

Chapter 2 - Frequency Distributions and Graphs

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.

2. Categorical distributions are used with nominal or ordinal data, ungrouped distributions are used with data having a small range, and grouped distributions are used when the range of the data is large.

3.

a. $31.5 - 38.5, \frac{32+38}{2} = \frac{70}{2} = 35,$

$38.5 - 31.5 = 7$

b. $85.5 - 104.5, \frac{86+104}{2} = \frac{190}{2} = 95,$

$104.5 - 85.5 = 19$

c. $894.5 - 905.5, \frac{895+905}{2} = \frac{1800}{2} = 900,$

$905.5 - 894.5 = 11$

d. $12.25 - 13.55, \frac{12.3+13.5}{2} = \frac{25.8}{2} = 12.9,$

$13.55 - 12.25 = 1.3$

e. $3.175 - 4.965, \frac{3.18+4.96}{2} = \frac{8.14}{2} = 4.07,$

$4.965 - 3.175 = 1.79$

4. Five to twenty classes. Width should be an odd number so that the midpoint will have the same place value as the data.

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.

6. An open-ended frequency distribution has either a first class with no lower limit or a last class with no upper limit. They are necessary to accommodate all the data.

7. Class	Tally	f	Percent
A		4	10%
M		28	70%
H		6	15%
S		2	5%
		40	100%

8. $H = 52 \quad L = 21$

Range = $52 - 21 = 31$

8. continued

Width = $31 \div 5 = 6.2$ or 7

Limits	Boundaries	f
21 - 27	20.5 - 27.5	6
28 - 34	27.5 - 34.5	9
35 - 41	34.5 - 41.5	5
42 - 48	41.5 - 48.5	7
49 - 55	48.5 - 55.5	<u>3</u>
		30

	cf
Less than 20.5	0
Less than 27.5	6
Less than 34.5	15
Less than 41.5	20
Less than 48.5	27
Less than 55.5	30

9. $H = 325 \quad L = 165$

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

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

10. $H = 110 \quad L = 54$

Range = $110 - 54 = 56$

Width = $56 \div 7 = 8$ round up to 9

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10. continued

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
54 - 62	53.5 - 62.5	7
63 - 71	62.5 - 71.5	6
72 - 80	71.5 - 80.5	8
81 - 89	80.5 - 89.5	4
90 - 98	89.5 - 98.5	1
99 - 107	98.5 - 107.5	3
108 - 116	107.5 - 116.5	<u>1</u>
		30

	<i>cf</i>
Less than 53.5	0
Less than 62.5	7
Less than 71.5	13
Less than 80.5	21
Less than 89.5	25
Less than 98.5	26
Less than 107.5	29
Less than 116.5	30

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

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
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	<u>3</u>
		30

	<i>cf</i>
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

12. H = 91,570 L = 5427
 Range = 91,570 - 5427 = 86,143
 Width = $86,143 \div 7 = 12,306.1$
 Round up to 12,307

12. continued

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
5427 - 17,733	5426.5 - 17,733.5	17
17,734 - 30,040	17,733.5 - 30,040.5	1
30,041 - 42,347	30,040.5 - 42,347.5	1
42,348 - 54,654	42,347.5 - 54,654.5	1
54,655 - 66,961	54,654.5 - 66,961.5	1
66,962 - 79,268	66,961.5 - 79,268.5	1
79,269 - 91,575	79,268.5 - 91,575.5	3
		25

The majority of the data values are in the lowest class. There are no empty classes in the distribution.

	<i>cf</i>
Less than 5426.5	0
Less than 17,733.5	17
Less than 30,040.5	18
Less than 42,347.5	19
Less than 54,654.5	20
Less than 66,961.5	21
Less than 79,268.5	22
Less than 91,575.5	25

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

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
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	<u>2</u>
		55

	<i>cf</i>
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

14. H = 51.7 L = 1.2
 Range = 51.7 - 1.2 = 50.5
 Width = $50.5 \div 5 = 10.1$ round up to 11

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14. continued

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
0 - 10	-0.5 - 10.5	7
11 - 21	10.5 - 21.5	6
22 - 32	21.5 - 32.5	2
33 - 43	32.5 - 43.5	0
44 - 54	43.5 - 54.5	<u>1</u>
		16

<i>cf</i>	
Less than -0.5	0
Less than 10.5	7
Less than 21.5	13
Less than 32.5	15
Less than 43.5	15
Less than 54.5	16

15. H = 635 L = 6

Width = 635 - 6 = 629

Range = 629 ÷ 5 = 125.8 round up to 127

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
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	<u>1</u>
		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.

<i>cf</i>	
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

16. H = 857 L = 140

Width = 857 - 140 = 717

Range = 717 ÷ 8 = 89.6 or 91

16. continued

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
140 - 230	139.5 - 230.5	11
231 - 321	230.5 - 321.5	5
322 - 412	321.5 - 412.5	4
413 - 503	412.5 - 503.5	4
504 - 594	503.5 - 594.5	4
595 - 685	594.5 - 685.5	1
686 - 776	685.5 - 776.5	0
777 - 867	776.5 - 867.5	<u>1</u>
		30

<i>cf</i>	
Less than 139.5	0
Less than 230.5	11
Less than 321.5	16
Less than 412.5	20
Less than 503.5	24
Less than 594.5	28
Less than 685.5	29
Less than 776.5	29
Less than 867.5	30

17. H = 123 L = 77

Range = 123 - 77 = 46

Width = 46 ÷ 7 = 6.6 or 7

<i>Limits</i>	<i>Boundaries</i>	<i>f</i>
77 - 83	76.5 - 83.5	1
84 - 90	83.5 - 90.5	1
91 - 97	90.5 - 97.5	6
98 - 104	97.5 - 104.5	14
105 - 111	104.5 - 111.5	8
112 - 118	111.5 - 118.5	1
119 - 125	118.5 - 125.5	<u>1</u>
		32

<i>cf</i>	
Less than 76.5	0
Less than 83.5	1
Less than 90.5	2
Less than 97.5	8
Less than 104.5	22
Less than 111.5	30
Less than 118.5	31
Less than 125.5	32

18.

H = 31.5 L = 7.5

Range = 31.5 - 7.5 = 24

Width = 24 ÷ 5 = 4.8 or 5

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18. continued

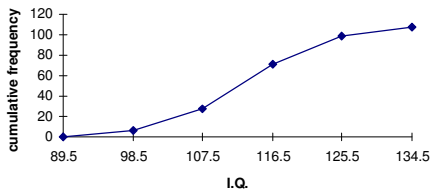
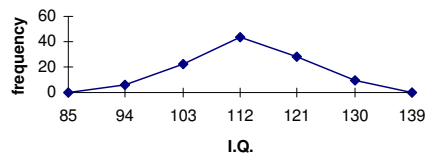
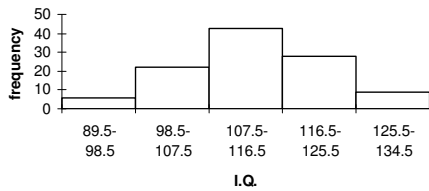
Limits	Boundaries	<i>f</i>
7.5 - 12.4	7.45 - 12.45	1
12.5 - 17.4	12.45 - 17.45	4
17.5 - 22.4	17.45 - 22.45	10
22.5 - 27.4	22.45 - 27.45	6
27.5 - 32.4	27.45 - 32.45	4
		25

	<i>cf</i>
Less than 7.45	0
Less than 12.45	1
Less than 17.45	5
Less than 22.45	15
Less than 27.45	21
Less than 32.45	25

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

EXERCISE SET 2-2

1.

