CHAPTER 3

3.1 (a) Excel output:

X	
Mean	6
Median	7
Mode	#N/A
Standard Deviation	2.915476
Sample Variance	8.5
Range	7
Minimum	2
Maximum	9
Sum	30
Count	5
First Quartile	3
Third Quartile	8.5
Interquartile Range	5.5
Coefficient of Variation	48.5913%

Mean = 6 Median = 7 There is no mode.

(b) Range = 7 Variance = 8.5

Standard deviation = 2.9 Coefficient of variation = (2.915/6)•100% = 48.6%

(c) Z scores: 0.343, -0.686, 1.029, 0.686, -1.372

None of the Z scores is larger than 3.0 or smaller than -3.0. There is no outlier.

(d) Since the mean is less than the median, the distribution is left-skewed.

3.2 (a) Excel output:

X	
Mean	7
Median	7
Mode	7
Standard Deviation	3.286335
Sample Variance	10.8
Range	9
Minimum	3
Maximum	12
Sum	42
Count	6
First Quartile	4
Third Quartile	9
Interquartile Range	5
Coefficient of Variation	46.9476%

Mean = 7 Median = 7 Mode = 7

(b) Range = 9 Variance = 10.8

Standard deviation = 3.286

Coefficient of variation = (3.286/7)•100% = 46.948%

3.2 cont. (c) Z scores: 0, -0.913, 0.609, 0, -1.217, 1.522
None of the Z scores is larger than 3.0 or smaller than -3.0. There is no outlier.
(d) Since the mean equals the median, the distribution is symmetrical.

3.3 (a) Excel output:

X	
Mean	6
Median	7
Mode	7
Standard Deviation	4
Sample Variance	16
Kurtosis	-0.34688
Minimum	0
Maximum	12
Sum	42
Count	7
First Quartile	3
Third Quartile	9
Interquartile Range	6
Coefficient of Variation	66.6667%

Mean = 6 Median = 7 Mode = 7
(b) Range = 12 Variance = 16 Standard deviation = 4
Coefficient of variation = (4/6)•100% = 66.67%
(c) Z scores: 1.5, 0.25, -0.5, 0.75, -1.5, 0.25, -0.75. There is no outlier.
(d) Since the mean is less than the median, the distribution is left-skewed.

3.4 Excel output:

X	
Mean	2
Median	7
Mode	7
Standard Deviation	7.874007874
Sample Variance	62
Range	17
Minimum	-8
Maximum	9
Sum	10
Count	5
First Quartile	-6.5
Third Quartile	8
Interquartile Range	14.5
Coefficient of Variation	393.7004%

(a) Mean = 2 Median = 7 Mode = 7

3.4 cont.

(b) Range = 17 Variance = 62

Standard deviation = 7.874 Coefficient of variation = (7.874/2)•100% = 393.7%

(c) Z scores: 0.635, -0.889, -1.270, 0.635, 0.889. No outliers.

(d) Since the mean is less than the median, the distribution is left-skewed.

3.5 $\bar{R}_G = \left[(1+0.1)(1+0.3)\right]^{1/2} - 1 = 19.58\%$

3.6 $\bar{R}_G = \left[(1+0.2)(1-0.3)\right]^{1/2} - 1 = -8.348\%$

3.7 Half of the *Saveur* readers have an income of no more than $163,108 while half of the **Saveur.com** readers have an income of no more than $84,548.

3.8 (a)

	Grade *X*	Grade *Y*
Mean	575	575.4
Median	575	575
Standard deviation	6.4	2.1

(b) If quality is measured by central tendency, Grade *X* tires provide slightly better quality because *X*'s mean and median are both equal to the expected value, 575 mm. If, however, quality is measured by consistency, Grade *Y* provides better quality because, even though *Y*'s mean is only slightly larger than the mean for Grade *X*, *Y*'s standard deviation is much smaller. The range in values for Grade *Y* is 5 mm compared to the range in values for Grade *X*, which is 16 mm.

(c) Excel output:

Grade X		*Grade Y*	
Mean	575	Mean	577.4
Median	575	Median	575
Mode	#N/A	Mode	#N/A
Standard Deviation	6.403124	Standard Deviation	6.107373
Sample Variance	41	Sample Variance	37.3
Range	16	Range	15
Minimum	568	Minimum	573
Maximum	584	Maximum	588
Sum	2875	Sum	2887
Count	5	Count	5

	Grade *X*	Grade *Y*, Altered
Mean	575	577.4
Median	575	575
Standard deviation	6.4	6.1

When the fifth *Y* tire measures 588 mm rather than 578 mm, *Y*'s mean inner diameter becomes 577.4 mm, which is larger than *X*'s mean inner diameter, and *Y*'s standard deviation increases from 2.1 mm to 6.1 mm. In this case, *X*'s tires are providing better quality in terms of the mean inner diameter, with only slightly more variation among the tires than *Y*'s.

3.9 (a) Half of the new houses were sold at a price no higher than $282,800.
(b) On average, the sales price of houses was $345,800.
(c) The sales price of new houses was right-skewed probably because a small portion of extremely expensive houses unduly biased the mean price towards the higher end.

3.10 (a), (b)

Cost ($)	
Mean	7.093333
Median	6.8
Mode	6.5
Standard Deviation	1.406031
Sample Variance	1.976924
Range	4.71
Minimum	4.89
Maximum	9.6
Sum	106.4
Count	15
First Quartile	5.9
Third Quartile	8.3
CV	19.82%

(c) The mean is only slightly larger than the median, so the data are only slightly right-skewed.
(d) The mean amount spent is $7.09 and the median is $6.8. The average scatter of the amount spent around the mean is $1.41. The difference between the highest and the lowest amount spent is $4.71.

3.11 (a), (b)

	MPG
Mean	28.70833333
Median	27
Mode	26
Minimum	22
Maximum	40
Range	18
Variance	28.3025
Standard Deviation	5.3200
Coeff. of Variation	18.53%
Skewness	0.9278
Kurtosis	-0.2071
Count	24
Standard Error	1.0859
First Quartile	24
Third Quartile	32

3.11 cont. (b)

MPG	Z Score	MPG	Z Score
26	-0.5091	32	0.6187
38	1.7465	23	-1.0730
26	-0.5091	22	-1.2610
30	0.2428	24	-0.8850
24	-0.8850	28	-0.1331
26	-0.5091	37	1.5586
28	-0.1331	31	0.4308
28	-0.1331	40	2.1225
24	-0.8850	25	-0.6971
26	-0.5091	25	-0.6971
24	-0.8850	33	0.8067
39	1.9345	30	0.2428

(c) The mean is only slightly larger than the median, so the data are only slightly right-skewed.

(d) The distribution of MPG of the midsized sedans is slightly right-skewed while that of the small SUVs is symmetrical. The mean MPG of midsized sedans is 4.59 higher than that of small SUVs. The average scatter of the MPG of sedans is almost 3 times that of SUVs. The range of sedans is slightly more than 2.5 times that of small SUVs.
The mean miles per gallon of small SUVs is 23.15 and half the small SUVs achieve at least 22.5 miles per gallon. There are no outliers in the data as the largest Z score is 2.482 and the smallest Z score is -1.10. The average scatter around the mean is 1.9541 mpg. The lowest mpg is 21 and the highest is 28. The mpg of mid-sized sedans is much higher than for small SUVs. The mean miles per gallon of mid-sized sedans is 28.7083 and half the mid-sized sedans achieve at least 27 miles per gallon. The average scatter around the mean is 5.32 mpg. The lowest mpg of midsized sedans is 22 and the highest is 40.

3.12 (a), (b)

	MPG
Mean	23.15
Median	22.5
Mode	22
Minimum	21
Maximum	28
Range	7
Variance	3.8184
Standard Deviation	1.9541
Coeff. of Variation	8.44%
Skewness	0.9427
Kurtosis	0.3998
Count	20
Standard Error	0.4369
First Quartile	22
Third Quartile	24

MPG	Z Score	MPG	Z Score
26	1.4585	22	-0.5885
22	-0.5885	21	-1.1003
24	0.4350	22	-0.5885
22	-0.5885	21	-1.1003
26	1.4585	24	0.4350
21	-1.1003	23	-0.0768
24	0.4350	23	-0.0768
25	0.9467	22	-0.5885
28	2.4820	21	-1.1003
24	0.4350	22	-0.5885

(c) The mean is only slightly larger than the median, so the data are only slightly right-skewed.

(d) The distribution of MPG of the sedans and small SUV are slightly right-skewed. The mean MPG of midsized sedans is 4.59 higher than that of small SUVs. The average scatter of the MPG of midsized sedans is almost 3 times that of small SUVs. The range of midsized sedans is slightly more than 2.5 times that of small SUVs.
The mean miles per gallon of small SUVs is 23.15 and half the small SUVs achieve at least 22.5 miles per gallon. There are no outliers in the data as the largest Z score is 2.482 and the smallest Z score is -1.10. The average scatter around the mean is 1.9541 mpg. The lowest mpg is 21 and the highest is 28. The mpg of mid-sized sedans is much higher than for small SUVs. The mean miles per gallon of mid-sized sedans is 28.7083 and half the mid-sized sedans achieve at least 27 miles per gallon. The average scatter around the mean is 5.32 mpg. The lowest mpg of midsized sedans is 22 and the highest is 40.

3.13 (a), (b)

	Number of Partners
Mean	19.5
Median	18
Mode	16
Minimum	10
Maximum	34
Range	24
Variance	49.2879
Standard Deviation	7.0205
Coeff. of Variation	36.00%
Skewness	0.5206
Kurtosis	-0.7462
Count	34
Standard Error	1.2040
First Quartile	14
Third Quartile	25

Number of Partners	Z Scores	Number of Partners	Z Scores
16	-0.4985	13	-0.9259
21	0.2137	16	-0.4985
27	1.0683	16	-0.4985
11	-1.2107	13	-0.9259
33	1.9229	16	-0.4985
20	0.0712	21	0.2137
30	1.4956	17	-0.3561
27	1.0683	10	-1.3532
31	1.6381	19	-0.0712
15	-0.6410	10	-1.3532
21	0.2137	10	-1.3532
20	0.0712	20	0.0712
28	1.2107	25	0.7834
34	2.0654	11	-1.2107
23	0.4985	14	-0.7834
17	-0.3561	13	-0.9259
29	1.3532	16	-0.4985

There is no outlier since none of the Z scores is greater than 3 or smaller than -3.

(c) The data is quite symmetrical since the mean and the median are about the same.

(d) The mean number of partners is 19.5 while the median number of partners is 18. The average scatter of the number of partners around the mean is 7.0205. The difference between the highest and the lowest number of partners is 24.

