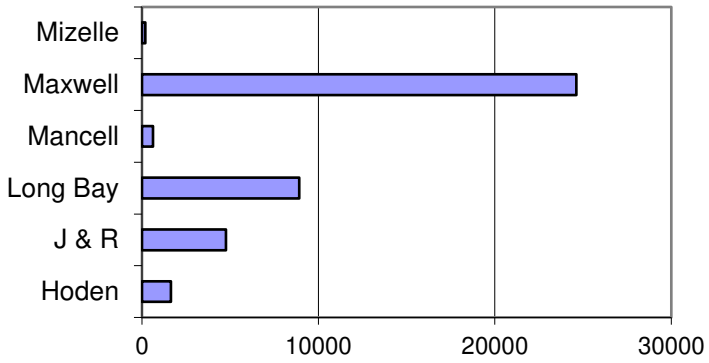
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SKU: 9781259268939-SOLUTIONS

CHAPTER 2

DESCRIBING DATA: FREQUENCY DISTRIBUTIONS AND GRAPHIC PRESENTATION

1. Maxwell Heating & Air Conditioning far exceeds the other corporations in sales. Mancell Electric & Plumbing and Mizelle Roofing & Sheet Metals are the two corporations with the least amount of fourth quarter sales.

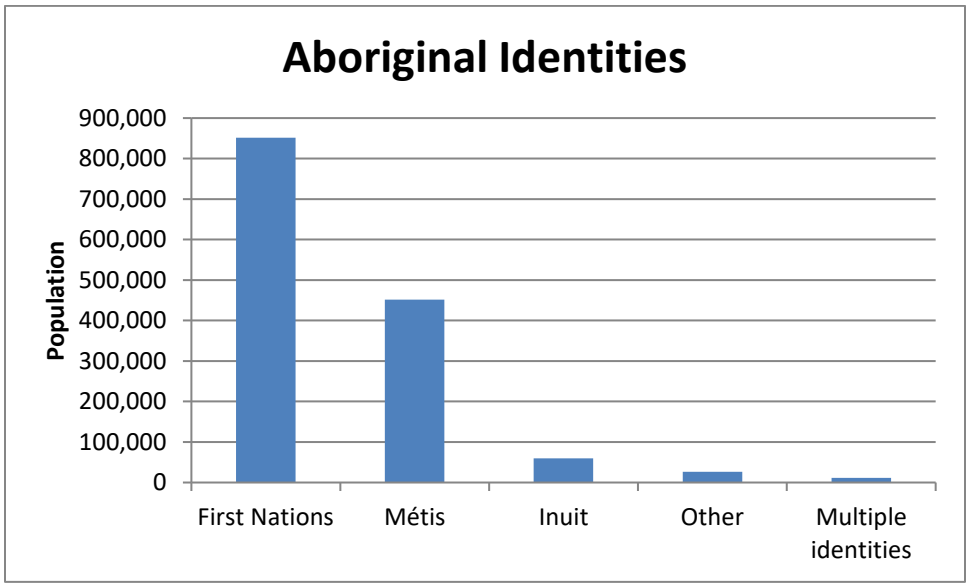


Maxwell has the highest sales, and Mizelle the lowest. **(LO2-2)**

2. Three classes are needed, one for each player. **(LO2-1)**

3. There are four classes: winter, spring, summer, and fall.
The relative frequencies are 0.1, 0.3, 0.4, and 0.2, respectively. **(LO2-1)**

4. a.



(LO2-2)

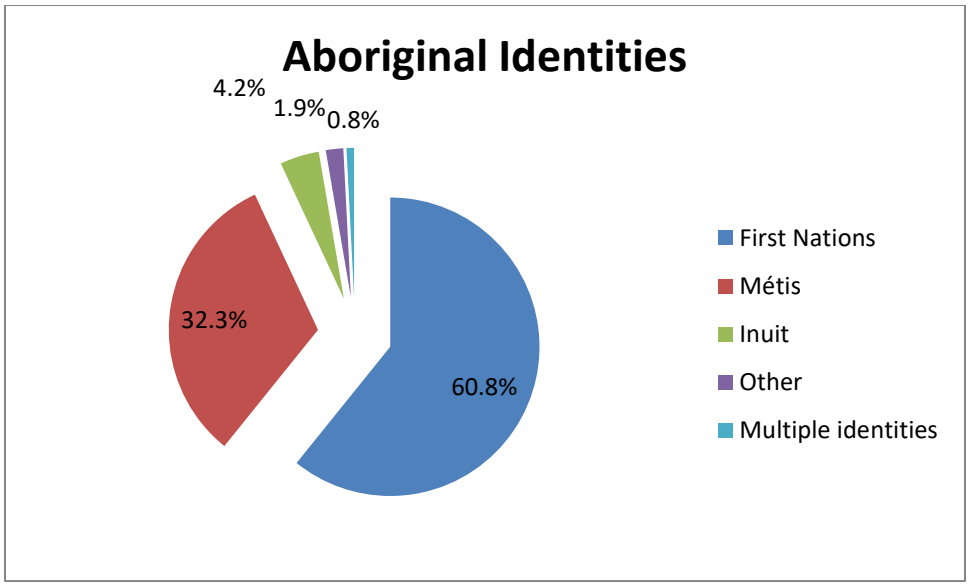
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b.

Aboriginal Identity	Number	Relative Frequency	Percent
First Nations	851 560	0.608	60.8
Métis	451 795	0.323	32.3
Inuit	59 445	0.042	4.2
Other	26 475	0.019	1.9
Multiple identities	11 415	0.008	0.8

(LO2-1)

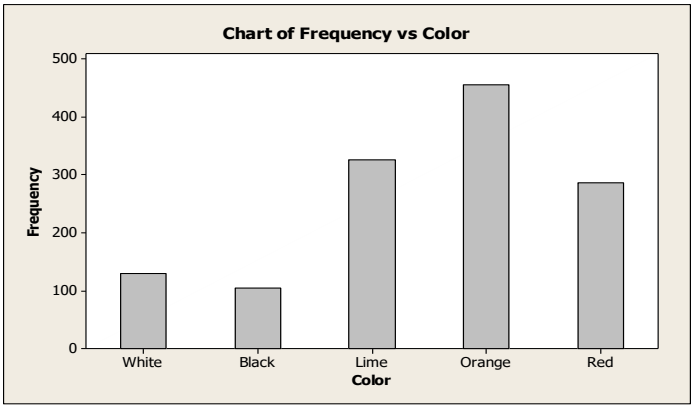
c.



(LO2-2)

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5. a.



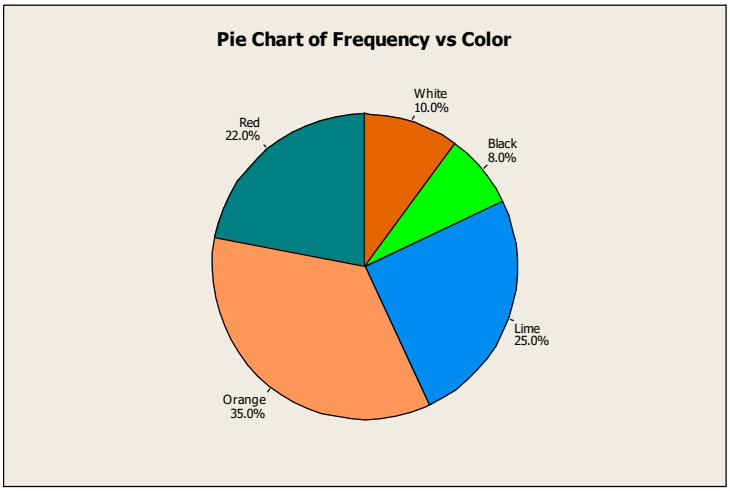
(LO2-2)

b.

Type	Number	Relative Frequencies
Bright white	130	0.10
Metallic black	104	0.08
Magnetic lime	325	0.25
Tangerine orange	455	0.35
Fusion red	286	0.22
Total	1300	1.00 **(LO2-1)**

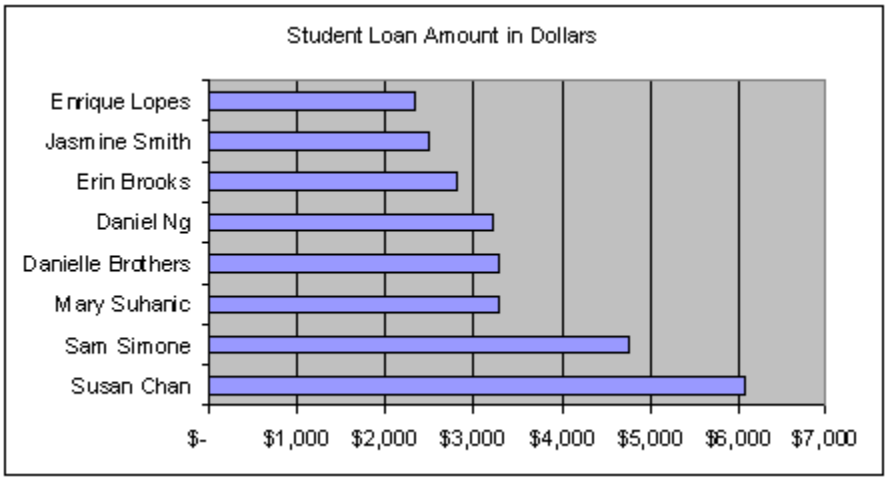
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c.



(LO2-2)

6. Student loan amounts for 2014. Susan Chan's loan is the largest.



(LO2-2)

7. $2^5 = 32,\ 2^6 = 64$; therefore 6 classes **(LO2-3)**

8. $2^5 = 32,\ 2^6 = 64$ suggests 6 classes. $i \geq \dfrac{\$29 - \$0}{6} = 4.83$ Use interval of 5. **(LO2-3)**

9. $2^7 = 128,\ 2^8 = 256$ suggests 8 classes $i \geq \dfrac{567 - 235}{8} = 41.5$. Use interval of 42 or 45. **(LO2-3)**

10. a. $2^5 = 32,\ 2^6 = 64$ suggests 6 classes.

    b. $i \geq \dfrac{129 - 42}{6} = 14.5$ Use interval of 15 and start first class at 40. **(LO2-3)**

11. a. $2^4 = 16$ suggests 5 classes
    b. (31-25)/5 = 6/5 = 1.2 Use interval of 1.5
    c. 24

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d.

