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

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

3.7 Half of the associate professors make no more than \$90,200 while half of the full professors make no more than \$112,000 a year.

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 $227,200.

(b) On average, the sales price of houses was $267,900.

(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	25.75
Median	23.5
Mode	22
Standard Deviation	6.137318
Sample Variance	37.66667
Range	18
Minimum	20
Maximum	38
Sum	412
Count	16
First Quartile	21
Third Quartile	33
CV	23.83%

3.11 (b)
cont.

MPG	Z Score	MPG	Z Score
38	1.9960	23	-0.4481
24	-0.2851	20	-0.9369
26	0.0407	37	1.8330
21	-0.7740	22	-0.6110
25	-0.1222	20	-0.9369
22	-0.6110	33	1.1813
24	-0.2851	22	-0.6110
34	1.3442	21	-0.7740

(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 is slightly right-skewed while that of the SUVs is symmetrical. The mean MPG of sedans is 4.14 higher than that of SUVs. The average scatter of the MPG of sedans is almost 3 times that of SUVs. The range of sedans is almost 2 times that of SUVs.

3.12 (a), (b)

MPG	
Mean	21.61111
Median	22
Mode	22
Standard Deviation	2.173067
Sample Variance	4.722222
Range	10
Minimum	16
Maximum	26
Sum	389
Count	18
First Quartile	21
Third Quartile	23
CV	10.0553%

3.12 (a),(b) cont.

MPG	Z Score	MPG	Z Score
20	-0.7414	22	0.1790
22	0.1790	22	0.1790
23	0.6391	26	2.0197
22	0.1790	23	0.6391
23	0.6391	24	1.0993
22	0.1790	19	-1.2016
22	0.1790	21	-0.2812
21	-0.2812	22	0.1790
19	-1.2016	16	-2.5821

(c) The data appears to be symmetrical since the median is about the same as the mean.

(d) The distribution of MPG of the sedans is slightly right-skewed while that of the SUVs is symmetrical. The mean MPG of sedans is 4.14 higher than that of SUVs. The average scatter of the MPG of sedans is almost 3 times that of SUVs. The range of sedans is almost 2 times that of SUVs.

3.13 (a), (b)

Number of Partners	
Mean	20.94737
Median	21
Mode	30
Standard Deviation	7.074788
Sample Variance	50.05263
Range	23
Minimum	9
Maximum	32
Sum	398
Count	19
First Quartile	15
Third Quartile	29
CV	33.77%

3.13 (a), (b)
cont.

Firm	Number of Partners	Z Score
Kennedy and Coe	24	0.43148
Mountjoy Chilton Medley	32	1.562256
Macias Gini & O'Connell	12	-1.26468
Grassi & Co.	13	-1.12334
Rea & Associates	29	1.138215
Wiss & Co.	30	1.279562
Baker Newman & Noyes	26	0.714174
Wolf & Co.	17	-0.55795
Padgett, Stratemann & Co.	15	-0.84064
Yeo & Yeo	21	0.007439
Clark Nuber	16	-0.6993
Brown Smith Wallace	23	0.290133
Jackson Thornton & Co.	21	0.007439
Yount, Hyde & Barbour	19	-0.27525
Brady, Martz & Associates	30	1.279562
Feeley & Driscoll	14	-0.98199
Frost	9	-1.68872
Dean Dorton Allen Ford	30	1.279562
LaPorte Shert Romig Hand	17	-0.55795

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 20.95 while the median number of partners is 21. The average scatter of the number of partners around the mean is 7.0748. The difference between the highest and the lowest number of partners is 23.

3.14 (a), (b)

Facebook Penetration	
Mean	34.82533
Standard Error	3.320611
Median	37.52
Mode	#N/A
Standard Deviation	12.86067
Sample Variance	165.3968
Kurtosis	0.933459
Skewness	-0.82106
Range	47.99
Minimum	4.25
Maximum	52.24
Sum	522.38
Count	15
First Quartile	28.29
Third Quartile	46.04
CV	36.93%

Country	Facebook Penetration	Z Score
United States	50.19	1.194702
Brazil	25.45	-0.72899
India	4.25	-2.37743
Indonesia	18.04	-1.30517
Mexico	31.66	-0.24613
United Kingdom	49.14	1.113058
Turkey	39.99	0.401586
Philippines	28.29	-0.50816
France	37.52	0.209528
Germany	28.87	-0.46307
Italy	37.73	0.225857
Argentina	46.04	0.872013
Canada	52.24	1.354103
Colombia	38.06	0.251516
Spain	34.91	0.006583

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 smaller than the median, so the data are only slightly left-skewed.