3.14 (a), (b)

	Mobile Commerce Penetration (%)
Mean	16.39285714
Median	15
Mode	15
Minimum	6
Maximum	37
Range	31
Variance	44.2474
Standard Deviation	6.6519
Coeff. of Variation	40.58%
Skewness	1.1724
Kurtosis	2.1999
Count	28
Standard Error	1.2571
First Quartile	11
Third Quartile	19

Mobile Commerce Penetration (%)	Z Score	Mobile Commerce Penetration (%)	Z Score
17	0.0913	11	-0.8107
15	-0.2094	14	-0.3597
15	-0.2094	8	-1.2617
13	-0.5101	15	-0.2094
27	1.5946	23	0.9933
12	-0.6604	11	-0.8107
20	0.5423	37	3.0979
23	0.9933	17	0.0913
9	-1.1114	11	-0.8107
9	-1.1114	19	0.3919
16	-0.0591	27	1.5946
6	-1.5624	18	0.2416
19	0.3919	18	0.2416
14	-0.3597	15	-0.2094

None of the Z scores are more than 3 standard deviations away from the mean so there is not any outlier.

(c) The mean is only slightly larger than the median, so the data are only slightly right-skewed.

(d) The mean Mobile Commerce penetration is 16.3929% and half the countries have Mobile Commerce penetration greater than or equal to 15%. The average scatter around the mean is 6.6519%. The lowest Mobile Commerce penetration is 6% in Japan and the highest Mobile Commerce penetration is 37% in South Korea.

3.15 (a)

	One-Year	Five-Year
Mean	0.86	1.64
Median	0.90	1.73
Mode	1	1.98
Minimum	0.23	0.49
Maximum	1.34	2.23
Range	1.11	1.74
Variance	0.0837	0.1802
Standard Deviation	0.2893	0.4244
Coeff. of Variation	33.55%	25.91%
Skewness	-0.3677	-0.8321
Kurtosis	-0.3739	0.8276
Count	25	25
Standard Error	0.0579	0.0849
First Quartile	0.675	1.42
Third Quartile	1.065	1.98

(b) The standard deviation and range of one-year CDs are roughly 70% of those of the five-year CD. Hence, you might conclude that the five-year CDs have a larger amount of variation in the yields offered as compared to the one-year CDs. But the one-year CDs have a higher variation relative to the average in the yields offered than the five-year CDs.

3.16 (a), (b)

	Price (US$)
Mean	159.75
Median	162
Mode	#N/A
Minimum	141
Maximum	174
Range	33
Variance	134.5000
Standard Deviation	11.5974
Coeff. of Variation	7.26%
Skewness	-0.5031
Kurtosis	-0.8964
Count	8
Standard Error	4.1003
First Quartile	147
Third Quartile	171
Interquartile Range	24

(c) The mean room price is $159.75 and half the room prices are greater than or equal to $162, so room price is left-skewed. The average scatter around the mean is 11.5974. The lowest room price is $141 in France and the highest room price is $174 in the United States.

3.17 Excel output:

Waiting Time	
Mean	4.286667
Median	4.5
Mode	#N/A
Standard Deviation	1.637985
Sample Variance	2.682995
Range	6.08
Minimum	0.38
Maximum	6.46
Sum	64.3
Count	15
First Quartile	3.2
Third Quartile	5.55
Interquartile Range	2.35
Coefficient of Variation	38.2112%

(a) Mean = 4.287 Median = 4.5

(b) Variance = 2.683 Standard deviation = 1.638 Range = 6.08
Coefficient of variation = 38.21%
Z scores: –0.05, 0.77, –0.77, 0.51, 0.30, –1.19, –0.46, –0.66, 0.13, 1.11, –2.39, 0.51, 1.33, 1.16, –0.30
There are no outliers.

(c) Since the mean is less than the median, the distribution is left-skewed.

(d) The mean and median are both under 5 minutes and the distribution is left-skewed, meaning that there are more unusually low observations than there are high observations. But six of the 15 bank customers sampled (or 40%) had wait times in excess of 5 minutes. So, although the customer is more likely to be served in less than 5 minutes, the manager may have been overconfident in responding that the customer would “almost certainly” not wait longer than 5 minutes for service.

3.18 Excel output:

Waiting Time	
Mean	7.114667
Median	6.68
Mode	#N/A
Standard Deviation	2.082189
Sample Variance	4.335512
Range	6.67
Minimum	3.82
Maximum	10.49
Sum	106.72
Count	15
First Quartile	5.64
Third Quartile	8.73
Interquartile Range	3.09
Coefficient of Variation	29.2662%

(a) Mean = 7.114 Median = 6.68

(b) Variance = 4.336 Standard deviation = 2.082 Range = 6.67
Coefficient of variation = 29.27%

Waiting Time	Z Score
9.66	1.222431
5.90	-0.58336
8.02	0.434799
5.79	-0.63619
8.73	0.775786
3.82	-1.58231
8.01	0.429996
8.35	0.593286
10.49	1.62105
6.68	-0.20875
5.64	-0.70823
4.08	-1.45744
6.17	-0.45369
9.91	1.342497
5.47	-0.78987

(b) There is no outlier since none of the observations are greater than 3 standard deviations away from the mean.

(c) Because the mean is greater than the median, the distribution is right-skewed.

(d) The mean and median are both greater than 5 minutes. The distribution is right-skewed, meaning that there are some unusually high values. Further, 13 of the 15 bank customers sampled (or 86.7%) had waiting times greater than 5 minutes. So the customer is likely to experience a waiting time in excess of 5 minutes. The manager overstated the bank's service record in responding that the customer would "almost certainly" not wait longer than 5 minutes for service.

3.19 (a) $\bar{R}_G = \left[(1+0.3354)(1-0.098)\right]^{1/2} - 1 = 9.75\%$

(b) If you purchased $1,000 of GE stock at the start of 2013, its value at the end of 2014 was $\$1000(1+0.0975)^2 = \$1204.53$.

Note: The answer is obtained using Excel without rounding. Answer will be $1204.51 with rounding.

(c) The result for Facebook ($2931.68) was better than the result for GE ($1204.53).

3.20 (a) $\bar{R}_G = \left[(1+1.053)(1+0.428)\right]^{1/2} - 1 = 71.22\%$

(b) If you purchased $1,000 of Facebook stock at the start of 2013, its value at the end of 2014 was $\$1000(1+0.7122)^2 = \$2931.68$.

Note: The answer is obtained using Excel without rounding. Answer will be $2931.63 with rounding.

(c) The result for Facebook ($2931.68) was better than the result for GE ($1204.53).

3.21 (a)

Year	DJIA	S&P 500	Nasdaq
2011	5.5	0	-1.8
2012	7.3	13.4	15.9
2013	26.5	29.6	38.3
2014	7.5	11.4	13.4
Geometric mean	11.39%	13.12%	15.59%

(b) The rate of return of Nasdaq 500 is the best at 15.59% followed by S&P 500 at 13.12% and DJIA at 11.39%.

(c) All the metals had negative returns, whereas the three stock indices all had positive returns.

3.22 (a)

Year	Platinum	Gold	Silver
2011	-21.1	10.2	-9.8
2012	8.68	0.1	7.1
2013	-11.7	6.08	7.13
2014	-0.72	-28.65	-26.65
Geometric mean	-6.89%	-4.41%	-6.66%

(b) Platinum had the least negative return.

(c) All the metals had negative returns, whereas the three stock indices all had positive returns.

3.23 (a)

Average of 1YrReturn%	Risk			
Type	Average	High	Low	Grand Total
Growth	**8.8636**	**1.2115**	**11.5488**	**7.4872**
Large	10.9319	6.4883	11.6746	10.7980
Mid-Cap	7.1943	3.6250	11.0033	6.7612
Small	3.4326	-0.7135		0.7728
Value	**9.0106**	**1.1325**	**10.9560**	**8.4496**
Large	9.8951	-13.7900	10.9713	9.9080
Mid-Cap	9.6804	1.3800	10.7800	9.2003
Small	3.2108	2.2423		2.7072
Grand Total	**8.9118**	**1.1934**	**11.1873**	**7.8135**

(b)

StdDev of 1YrReturn%	Risk			
Type	Average	High	Low	Grand Total
Growth	**4.4343**	**5.6220**	**2.6660**	**5.6128**
Large	3.6920	4.9304	2.8244	3.7788
Mid-Cap	3.6071	5.4843	2.2121	4.1694
Small	3.9998	4.8866		4.9720
Value	**4.1966**	**5.8365**	**3.1582**	**5.0438**
Large	3.6144	#DIV/0!	3.2362	4.3836
Mid-Cap	3.3742	10.5359	2.9840	4.3065
Small	4.1223	3.6646		3.8402
Grand Total	**4.3513**	**5.6289**	**2.9556**	**5.4395**

(c) The mean one-year return of growth funds is higher than that of the value funds for the large-cap, mid-cap and small-cap and the various risk ratings with the exception of the mid-cap with average risk rating and small-cap with high-risk rating.

The standard deviation of the one-year return of growth funds is higher than that of the value funds for the large and mid-cap with average risk rating and large-cap and small-cap with high risk rating.

3.24 (a)

Average of 1YrReturn%	Star Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**13.9111**	**9.2507**	**2.8416**	**7.9194**	**6.2064**	**7.4872**
Large	14.8043	11.7167	8.7433	11.0141	9.5938	10.7980
Mid-Cap	11.2700	8.7429	1.6867	7.0326	6.0562	6.7612
Small	10.3000	3.0857	-8.7050	1.8883	0.0250	0.7728
Value	**14.4450**	**10.7559**	**0.9167**	**9.1857**	**7.1840**	**8.4496**
Large	11.1400	12.1919	-0.1480	10.7682	8.9514	9.9080
Mid-Cap	17.7500	10.4350	3.8967	10.2310	8.1650	9.2003
Small		6.5460	-2.7000	2.6245	1.0975	2.7072
Grand Total	**14.0082**	**9.8151**	**2.2229**	**8.3462**	**6.5378**	**7.8135**

(b)

StdDev of 1YrReturn%	Star Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**4.0665**	**4.5287**	**7.9517**	**5.1226**	**5.2576**	**5.6128**
Large	4.2169	4.0362	2.0218	3.5888	3.5057	3.7788
Mid-Cap	#DIV/0!	1.8247	5.1351	4.0308	4.3353	4.1694
Small	#DIV/0!	4.5672	6.2933	3.9359	3.2039	4.9720
Value	**4.6740**	**2.8695**	**8.8806**	**4.1795**	**4.4291**	**5.0438**
Large	#DIV/0!	1.5642	10.4456	2.4800	3.3042	4.3836
Mid-Cap	#DIV/0!	2.4363	8.6339	2.7058	3.4190	4.3065
Small		2.5242	#DIV/0!	3.8583	2.8250	3.8402
Grand Total	**3.9320**	**4.0328**	**8.1461**	**4.8506**	**4.9947**	**5.4395**

(c) The mean one-year return of small-cap and mid-cap value funds is higher than that of the growth counterparts across the different star ratings. On the other hand, the mean one-year return of large-cap value funds is lower than that of the growth counterparts across the different star ratings with the exception of the four-star.
The standard deviation of the one-year return of growth funds is generally higher than that of the value funds across all the star ratings and market caps with the exception of the large-cap and one-star, mid-cap and four-star, mid-cap and one-star.