Units	*f*	**Relative frequency**
24 to under 25.5	2	0.125
25.5 to under 27	4	0.250
27 to under28.5	8	0.500
28.5 to under 30	0	0.000
30 to under 31.5	2	0.125
Total	16	1.000

e. The largest concentration is in the 27 up to 28.5 class (8). **(LO2-3)**

12. a. $2^4 = 16$, $2^5 = 32$, suggest 5 classes
b. 47/5 = 9.4 Use interval of 10.
c. 50
d.

	f	Relative frequency
50 to under 60	4	0.20
60 to under 70	5	0.25
70 to under 80	6	0.30
80 to under 90	2	0.10
90 to under 100	3	0.15
Total	20	1.00

e. The fewest number is about 50, the highest about 100. The greatest concentration is in classes 60 up to 70 and 70 up to 80. **(LO2-3)**

13. a.

Shoppers	*f*
0 to under 3	9
3 to under 6	21
6 to under 9	13
9 to under 12	4
12 to under 15	3
15 to under 18	1
Total	51

b. The largest group of shopper's (21) shop at BiLo Supermarket 3, 4 or 5 times during a month and only one customer visits the store as many as 15 times in a month.
c.

Number of Shoppers	*Relative Frequency*
0 to under 3	0.1765
3 to under 6	0.41180
6 to under 9	0.2549
9 to under 12	0.0784
12 to under 15	0.0588
15 to under 18	0.1960
Total	1.0000

(LO2-3)

14. a. An interval of 10 is more convenient to work with. The distribution using 10 is:

	f
15 to under 25	1
25 to under 35	2
35 to under 45	5
45 to under 55	10
55 to under 65	15
65 to under 75	4
75 to under 85	3

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	Total	40

b. Data tends to cluster in classes 45 up to 55 and 55 up to 65.

c. Based on the distribution, the least spent is $15 (actually $18 from the raw data). The most spent was less than $85. The largest concentration of spending is between $45 up to $65.

d.

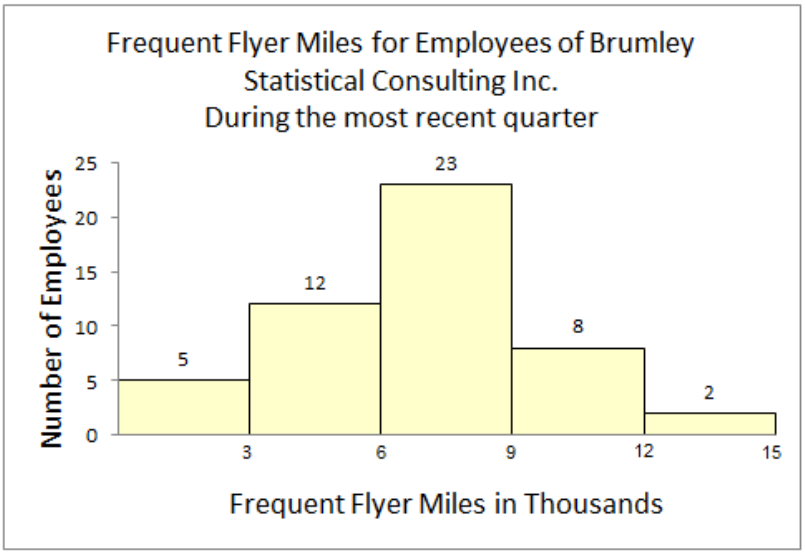
$ Spent	*Relative Frequency*
15 to under 25	0.025
25 to under 35	0.050
35 to under 45	0.125
45 to under 55	0.250
55 to under 65	0.375
65 to under 75	0.100
75 to under 85	0.075
Total	1.000

(LO2-3)

15. a. Histogram
b. 100
c. 5
d. 28
e. 0.28
f. 12.5
g. 13 **(LO2-4)**

16. a. 3
b. approximately 27
c. 84
d. 2
e. frequency polygon **(LO2-4)**

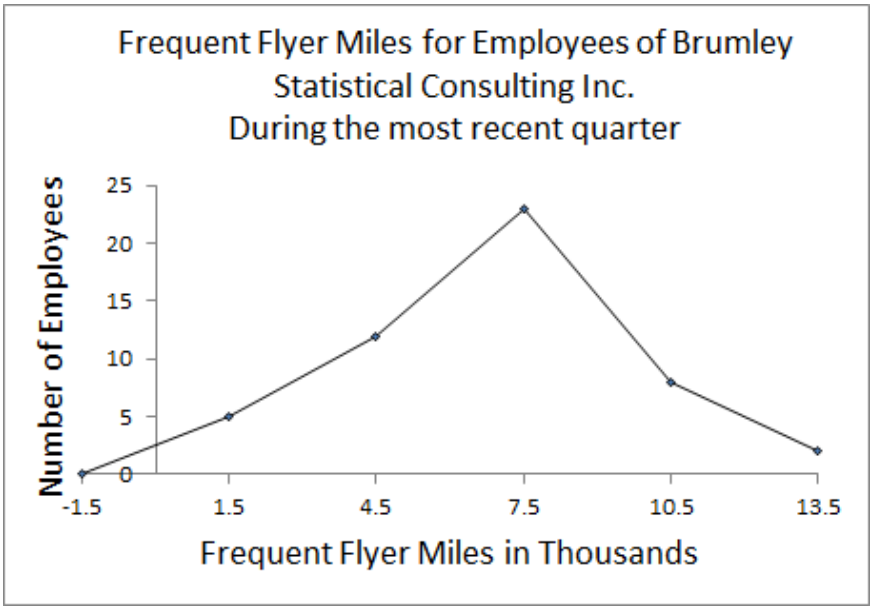
17. a. 50
b. 1.5 thousands or 1500 miles
c. Using lower limits on the X-axis



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d. 1.5, 5

e.



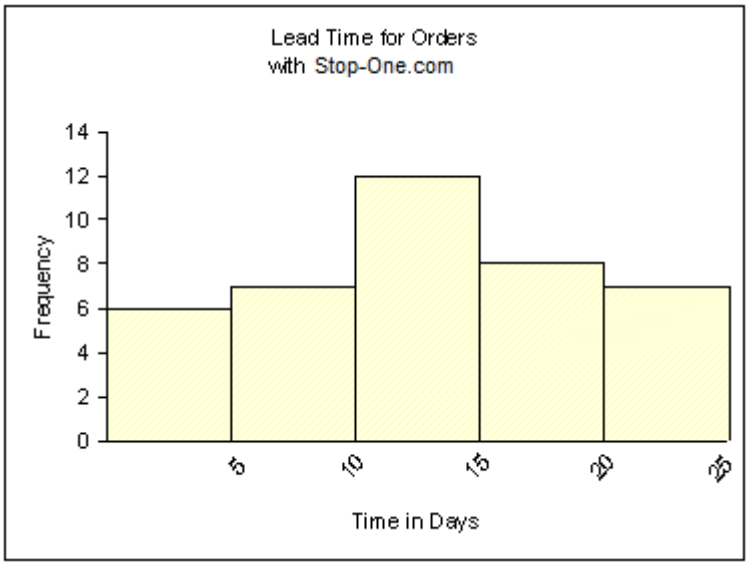
f. Most between 6000-9000, even spread on both sides **(LO2-4)**

18. a. 40

b. 2.5

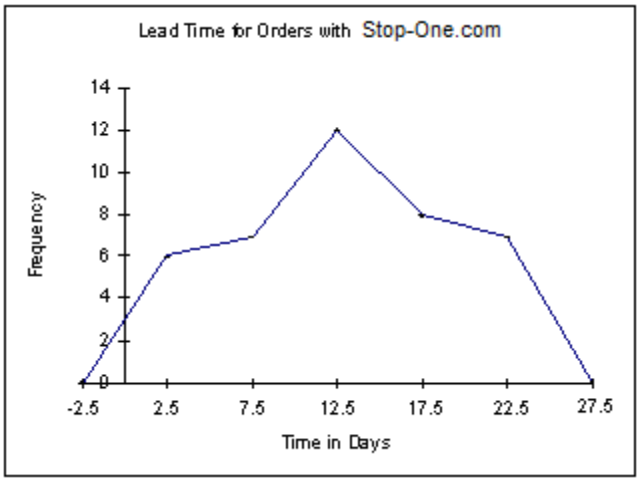
c. 2.5, 6 (always draw a frequency polygon using the midpoints)

d.



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e.



f. Most orders take around 10-15 days. **(LO2-4)**

19. a. 40
b. 5
c. 11 or 12
d. about $18 per hour
e. about $9 per hour
f. about 75% **(LO2-5)**

20. a. 200
b. 50 or $50,000
c. approximately $175,000
d. about $240,000
e. about 60 homes
f. about 130 homes **(LO2-5)**

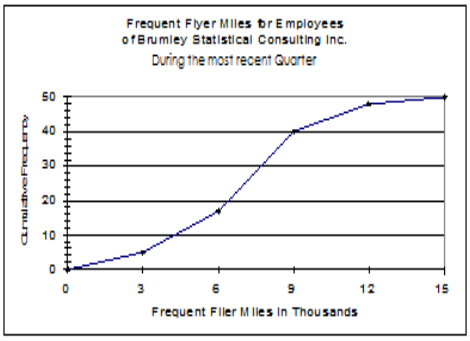
21. a. 5

b.

Miles	*f*	*Cumulative Frequency Less than*
0 to under 3	5	5
3 to under 6	12	17
6 to under 9	23	40
9 to under 12	8	48
12 to under 15	2	50

c.

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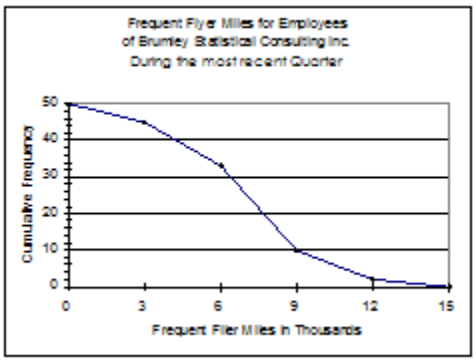


d. about 8500 miles **(LO2-5)**

22. a.

