1		
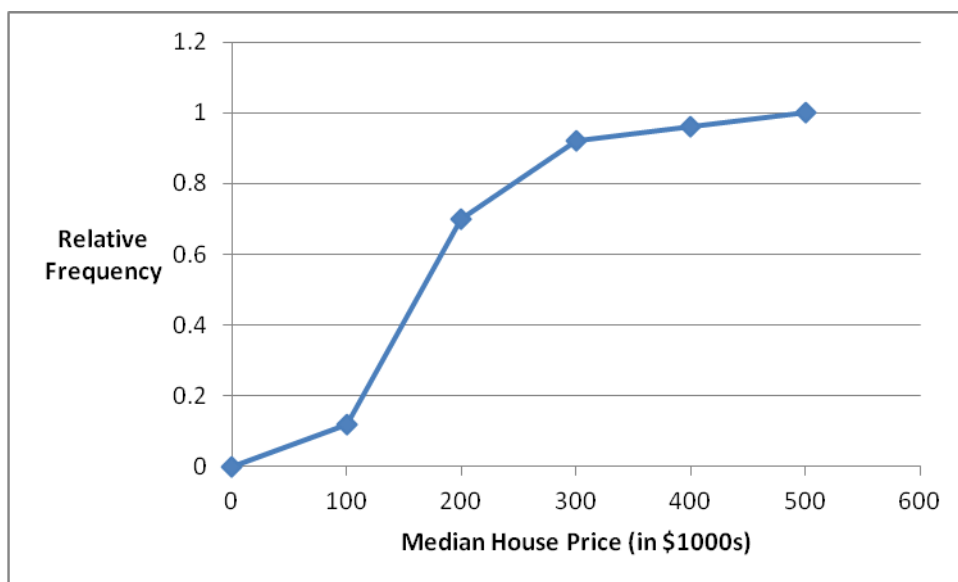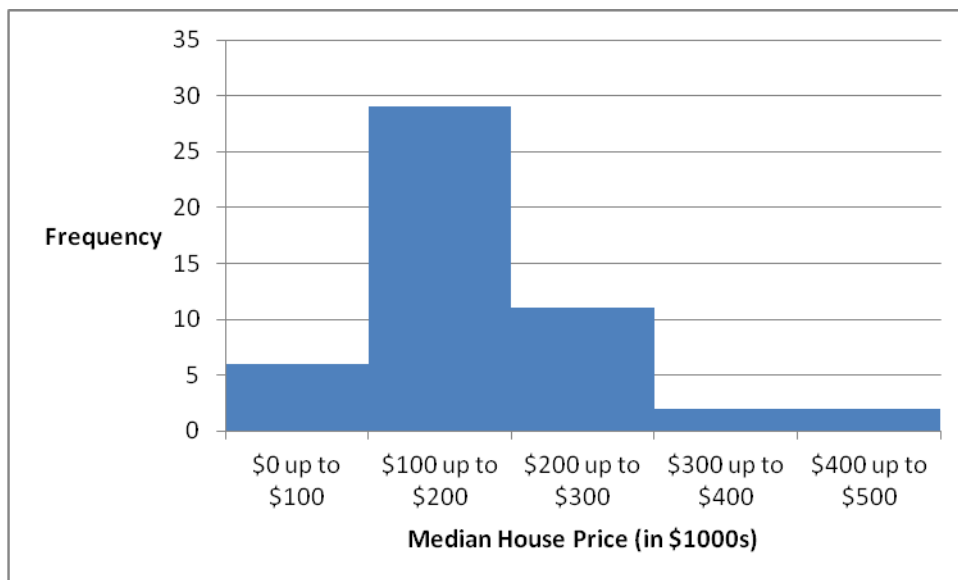
- The majority of median housing prices (70%) are below $200,000. The prices range from $82,700 up to $477,700. The distribution is positively skewed with only 4 states having a median housing price above $400,000.