3.25 (a)

Average of 1YrReturn%	Star Rating					
Market Cap	**Five**	**Four**	**One**	**Three**	**Two**	**Grand Total**
Large	**14.3463**	**11.9222**	**5.5679**	**10.9132**	**9.3414**	**10.4462**
Average	14.2957	11.7241	7.0569	10.9728	9.6220	10.5656
High	14.7000	6.4200	-13.7900	1.7150	7.1900	3.5914
Low		13.5286		11.5848	8.2663	11.2253
Mid-Cap	**14.5100**	**9.1843**	**2.4233**	**7.6853**	**6.6419**	**7.3761**
Average	17.7500	8.9229	2.4633	7.7839	7.3741	7.8539
High		10.7900	-0.7300	2.8150	4.4456	3.3444
Low	11.2700	13.0700	8.6700	12.8900		10.9140
Small	**10.3000**	**4.5275**	**-7.5040**	**2.1265**	**0.3550**	**1.3928**
Average	10.3000	6.6400		3.4889	-0.3643	3.3468
High		3.0186	-7.5040	0.5938	0.6200	0.1040
Grand Total	**14.0082**	**9.8151**	**2.2229**	**8.3462**	**6.5378**	**7.8135**

(b)

StdDev of 1YrReturn%	Star Rating					
Market Cap	**Five**	**Four**	**One**	**Three**	**Two**	**Grand Total**
Large	**4.1134**	**3.1823**	**7.4589**	**3.1681**	**3.4122**	**4.0420**
Average	4.4403	3.3035	5.1615	2.9838	3.4393	3.6875
High	#DIV/0!	#DIV/0!	#DIV/0!	1.6758	2.1779	8.8883
Low		1.2610		2.5457	3.4059	3.0717
Mid-Cap	**4.5821**	**2.0851**	**6.0281**	**3.9914**	**4.1651**	**4.3190**
Average	#DIV/0!	1.9562	7.1771	3.6128	3.6376	3.6980
High		#DIV/0!	4.8256	10.1187	5.0655	5.8357
Low	#DIV/0!	#DIV/0!	0.0000	#DIV/0!		2.1651
Small	**#DIV/0!**	**4.1072**	**6.0759**	**3.8679**	**3.0773**	**4.7029**
Average	#DIV/0!	3.4890		3.3157	2.5929	3.9802
High		4.0542	6.0759	3.9649	3.2613	4.7350
Grand Total	**3.9320**	**4.0328**	**8.1461**	**4.8506**	**4.9947**	**5.4395**

(c) The mean one-year return of five-star funds is generally the highest, followed by the four-star, three-star, two-star and one-star funds across the various market caps and risk ratings with the exception of the small-cap, mid-cap and large-cap high risk funds rated at two-star.

There is no obvious pattern in the standard deviation of the one-year return.

3.26 (a)

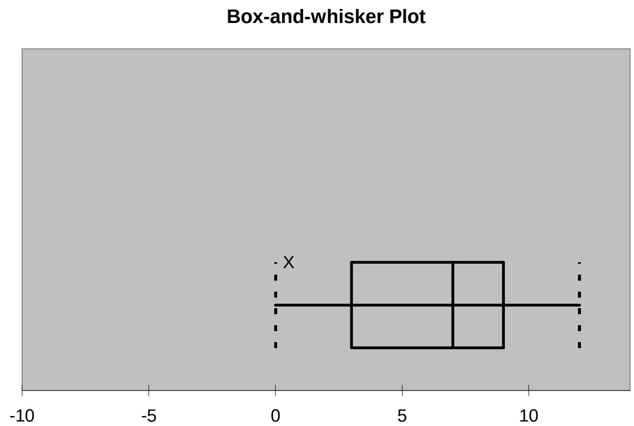
Average of 1YrReturn%	Star Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**13.9111**	**9.2507**	**2.8416**	**7.9194**	**6.2064**	**7.4872**
Average	14.1757	9.9846	6.9991	8.9641	7.5802	8.8636
High	14.7000	3.6314	-4.5243	0.1375	2.3813	1.2115
Low	11.2700	13.8000	8.6700	11.5286	10.6850	11.5488
Value	**14.4450**	**10.7559**	**0.9167**	**9.1857**	**7.1840**	**8.4496**
Average	14.4450	10.5560	4.4280	8.7637	8.7093	9.0106
High		6.4600	-7.5200	4.0900	1.6286	1.1325
Low		13.2740	8.6700	11.6980	5.8475	10.9560
Grand Total	**14.0082**	**9.8151**	**2.2229**	**8.3462**	**6.5378**	**7.8135**

(b)

StdDev of 1YrReturn%	Star Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**4.0665**	**4.5287**	**7.9517**	**5.1226**	**5.2576**	**5.6128**
Average	4.5498	3.6713	4.6952	4.0607	4.8491	4.4343
High	#DIV/0!	4.8285	7.2317	4.3376	4.4523	5.6220
Low	#DIV/0!	1.0633	#DIV/0!	3.5158	1.1001	2.6660
Value	**4.6740**	**2.8695**	**8.8806**	**4.1795**	**4.4291**	**5.0438**
Average	4.6740	2.6492	7.5990	4.3269	3.4779	4.1966
High		2.0930	5.6854	2.5124	4.1821	5.8365
Low		1.3177	#DIV/0!	2.0166	3.2025	3.1582
Grand Total	**3.9320**	**4.0328**	**8.1461**	**4.8506**	**4.9947**	**5.4395**

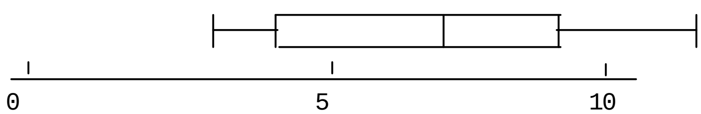
(c) In general, the mean one-year return of the five-star rated growth and value funds is highest, followed by that of the four-star, three-star, two-star and one-star rated growth funds across the various risk levels.
There is no obvious pattern in the standard deviation of the one-year return.

3.27 (a) $Q_1 = 3$, $Q_3 = 9$, interquartile range = 6
(b) Five-number summary: 0 3 7 9 12
(c)



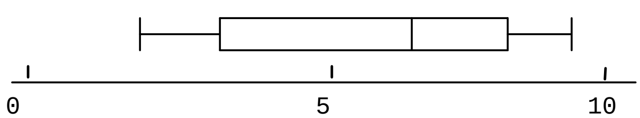
The distribution is left-skewed.
(d) Answers are the same.

3.28 (a) $Q_1 = 4$, $Q_3 = 9$, interquartile range = 5
(b) Five-number summary: 3 4 7 9 12
(c)



The distances between the median and the extremes are close, 4 and 5, but the differences in the tails are different (1 on the left and 3 on the right), so this distribution is slightly right-skewed.
(d) In 3.2 (d), because the mean and median are equal , the distribution is symmetric. The box part of the graph is symmetric, but the tails show right-skewness.

3.29 (a) $Q_1 = 3$, $Q_3 = 8.5$, interquartile range = 5.5
(b) Five-number summary: 2 3 7 8.5 9
(c)

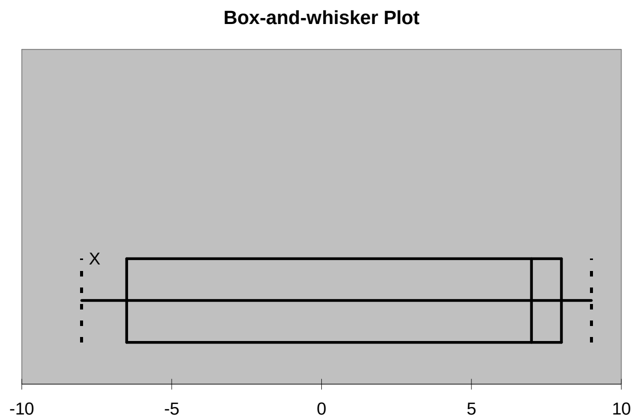


The distribution is left-skewed.
(d) Answers are the same.

3.30 (a) Q_1 = -6.5, Q_3 = 8, interquartile range = 14.5

(b) Five-number summary: – 8 – 6.5 7 8 9

(c)



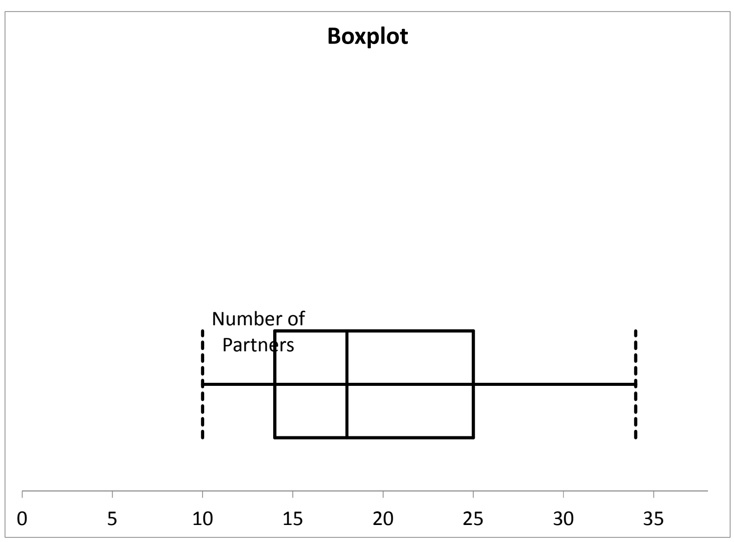
The distribution is left-skewed.

(d) This is consistent with the answer in 3.4 (d).