Miles	*f*	*More than*
0 to under 3	5	50
3 to under 6	12	45
6 to under 9	23	33
9 to under 12	8	10
12 to under 15	2	2

b.



c. about 7500 miles **(LO2-5)**

23. a. 13, 25

b.

Lead Time	*f*	*Cumulative Frequency Less than*
0 to under 5	6	6
5 to under 10	7	13
10 to under 15	12	25
15 to under 20	8	33
20 to under 25	7	40

c.

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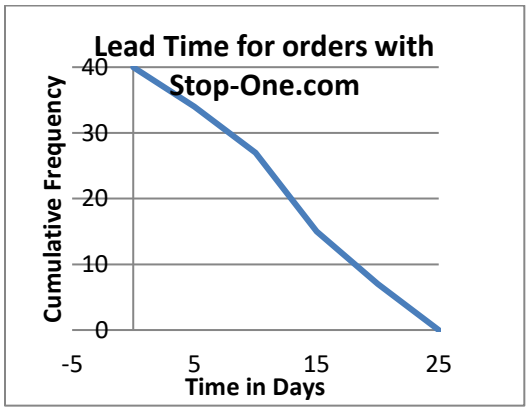


d. About 14 days **(LO2-5)**

24. a.

Lead Time	*f*	*More than*
0 to under 5	6	40
5 to under 10	7	34
10 to under 15	12	27
15 to under 20	8	15
20 to under 25	7	7

b.



c. About 18 days **(LO2-5)**

25. a. 621 to 629
b. 5
c. 621, 623, 623, 627, 629 **(LO2-8)**

26. a. 210 - 219
b. 6
c. 210, 211, 213, 215, 217, 219 **(LO2-8)**

27. a. 25
b. 1

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c. 38, 106
d. 60, 61, 63, 63, 65, 65, 69
e. No values
f. 9
g. 9
h. 76
i. 16 **(LO2-8)**

28. a. 50
b. one
c. 270, 126
d. 155, 158, 159
e. No values
f. 13
g. 12
h. 193.5
i. 19 **(LO2-8)**

29.

Stem	Leaves
0	5
1	28
2	
3	0024789
4	12366
5	2

There were a total of 16 calls studied. The number of calls ranged from 5 to 52 received. Typical was 30-39 calls, smallest was 5, largest was 52 **(LO2-8)**

30.

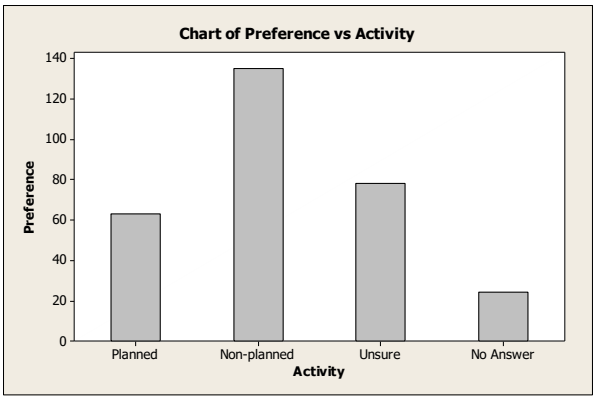
Stem	Leaves
3	6
4	7
5	22499
6	0113458
7	035678
8	0344447
9	055

The daily usage ranged from 36 to 95. In a typical day the ATM is typically used between 52-87 times, smallest was 36, largest was 95; clustered between 52-87 times **(LO2-8)**

31. a. Qualitative variables are ordinarily nominal level of measurement, but some are ordinal. Quantitative variables are commonly of interval or ratio level of measurement.
b. Yes, both types depict samples and populations. **(LO2-1&3)**

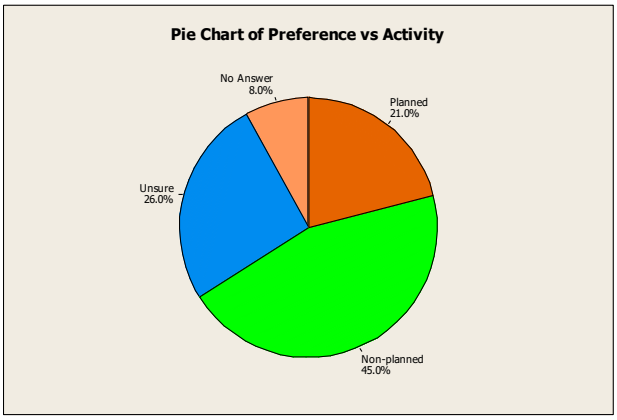
32. a.

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(LO2-2)

b.



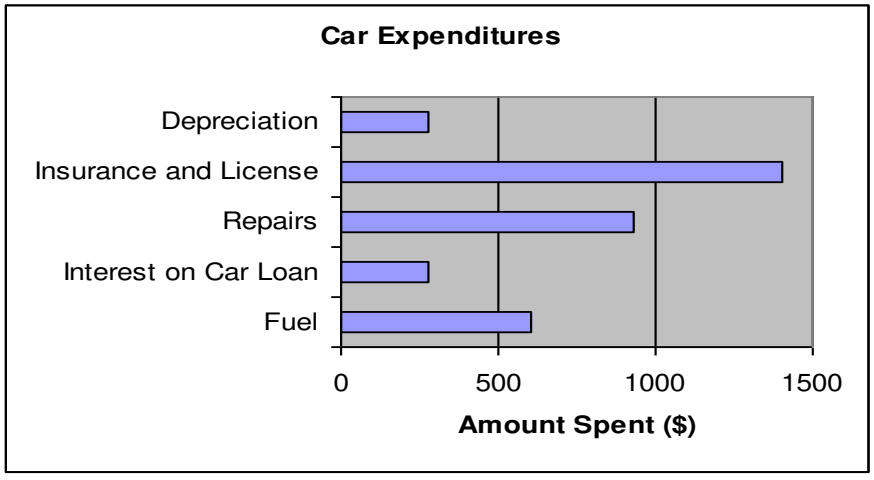
(LO 2-2)

c. Both are readable, but the pie chart may be easier to comprehend. **(LO2-2)**

33. $2^6 = 64$ and $2^7 = 128$ suggest 7 classes **(LO2-3)**

34. $2^7 = 128$, $2^8 = 256$ suggests 8 classes. $i \geq \dfrac{490 - 56}{8} = 54.25$ Use interval of 55. **(LO2-3)**

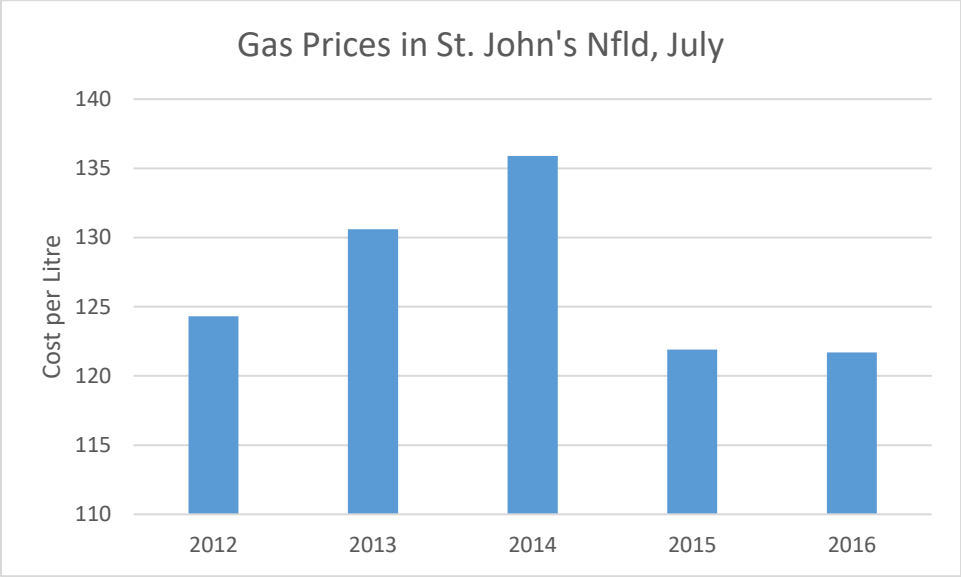
35.



A pie chart is also acceptable. From the graph we can see that insurance and license fees are the highest expense at close to $1500 per year. **(LO2-2)**

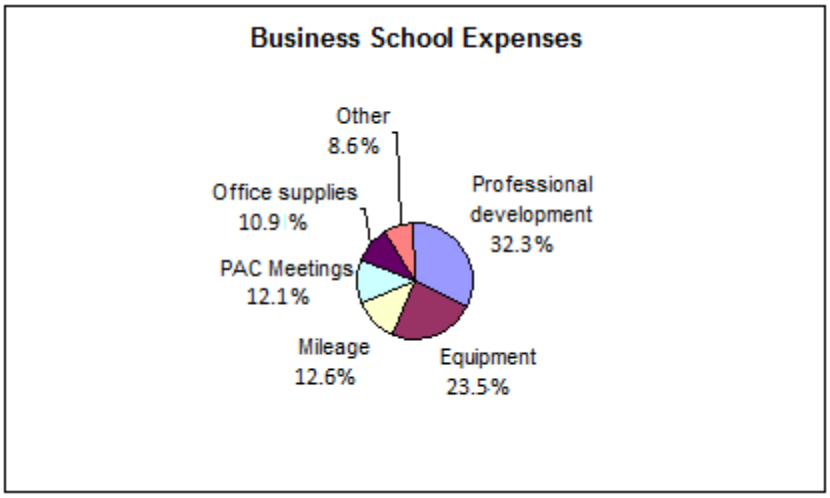
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36.