(d) The mean market penetration value is 34.8253 and the median is 37.52. The average scatter around the mean is 12.8607. The difference between the highest and the lowest value is 47.99.

3.15 (a)

	One-Year	*Five-Year*
Mean	0.684167	1.472083
Median	0.8	1.58
Mode	0.9	1.6
Standard Deviation	0.304201	0.299637
Sample Variance	0.092538	0.089782
Range	0.95	1.3
Minimum	0.1	0.5
Maximum	1.05	1.8
Sum	16.42	35.33
Count	24	24
First Quartile	0.4	1.26
Third Quartile	0.9	1.66
CV	44.46%	20.35%

(b) The one-year CDs have about the same standard deviation but a slightly lower range in the yields offered than the five-year CD. Hence, you might conclude that both types of CDs have about the same amount of variation in the yields offered. But the one-year CDs do have a much higher variation relative to the average in the yields offered than the five-year CDs.

3.16 (a), (b)

Cost(U.S. $)	
Mean	155.5
Standard Error	3.311236
Median	153.5
Mode	#N/A
Standard Deviation	9.365591
Sample Variance	87.71429
Kurtosis	-1.00189
Skewness	0.664989
Range	25
Minimum	146
Maximum	171
Sum	1244
Count	8
First Quartile	147
Third Quartile	166

(c) The mean price is $155.5 and the median is $153.5. The average scatter around the mean is $9.37. The difference between the highest and the lowest value is $25.

3.16 (d) (a), (b)
cont.

Cost(U.S. $)	
Mean	159.125
Standard Error	6.337072
Median	153.5
Mode	#N/A
Standard Deviation	17.92395
Sample Variance	321.2679
Kurtosis	4.624552
Skewness	2.064985
Range	54
Minimum	146
Maximum	200
Sum	1273
Count	8
First Quartile	147
Third Quartile	166

(c) The mean price is \$159.13 and the median is \$153.5. The average scatter around the mean is \$17.92. The difference between the highest and the lowest value is \$54.
The mean, standard deviation and range are sensitive to outliers. The higher price at \$200 raises the value of mean, standard deviation and range while having no impact on the median.

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%

3.17 (a) Mean = 4.287 Median = 4.5
cont. (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

3.18 cont. (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) $\bar{R}_G = \left[\left(1+0.1773\right)\left(1+0.0138\right)\right]^{1/2} - 1 = 9.25\%$

(b) If you purchased \$1,000 of GE stock at the start of 2010, its value at the end of 2011 was $\$1000\left(1+0.0925\right)^2 = \$1{,}193.55$.

(c) The result for Taser was worse than the result for GE, which was worth \$1,193.55.

3.20 (a) $\bar{R}_G = \left[\left(1+0.0108\right)\left(1+0.024\right)\right]^{1/2} - 1 = 1.74\%$

(b) If you purchased \$1,000 of TASER stock at the start of 2010, its value at the end of 2011 was $\$1000\left(1+0.0174\right)^2 = \$1{,}035.06$.

(c) The result for Taser was worse than the result for GE, which was worth \$1,193.55.

3.21 (a)

Year	DJIA	S&P 500	Nasdaq
2011	5.5	0	-1.8
2010	11	12.8	16.9
2009	18.8	23.5	43.9
2008	-33.8	-38.5	-40.5
Geometric mean	-2.04%	-3.79%	-0.43%

(b) The rate of return of S&P 500 is the worst at -3.79% followed by DJIA at -2.04% and Nasdaq at -0.43%.

(c) Gold and silver had a much higher return than the DJIA, the S&P 500, and the NASDAQ, but platinum's return was worse than the DJIA and the NASDAQ, but slightly better than the S&P 500.