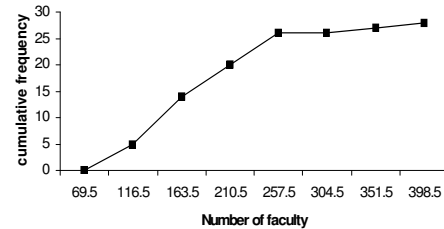
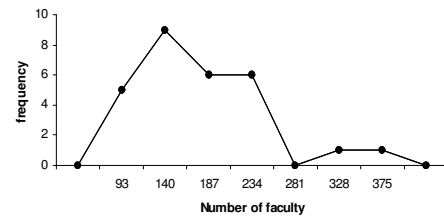
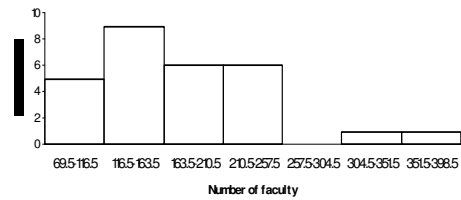


Eighty applicants do not need to enroll in the summer programs.

2.

Limits	Boundaries	<i>f</i>
70 - 116	69.5 - 116.5	5
117 - 163	116.5 - 163.5	9
164 - 210	163.5 - 210.5	6
211 - 257	210.5 - 257.5	6
258 - 304	257.5 - 304.5	0
305 - 351	304.5 - 351.5	1
352 - 398	351.5 - 398.5	1
		28

	<i>cf</i>
Less than 69.5	0
Less than 116.5	5
Less than 163.5	14
Less than 210.5	20
Less than 257.5	26
Less than 304.5	26
Less than 351.5	27
Less than 398.5	28



$\frac{12}{28} = 0.429$ or 42.9% have 180 or more.
The histogram and frequency polygon are positively skewed.

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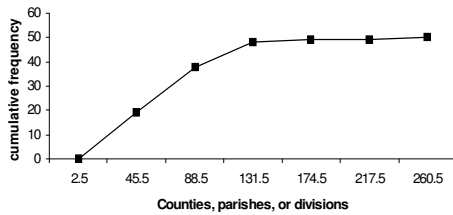
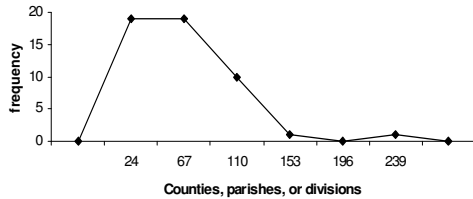
3.

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	$\frac{1}{50}$
		50

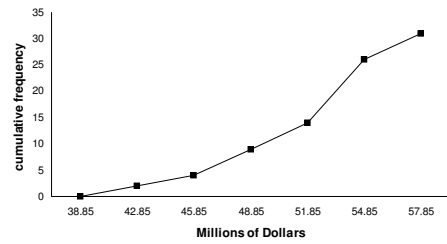
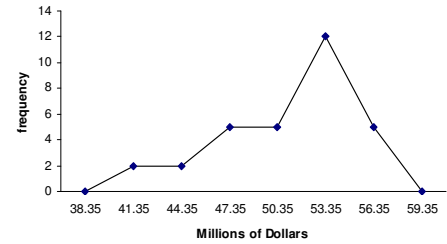
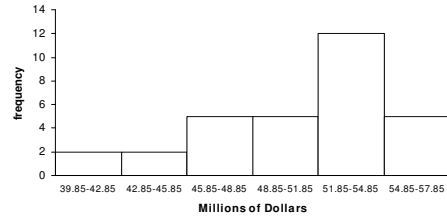
	cf
Less than 2.5	0
Less than 45.5	19
Less than 88.5	38
Less than 131.5	48
Less than 174.5	49
Less than 217.5	49
Less than 260.5	50



The distribution is positively skewed.



4.



The distribution is left skewed or negatively skewed.

5.

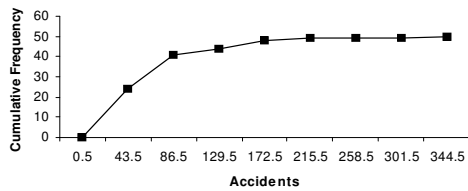
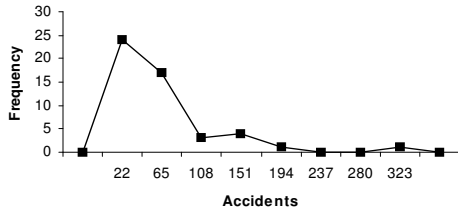
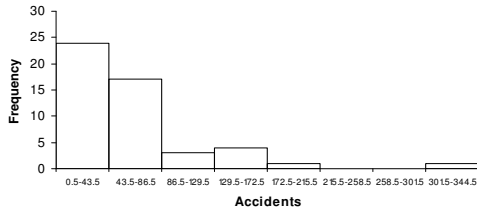
Limits	Boundaries	f
1 - 43	0.5 - 43.5	24
44 - 86	43.5 - 86.5	17
87 - 129	86.5 - 129.5	3
130 - 172	129.5 - 172.5	4
173 - 215	172.5 - 215.5	1
216 - 258	215.5 - 258.5	0
259 - 301	258.5 - 301.5	0
302 - 344	301.5 - 344.5	$\frac{1}{50}$
		50

	cf
Less than 0.5	0
Less than 43.5	24
Less than 86.5	41
Less than 129.5	44
Less than 172.5	48
Less than 215.5	49
Less than 258.5	49
Less than 301.5	49
Less than 344.5	50

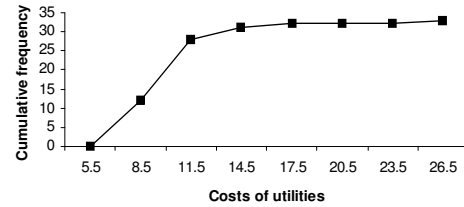
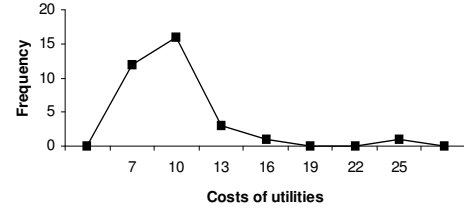
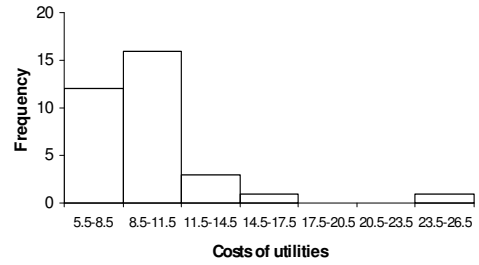
The distribution is positively skewed.

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5. continued



6. continued



6.