(LO2-2)

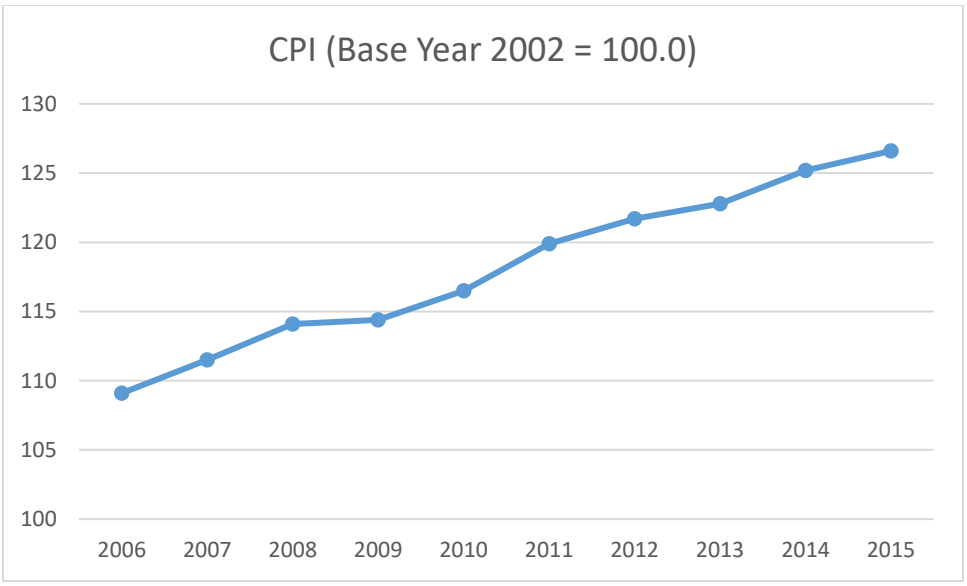
37.



Professional development is the largest expense. **(LO2-2)**

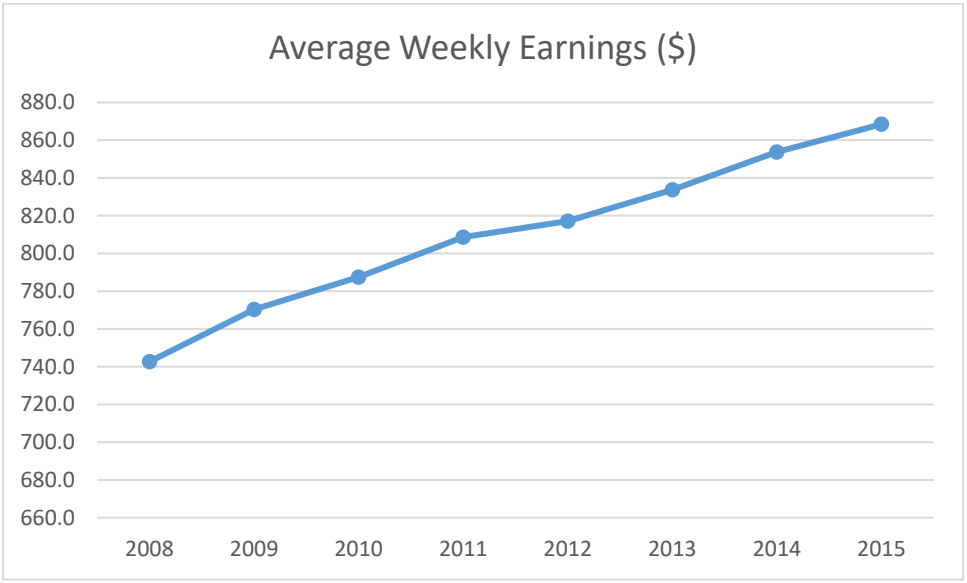
38.

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(LO 2-2)

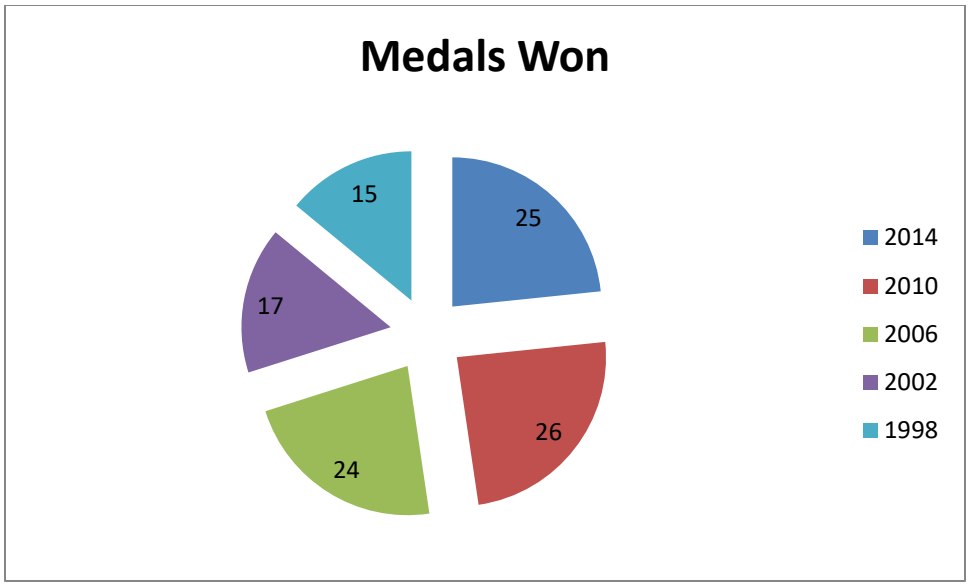
39.



(LO2-2)

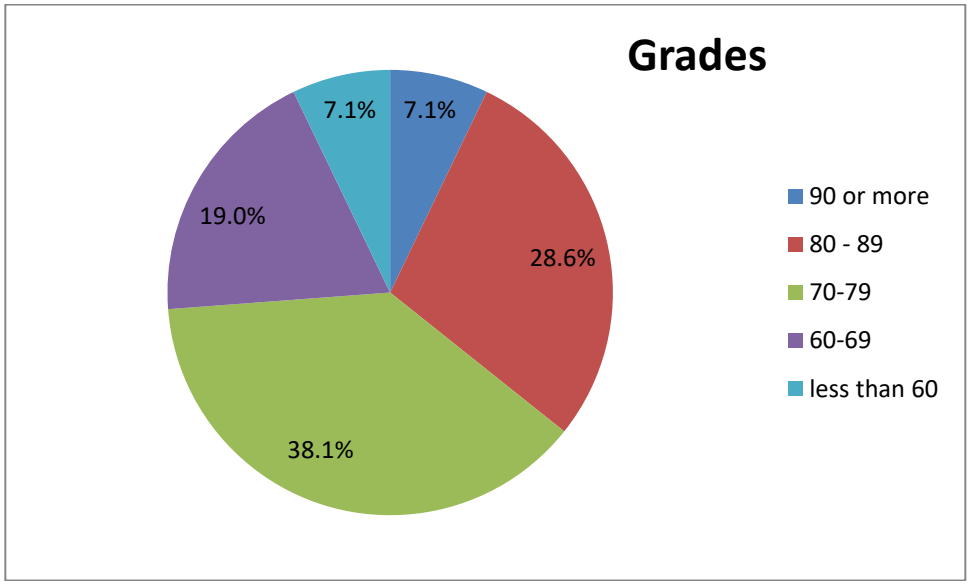
40. Canada won the most medals in 2010 at 26, but 2014 is a very close second with 25 medals won.

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(LO 2-2)

41.



The largest group had grades between 70 and 79 (38.1%). Three students (7.1%) had grades at 90 or more and 3 students (7.1%) had grades less than 60. **(LO 2-2)**

42.

Class	Frequency
0 to under 200	19
200 to under 400	1
400 to under 600	4
600 to under 800	1
800 to under 1000	2

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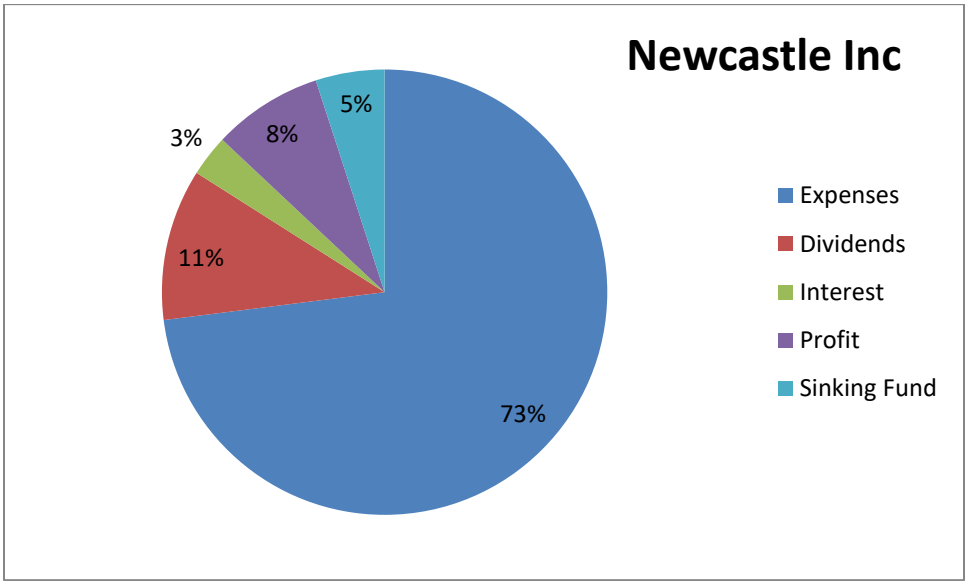
This distribution is skewed with a large number of observations in the first class. Notice that the top 19 tunes account for 1318 plays out of a total of 5958 or about 70% of all plays. **(LO2-3)**

43.

City	Frequency	Relative Frequency
Vancouver	100	0.05
Calgary	450	0.225
Edmonton	1300	0.65
Saskatoon	150	0.075
	2000	

The preference among frequent business travelers is definitely Edmonton (65%). The least preferred is Vancouver (5%). **(LO 2-3)**

44.



By far the largest part of sales revenue goes towards operating expenses. **(LO2-2)**

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45. a. 5 because $2^4 = 16 < 25$ and $2^5 = 32 > 25$

b. $i \geq \dfrac{48-16}{5} = 6.4$ use interval of 7.

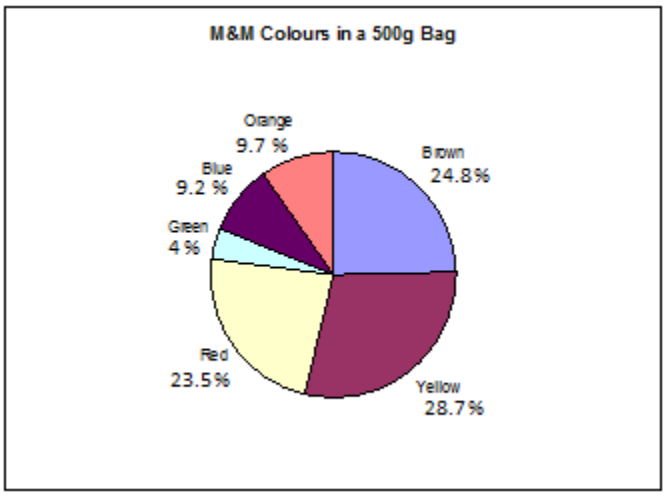
c. 15

d.