3.22 (a)

Year	Platinum	Gold	Silver
2011	-21.1	10.2	-9.8
2010	21.5	29.8	83.7
2009	55.9	23.9	49.3
2008	-41.3	4.3	-26.9
Geometric mean	-3.22%	16.60%	15.96%

(b) Gold had a slightly higher return than silver and a much higher return than platinum.

(c) Gold and silver had a much higher return than the DJIA, the S&P 500, and the NASDAQ, but platinum's return was worse than the DJIA and the NASDAQ, but slightly better than the S&P 500.

3.23 (a)

Average of 3YrReturn%	Risk			
Type	Average	High	Low	Grand Total
Growth	**22.7413**	**26.7529**	**18.5432**	**22.4376**
Large	21.6985	36.2338	17.8696	21.0431
Mid-Cap	22.6957	26.3420	19.7233	22.7077
Small	25.0605	24.3617	27.6300	24.7674
Value	**18.8719**	**26.7200**	**17.3435**	**20.4245**
Large	18.0752		16.2473	17.0782
Mid-Cap	22.0420	26.1300	21.8040	23.9158
Small	20.9050	27.0324	22.6350	26.0300
Grand Total	**21.8874**	**26.7414**	**18.0948**	**21.8362**

(b)

StdDev of 3YrReturn%	Risk			
Type	Average	High	Low	Grand Total
Growth	**4.8769**	**9.2959**	**4.4731**	**6.6408**
Large	4.8083	18.2311	3.9479	7.9658
Mid-Cap	5.2090	4.5951	4.9521	5.3572
Small	3.5458	4.7432	3.8184	4.2432
Value	**3.7904**	**5.0234**	**3.7109**	**5.6783**
Large	3.8638		3.1882	3.5969
Mid-Cap	1.4137	4.7098	1.4211	3.9265
Small	2.1708	5.2951	1.1667	5.2314
Grand Total	**4.9178**	**8.0173**	**4.2253**	**6.4263**

(c) The mean three-year return of growth funds is generally higher than that of the value funds across the various market caps and risk rating with the exception of the mid-cap low-risk and small-cap high-risk funds.
The standard deviation of the three-year return of growth funds is generally higher than that of the value funds across the various market caps and risk rating with the exception of the mid-cap and small-cap high-risk funds.

3.24 (a)

Average of 3YrReturn%	Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**22.6507**	**24.3170**	**19.4017**	**22.5215**	**19.2314**	**22.4376**
Large	21.0080	22.4357	15.4300	21.3636	20.1550	21.0431
Mid-Cap	23.1086	25.0600		22.5731	17.8143	22.7077
Small	24.8783	27.1243	23.3733	25.3490	19.4025	24.7674
Value	**19.8206**	**19.8369**	**23.5700**	**22.3324**	**20.5120**	**20.4245**
Large	17.1623	16.1870	14.9300	18.9538	15.7680	17.0782
Mid-Cap	23.3370	23.7175		27.2100	22.2650	23.9158
Small	25.0700	30.3250	32.2100	24.3983	27.2500	26.0300
Grand Total	**21.8084**	**22.7587**	**20.4438**	**22.4720**	**19.6445**	**21.8362**

(b)

StdDev of 3YrReturn%	Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**5.9833**	**3.6809**	**4.6102**	**7.8469**	**9.5545**	**6.6408**
Large	7.2865	3.0474	2.0099	9.5065	12.4171	7.9658
Mid-Cap	4.7457	3.4045		5.7344	7.5697	5.3572
Small	3.8454	3.4101	1.3312	4.9093	4.8856	4.2432
Value	**5.1254**	**6.3287**	**12.2188**	**5.7936**	**6.2446**	**5.6783**
Large	3.8638	1.9349	#DIV/0!	4.7559	1.5196	3.5969
Mid-Cap	2.8793	4.4491		6.9632	2.2415	3.9265
Small	4.6636	9.7086	#DIV/0!	4.3233	6.3962	5.2314
Grand Total	**5.8714**	**5.1707**	**6.3429**	**7.3224**	**8.5398**	**6.4263**

(c) The mean three-year return of small-cap value funds is higher than that of the small-cap growth funds across the different star ratings with the exception of those rated as three-star. On the other hand, the mean three-year return of large-cap value funds is lower than that of the growth funds across the different star ratings and is lower for the mid-cap with the exception of the mid-cap two-star, three-star and five-star funds. The standard deviation of the three-year return of large-cap growth funds is higher than that of the value funds across all the star ratings.