Limits	Boundaries	f
6 - 8	5.5 - 8.5	12
9 - 11	8.5 - 11.5	16
12 - 14	11.5 - 14.5	3
15 - 17	14.5 - 17.5	1
18 - 20	17.5 - 20.5	0
21 - 23	20.5 - 23.5	0
24 - 26	23.5 - 26.5	$\frac{1}{33}$
		33

	cf
Less than 5.5	0
Less than 8.5	12
Less than 11.5	28
Less than 14.5	31
Less than 17.5	32
Less than 20.5	32
Less than 23.5	32
Less than 26.5	33

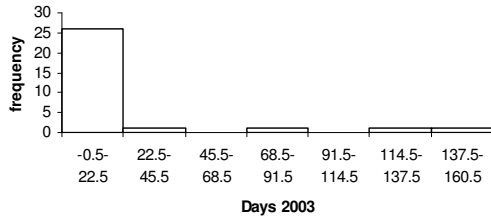
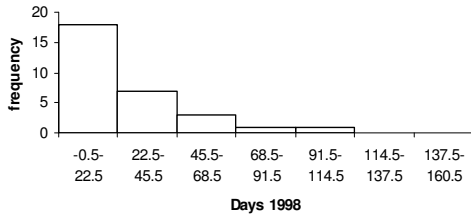
The distribution is positively skewed.

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	$\frac{0}{30}$	$\frac{1}{30}$
		30	30

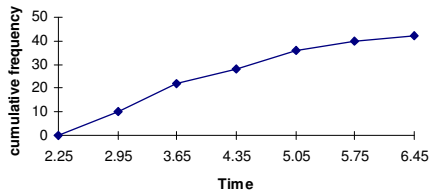
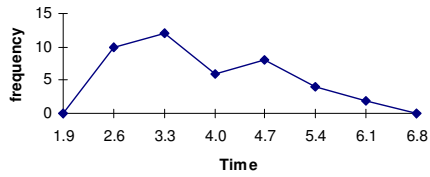
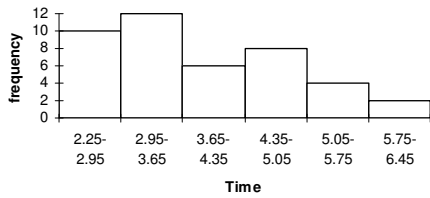
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7. continued



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.

8.

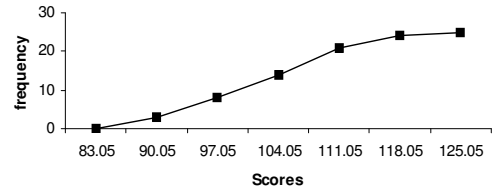
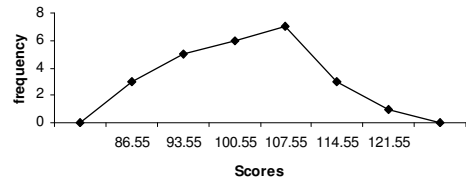
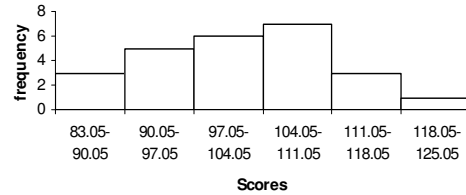


The data values fall somewhat on the left side of the distribution. The histogram is right skewed. There are no gaps in the histogram.

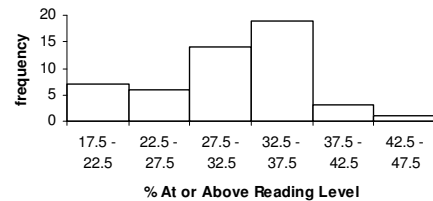
9.

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

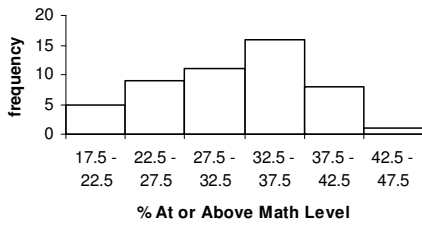


10.



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10. continued



The distribution of math percentages is more bell-shaped than the distribution of reading percentages, and its peak in the class of 32.5 – 37.5 is not as high as the peak of the reading percentages.

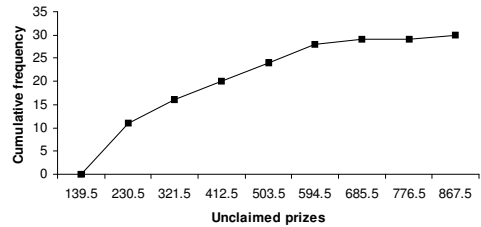
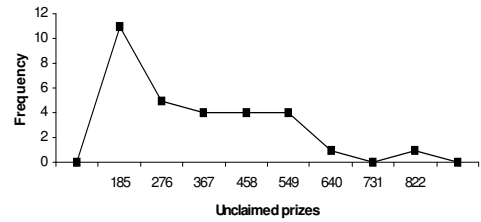
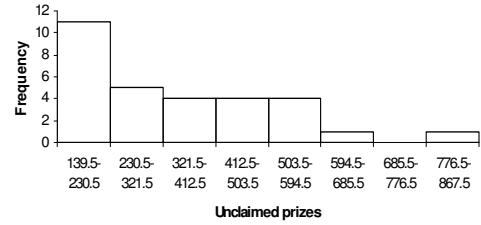
11.

Limits	Boundaries	<i>f</i>
140 - 230	139.5 - 230.5	11
231 - 321	230.5 - 321.5	5
322 - 412	321.5 - 412.5	4
413 - 503	412.5 - 503.5	4
504 - 594	503.5 - 594.5	4
595 - 685	594.5 - 685.5	1
686 - 776	685.5 - 776.5	0
777 - 867	776.5 - 867.5	<u>1</u>
		30

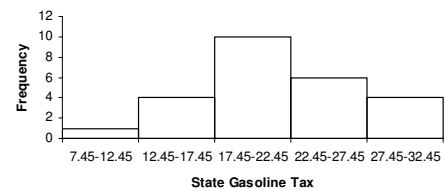
	<i>cf</i>
Less than 139.5	0
Less than 230.5	11
Less than 321.5	16
Less than 412.5	20
Less than 503.5	24
Less than 594.5	28
Less than 685.5	29
Less than 776.5	29
Less than 867.5	30

The distribution is positively skewed.

11. continued

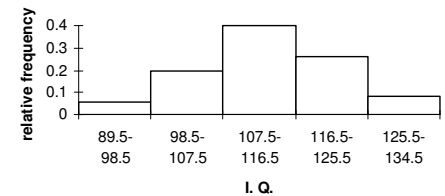


12.



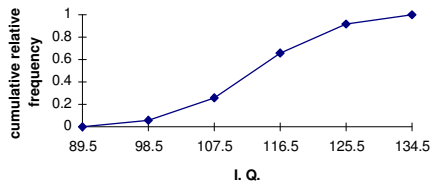
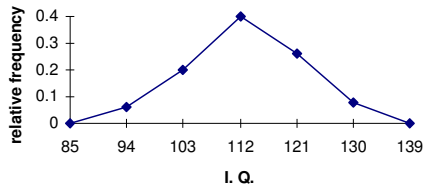
The histogram shows that state gasoline taxes are somewhat normal with the peak in the middle of the graph.

13.