Class	*Frequency*
15 to under 22	3
22 to under 29	8
29 to under 36	7
36 to under 43	5
43 to under 50	2
	25

e. The values are clustered between 22 and 36. **(LO2-3)**

46. There will be many answers. The following pie chart shows the breakdown of the six colours. About 77% of the candies are either brown, yellow or red. Each of these colours represents about 25% of the total. The percent of orange and blue is less than 10% each. About 4% of the candies are green.



(LO2-2)

47. a. 70
b. 1
c. 0, 145
d. 30, 30, 32, 39
e. 24
f. 21
g. 77.5
h. 25 **(LO2-6)**

48. a. 6 because $2^5 = 32 < 45$ and $2^6 = 64 > 45$

b. 90, found by $\dfrac{570-41}{6} = 88.17$

c. 40

d.

Class	*Frequency*

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40 to under 130	6
130 to under 220	10
220 to under 310	17
310 to under 400	8
400 to under 490	3
490 to under 580	1
	45

(LO2-4)

49. a. $36.60, (found by 265 – 82)/5

b. approx $40

c.

$80 to under $120	8
120 to under 160	19
160 to under 200	10
200 to under 240	6
240 to under 280	1
Total	44

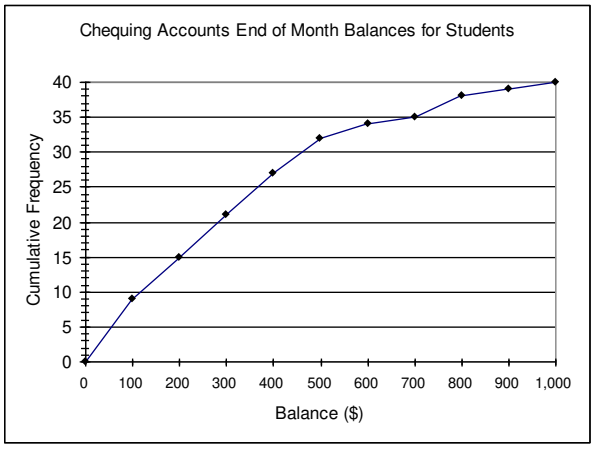
d. The purchases ranged from a low of about $80 to a high of about $280. The concentration is in the $120 to under $160 class. **(LO2-3)**

50. a. ***Student Chequing Accounts End of Month Balances***

Balance	*f*	*CF*
0 to under 100	9	9
100 to under 200	6	15
200 to under 300	6	21
300 to under 400	6	27
400 to under 500	5	32
500 to under 600	2	34
600 to under 700	1	35
700 to under 800	3	38
800 to under 900	1	39
900 to under 1000	1	40
Total	40	

Probably a class interval of $200 would be better.

b.



c. About 67% have less than a $400 balance. Therefore, about 33% would be considered "preferred."

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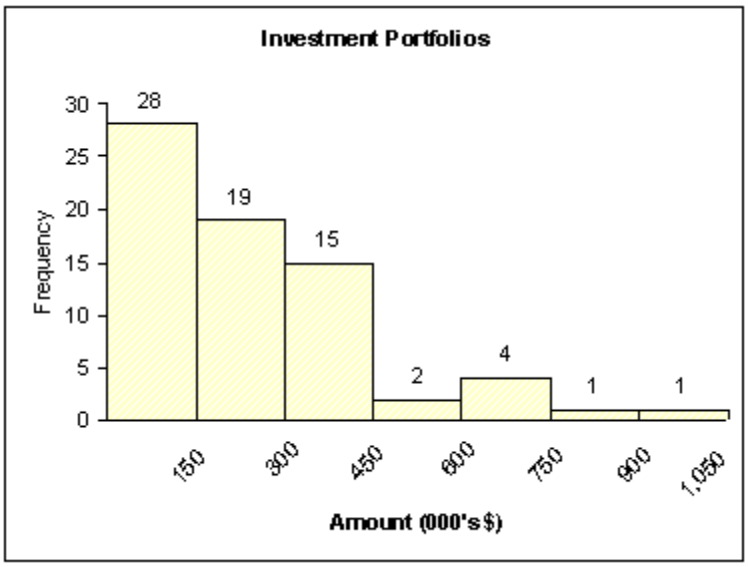
d. Approx $50 would be a convenient cutoff point. **(LO2-3)**

51. a. Since $2^6 = 64 < 70 < 128 = 2^7$, 7 classes are recommended. The interval should be at least (1002.2 – 3.3)/7 = 142.7; use 150 as a convenient value.

Investment Portfolios

lower		*upper*	*midpoint*	*width*	*frequency*	*percent*	*cumulative frequency*	*cumulative percent*
0	<	150	75	150	28	40.0	28	40.0
150	<	300	225	150	19	27.1	47	67.1
300	<	450	375	150	15	21.4	62	88.6
450	<	600	525	150	2	2.9	64	91.4
600	<	750	675	150	4	5.7	68	97.1
750	<	900	825	150	1	1.4	69	98.6
900	<	1,050	975	150	1	1.4	70	100.0
					70	100.0		

b.



There will be many answers for the interpretation. **(LO2-3&4)**

52. a. less-than frequency diagram or ogive
b. 250
c. 50 (found by 100 – 50)
d. approx $240,000
e. approx $230,000 **(LO2-5)**

53. a. 2^5 = 32 <36 < 64 = 2^6. Thus 6 classes are recommended.
b. The interval width should be at least 2, found by (15-3) /6. Use 2.2 for convenience and to ensure there are only 6 classes
c. 2.2
d.

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Class	Frequency
2.2 to under 4.4	2
4.4 to under 6.6	7
6.6 to under 8.8	11
8.8to under 11	7
11 to under 13.2	7
13.2 to under 15.4	2

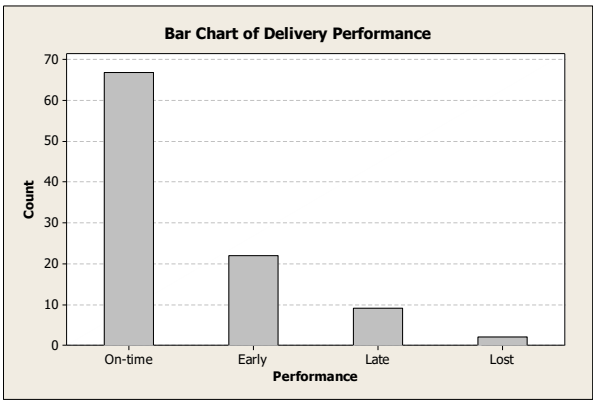
e. The distribution is slightly right-skewed with the largest concentration in the class of 6.6 up to 8.8. **(LO2-3)**

54. a. ordinal and qualitative.

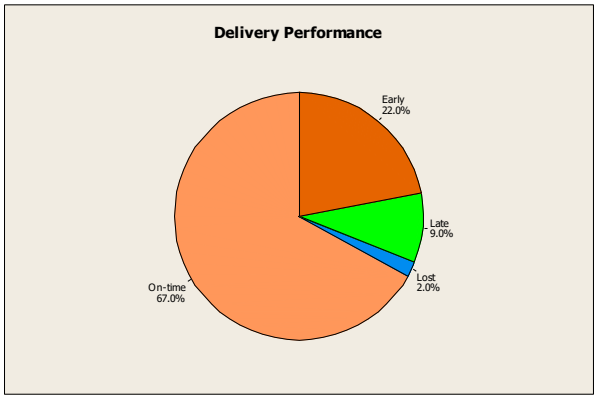
b.

Performance	Relative Frequency
Early	.22
On-time	.67
Late	.09
Lost	.02

c.



d.



e. 89% of the packages are either early or on-time and 2% of the packages are lost. So they are missing both of their objectives. They must eliminate all lost packages and reduce the late percentage to below 1%. **(LO2-1&2)**

55. a. $2^5 = 32 < 33 < 64 = 2^6$. Thus 6 classes are recommended.

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b. The interval width should be at least 1253, found by (7829-312) /6. Use 1500 for simplicity.

c. 0

d.

Class	Frequency
0 to under 1500	1
1500 to under 3000	2
3000 to under 4500	0
4500 to under 6000	7
6000 to under 7500	20
7500 to under 9000	3

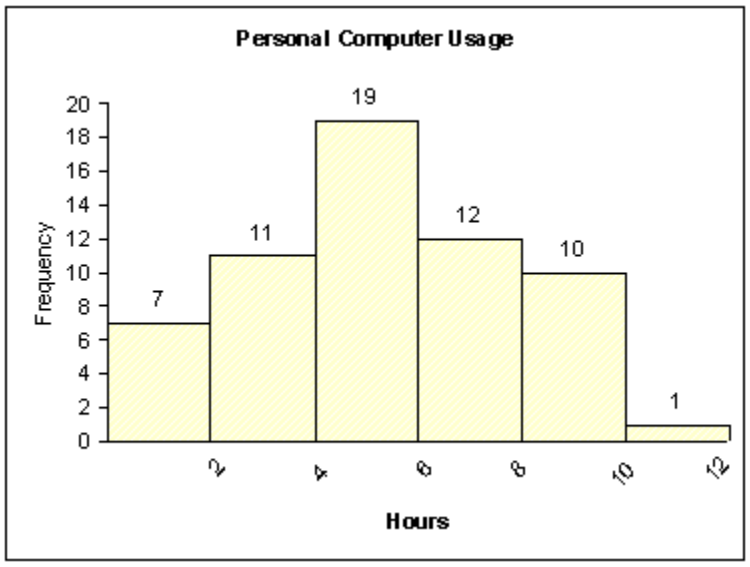
e. This distribution is skewed with a few very small values which likely correspond to the "start up" phase of this publication. Most observations fall in the 6000 up to 7500 class which contains 20 of the 33 (60.6%) months. **(LO 2-3)**

56. a. Since $2^5 = 32$, $2^6 = 64$, and $60 < 64$, 6 classes are recommended. The interval should be at least $(10.1 - 0.4)/6 = 1.6$. So we will use 2 as a convenient value.