3.25 (a)

Average of 3YrReturn%	Rating					
Market Cap	Five	Four	One	Three	Two	Grand Total
Large	**19.5541**	**19.8321**	**15.3050**	**20.7794**	**18.6927**	**19.6629**
Average	20.9487	24.1450	15.3050	20.4394	16.9433	20.4404
High	30.3250			47.6800	36.6050	36.2338
Low	17.1523	18.3944		17.1115	15.0743	17.2456
Mid-Cap	**23.1572**	**24.6469**		**23.4425**	**18.8033**	**22.9778**
Average	23.0719	25.5186		22.8467	17.8143	22.6290
High	24.9746	29.8300		30.0600	23.8500	26.2416
Low	20.4813	22.3900		16.4067	20.6800	20.3353
Small	**24.9226**	**27.8356**	**25.5825**	**24.9925**	**22.7657**	**25.1209**
Average	24.9493	27.8025		21.1100	22.1800	24.7142
High	24.7938	28.9625	25.5825	25.8885	23.0000	25.3277
Low	25.6900	23.4600				25.1325
Grand Total	**21.8084**	**22.7587**	**20.4438**	**22.4720**	**19.6445**	**21.8362**

(b)

StdDev of 3YrReturn%	Rating					
Market Cap	Five	Four	One	Three	Two	Grand Total
Large	**6.4671**	**4.0764**	**1.6600**	**8.5923**	**10.2157**	**7.0189**
Average	5.5497	3.3066	1.6600	2.8895	2.0285	4.8003
High	16.3530			21.5385	25.6609	18.2311
Low	4.1669	3.2423		3.3215	2.2465	3.7380
Mid-Cap	**4.3882**	**3.6182**		**6.0221**	**6.8887**	**5.0762**
Average	4.4063	3.7742		2.1141	7.5697	4.9511
High	3.9450	#DIV/0!		5.2650	#DIV/0!	4.5197
Low	4.0221	1.8694		7.0070	#DIV/0!	4.2801
Small	**3.9838**	**4.7430**	**4.5501**	**4.5735**	**6.5702**	**4.5407**
Average	3.1593	4.1651		2.9407	0.7212	3.6139
High	4.6047	5.8791	4.5501	4.4796	8.0237	5.0615
Low	4.3105	#DIV/0!				3.6919
Grand Total	**5.8714**	**5.1707**	**6.3429**	**7.3224**	**8.5398**	**6.4263**

(c) The mean three-year return of small-cap low-risk or average-risk funds is the highest, followed by the mid-cap low-risk or average-risk and finally the large-cap low-risk or average-risk funds across the various star ratings. On the other hand, the mean three-year return of large-cap high-risk funds is the highest, followed by the mid-cap high-risk and finally the small-cap high-risk funds across the various star ratings.
The standard deviation of the three-year return of large-cap high-risk funds is substantially higher than that of the other risk levels and market caps across all the star ratings.

3.26 (a)

Average of 3YrReturn%	Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**22.6507**	**24.3170**	**19.4017**	**22.5215**	**19.2314**	**22.4376**
Average	23.4607	26.4473	15.4300	21.3446	18.8055	22.7413
High	25.3019	26.2200	23.3733	31.4318	26.6150	26.7529
Low	18.7739	21.1783		17.1546	15.0900	18.5432
Value	**19.8206**	**19.8369**	**23.5700**	**22.3324**	**20.5120**	**20.4245**
Average	19.0800	19.0000	14.9300	20.7650	15.9650	18.8719
High	25.7718	33.5100	32.2100	25.8000	26.4000	26.7200
Low	17.2510	17.6975		16.2200	17.8300	17.3435
Grand Total	**21.8084**	**22.7587**	**20.4438**	**22.4720**	**19.6445**	**21.8362**

