EXERCISE SET 2-1

1. Frequency distributions are used to organize data in a meaningful way, to facilitate computational procedures for statistics, to make it easier to draw charts and graphs, and to make comparisons among different sets of data.

3.
a. $11.5 - 18.5$, $\frac{12+18}{2} = \frac{30}{2} = 15$, $18.5 - 11.5 = 7$
b. $55.5 - 74.5$, $\frac{56+74}{2} = \frac{130}{2} = 65$, $74.5 - 55.5 = 19$
c. $694.5 - 705.5$, $\frac{695+705}{2} = \frac{1400}{2} = 700$, $705.5 - 694.5 = 11$
d. $13.55 - 14.75$, $\frac{13.6+14.7}{2} = \frac{28.3}{2} = 14.15$, $14.75 - 13.55 = 1.2$
e. $2.145 - 3.935$, $\frac{2.15+3.93}{2} = \frac{6.08}{2} = 3.04$, $3.935 - 2.145 = 1.79$

5.
a. Class width is not uniform.
b. Class limits overlap, and class width is not uniform.
c. A class has been omitted.
d. Class width is not uniform.

7.

Class	Tally	f	Percent
A	IIII	4	10%
M	IHI IHI IHI IHI IHI III	28	70%
H	IHI I	6	15%
S	II	2	5%
		40	100%

9. $H = 325$ $L = 165$
Range $= 325 - 165 = 160$
Width $= 160 \div 8 = 20$ round up to 21

Limits	Boundaries	f
165 - 185	164.5 - 185.5	4
186 - 206	185.5 - 206.5	6
207 - 227	206.5 - 227.5	15
228 - 248	227.5 - 248.5	13
249 - 269	248.5 - 269.5	9
270 - 290	269.5 - 290.5	1
291 - 311	290.5 - 311.5	1
312 - 332	311.5 - 332.5	1
		50

9. continued
A peak occurs in class 207 - 227. There are no empty classes. Each of the three highest classes has one data value.

	cf
Less than 164.5	0
Less than 185.5	4
Less than 206.5	10
Less than 227.5	25
Less than 248.5	38
Less than 269.5	47
Less than 290.5	48
Less than 311.5	49
Less than 332.5	50

11. $H = 780$ $L = 746$
Range $= 780 - 746 = 34$
Width $= 34 \div 5 = 6.8$ round up to 7

Limits	Boundaries	f
746 - 752	745.5 - 752.5	4
753 - 759	752.5 - 759.5	6
760 - 766	759.5 - 766.5	8
767 - 773	766.5 - 773.5	9
774 - 780	773.5 - 780.5	3
		30

	cf
Less than 745.5	0
Less than 752.5	4
Less than 759.5	10
Less than 766.5	18
Less than 773.5	27
Less than 780.5	30

13. $H = 70$ $L = 27$
Range $= 70 - 27 = 43$
Width $= 43 \div 7 = 6.1$ or 7

Limits	Boundaries	f
27 - 33	26.5 - 33.5	7
34 - 40	33.5 - 40.5	14
41 - 47	40.5 - 47.5	15
48 - 54	47.5 - 54.5	11
55 - 61	54.5 - 61.5	3
62 - 68	61.5 - 68.5	3
69 - 75	68.5 - 75.5	2
		55

13. continued

	cf
Less than 26.5	0
Less than 33.5	7
Less than 40.5	21
Less than 47.5	36
Less than 54.5	47
Less than 61.5	50
Less than 68.5	53
Less than 75.5	55

15. H = 632   L = 6

Width = 632 − 6 = 626

Range = 626 ÷ 5 = 125.2 round up to 127

Limits	Boundaries	f
6 - 132	5.5 - 132.5	16
133 - 259	132.5 - 259.5	3
260 - 386	259.5 - 386.5	0
387 - 513	386.5 - 513.5	0
514 - 640	513.5 - 640.5	1
		20

The greatest concentration of data values is in the lowest class. All but one of the data values are in the lowest two classes. There is one extremely large data value occurring in the highest class.