Personal Computer Usage (Hours)							*cumulative*	
Lower		*upper*	*midpoint*	*width*	*frequency*	*percent*	*Frequency*	*percent*
0	<	2	1	2	7	11.7	7	11.7
2	<	4	3	2	11	18.3	18	30.0
4	<	6	5	2	19	31.7	37	61.7
6	<	8	7	2	12	20.0	49	81.7
8	<	10	9	2	10	16.7	59	98.3
10	<	12	11	2	1	1.7	60	100.0
					60	100.0		

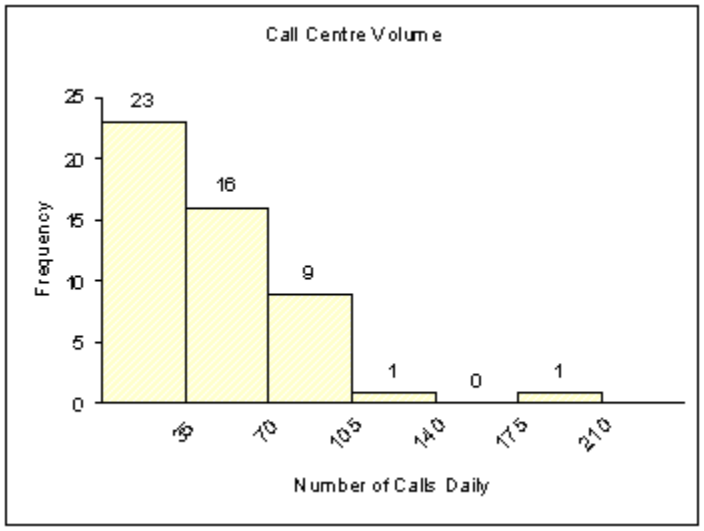
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b.



Interpretations will vary. The "typical" person used the computer about 5 hours per week and most of them are within about five hours. **(LO2-3&4)**

57. There are 50 observations so the recommended number of classes is 6.



Twenty-three of the 50 days, or 46%, have fewer than 35 calls waiting. There are two days that have more than 105 calls waiting. **(LO2-3&4)**

58.
a. 55
b. two
c. 91, 237
d. 141, 143, 145
e. 8
f. 12

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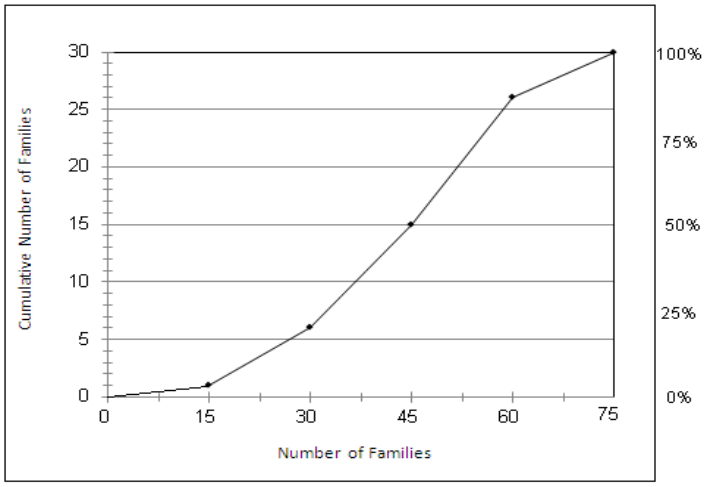
g. three
h. 180 **(LO2-6)**

59. a. 56
b. 10 (found by 60 – 50)
c. 55
d. 17 **(LO2-4)**

60. a.

Class	Cumulative Frequency
Less than 15	1
Less than 30	6
Less than 45	15
Less than 60	26
Less than 75	30

b.

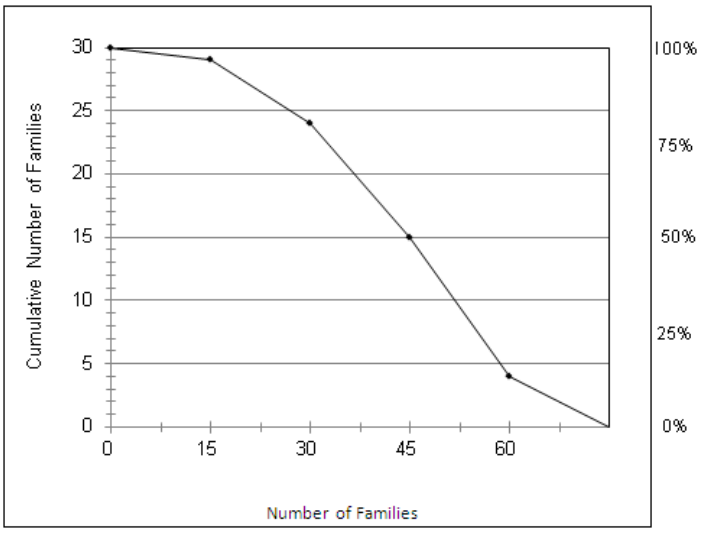


c. 6 days saw fewer than 30 and 11 days saw fewer than 40.
d. The highest 80% of the days had at least 30 families.
e.

Class	Cumulative Frequency
More than 0	30
More than 15	29
More than 30	24
More than 45	15
More than 60	4
More than 75	0

f.

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g. About 27; about 12 **(LO 2-3&5)**

61. a. 2^5 = 32 <45 < 64 = 2^6. Thus 6 classes are recommended.
b. The interval width should be at least 1.5, found by (10-1) /6. Use 2 for simplicity.
c. 0
d.

Class	Frequency
0 to under 2	1
2 to under 4	5
4 to under 6	12
6 to under 8	17
8 to under 10	8
10 to under 12	2

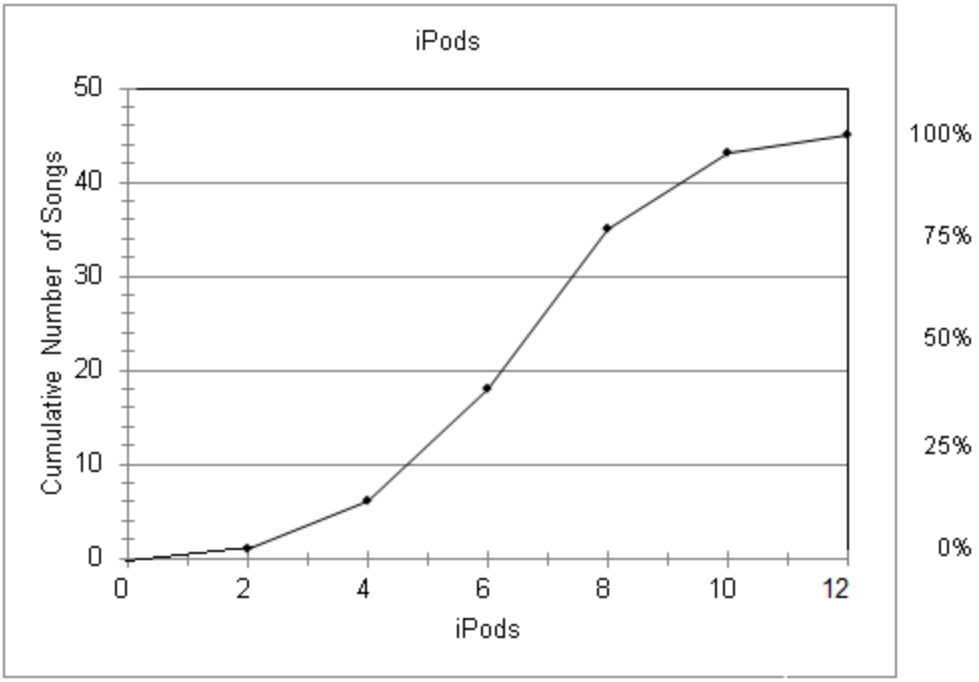
The distribution is fairly symmetric or "bell-shaped" with a large peak in the middle two classes of 4 up to 8.

e.

Class	Frequency
Less than 2	1
Less than 4	6
Less than 6	18
Less than 8	35
Less than 10	43
Less than 12	45

f.

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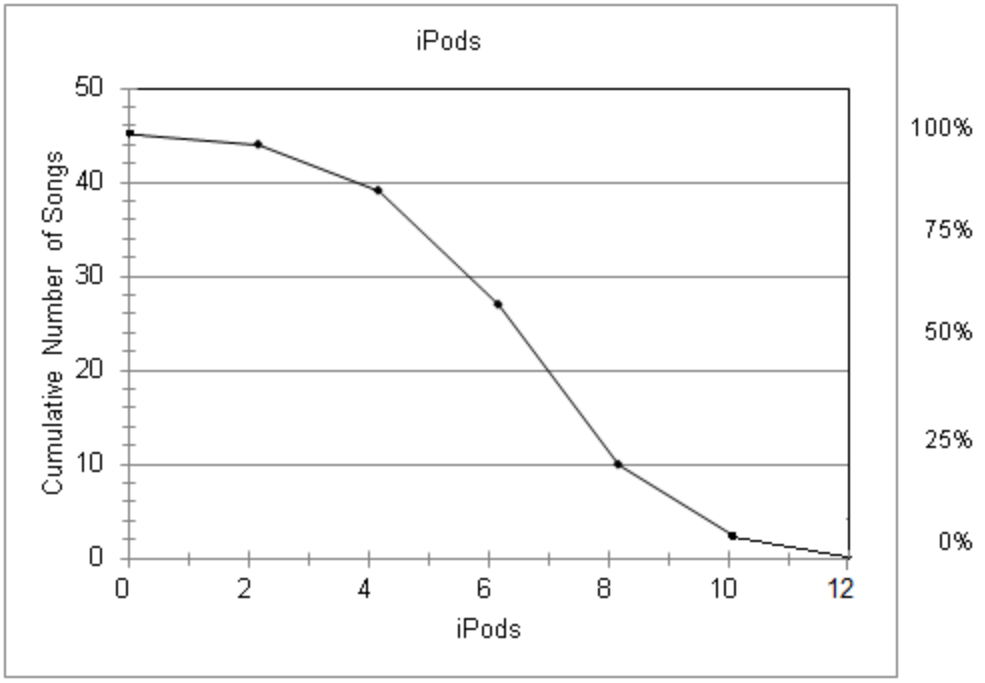
g. About 28

h.