3.31 (a), (b)

Five-Number Summary	
Minimum	10
First Quartile	14
Median	18
Third Quartile	25
Maximum	34
Interquartile Range	11

(c)

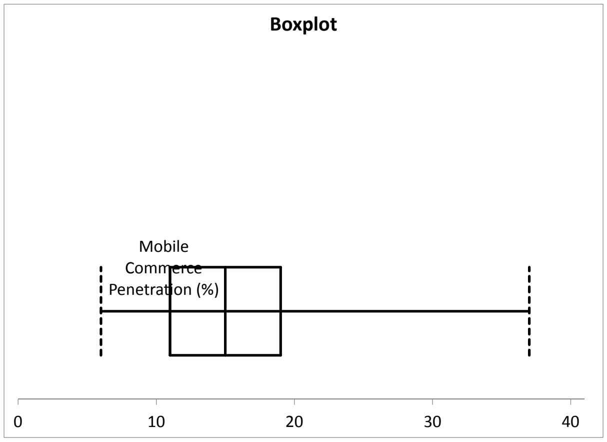


The number of partners is right-skewed.

3.32 (a), (b)

Five-Number Summary	
Minimum	6
First Quartile	11
Median	15
Third Quartile	19
Maximum	37
Interquartile Range	8

(c)

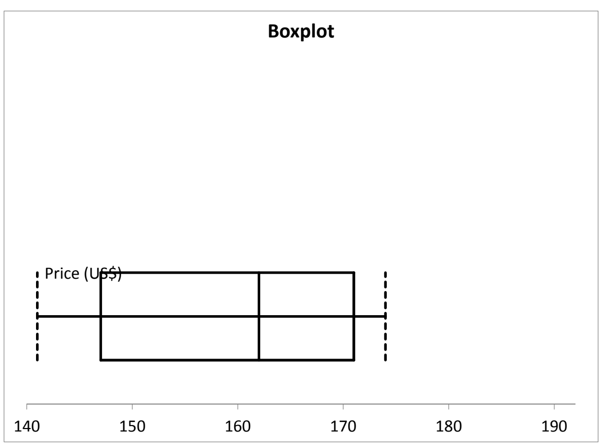


The penetration value is right-skewed.

3.33 (a), (b)

Five-Number Summary	
Minimum	141
First Quartile	147
Median	162
Third Quartile	171
Maximum	174
Interquartile Range	24

(c)

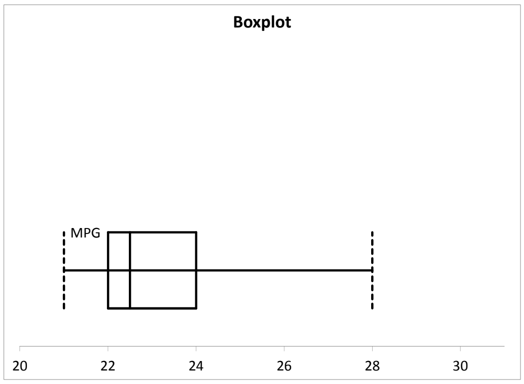


The price is left-skewed.

3.34 (a), (b)

Five-Number Summary	
Minimum	21
First Quartile	22
Median	22.5
Third Quartile	24
Maximum	28
Interquartile Range	2

(c)

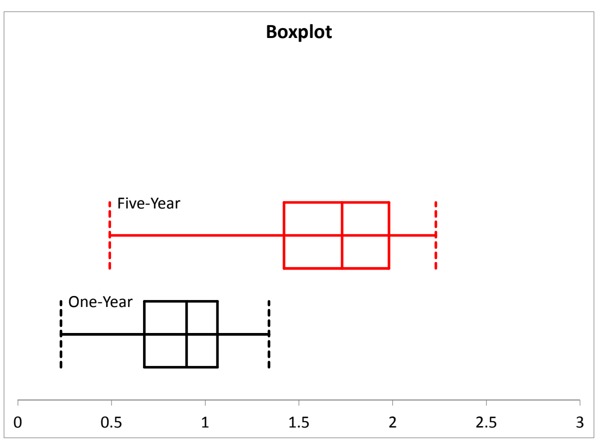


The MPG is right-skewed.

3.35 (a), (b)

Five-Number Summary		
	One-Year	Five-Year
Minimum	0.23	0.49
First Quartile	0.675	1.42
Median	0.9	1.73
Third Quartile	1.065	1.98
Maximum	1.34	2.23
Interquartile Range	0.39	0.56

(c)



(d) Both the one-year CDs' and five-year CDs' yields are left-skewed.

3.36 Excel output for Residential Area:

Waiting Time	
Mean	7.114667
Median	6.68
Mode	#N/A
Standard Deviation	2.082189
Sample Variance	4.335512
Range	6.67
Minimum	3.82
Maximum	10.49
Sum	106.72
Count	15
First Quartile	5.64
Third Quartile	8.73
Interquartile Range	3.09
Coefficient of Variation	29.2662%

Excel output for Residential Area:

Box-and-whisker Plot	
Five-number Summary	
Minimum	3.82
First Quartile	5.64
Median	6.68
Third Quartile	8.73
Maximum	10.49

Excel output for Commercial District:

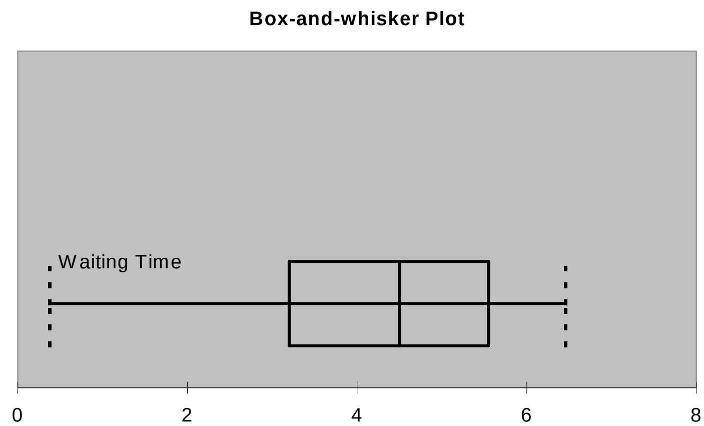
Waiting Time	
Mean	4.286667
Standard Error	0.422926
Median	4.5
Mode	#N/A
Standard Deviation	1.637985
Sample Variance	2.682995
Kurtosis	0.832925
Skewness	-0.83295
Range	6.08
Minimum	0.38
Maximum	6.46
Sum	64.3
Count	15
First Quartile	3.2
Third Quartile	5.55
Interquartile Range	2.35
Coefficient of Variation	38.2112%

3.36
cont.

Box-and-whisker Plot	
Five-number Summary	
Minimum	0.38
First Quartile	3.2
Median	4.5
Third Quartile	5.55
Maximum	6.46

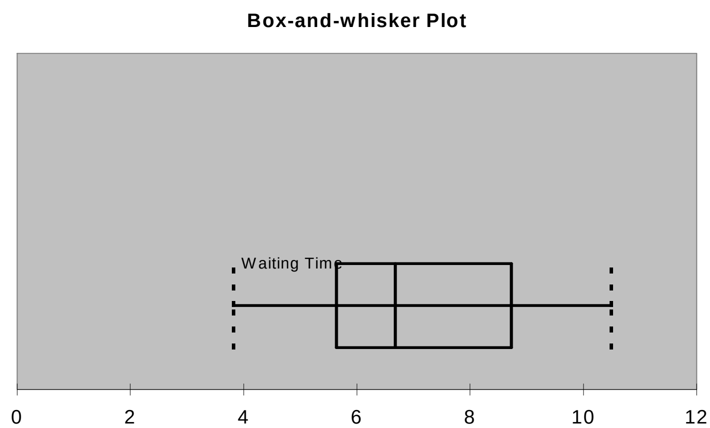
(a) **Commercial district**: Five-number summary: 0.38 3.2 4.5 5.55 6.46
Residential area: Five-number summary: 3.82 5.64 6.68 8.73 10.49

(b) **Commercial district:**



The distribution is skewed to the left.

Residential area:



The distribution is skewed slightly to the right.

(c) The central tendency of the waiting times for the bank branch located in the commercial district of a city is lower than that of the branch located in the residential area. There are a few longer than normal waiting times for the branch located in the residential area whereas there are a few exceptionally short waiting times for the branch located in the commercial area.

3.37 (a) Population Mean = 6
(b) $\sigma^2 = 9.4$ $\sigma = 3.1$

3.38 (a) Population Mean = 6
(b) $\sigma^2 = 2.8$ $\sigma = 1.67$

3.39 (a) $\mu = \frac{\sum_{i=1}^{50} X_i}{N} = 310.2353$ $\sigma^2 = \frac{\sum_{i=1}^{N}(X_i - \mu)^2}{N} = 95286.89$

$\sigma = \sqrt{\sigma^2} = 308.6857$

(b) 86% 94% 98%
(c) Except the 86% which is quite a bit higher than the 68%, the remaining percentages of 94% and 98% are quite close to the 95% and 99.5% in the empirical rule.

3.40 (a) 68% (b) 95% (c) at least 0% 75% 88.89%
(d) $\mu - 4\sigma$ to $\mu + 4\sigma$ or -2.8 to 19.2

3.41 (a) $\mu = 1.518$ $\sigma^2 = 1.0169$

$\sigma = \sqrt{\sigma^2} = 1.0084$

(b) On average, the cigarette tax is \$1.52. The average distances between the cigarette tax in each of the 50 states and the population mean cigarette tax is \$1.01.

3.42 (a) mean = 349.7882, variance = 29046.7924, std. dev. = 170.4312
(b) 90%, 92% and 96% of these states have average per capita energy consumption within 1, 2 and 3 standard deviations of the mean, respectively.
(c) This is different from the 68%, 95% and 99.7% according to the empirical rule.

3.43 (a) $\mu = \$185.8$ billion $\sigma = \$131.4613$ billion
(b) On average, the market capitalization for this population of 30 companies is \$185.8 billion. The average distances between the market capitalization and the mean market capitalization for this population of 30 companies \$131.4613 billion.

3.44 (a) *cov(X,Y)* = 65.2909
(b) $S_X^2 = 21.7636$, $S_Y^2 = 195.8727$

$$r = \frac{\text{cov}(X,Y)}{\sqrt{S_X^2}\sqrt{S_Y^2}} = \frac{65.2909}{\sqrt{21.7636}\sqrt{195.8727}} = +1.0$$

(c) There is a perfect positive linear relationship between X and Y; all the points lie exactly on a straight line with a positive slope.

3.45 (a) The study suggests that time spent on Facebook and grade point average are negatively correlated.
(b) There might be a cause-and-effect relationship between time spent on Facebook and grade point average. The more time spent on Facebook, the less time a student would have available for study and, hence, results in lower grade point average holding constant all the other factors that could have affected grade point average.