	cf
Less than 5.5	0
Less than 132.5	16
Less than 259.5	19
Less than 386.5	19
Less than 513.5	19
Less than 640.5	20

17. H = 11,413   L = 150

Range = 11,413 − 150 = 11,263

Width = 11,263 ÷ 10 = 1126.3 or 1127

17. continued

Limits	Boundaries	f
150 - 1276	149.5 - 1276.5	2
1277 - 2403	1276.5 - 2403.5	2
2404 - 3530	2403.5 - 3530.5	5
3531 - 4657	3530.5 - 4657.5	8
4658 - 5784	4657.5 - 5784.5	7
5785 - 6911	5784.5 - 6911.5	3
6912 - 8038	6911.5 - 8038.5	7
8039 - 9165	8038.5 - 9165.5	3
9166 - 10,292	9165.5 - 10,292.5	3
10,293 - 11,419	10,292.5 - 11,419.5	2
		42

	cf
Less than 149.5	0
Less than 1276.5	2
Less than 2403.5	4
Less than 3530.5	9
Less than 4657.5	17
Less than 5784.5	24
Less than 6911.5	27
Less than 8038.5	34
Less than 9165.5	37
Less than 10,292.5	40
Less than 11,419.5	42

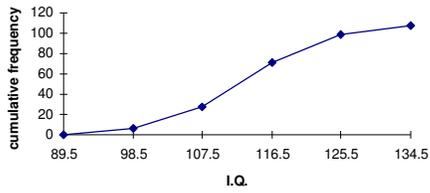19. The percents add up to 101%. They should total 100% unless rounding was used.
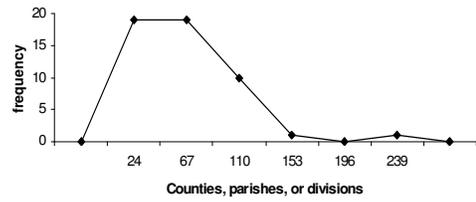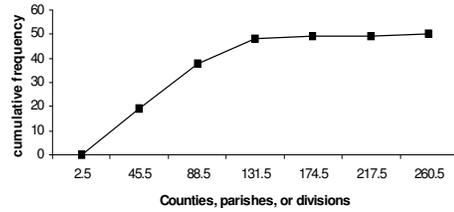
EXERCISE SET 2-2

1.
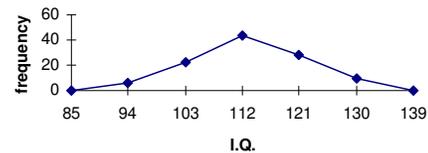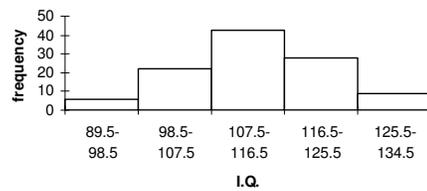
1. continued

Eighty applicants do not need to enroll in the summer programs.
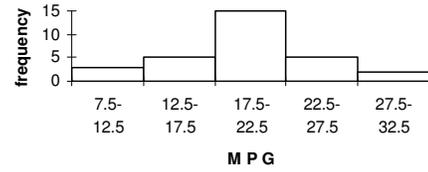
3.

Limits	Boundaries	f
3 - 45	2.5 - 45.5	19
46 - 88	45.5 - 88.5	19
89 - 131	88.5 - 131.5	10
132 - 174	131.5 - 174.5	1
175 - 217	174.5 - 217.5	0
218 - 260	217.5 - 260.5	1
		50

	cf
Less than 2.5	0
Less than 45.5	19
Less than 88.5	38
Less than 131.5	48
Less than 174.5	49
Less than 217.5	49
Less than 260.5	50
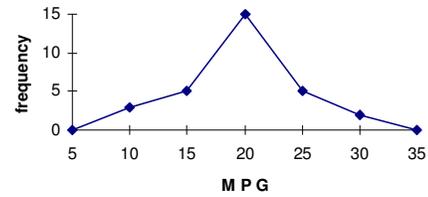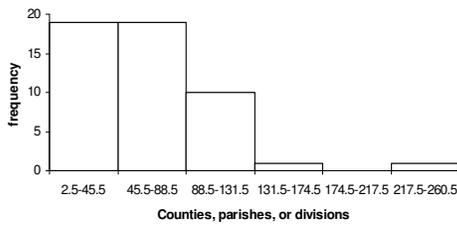
The distribution is positively skewed.