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13. continued



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

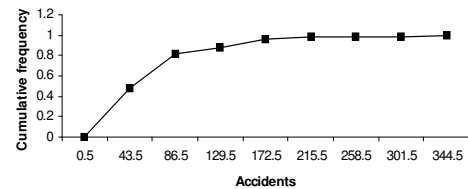
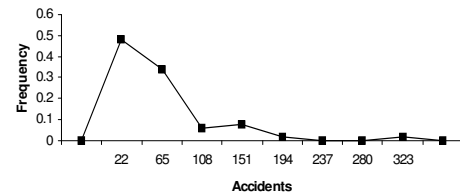
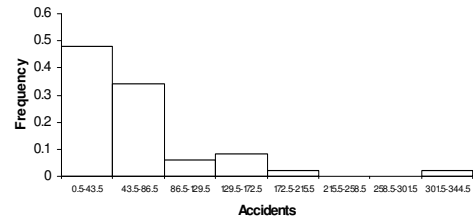
14.

Limits	Boundaries	rf
1 - 43	0.5 - 43.5	0.48
44 - 86	43.5 - 86.5	0.34
87 - 129	86.5 - 129.5	0.06
130 - 172	129.5 - 172.5	0.08
173 - 215	172.5 - 215.5	0.02
216 - 258	215.5 - 258.5	0
259 - 301	258.5 - 301.5	0
302 - 344	301.5 - 344.5	0.02

	crf
Less than 0.5	0
Less than 43.5	0.48
Less than 86.5	0.82
Less than 129.5	0.88
Less than 172.5	0.96
Less than 215.5	0.98
Less than 258.5	0.98
Less than 301.5	0.98
Less than 344.5	1.00

Of the states 82% have fewer than 87 accidents per year.

14. continued



15. $H = 270$ $L = 80$
 Range = $270 - 80 = 190$
 Width = $190 \div 7 = 27.1$ or 28
 Use width = 29 (rule 2)

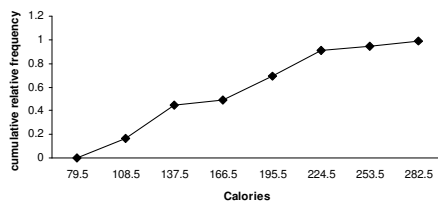
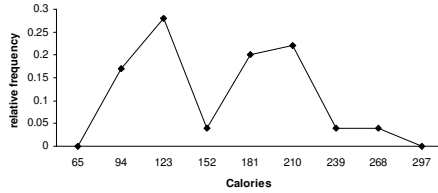
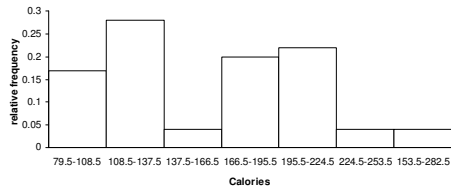
Limits	Boundaries	f	rf
80 - 108	79.5 - 108.5	8	0.17
109 - 137	108.5 - 137.5	13	0.28
138 - 166	137.5 - 166.5	2	0.04
167 - 195	166.5 - 195.5	9	0.20
196 - 224	195.5 - 224.5	10	0.22
225 - 253	224.5 - 253.5	2	0.04
254 - 282	253.5 - 282.5	2	0.04
			0.99*

*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

Chapter 2 - Frequency Distributions and Graphs

15. continued



The histogram has two peaks.

16.

$H = 57 \quad L = 12$

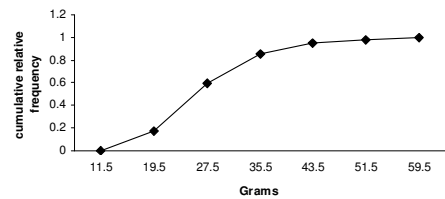
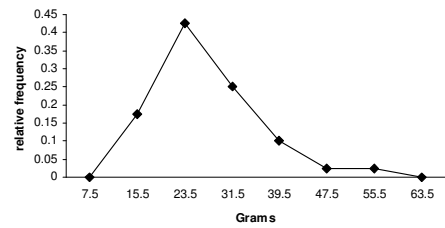
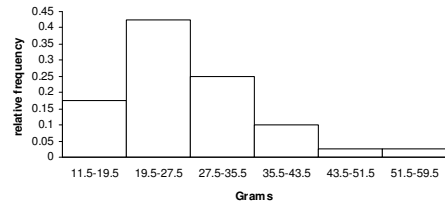
Range = $57 - 12 = 45$

Width = $45 \div 6 = 7.5$ or 8

Limits	Boundaries	f	rf
12 - 19	11.5 - 19.5	7	0.175
20 - 27	19.5 - 27.5	17	0.425
28 - 35	27.5 - 35.5	10	0.25
36 - 43	35.5 - 43.5	4	0.10
44 - 51	43.5 - 51.5	1	0.025
52 - 59	51.5 - 59.5	<u>1</u>	<u>0.025</u>
		40	1.000

	crf
Less than 11.5	0.000
Less than 19.5	0.175
Less than 27.5	0.600
Less than 35.5	0.850
Less than 43.5	0.950
Less than 51.5	0.975
Less than 59.5	1.000

16. continued



The histogram is positively skewed.

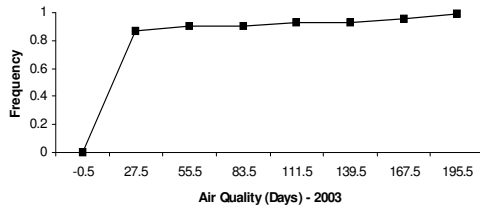
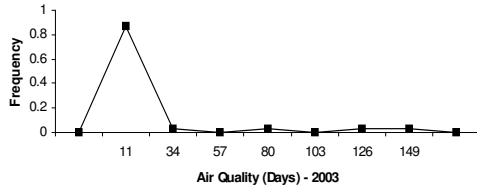
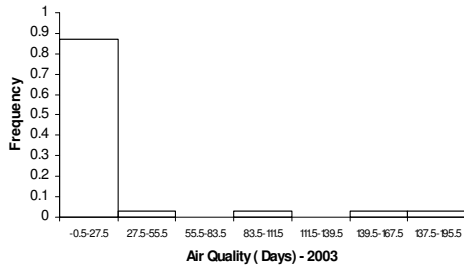
17.

Boundaries	crf
-0.5 - 27.5	0.87
27.5 - 55.5	0.03
55.5 - 83.5	0.00
83.5 - 111.5	0.03
111.5 - 139.5	0.00
139.5 - 167.5	0.03
167.5 - 195.5	0.03
	0.99

	crf
Less than -0.5	0.00
Less than 27.5	0.87
Less than 55.5	0.90
Less than 83.5	0.90
Less than 111.5	0.93
Less than 139.5	0.93
Less than 167.5	0.96
Less than 195.5	0.99

Chapter 2 - Frequency Distributions and Graphs

17. continued



18. continued

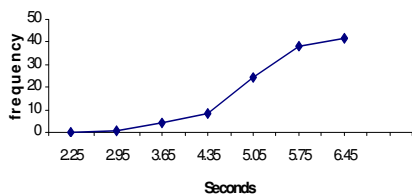
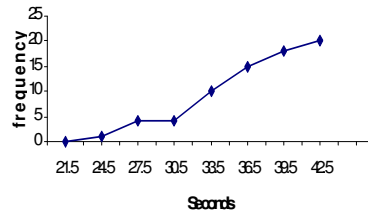
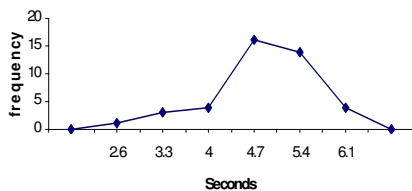
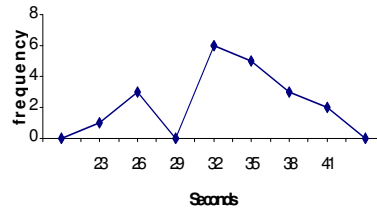
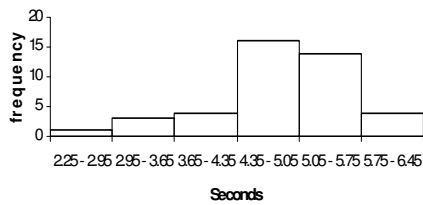
Based on the histograms, the older dogs have longer reaction times. Also, the reaction times for older dogs is more variable.