3.46 (a) *cov(X,Y)* = 133.3333

(b) S_X^2 = 2200, S_Y^2 = 11.4762

$$r = \frac{\text{cov}(X,Y)}{S_X S_Y} = 0.8391$$

(c) The correlation coefficient is more valuable for expressing the relationship between calories and sugar because it does not depend on the units used to measure calories and sugar.

(d) There is a strong positive linear relationship between calories and sugar.

3.47 (a)

	First Weekend	*US Gross*	*Worldwide Gross*
First Weekend	947.4799		
US Gross	890.3014	1576.679	
Worldwide Gross	4001.782	6045.573	24934.48

(b)

	First Weekend	*US Gross*	*Worldwide Gross*
First Weekend	1		
US Gross	0.728417	1	
Worldwide Gross	0.823319	0.964197	1

(c) The correlation coefficient is more valuable for expressing the relationship because it does not depend on the units used.

(d) There is a strong positive linear relationship between U.S. gross and worldwide gross, first weekend gross and worldwide gross and first weekend gross and U.S. gross.

3.48 (a) *cov(X,Y)* = 4.46243×10^{13}

(b) S_X^2 = 2.13215×10^{12}, S_Y^2 = 1.32732×10^{14}

$$r = \frac{\text{cov}(X,Y)}{S_X S_Y} = 0.7752$$

(c) There is a positive linear relationship between the coaches' pay and revenue.

3.49 Relationship between percentage of Internet users polled who use social networking sites, and GDP:

(a) *cov(X,Y)* = 1731.8204

(b) S_X^2 = 49815607.72, S_Y^2 = 64.5699

$$r = \frac{\text{cov}(X,Y)}{S_X S_Y} = 0.0305$$

(c) There is not a linear relationship between the GDP and social media use.

3.49 cont. Relationship between the percentage of adults polled who use the Internet at least occasionally and GDP:

(a) $cov(X,Y)$ = 104885.9387

(b) S_X^2 = 49815607.72, S_Y^2 = 299.6624

$$r = \frac{\text{cov}(X,Y)}{S_X S_Y} = 0.8585$$

(c) There is a strong positive linear relationship between the GDP and internet usage.

3.50 We should look for ways to describe the typical value, the variation, and the distribution of the data within a range.

3.51 Central tendency or location refers to the fact that most sets of data show a distinct tendency to group or cluster about a certain central point.

3.52 The arithmetic mean is a simple average of all the values, but is subject to the effect of extreme values. The median is the middle ranked value, but varies more from sample to sample than the arithmetic mean, although it is less susceptible to extreme values. The mode is the most common value, but is extremely variable from sample to sample.

3.53 The first quartile is the value below which ¼ of the total ranked observations will fall, the median is the value that divides the total ranked observations into two equal halves and the third quartile is the observation above which ¼ of the total ranked observations will fall.

3.54 Variation is the amount of dispersion**,** or “spread,” in the data.

3.55 The Z score measures how many standard deviations an observation in a data set is away from the mean.

3.56 The range is a simple measure, but only measures the difference between the extremes. The interquartile range measures the range of the center fifty percent of the data. The standard deviation measures variation around the mean while the variance measures the squared variation around the mean, and these are the only measures that take into account each observation. The coefficient of variation measures the variation around the mean relative to the mean. The range, standard deviation, variance and coefficient of variation are all sensitive to outliers while the interquartile range is not.

3.57 The empirical rule relates the mean and standard deviation to the percentage of values that will fall within a certain number of standard deviations of the mean.

3.58 The Chebyshev rule applies to any type of distribution while the empirical rule applies only to data sets that are approximately bell-shaped. The empirical rule is more accurate than the Chebyshev rule in approximating the concentration of data around the mean.

3.59 Shape is the manner in which the data are distributed. The shape of a data set can be symmetrical or asymmetrical (skewed).

3.60 The arithmetic mean is appropriate if you want to obtain a typical value and serves as a “balance point” in a set of data, similar to the fulcrum on a seesaw. The geometric mean is appropriate when you want to measure the rate of change of a variable over time.

3.61 Skewness measures the extent to which the data values are not symmetrical around the mean. Kurtosis measures the extent to which values that are very different from the mean affect the shape of the distribution of a set of data.

3.62 The covariance measures the strength of the linear relationship between two numerical variables while the coefficient of correlation measures the relative strength of the linear relationship. The value of the covariance depends very much on the units used to measure the two numerical variables while the value of the coefficient of correlation is totally free from the units used.

3.63 On average, the Master Black Belt has the highest average salary ($123,091), followed by the managers ($94,279), the quality engineers ($79,152), and then the Green Belts ($77,514). The middle rank salary for the Master Black Belt ($120,000) is also the highest, followed by the managers ($90,700), the quality engineers ($77,000), and then the Green Belts ($76,000). The overall spread between the highest and lowest salary for the managers ($720,400) is the highest, followed by the quality engineers ($168,000), the Green Belts ($119,000), and then the Master Black Belt ($116,355). The average spread of the salary around the mean of the manager ($34,896) is the highest, followed by the Master Black Belt ($27,865), the Green Belts ($25,503) and then the Quality Engineer ($21,921).

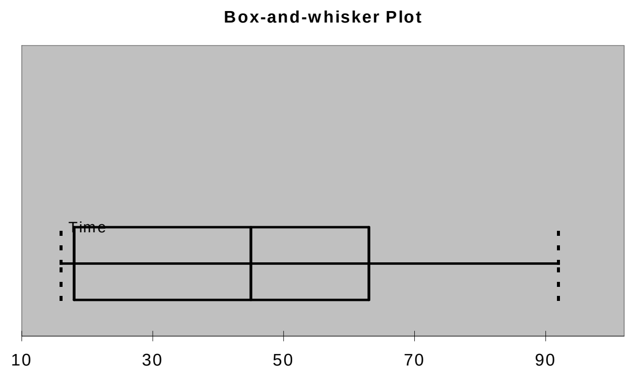
3.64 Excel output:

Time	
Mean	43.88889
Standard Error	4.865816
Median	45
Mode	17
Standard Deviation	25.28352
Sample Variance	639.2564
Range	76
Minimum	16
Maximum	92
First Quartile	18
Third Quartile	63
interquartile range	45
c.v	57.61%

(a) mean = 43.89 median = 45 1^{st} quartile = 18 3^{rd} quartile = 63

(b) range = 76 interquartile range = 45 variance = 639.2564
standard deviation = 25.28 coefficient of variation = 57.61%

3.64 cont. (c)



The distribution is skewed to the right because there are a few policies that require an exceptionally long period to be approved even though the mean is smaller than the median.

(d) The mean approval process takes 43.89 days with 50% of the policies being approved in less than 45 days. 50% of the applications are approved between 18 and 63 days. About 67% of the applications are approved between 18.6 to 69.2 days.

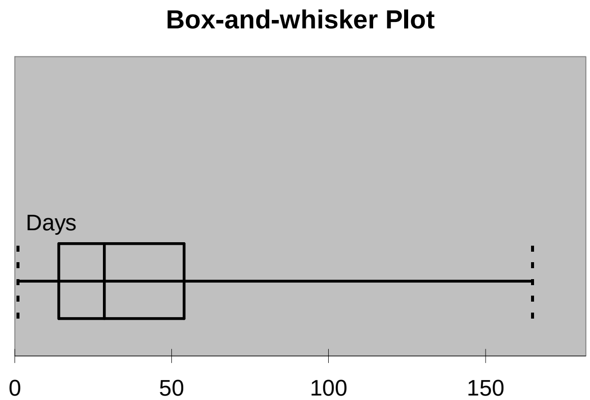
3.65 Excel output:

Days	
Mean	43.04
Median	28.5
Mode	5
Standard Deviation	41.92606
Sample Variance	1757.794
Range	164
Minimum	1
Maximum	165
First Quartile	14
Third Quartile	54
Interquartile Range	40
CV	97.41%

(a) Mean = 43.04 Median = 28.5 $Q_1 = 14$ $Q_3 = 54$

(b) Range = 164 Interquartile range = 40 Variance = 1,757.79
Standard deviation = 41.926 Coefficient of variation = 97.41%

3.65 cont. (c) Box-and-whisker plot for Days to Resolve Complaints



The distribution is right-skewed.

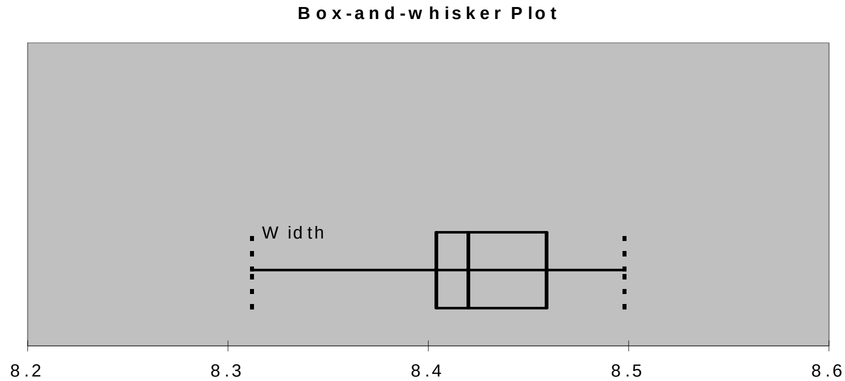
(d) Half of all customer complaints that year were resolved in less than a month (median = 28.5 days), 75% of them within 54 days. There were five complaints that were particularly difficult to settle which brought the overall mean up to 43 days. No complaint took longer than 165 days to resolve.

3.66 Excel output:

Width	
Mean	8.420898
Standard Error	0.006588
Median	8.42
Mode	8.42
Standard Deviation	0.046115
Sample Variance	0.002127
Kurtosis	0.035814
Skewness	-0.48568
Range	0.186
Minimum	8.312
Maximum	8.498
Sum	412.624
Count	49
First Quartile	8.404
Third Quartile	8.459
Interquartile Range	0.055
CV	0.55%

(a) mean = 8.421, median = 8.42, range = 0.186 and standard deviation = 0.0461. On average, the width is 8.421 inches. The width of the middle ranked observation is 8.42. The difference between the largest and smallest width is 0.186 and majority of the widths fall between 0.0461 inches around the mean of 8.421 inches.

3.66 cont. (b) Minimum = 8.312, 1st quartile = 8.404, median = 8.42, 3rd quartile = 8.459 and maximum = 8.498



(c) Even though the median is equal to the mean, the distribution is not symmetrical but skewed to the left.