3. continued

5.

7.
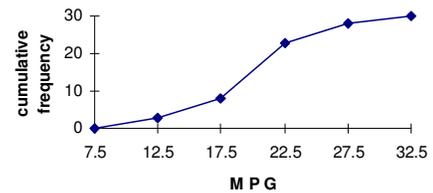
| Limits	Boundaries	f (1998)	f (2003)
0 - 22	-0.5 - 22.5	18	26
23 - 45	22.5 - 45.5	7	1
46 - 68	45.5 - 68.5	3	0
69 - 91	68.5 - 91.5	1	1
92 - 114	91.5 - 114.5	1	0
115 - 137	114.5 - 137.5	0	1
138 - 160	137.5 - 160.5	0	1
		30	30
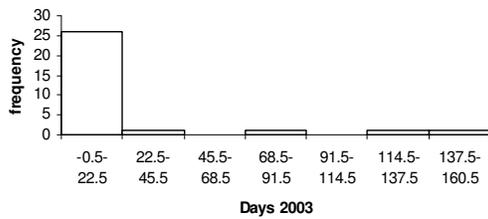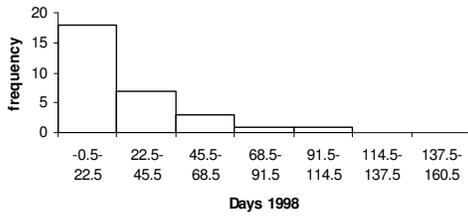
Both distributions are positively skewed, but the data are somewhat more spread out in the first three classes in 1998 than in 2003. There are two large data values in the 2003 data.
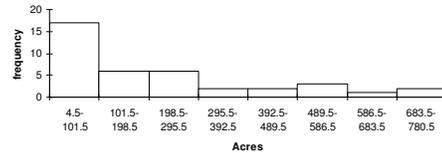
9.

Limits	Boundaries	f
83.1 - 90.0	83.05 - 90.05	3
90.1 - 97.0	90.05 - 97.05	5
97.1 - 104.0	97.05 - 104.05	6
104.1 - 111.0	104.05 - 111.05	7
111.1 - 118.0	111.05 - 118.05	3
118.1 - 125.0	118.05 - 125.05	1
		25

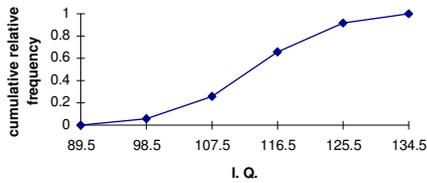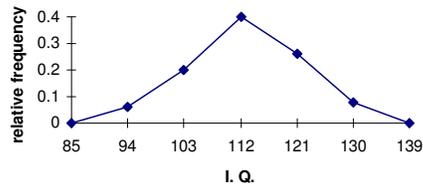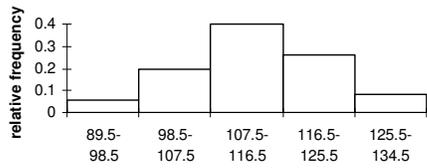|	cf
Less than 83.05	0
Less than 90.05	3
Less than 97.05	8
Less than 104.05	14
Less than 111.05	21
Less than 118.05	24
Less than 125.05	25