Class	Frequency
More than 0	45
More than 2	44
More than 4	39
More than 6	27
More than 8	10
More than 10	2
More than 12	0

i.

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j. About 32 **(LO 2-3&5)**

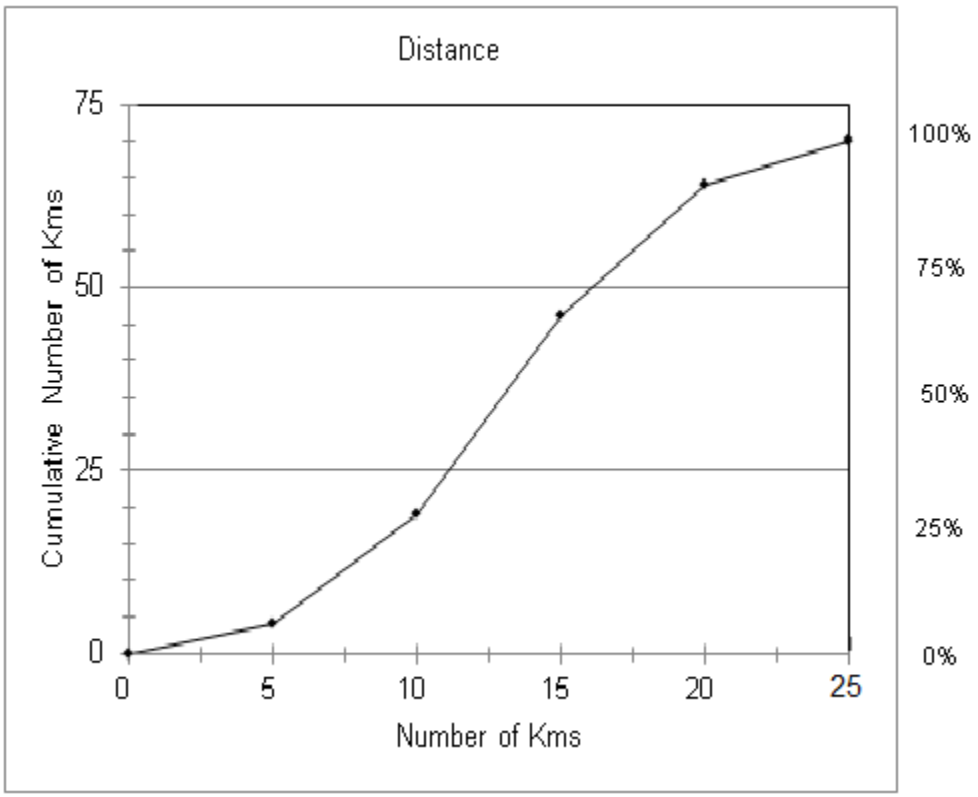
62. a. approximately 180
b. 400
c. 23/180 = .128
d. (32+19)/180 = .283 = 28.3%
e. 2000,45 **(LO2-4)**

63. a.

	cumulative frequency
Less than 5	4
Less than 10	19
Less than 15	46
Less than 20	64
Less than 25	70

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b.



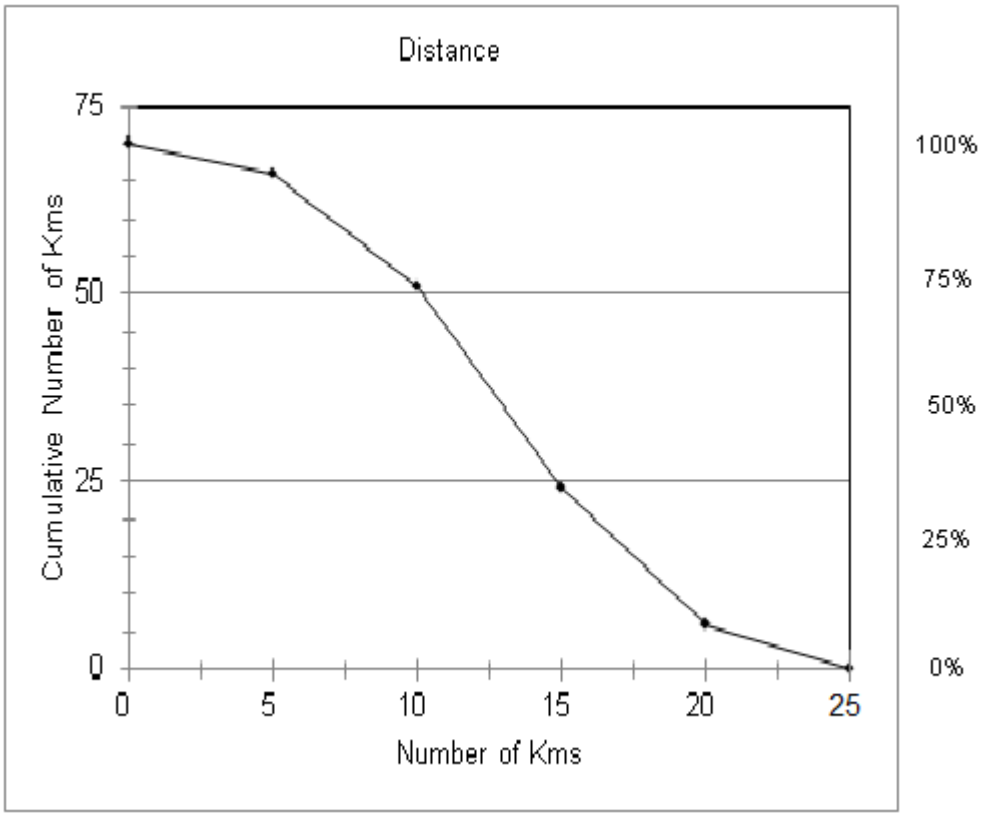
c. About 30; about 60

d.

	cumulative frequency
More than 0	70
More than 5	66
More than 10	51
More than 15	24
More than 20	6
More than 25	0

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e.



f. About 25% **(LO 2-5)**

64. Answers will vary depending on how the data is organized. One possible frequency distribution created using MegaStat is:

a.

n = 172 use 8 classes interval = (1338000-33000)/8 = 163125

Frequency Distribution – Quantitative

List Price							*cumulative*	
lower		*upper*	*midpoint*	*width*	*frequency*	*percent*	*frequency*	*percent*
0	<	200,000	100,000	200,000	19	11.0	19	11.0
200,000	<	400,000	300,000	200,000	126	73.3	145	84.3
400,000	<	600,000	500,000	200,000	18	10.5	163	94.8
600,000	<	800,000	700,000	200,000	7	4.1	170	98.8
800,000	<	1,000,000	900,000	200,000	0	0.0	170	98.8

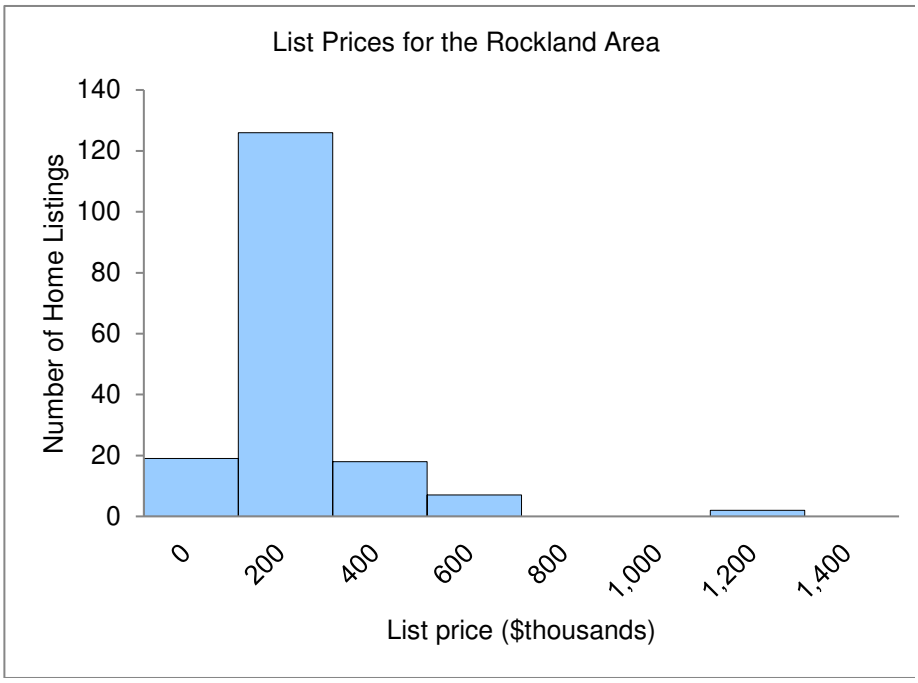
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1,000,000	<	1,200,000	1,100,000	200,000	0	0.0	170	98.8
1,200,000	<	1,400,000	1,300,000	200,000	2	1.2	172	100.0
					172	100.0		

1. the list prices are clustered in the 2nd class between $200 000 to under $400 000.

2. the list prices range from $0 to under $1 400 000.

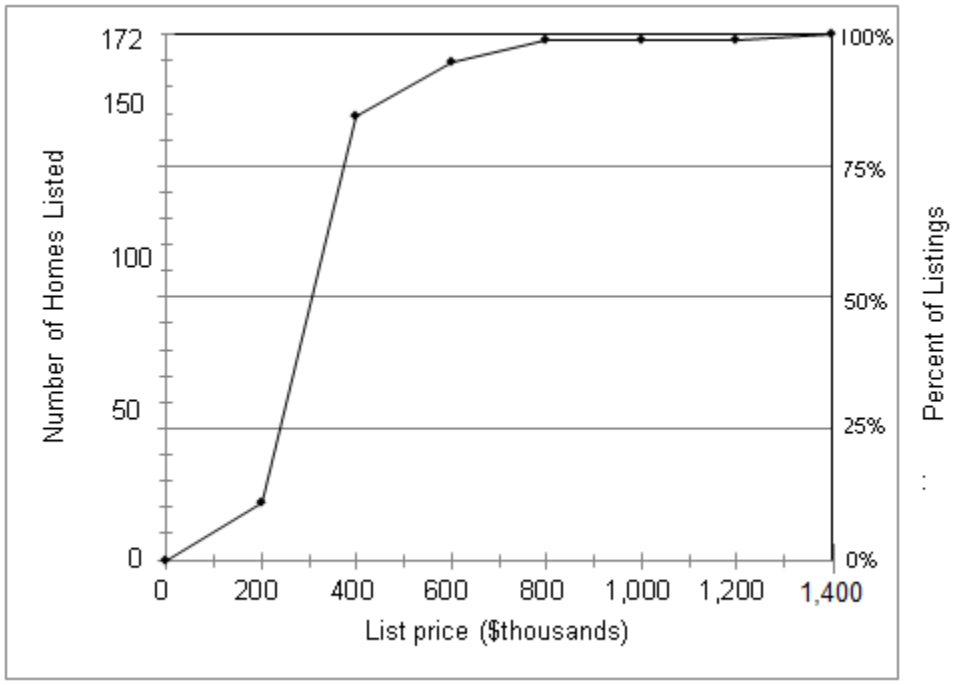
b.