(d) All the troughs fall within the limit of 8.31 and 8.61 inches.

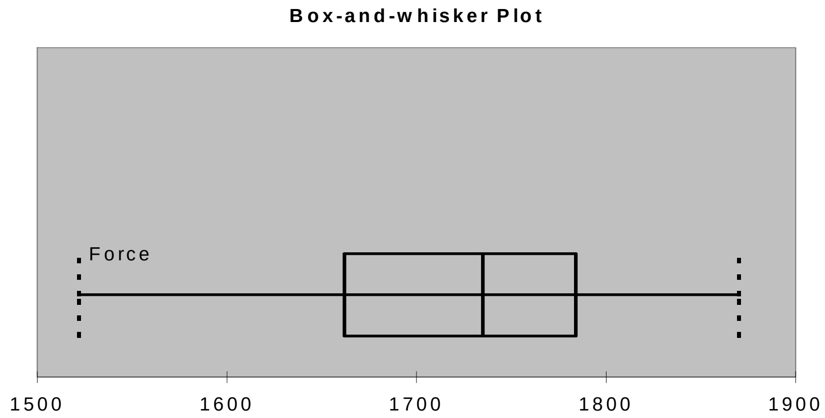
3.67 Excel output:

Force	
Mean	1723.4
Standard Error	16.34967
Median	1735
Mode	1662
Standard Deviation	89.55083
Sample Variance	8019.352
Kurtosis	-0.24355
Skewness	-0.36714
Range	348
Minimum	1522
Maximum	1870
Sum	51702
Count	30
First Quartile	1662
Third Quartile	1784
Interquartile Range	122
CV	5.1962%

(a) mean = 1723.4 median = 1735 range = 348 standard deviation = 89.55

(b) The mean force required to break the insulators in the sample is 1723.4 pounds. The middle ranked breaking force is 1735 pounds. The differences between the smallest and largest breaking force is 348 pounds. Roughly about 68% of the insulators will have breaking force that falls within 89.55 pounds of 1723.4 pounds.

3.67 cont. (c) Five-number summary: 1522 1662 1735 1784 1870.



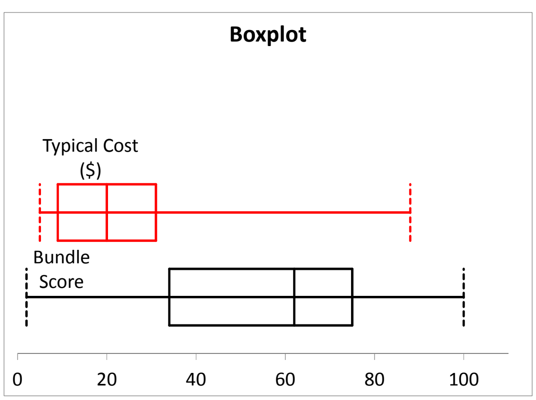
The distribution is skewed to the left.

(d) All the observations in the sample have breaking force that is greater than 1500 pounds and, hence, will fulfill the company's requirement.

3.68 (a), (b)

	Bundle Score	*Typical Cost ($)*
Mean	54.775	24.175
Standard Error	4.367344951	2.866224064
Median	62	20
Mode	75	8
Standard Deviation	27.62151475	18.12759265
Sample Variance	762.9480769	328.6096154
Kurtosis	-0.845357193	2.766393511
Skewness	-0.48041728	1.541239625
Range	98	83
Minimum	2	5
Maximum	100	88
Sum	2191	967
Count	40	40
First Quartile	34	9
Third Quartile	75	31
Interquartile Range	41	22
CV	50.43%	74.98%

(c)



The typical cost is right-skewed, while the bundle score is left-skewed.

3.68 (d) $r = \dfrac{\text{cov}(X,\ Y)}{S_X S_Y} = 0.3465$

cont. (e) The mean typical cost is $24.18, with an average spread around the mean equaling $18.13. The spread between the lowest and highest costs is $83. The middle 50% of the typical cost fall over a range of $22 from $9 to $31, while half of the typical cost is below $20. The mean bundle score is 54.775, with an average spread around the mean equaling 27.6215. The spread between the lowest and highest scores is 98. The middle 50% of the scores fall over a range of 41 from 34 to 75, while half of the scores are below 62. The typical cost is right-skewed, while the bundle score is left-skewed. There is a weak positive linear relationship between typical cost and bundle score.

3.69 Excel output:

Teabags	
Mean	5.5014
Standard Error	0.014967
Median	5.515
Mode	5.53
Standard Deviation	0.10583
Sample Variance	0.0112
Kurtosis	0.127022
Skewness	-0.15249
Range	0.52
Minimum	5.25
Maximum	5.77
Sum	275.07
Count	50
First Quartile	5.44
Third Quartile	5.57
Interquartile Range	0.13
CV	1.9237%

(a) mean = 5.5014, median = 5.515, first quartile = 5.44, third quartile = 5.57

(b) range = 0.52, interquartile range = 0.13, variance = 0.0112, standard deviation = 0.10583, coefficient of variation = 1.924%

(c) The mean weight of the tea bags in the sample is 5.5014 grams while the middle ranked weight is 5.515. The company should be concerned about the central tendency because that is where the majority of the weight will cluster around. The average of the squared differences between the weights in the sample and the sample mean is 0.0112 whereas the square-root of it is 0.106 gram. The difference between the lightest and the heaviest tea bags in the sample is 0.52. 50% of the tea bags in the sample weigh between 5.44 and 5.57 grams. According to the empirical rule, about 68% of the tea bags produced will have weight that falls within 0.106 grams around 5.5014 grams. The company producing the tea bags should be concerned about the variation because tea bags will not weigh exactly the same due to various factors in the production process, e.g. temperature and humidity inside the factory, differences in the density of the tea, etc. Having some idea about the amount of variation will enable the company to adjust the production process accordingly.

3.69 cont. (d)

The data is slightly left skewed.

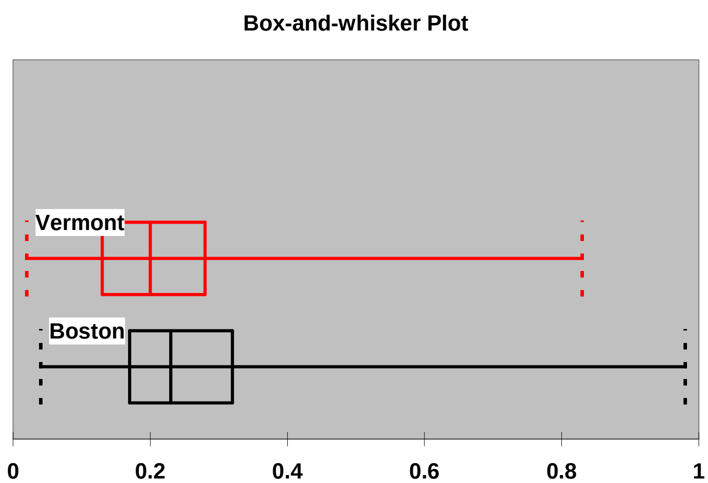
(e) On average, the weight of the teabags is quite close to the target of 5.5 grams. Even though the mean weight is close to the target weight of 5.5 grams, the standard deviation of 0.106 indicates that about 75% of the teabags will fall within 0.212 grams around the target weight of 5.5 grams. The interquartile range of 0.13 also indicates that half of the teabags in the sample fall in an interval 0.13 grams around the median weight of 5.515 grams. The process can be adjusted to reduce the variation of the weight around the target mean.

3.70 (a) Excel output:

Five-number Summary

	Boston	Vermont
Minimum	0.04	0.02
First Quartile	0.17	0.13
Median	0.23	0.2
Third Quartile	0.32	0.28
Maximum	0.98	0.83

(b)



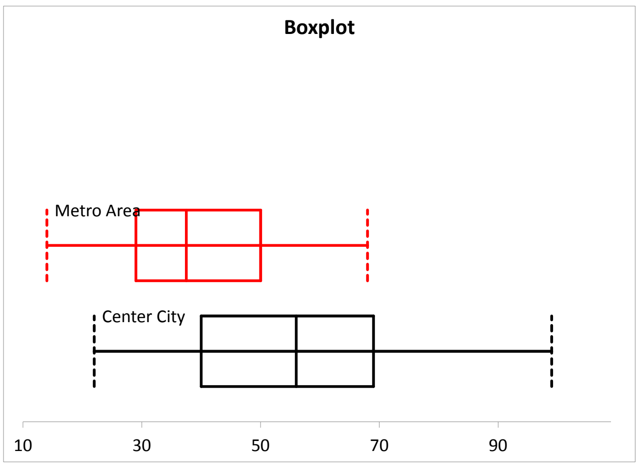
Both distributions are right skewed.

3.70 cont. (c) Both sets of shingles did quite well in achieving a granule loss of 0.8 gram or less. The Boston shingles had only two data points greater than 0.8 gram. The next highest to these was 0.6 gram. These two data points can be considered outliers. Only 1.176% of the shingles failed the specification. In the Vermont shingles, only one data point was greater than 0.8 gram. The next highest was 0.58 gram. Thus, only 0.714% of the shingles failed to meet the specification.

3.71 (a) PHStat output:

Five-Number Summary		
	Center City	Metro Are
Minimum	22	14
First Quartile	40	29
Median	56	37.5
Third Quartile	69	50
Maximum	99	68

(b)



The distribution of the cost is right-skewed for both center city and metro area restaurants.

(c) r = 0.7147. There is a moderate positive linear relationship between the cost and rating of the restaurants. The higher priced restaurants tend to receive higher rating than the lower priced restaurants.

(d) The median cost of the center city restaurants is higher than that in the metro area restaurants. The cost of the most expensive center city restaurant is higher than that of the metro area and the cost of the least expensive center city restaurant is also higher than that of the metro area.