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

18.



20.

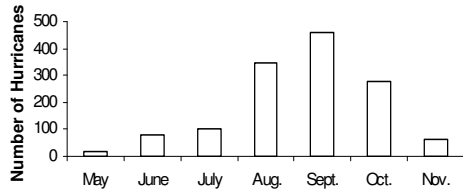
- a. 0
- b. 14
- c. 10
- d. 16

Chapter 2 - Frequency Distributions and Graphs

EXERCISE SET 2-3

1.

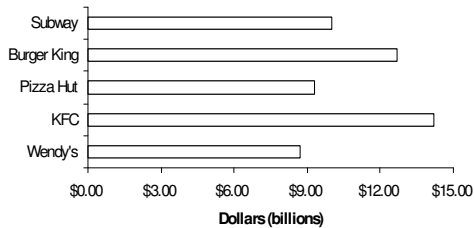
	<i>f</i>
May	18
June	79
July	101
August	344
September	459
October	280
November	61



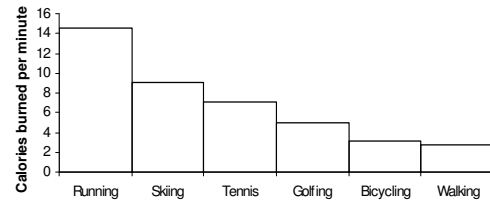
2.

	<i>f</i>
Wendy's	\$8.7
KFC	14.2
Pizza Hut	9.3
Burger King	12.7
Subway	10.0

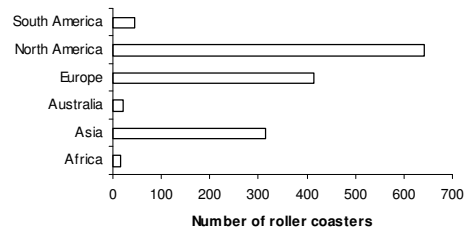
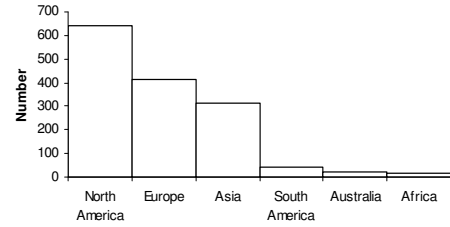
Sales of Fast Foods



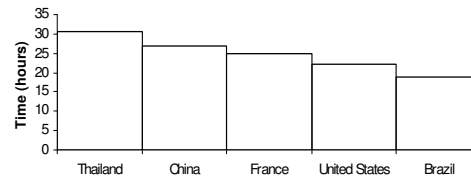
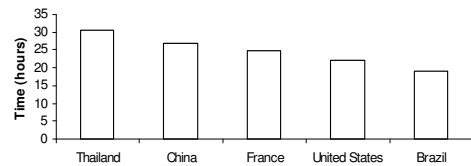
3.



4.

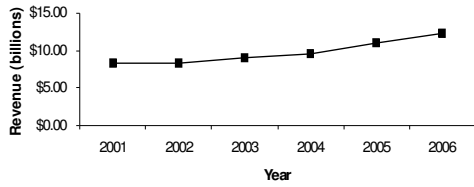


5.



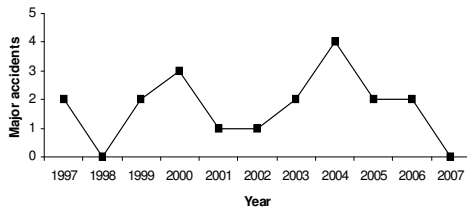
Chapter 2 - Frequency Distributions and Graphs

6.

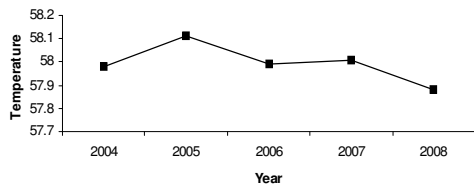


Sales of coffee are increasing.

7.

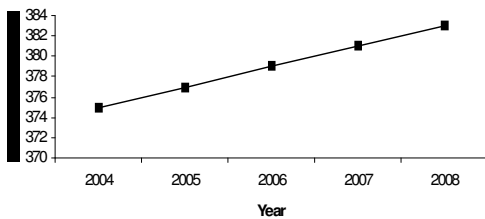


8.



After a slight increase in 2005, the average temperature has declined somewhat in the following years.

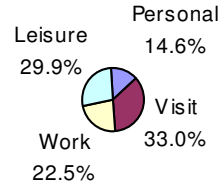
9.



The atmospheric concentration of carbon dioxide has been steadily increasing over the years.

10.

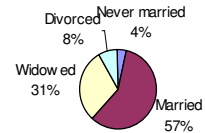
Personal Business	146	14.6%	52.56°
Visit friends or family	330	33.0%	118.8°
Work-related	225	22.5%	81.0°
Leisure	299	29.9%	107.64°
Total	1000	100%	360°



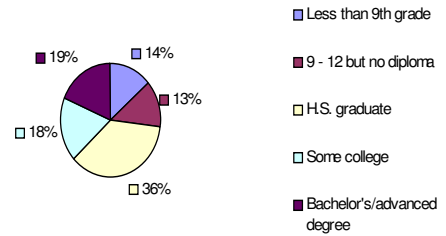
About $\frac{1}{3}$ of the travelers visit friends or relatives, with the fewest travelling for personal business.

11.

Marital Status



Educational Attainment

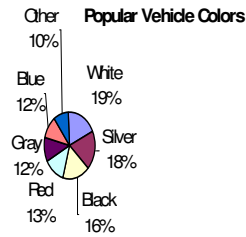


12.

White	19%	68.4°
Silver	18%	64.8°
Black	16%	57.6°
Red	13%	46.8°
Gray	12%	43.2°
Blue	12%	43.2°
Other	10%	36.0°

Chapter 2 - Frequency Distributions and Graphs

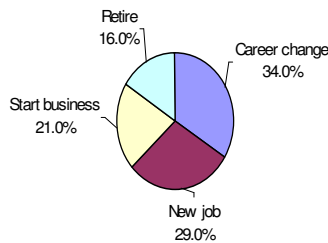
12. continued



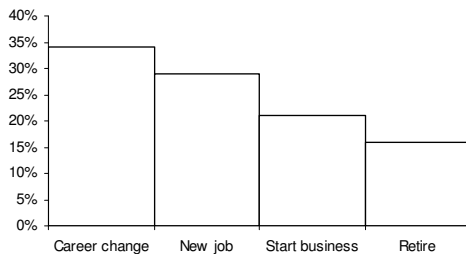
13.

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

Pie chart:



Pareto chart:



The pie graph better represents the data since we are looking at parts of a whole.

14.

- Time series graph
- Pie graph
- Pareto chart
- Pie graph
- Time series graph
- Pareto chart

15.

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

16.