9. continued
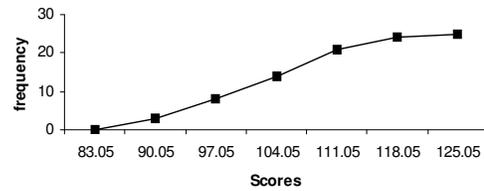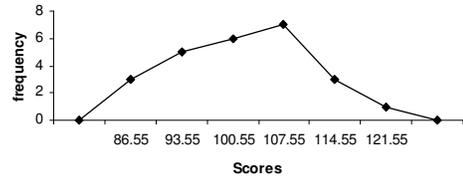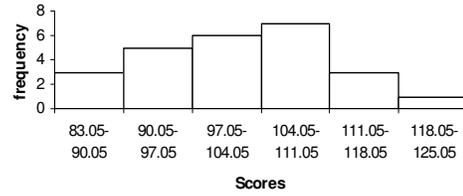
11.
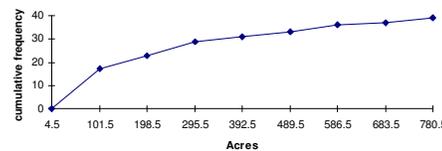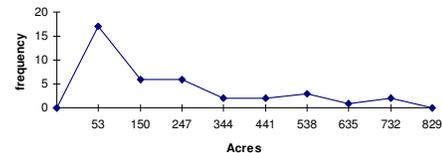
The peak is in the first class, and then the histogram is rather uniform after the first class. Most of the parks have less than 101.5 thousand acres as compared with any other class of values.

13.

15. continued

The proportion of applicants who need to enroll in a summer program is 0.26 or 26%.

The histogram has two peaks.

15. H = 270   L = 80
Range = 270 − 80 = 190
Width = 190 ÷ 7 = 27.1 or 28
Use width = 29 (rule 2)

Limits	Boundaries	f	rf
80 - 108	79.5 - 108.5	8	0.17
109 - 137	108.5 - 137.5	13	0.28
138 - 166	137.5 - 166.5	2	0.04
167 - 195	166.5 - 195.5	9	0.20
196 - 224	195.5 - 224.5	10	0.22
225 - 253	224.5 - 253.5	2	0.04
254 - 282	253.5 - 282.5	2	0.04
			0.99*

*due to rounding

	crf
Less than 79.5	0.00
Less than 108.5	0.17
Less than 137.5	0.45
Less than 166.5	0.49
Less than 195.5	0.69
Less than 224.5	0.91
Less than 253.5	0.95
Less than 282.5	0.99

17.

Boundaries	rf	crf
-0.5 - 27.5	0.63	0.63
27.5 - 55.5	0.20	0.83
55.5 - 83.5	0.07	0.90
83.5 - 111.5	0.00	0.90
111.5 - 139.5	0.00	0.90
139.5 - 167.5	0.10	1.00
167.5 - 195.5	0.00	1.00
	100.0	

	crf
Less than -0.5	0.00
Less than 27.5	0.63
Less than 55.5	0.83
Less than 83.5	0.90
Less than 111.5	0.90
Less than 139.5	0.90
Less than 167.5	1.00

17. continued

Air Quality (Days) - 2002

Air Quality (Days) - 2002

Air Quality (Days) - 2002

19.

Limits	Boundaries	X_m	f
22 - 24	21.5 - 24.5	23	1
25 - 27	24.5 - 27.5	26	3
28 - 30	27.5 - 30.5	29	0
31 - 33	30.5 - 33.5	32	6
34 - 36	33.5 - 36.5	35	5
37 - 39	36.5 - 39.5	38	3
40 - 42	39.5 - 42.5	41	2
			20

	cf
Less than 21.5	0
Less than 24.5	1
Less than 27.5	4
Less than 30.5	4
Less than 33.5	10
Less than 36.5	15
Less than 39.5	18
Less than 42.5	20