3.72 (a), (b), (c)

	Calories	*Protein*	*Cholesterol*
Calories	1		
Protein	0.464411	1	
Cholesterol	0.177665	0.141673	1

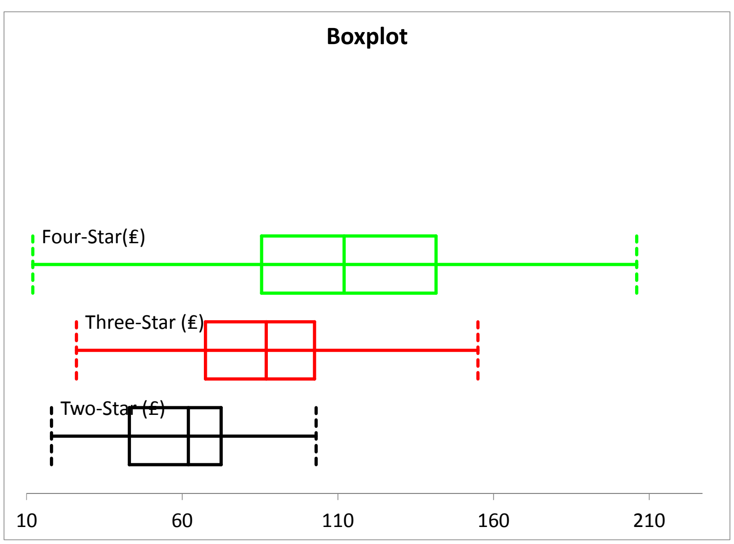
(d) There is a rather weak positive linear relationship between calories and protein with a correlation coefficient of 0.46. The positive linear relationship between calories and cholesterol is quite weak at .178.

3.73 (a),(b) PHStat output:

	Two-Star (£)	Three-Star (£)	Four-Star(£)
Mean	59.6097561	85.7804878	117.9512195
Median	62	87	112
Mode	67	89	79
Minimum	18	26	12
Maximum	103	155	206
Range	85	129	194
Variance	415.9439	782.5756	1759.4976
Standard Deviation	20.3947	27.9746	41.9464
Coeff. of Variation	34.21%	32.61%	35.56%
Skewness	0.0122	0.3151	0.1239
Kurtosis	-0.6318	0.1591	0.0198
Count	41	41	41
Standard Error	3.1851	4.3689	6.5509
First Quartile	43	67.5	85.5
Third Quartile	72.5	102.5	141.5
Interquartile Range	29.5	35	56

(c) The average prices of the two-star, three-star and four-star hotels are 59.61, 85.78 and 117.95 British pounds, respectively while the middle rank prices are 62, 87 and 112 British pounds, respectively. The difference in prices between the lowest and highest price hotels of the two-star, three-star and four-star hotels are 85, 129 and 194 British pounds, respectively while the difference in prices among the middle 50% hotels are 29.5, 35 and 56 British pounds, respectively. The average spread of the prices around the mean for the two-star, three-star and four-star hotels are 20.39, 27.94 and 41.95 British pounds, respectively. The amount of average spread around the mean in relative to the mean prices of the two-star, three-star and four-star hotels are 34.21%, 32.61% and 35.58%, respectively.

(d)



The prices of the two-star, three-star and four-star hotels are quite symmetircal.

3.73 cont. (e) Covariance Matrix

Covariance Matrix			
	Two-Star	Three-Star	Four-Star
Two-Star	415.9439		
Three-Star	499.6122	782.5756	
Four-Star	449.6805	846.039	1759.498

(f) Correlation coefficient matrix

Correlation Coefficient Matrix			
	Two-Star	Three-Star	Four-Star
Two-Star	1		
Three-Star	0.875694	1	
Four-Star	0.525645	0.720996	1

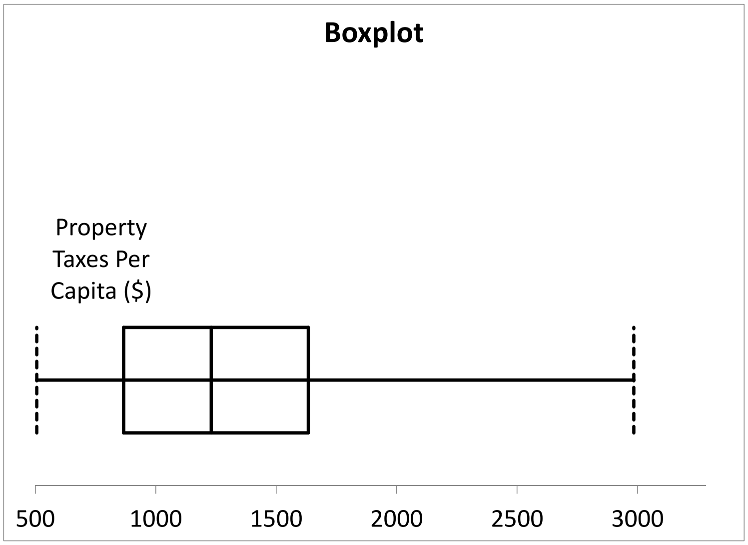
(g) The correlation coefficient is more valuable for expressing the relationship because it does not depend on the units used.

(h) The average price of a room at two-star, three-star, and four-star hotels are all linearly positively related to each other.

3.74 (a), (b)

Property Taxes Per Capita ($)	
Mean	1332.235
Standard Error	80.91249
Median	1230
Mode	#N/A
Standard Deviation	577.8308
Sample Variance	333888.4
Kurtosis	0.539467
Skewness	0.918321
Range	2479
Minimum	506
Maximum	2985
Sum	67944
Count	51
First Quartile	867
Third Quartile	1633
Interquartile Range	766
6 * std.dev	3466.985
1.33 * std.dev	768.515

3.74 cont. (c)

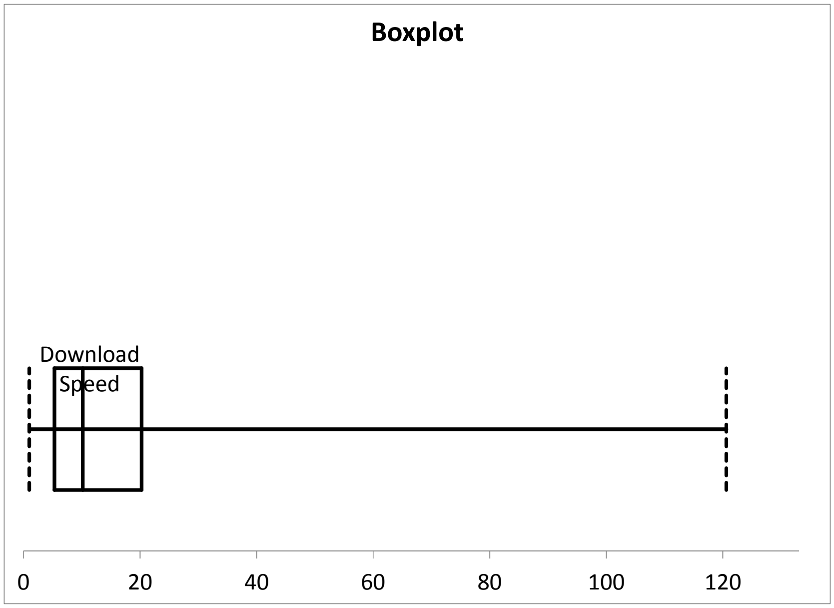


(d) The distribution of the property taxes per capita is right-skewed with an average value of $1,332.24, a median of $1,230 and an average spread around the mean of $577.83. There is an outlier in the right tail at $2985 while the standard deviation is about 43.37% of the average. Twenty-five percent of the states have property taxes that fall below $864 while twenty-five percent have property taxes higher than $1,633.

3.75 (a), (b)

	Download Speed
Mean	16.69
Median	10.16
Mode	29.89
Minimum	0.99
Maximum	120.60
Range	119.61
Variance	352.2944
Standard Deviation	18.7695
Coeff. of Variation	112.48%
Skewness	2.7349
Kurtosis	9.9727
Count	198
Standard Error	1.3339
First Quartile	5.29
Third Quartile	20.26
Interquartile Range	14.97

3.75 cont. (c)



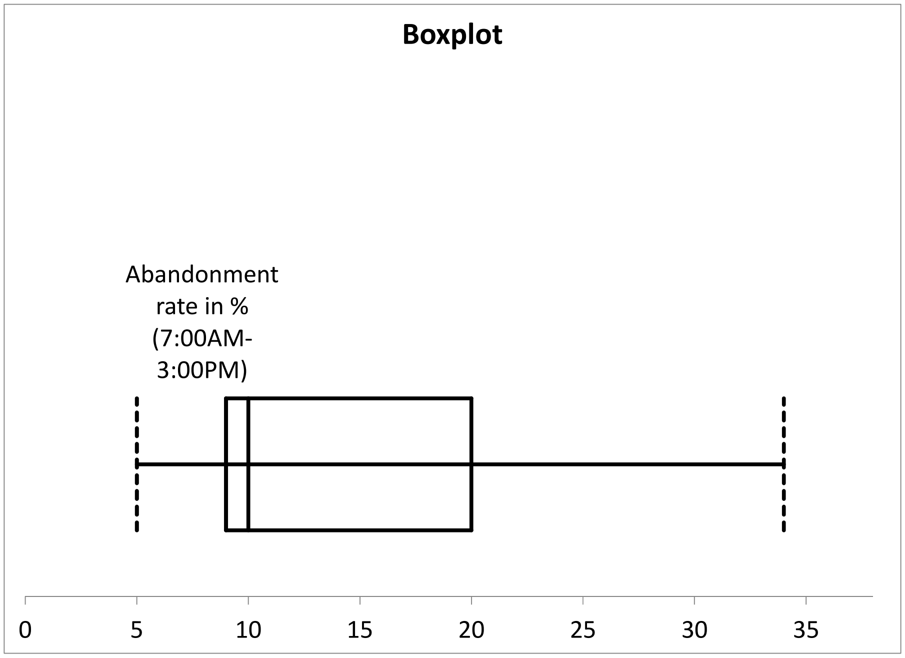
The data are right-skewed.

(d) The average download speed is 16.69 Mbps. Half of the countries have a download speed of less than 10.16 Mbps. One-quarter of the countries have a download speed less than 5.29 Mbps while another one-quarter have a download speed higher than 20.26. The spread of the download speed among all countries is 119.61 Mbps. The middle 50% of the download speed is spread over 14.97 Mbps. The average spread of the download speed around the mean is 18.7695 Mbps.

3.76 (a), (b)

	Abandonment rate in % (7:00AM-3:00PM)
Mean	13.86363636
Standard Error	1.625414306
Median	10
Mode	9
Standard Deviation	7.623868875
Sample Variance	58.12337662
Kurtosis	0.723568739
Skewness	1.180708144
Range	29
Minimum	5
Maximum	34
Sum	305
Count	22
First Quartile	9
Third Quartile	20
Interquartile Range	11
CV	54.99%

3.76 cont. (c)



The data are right-skewed.