10	0	0	0	0	0
11	0	0	5		
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	5
15	0	0	0		
16	0	0	0	0	0
17	0				
18	0	0			
19	0				

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

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

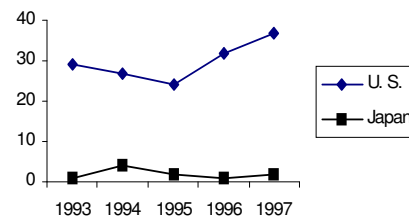
18.

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

19.

Answers will vary.

20.

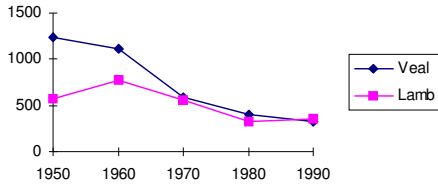


Chapter 2 - Frequency Distributions and Graphs

20. continued

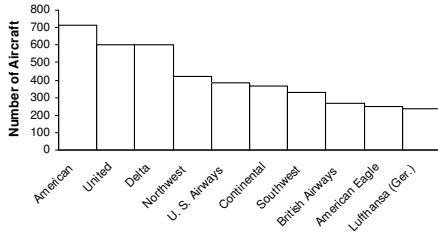
The United States has many more launches than Japan. The number of launches is relatively stable for Japan, while launches varied more for the U. S. The U. S. launches decreased slightly in 1995 and increased after that year.

21.



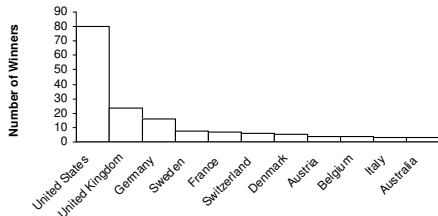
In 1950, veal production was considerably higher than lamb. By 1970, production was approximately the same for both.

22.



A Pareto chart is most appropriate.

23.



24. The bottle for 2004 is much wider, giving a distorted view of the difference since only the heights of the bottles should be compared.

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

EXERCISE SET 2-4

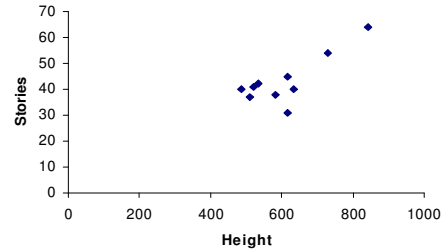
1. Scatter plot or scatter diagram

2. The two variables used are the independent variable, x , and the dependent variable, y .

3. Two variables are positively related when the dependent variable, y , increases as the independent variable, x , increases. The points on the scatter plot fall approximately in an ascending straight line.

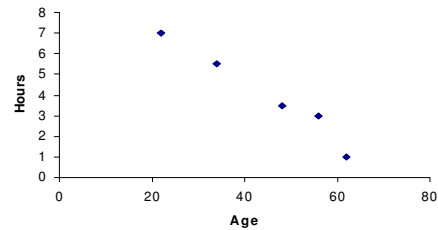
4. Two variables are negatively related when the dependent variable, y , decreases as the independent variable, x , increases. The points on the scatter plot fall approximately in a descending straight line.

5.



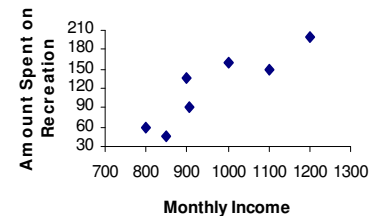
There appears to be a positive linear relationship between the height of a building and the number of stories in the building.

6.



There appears to be a negative linear relationship between age and the number of hours spent jogging per week.

7.

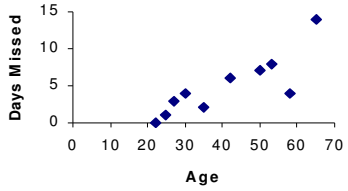


Chapter 2 - Frequency Distributions and Graphs

7. continued

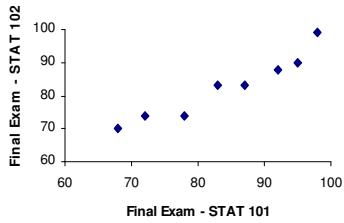
There appears to be a positive linear relationship between monthly income and amount spent on recreation.

8.



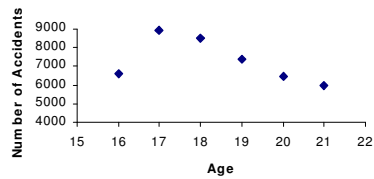
There appears to be a positive linear relationship between an employee's age and number of days missed per year.

9.



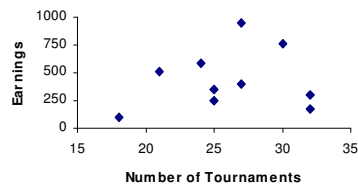
There appears to be a positive linear relationship between a student's final exam score in STAT 101 and STAT 102.

10.



There appears to be a negative linear relationship between the age of a driver and the number of accidents per year.

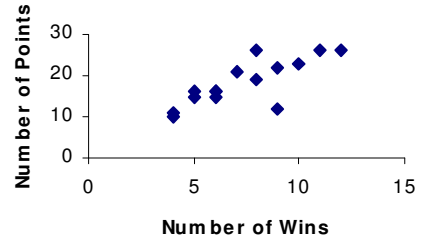
11.



11. continued

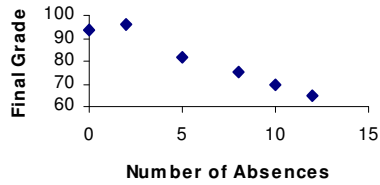
There appears to be neither a positive nor negative linear relationship between the number of tournaments and the earnings of LPGA golfers.

12.



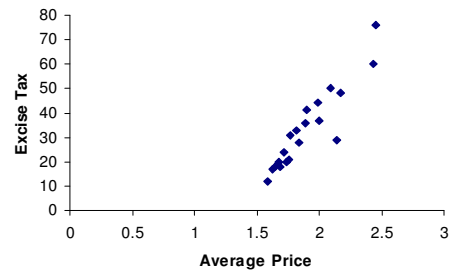
There appears to be a positive linear relationship between number of wins and points scored by NHL teams.

13.



There appears to be a negative linear relationship between the number of absences and at student's final grade in a course.

14.



There appears to be a positive linear relationship between average price per pack of cigarettes and state excise tax.

Chapter 2 - Frequency Distributions and Graphs

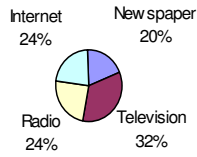
REVIEW EXERCISES - CHAPTER 2

1.

Class	f
Newspaper	10
Television	16
Radio	12
Internet	<u>12</u>
	50

2.

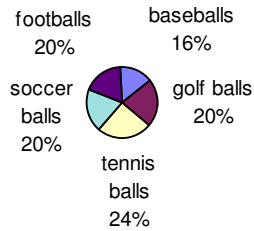
How People Receive News



3.

Class	f
Baseballs	4
Golf balls	5
Tennis balls	6
Soccer balls	5
Footballs	<u>5</u>
	25

4.