19. continued

Seconds

Seconds
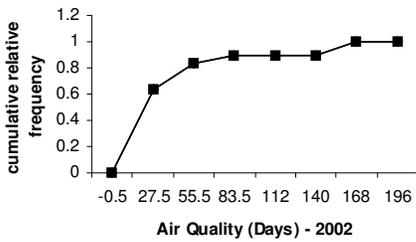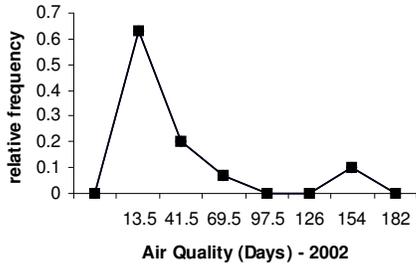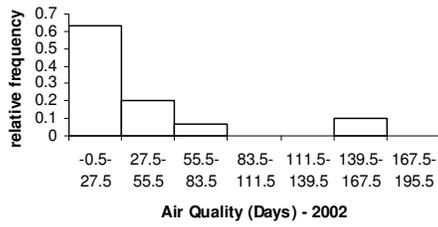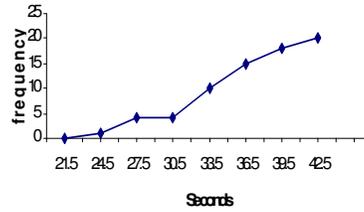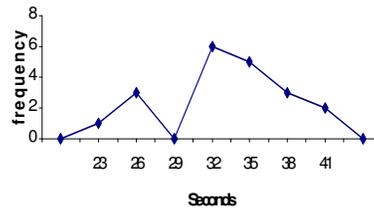
EXERCISE SET 2-3

1.

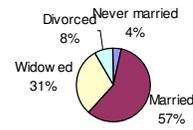|	f
UCLA	11
Texas A & M	2
Calif. State	1
Arizona	6
Fresno State	1
Oklahoma	1
California	1
Michigan	1
	24

School

School

3.
The best place to market products would be to residential (home) users.

5.

7.

9.
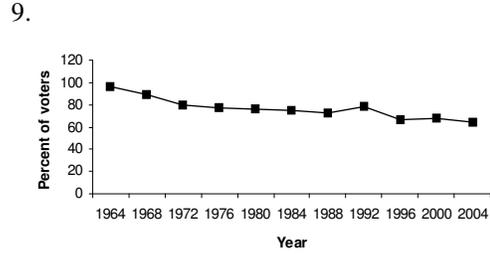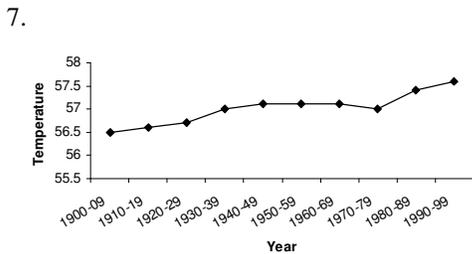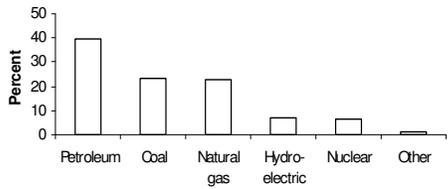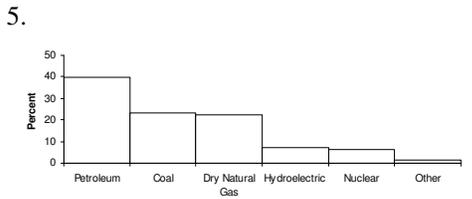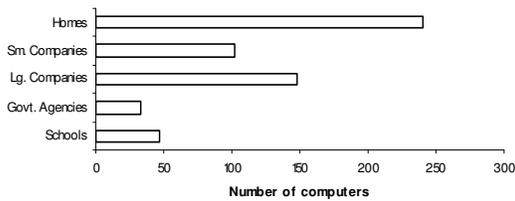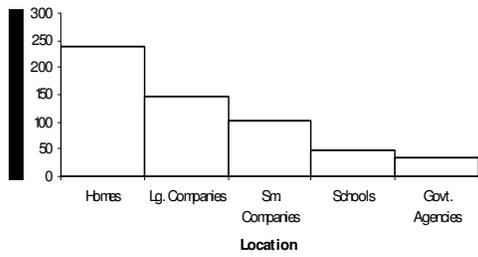
The sample used was not representative of the general population.

11.