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1. the list prices are clustered in the 2nd class between $200 000 to under $400 000.
2. the list prices range from $0 to under $1 400 000

c.



1. about 55 homes

2. about 88%.

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d.

Stem and Leaf plot for	List Price	
stem unit =	100000	
leaf unit =	10000	
Frequency	Stem	Leaf
4	0	3 4 4 6
15	1	4 6 8 8 8 8 8 8 9 9 9 9 9 9 9
62	2	0 0 0 0 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 5 5 6 6 6 6 6 6 6 6 6 6 6 6 7 8 8 8 8 8 9 9 9 9 9
64	3	0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 6 6 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 9 9 9 9
13	4	1 1 1 1 1 1 2 3 4 5 6 7 9
5	5	2 2 4 7 9
3	6	1 2 4
4	7	2 4 4 5
0	8	
0	9	
0	10	
0	11	
1	12	8
1	13	3

1. list prices are clustered between $200 000 and $390 000.

2. the smallest value is $30 000; the largest is $1 330 000.

(LO2-3,4,5&6)

65. **(LO 2-3,5&6)**

a.

min = 500

max = 5200 interval = (5200-500)/7 = 671

use 750 as the interval

Total Square Feet

lower		*upper*	frequency
0	<	750	11
750	<	1,500	48
1,500	<	2,250	18
2,250	<	3,000	8
3,000	<	3,750	6
3,750	<	4,500	2
4,500	<	5,250	5
			98

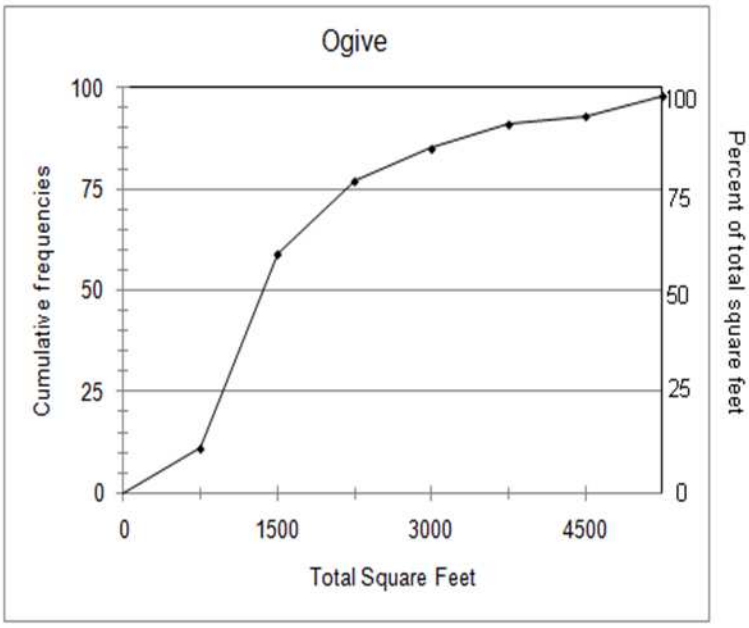
1. A typical size is from 750 to 1500. The range of the data is from about 0 to under 5250.

2. There are 7 values between 3750 and 5250 square feet. These values are much larger than the typical number of square feet.

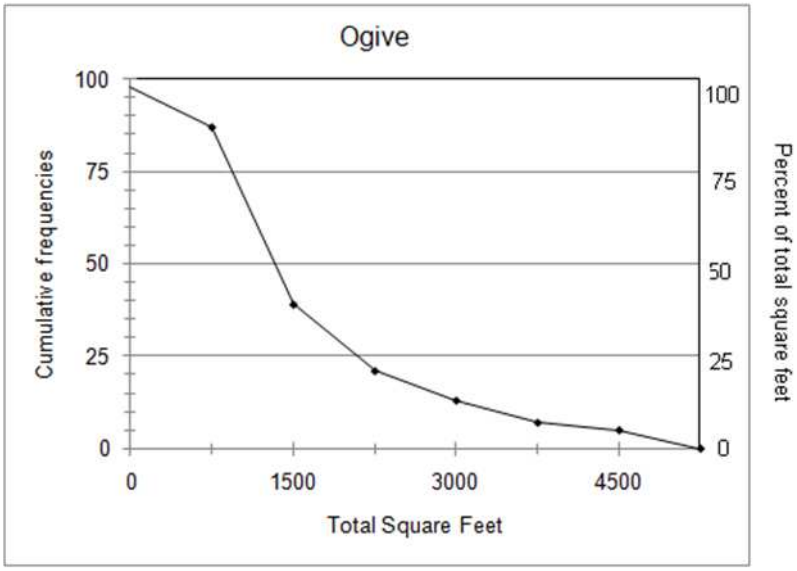
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b.

Total Square Feet					
Lower		*upper*	frequency	less-than	more-than
0	<	750	11	11	98
750	<	1,500	48	59	87
1,500	<	2,250	18	77	39
2,250	<	3,000	8	85	21
3,000	<	3,750	6	91	13
3,750	<	4,500	2	93	7
4,500	<	5,250	5	98	5



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1. less than 1500 Sq ft.
2. about 75
3. about 75%

c.

Stem and Leaf plot for List Price
stem unit = 1000000
leaf unit = 100000

Frequency	Stem	Leaf
88	0	1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 4
	0	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 6 6 6 6 6 7 7 7 7 7 7 8 9 9 9 9 9
9	1	1 3 3 3 4 5 5 5 8
1	2	4
98		

1. The values are clustered between $100 000 and $900 000.

2. Smallest value – 100000 Largest value - 2400000

3. There are 10 homes listed for more than $900000.

d.

Stem and Leaf plot for Total Square Feet
stem unit = 1000
leaf unit = 100

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Frequency	Stem	Leaf
19	0	5 5 5 5 6 6 7 7 7 7 7 7 7 8 8 8 8 9 9
53	1	0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 2 2 2 2 2
13	1	3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 4 5 5 6 6 6 6 6 6 6 7 8 9 9
6	2	1 1 1 1 1 2 2 2 3 4 4 5 8
4	3	0 2 2 3 5 6
3	4	0 3 7 8
98	5	0 2 2

1. The values are clustered between 1000 and 1900.

2. Smallest value – 500 Sq ft
   Largest value – 5200 Sq ft

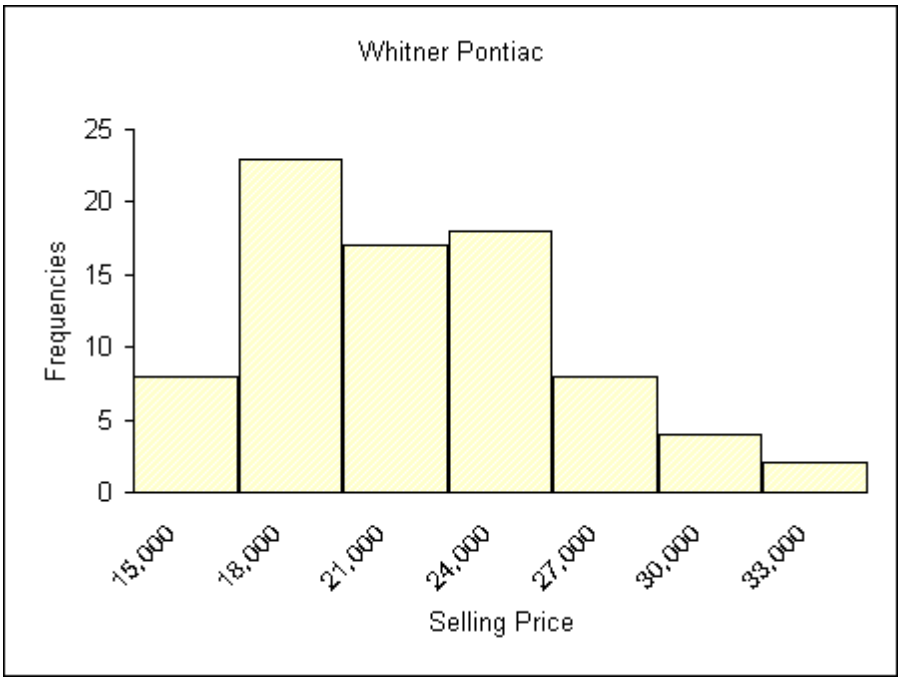
3. There are 6 homes with square footage more than 4000 sq ft.

CASE (LO2-4 & 2-6)

Answers may vary.

Price							*cumulative*	
lower		*upper*	*Midpoint*	*width*	*frequency*	*percent*	*frequency*	*percent*
15,000	<	18,000	16,500	3,000	8	10.0	8	10.0
18,000	<	21,000	19,500	3,000	23	28.8	31	38.8
21,000	<	24,000	22,500	3,000	17	21.3	48	60.0
24,000	<	27,000	25,500	3,000	18	22.5	66	82.5
27,000	<	30,000	28,500	3,000	8	10.0	74	92.5
30,000	<	33,000	31,500	3,000	4	5.0	78	97.5
33,000	<	36,000	34,500	3,000	2	2.5	80	100.0
					80	100.0		

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The selling prices range from about $15 000 to about $36 000. The selling prices are concentrated between $18 000 and $27 000. A total of 58, or 72.5%, of the vehicles sold within this range. The highest frequency is in the $18 000 to under $21 000 class. So we say that a typical selling price is $19 500. Eight vehicles sold for less than $18 000, and two sold for more than $33 000.

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