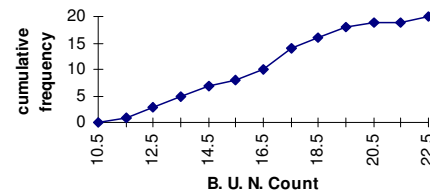
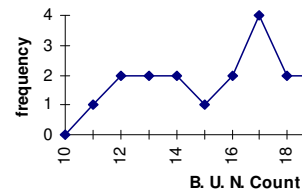
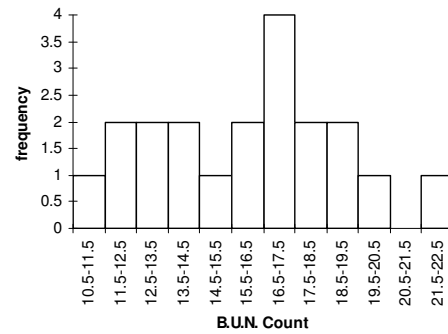


More tennis balls were sold than any other type of ball.

5.

Class	f	less than	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	<u>1</u>	less than 21.5	19
20	20	less than 22.5	20

6.



The distribution is somewhat uniform, with a slight peak in the 16.5 - 17.5 class. There is a gap in the 20.5 - 21.5 class.

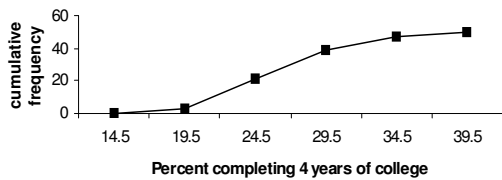
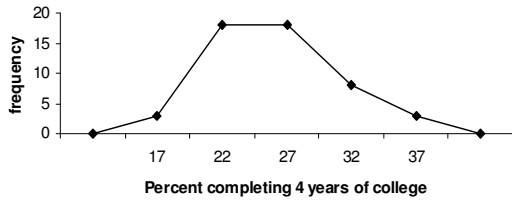
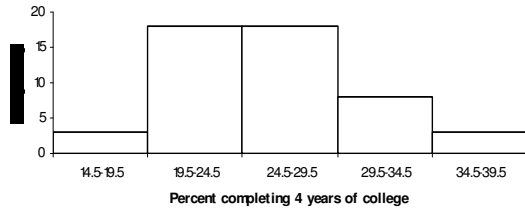
Chapter 2 - Frequency Distributions and Graphs

7.

Limits	Boundaries	<i>f</i>
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	<u>3</u>
		50

	<i>cf</i>
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

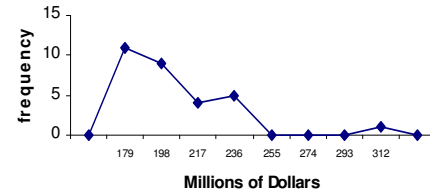
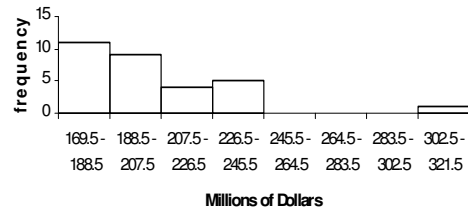
8.



9.

Limits	Boundaries	<i>f</i>	<i>cf</i>
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	<u>1</u>	less than 302.5 29
		30	less than 321.5 30

10.



The typical value of the franchises is between \$169.5 - \$188.5 million. All but one of the franchises are valued between \$169.5 and \$245.5 million.

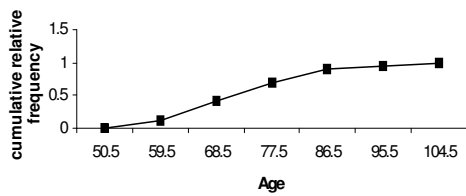
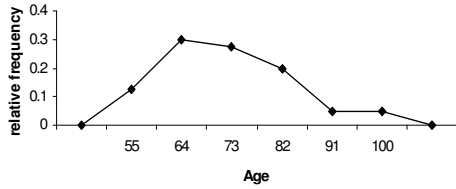
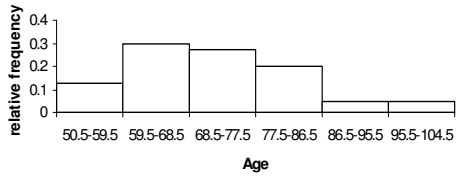
11.

Limits	Boundaries	<i>rf</i>
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	<u>0.050</u>
		1.000

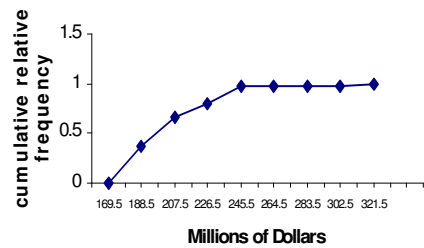
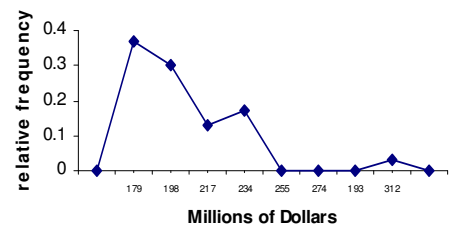
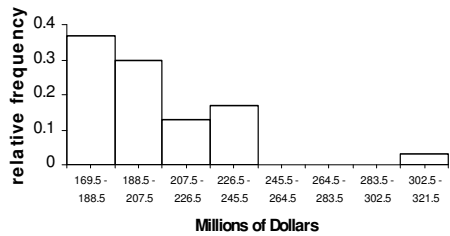
	<i>crf</i>
Less than 50.5	0.000
Less than 59.5	0.125
Less than 68.5	0.425
Less than 77.5	0.700
Less than 86.5	0.900
Less than 95.5	0.950
Less than 104.5	1.000

Chapter 2 - Frequency Distributions and Graphs

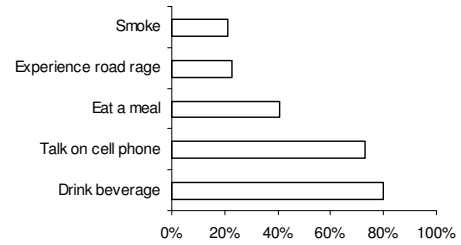
11. continued



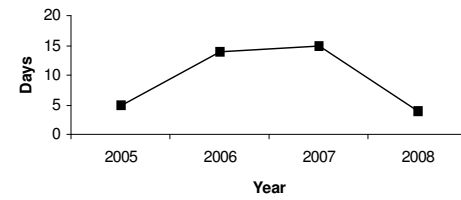
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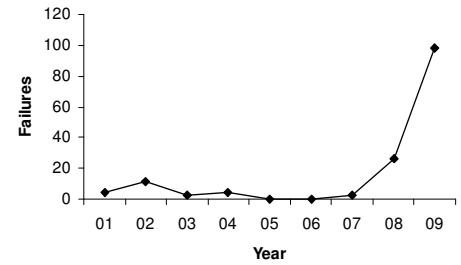
13.



14.



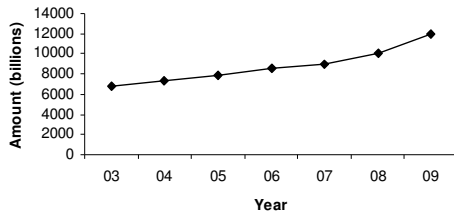
15.



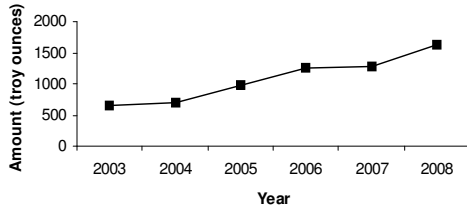
Bank failures increased in 2002 from 4 to 11, then dropped until 2008, when they increased to 28. The year 2009 brought an increase to 98.