Marital Status

Never married 4%
Divorced 8%
Widowed 31%
Married 57%

Educational Attainment

- Less than 9th grade — 14%
- 9 - 12 but no diploma — 13%
- H.S. graduate — 36%
- Some college — 18%
- Bachelor's/advanced degree — 19%

13.
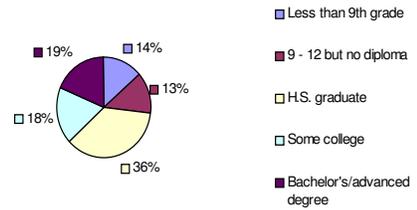
	%	degrees
Career change	34%	122.4°
New job	29%	104.4°
Start business	21%	75.6°
Retire	16%	57.6°
	100%	360.0°

Pie chart:

Retire 16.0%
Career change 34.0%
Start business 21.0%
New job 29.0%
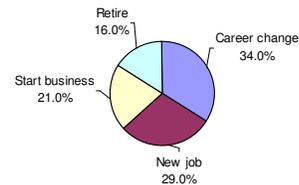
13. continued
Pareto chart:
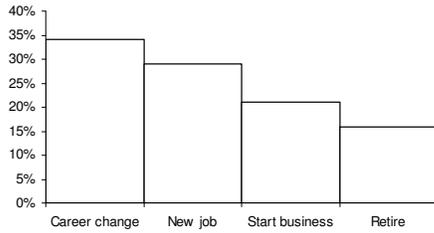
The pie graph better represents the data since we are looking at parts of a whole.

15.

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

The distribution is somewhat symmetric and unimodal. The majority of the Presidents were in their 50's when inaugurated.
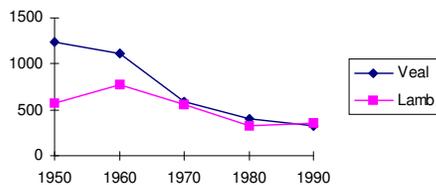
17.

```
        Variety 1                           Variety 2
                          2 | 1 | 3  8
                        3 0 | 2 | 5
                    9 8 8 5 2 | 3 | 6  8
                        3 3 1 | 4 | 1  2  5  5
            9 9 8 5 3 3 2 1 0 | 5 | 0  3  5  5  5  6  7  9
                          6 | 2  2
```

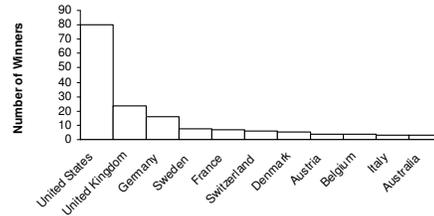The distributions are similar but variety 2 seems to be more variable than variety 1.

19.
Answers will vary.

21.

In 1950, veal production was considerably higher than lamb. By 1970, production was approximately the same for both.

23.

25. The values on the y axis start at 3.5. Also there are no data values shown for the years 2004 through 2011.

REVIEW EXERCISES - CHAPTER 2

1.
Class	f
Newspaper	10
Television	16
Radio	12
Internet	12
	50

3.
Class	f
baseball	4
golf ball	5
tennis ball	6
soccer ball	5
football	5
	25

5.
Class	f		cf
11	1	less than 10.5	0
12	2	less than 11.5	1
13	2	less than 12.5	3
14	2	less than 13.5	5
15	1	less than 14.5	7
16	2	less than 15.5	8
17	4	less than 16.5	10
18	2	less than 17.5	14
19	2	less than 18.5	16
20	1	less than 19.5	18
21	0	less than 20.5	19
22	1	less than 21.5	19
	20	less than 22.5	20

7.

Limits	Boundaries	f
15 - 19	14.5 - 19.5	3
20 - 24	19.5 - 24.5	18
25 - 29	24.5 - 29.5	18
30 - 34	29.5 - 34.5	8
35 - 39	34.5 - 39.5	3
		50

	cf
Less than 14.5	0
Less than 19.5	3
Less than 24.5	21
Less than 29.5	39
Less than 34.5	47
Less than 39.5	50

9.