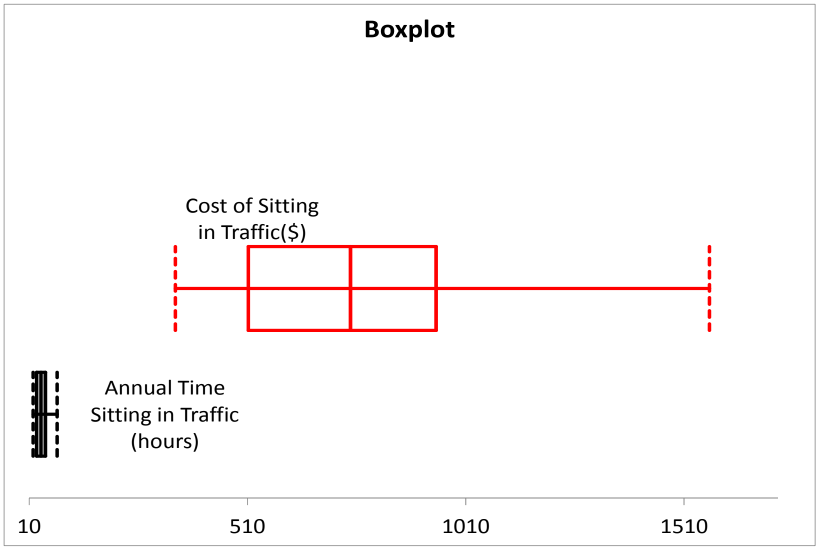
(d) $r = 0.7575$

(e) The average abandonment rate is 13.86%. Half of the abandonment rates are less than 10%. One-quarter of the abandonment rates are less than 9% while another one-quarter are more than 20%. The overall spread of the abandonment rates is 29%. The middle 50% of the abandonment rates are spread over 11%. The average spread of abandonment rates around the mean is 7.62%. The abandonment rates are right-skewed.

3.77 (a), (b)

	Annual Time Sitting in Traffic (hours)	*Cost of Sitting in Traffic($)*
Mean	39.12903226	770.3548387
Standard Error	2.605099191	52.39189686
Median	37	746
Mode	35	512
Standard Deviation	14.50457844	291.7057362
Sample Variance	210.3827957	85092.23656
Kurtosis	0.161745918	0.534793444
Skewness	0.714517855	0.694052033
Range	55	1223
Minimum	19	345
Maximum	74	1568
Sum	1213	23881
Count	31	31
First Quartile	27	512
Third Quartile	47	942
Interquartile Range	20	430
CV	37.07%	37.87%

3.77 cont. (c)



Both the time spent sitting in traffic and the cost of sitting in traffic are right-skewed.

(d) $r = 0.7970$.

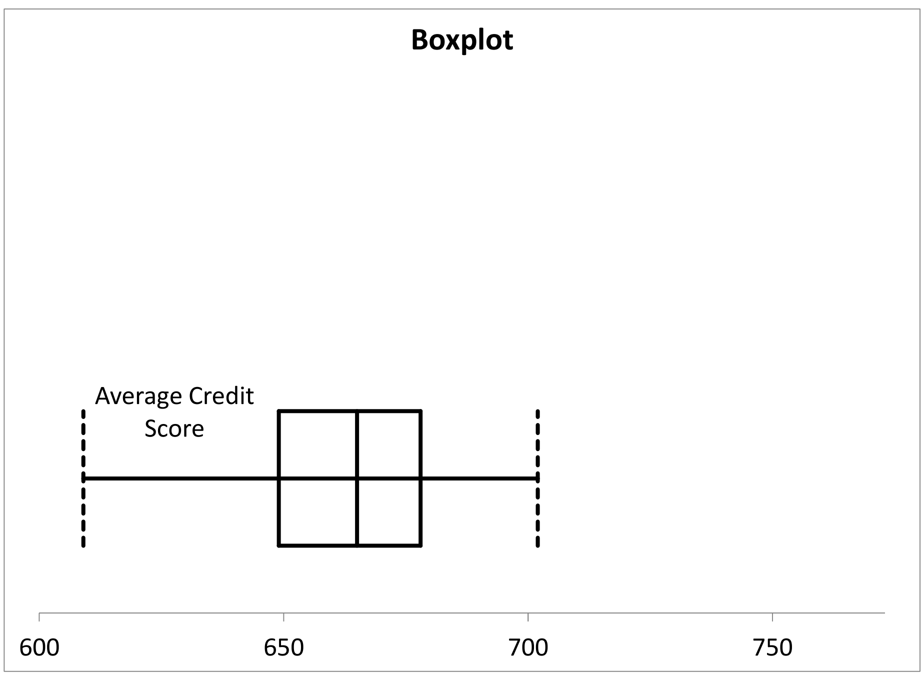
(e) The average time spent sitting in traffic is 39.1290 hours. Half of the time spent sitting in traffic is less than 37 hours. One-quarter of the time spent sitting in traffic is less than 27 hours while another one-quarter is more than 47 hours. The overall spread of the time spent sitting in traffic is 55 hours. The middle 50% of the time spent sitting in traffic spreads over 20 hours. The average spread of time spend sitting in traffic around the mean is 14.5046.

The average cost of sitting in traffic is $770.35. Half of the cost of sitting in traffic is less than $746. One-quarter of the cost of sitting in traffic is less than $512 while another one-quarter is more than $942. The overall spread of the cost of sitting in traffic is $1223. The middle 50% of the cost of sitting in traffic spreads over $430. The average spread of cost of sitting in traffic around the mean is $ 291.71.

3.78 (a), (b)

	Average Credit Score
Mean	664.027972
Median	665
Mode	649
Minimum	609
Maximum	702
Range	93
Variance	356.2246
Standard Deviation	18.8739
Coeff. of Variation	2.84%
Skewness	-0.1343
Kurtosis	-0.4740
Count	143
Standard Error	1.5783
First Quartile	649
Third Quartile	678
Interquartile Range	29

(c)

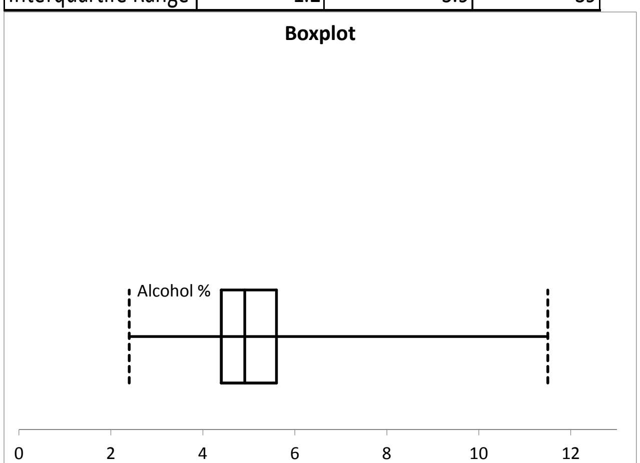


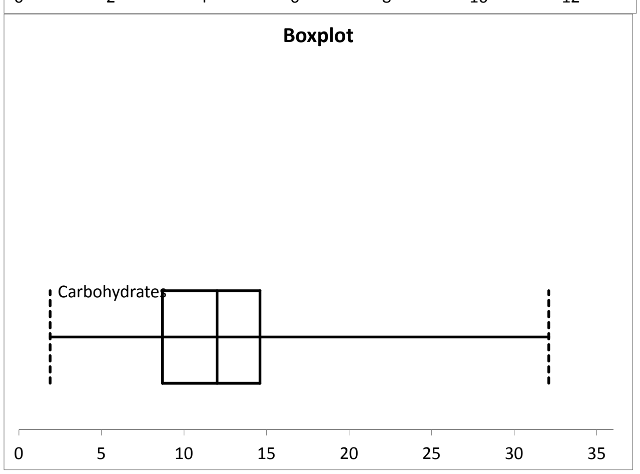
The data are slightly left-skewed.

(d) The mean of the average credit scores is 664.0280. Half of the average credit scores are less than 665. One-quarter of the average credit scores are less than 649 while another one-quarter is more than 678. The overall spread of average credit scores is 93. The middle 50% of the average credit scores spread over 29. The average spread of average credit scores around the mean is 18.8739.

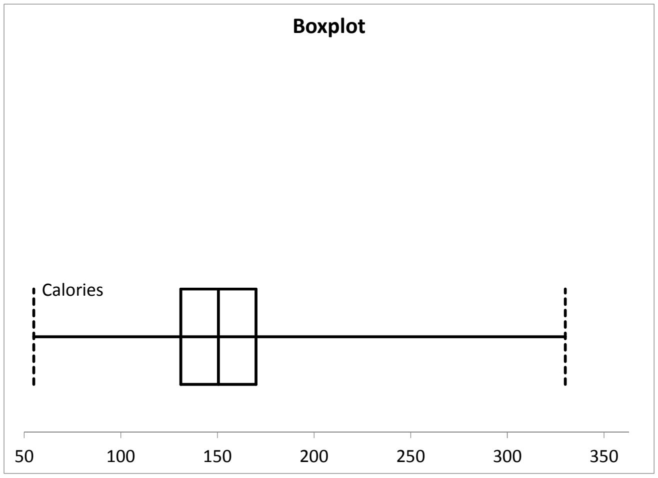
3.80 Excel output:

	Alcohol %	Carbohydrates	Calories
Mean	5.266518987	12.05772152	155.5443038
Median	4.91	12.005	150.5
Mode	4.2	12	110
Minimum	2.4	1.9	55
Maximum	11.5	32.1	330
Range	9.1	30.2	275
Variance	1.8372	24.6953	1905.9566
Standard Deviation	1.3554	4.9694	43.6573
Coeff. of Variation	25.74%	41.21%	28.07%
Skewness	1.8410	0.4877	1.2162
Kurtosis	4.5429	1.0901	3.0073
Count	158	158	158
Standard Error	0.1078	0.3953	3.4732
First Quartile	4.4	8.7	131
Third Quartile	5.6	14.6	170
Interquartile Range	1.2	5.9	39





3.80
cont.



The amount of % alcohol is right skewed with an average at 5.27%. Half of the beers have % alcohol below 4.91%. The middle 50% of the beers have alcohol content spread over a range of 1.2%. The highest alcohol content is at 11.5% while the lowest is at 2.4%. The average scatter of alcohol content around the mean is 1.3554%.
The number of calories is right-skewed with an average at 155.5443. Half of the beers have calories below 150.5. The middle 50% of the beers have calories spread over a range of 39. The highest number of calories is 330 while the lowest is 55. The average scatter of calories around the mean is 43.6573.
The number of carbohydrates is right-skewed from the boxplot with an average at 12.0577, which is almost identical to the median at 12.005. Half of the beers have carbohydrates below 12.005. The middle 50% of the beers have carbohydrates spread over a range of 5.9. The highest number of carbohydrates is 32.1 while the lowest is 1.9. The average scatter of carbohydrates around the mean is 4.9694.