Chapter 2 - Frequency Distributions and Graphs

16.

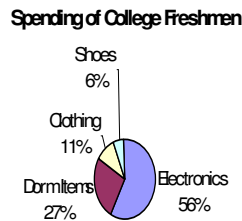


17.

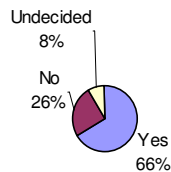


There has been a steady increase in the amount of gold produced by Columbia over the recent years.

18.



19.



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

20.

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

21.

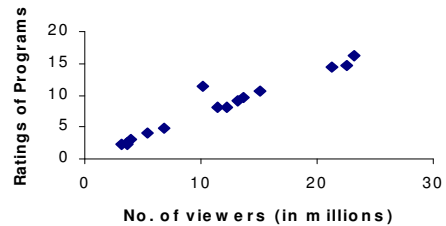
10	2 8 8
11	3
12	
13	
14	2 4
15	
16	
17	6 6 6
18	4 9
19	2
20	5 9
21	0

22.

20	0 4 9
21	0 1 2 7 8 8
22	2 7 7 7 8
23	0 1 3 7 8
24	1 2 2 3 7
25	1 1 3 4 6
26	0

The distribution of aptitude scores is fairly uniform.

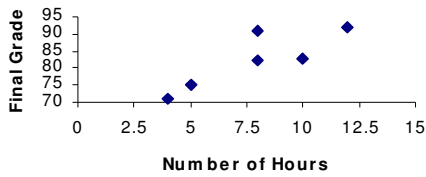
23.



There appears to be a positive linear relationship between the number of viewers (in millions) and the ratings of 15 television programs.

Chapter 2 - Frequency Distributions and Graphs

24.



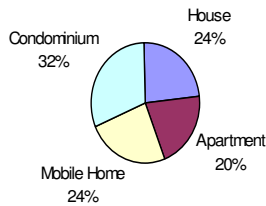
There appears to be a positive linear relationship between the final grade a student receives and the number of hours of tutoring received by the student.

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.

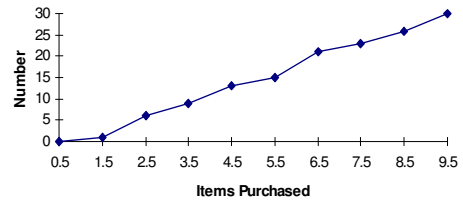
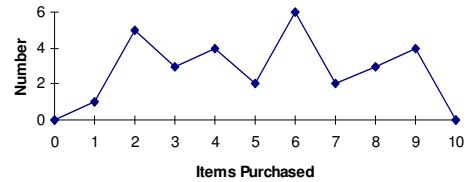
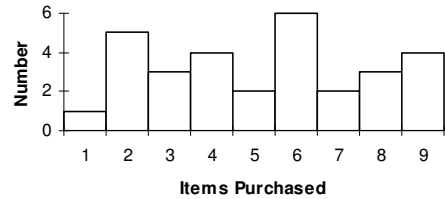


20.

Class	f
0.5 – 1.5	1
1.5 – 2.5	5
2.5 – 3.5	3
3.5 – 4.5	4
4.5 – 5.5	2
5.5 – 6.5	6
6.5 – 7.5	2
7.5 – 8.5	3
8.5 – 9.5	4
	<u>30</u>

Class	cf
less than 0.5	0
less than 1.5	1
less than 2.5	6
less than 3.5	9
less than 4.5	13
less than 5.5	15
less than 6.5	21
less than 7.5	23
less than 8.5	26
less than 9.5	30

21.

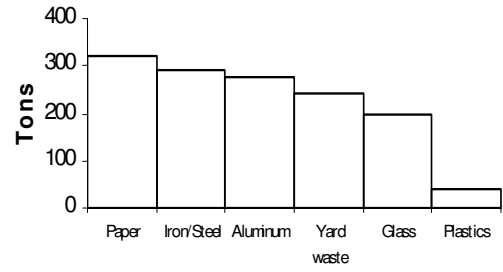


Chapter 2 - Frequency Distributions and Graphs

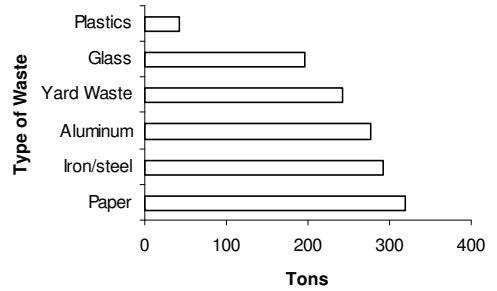
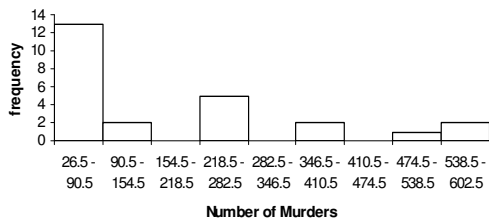
22.

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	<u>2</u>
		25

24.

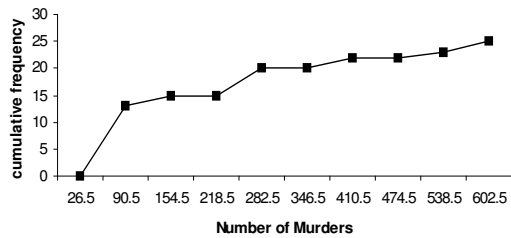
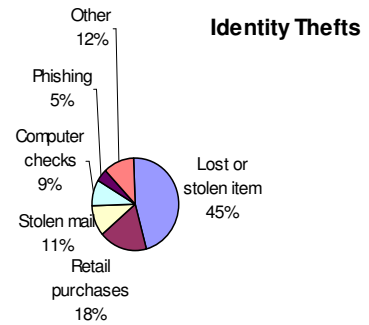
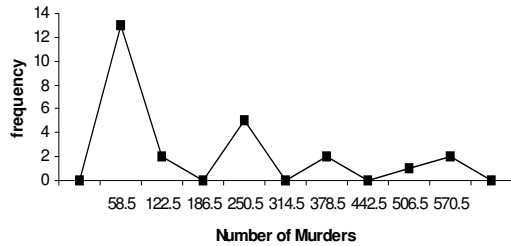


23.

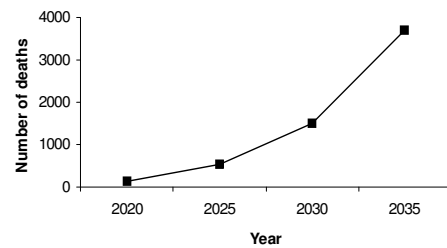


The distribution is positively skewed with one more than half of the data values in the lowest class.

25.



26.

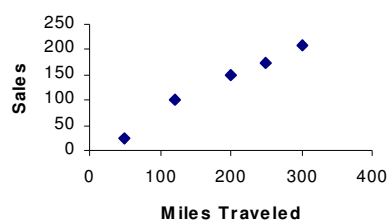


Chapter 2 - Frequency Distributions and Graphs

27.

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				

28.



There appears to be a positive linear relationship between the number of miles traveled and the sales (in hundreds of dollars) of a sales representative.