Limits	Boundaries	f		cf
170 - 188	169.5 - 188.5	11	less than 169.5	0
189 - 207	188.5 - 207.5	9	less than 188.5	11
208 - 226	207.5 - 226.5	4	less than 207.5	20
227 - 245	226.5 - 245.5	5	less than 226.5	24
246 - 264	245.5 - 264.5	0	less than 245.5	29
265 - 283	264.5 - 283.5	0	less than 264.5	29
284 - 302	283.5 - 302.5	0	less than 283.5	29
303 - 321	302.5 - 321.5	1	less than 302.5	29
		30	less than 321.5	30

11.

Limits	Boundaries	rf
51 - 59	50.5 - 59.5	0.125
60 - 68	59.5 - 68.5	0.300
69 - 77	68.5 - 77.5	0.275
78 - 86	77.5 - 86.5	0.200
87 - 95	86.5 - 95.5	0.050
96 - 104	95.5 - 104.5	0.050
		1.000

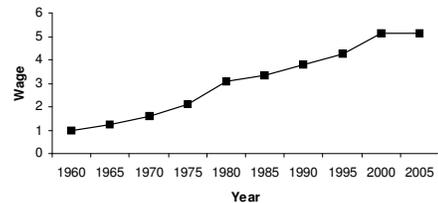|	crf
Less than 50.5	0.000
Less than 59.5	0.125
Less than 68.5	0.425
Less than 77.5	0.700
Less than 86.5	0.900
Less than 95.5	0.950
Less than 104.5	1.000

11. continued
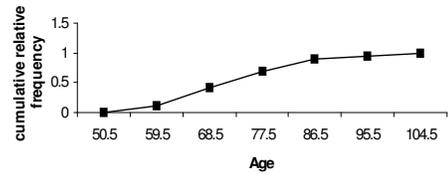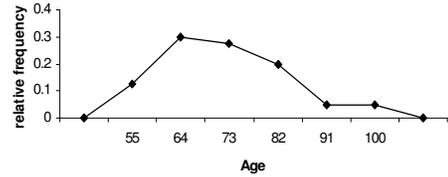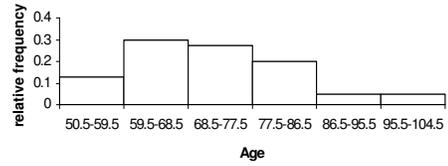
13.
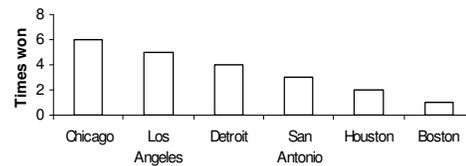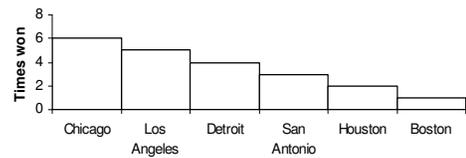
15.

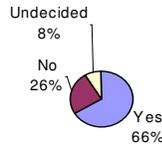The minimum wage has increased over the years with the largest increase occurring between 1975 and 1980.
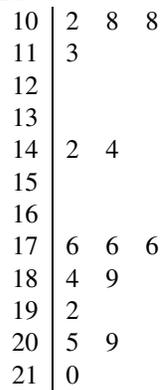
17.
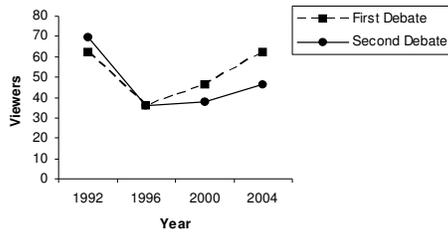
About the same number of people watched the first and second debates in 1992 and 1996. After that more people watched the first debate than watched the second debate.

19.

The majority of people surveyed would like to spend the rest of their careers with their present employer.

21.

10	2	8	8
11	3		
12			
13			
14	2	4	
15			
16			
17	6	6	6
18	4	9	
19	2		
20	5	9	
21	0		

CHAPTER 2 QUIZ

1. False
2. False
3. False
4. True
5. True
6. False
7. False
8. c.
9. c.
10. b.

11. b.
12. Categorical, ungrouped, grouped
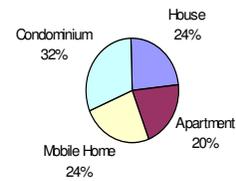13. 5, 20
14. categorical
15. time series
16. stem and leaf plot
17. vertical or y
18.

Class	f	cf
H	6	6
A	5	11
M	6	17
C	8	25
	25	

19.

20.

Class	f		cf
$0.5 - 1.5$	1	less than 0.5	0
$1.5 - 2.5$	5	less than 1.5	1
$2.5 - 3.5$	3	less than 2.5	6
$3.5 - 4.5$	4	less than 3.5	9
$4.5 - 5.5$	2	less than 4.5	13
$5.5 - 6.5$	6	less than 5.5	15
$6.5 - 7.5$	2	less than 6.5	21
$7.5 - 8.5$	3	less than 7.5	23
$8.5 - 9.5$	4	less than 8.5	26
	30	less than 9.5	30

21.

21. continued
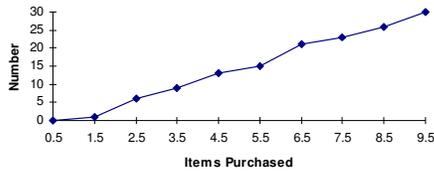
22.

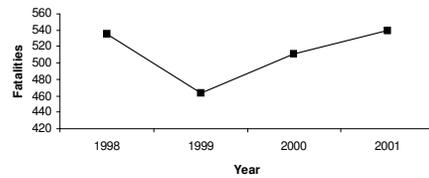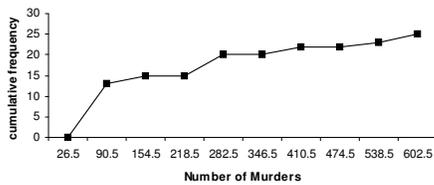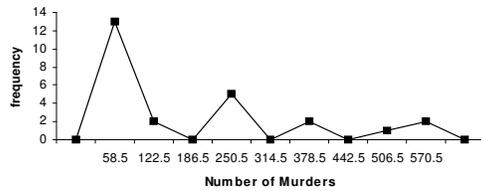| Limits	Boundaries	f
27 - 90	26.5 - 90.5	13
91 - 154	90.5 - 154.5	2
155 - 218	154.5 - 218.5	0
219 - 282	218.5 - 282.5	5
283 - 346	282.5 - 346.5	0
347 - 410	346.5 - 410.5	2
411 - 474	410.5 - 474.5	0
475 - 538	474.5 - 538.5	1
539 - 602	538.5 - 602.5	2
		25

23.
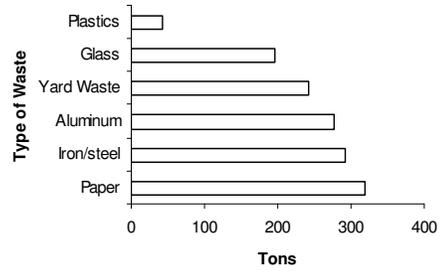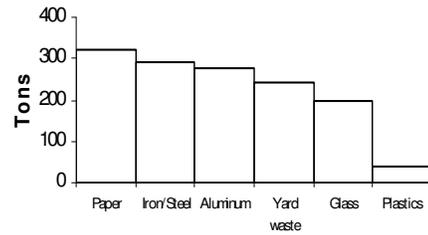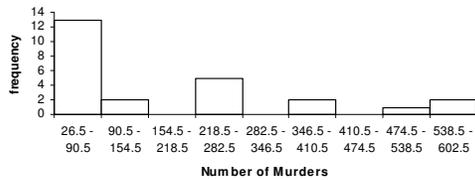
The distribution is positively skewed with one more than half of the data values in the lowest class.

24.

25.

Fatalities decreased in 1999 and then increased the next two years.

26.

1	5 9
2	6 8
3	1 5 8 8 9
4	1 7 8
5	3 3 4
6	2 3 7 8
7	6 9
8	6 8 9
9	8