(b)

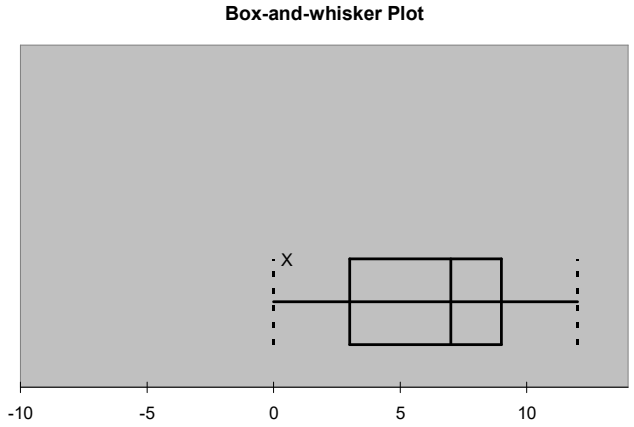
StdDev of 3YrReturn%	Rating					
Type	Five	Four	One	Three	Two	Grand Total
Growth	**5.9833**	**3.6809**	**4.6102**	**7.8469**	**9.5545**	**6.6408**
Average	4.8351	2.9753	2.0099	2.6636	6.1206	4.8769
High	7.1662	2.5920	1.3312	11.3068	19.1304	9.2959
Low	5.0955	2.3038		3.7787	2.4605	4.4731
Value	**5.1254**	**6.3287**	**12.2188**	**5.7936**	**6.2446**	**5.6783**
Average	4.0668	1.5839	#DIV/0!	3.6059	1.6793	3.7904
High	4.2796	5.2043	#DIV/0!	5.2196	5.4922	5.0234
Low	3.7995	3.5798		5.4001	4.0305	3.7109
Grand Total	**5.8714**	**5.1707**	**6.3429**	**7.3224**	**8.5398**	**6.4263**

(c) The mean three-year return of the average-risk or low-risk growth funds is generally higher than that of the value funds. The mean of the high-risk growth funds is higher than the value funds only for those rated at two-star or three-star.
The standard deviation of the three-year return of growth funds is generally higher than that of the value funds across the various risk levels and star ratings with the exception of the four-star high-risk, two-star, three-star or four-star low-risk funds.

3.27 (a) $Q_1 = 3$, $Q_3 = 9$, interquartile range = 6

(b) Five-number summary: 0 3 7 9 12

(c)



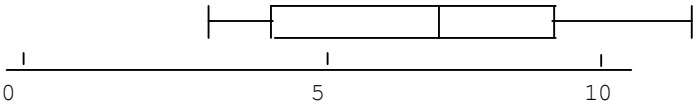
The distribution is left-skewed.

(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)



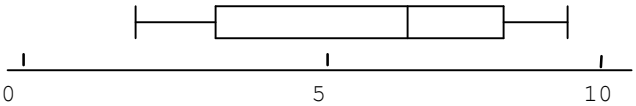
The distances between the median and the extremes are close, 4 and 5, but the differences in the tails are different (1 on the left and 3 on the right), so this distribution is slightly right-skewed.

(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)



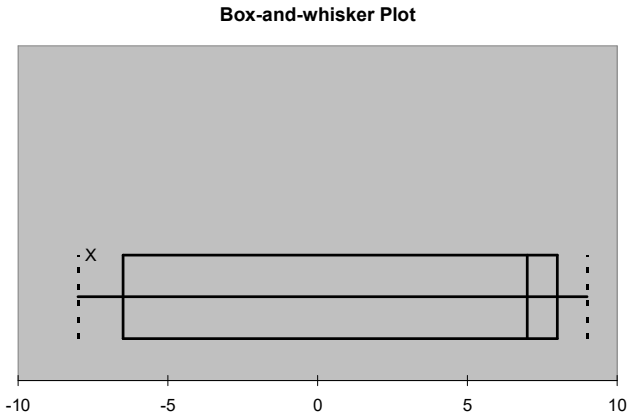
The distribution is left-skewed.

(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)



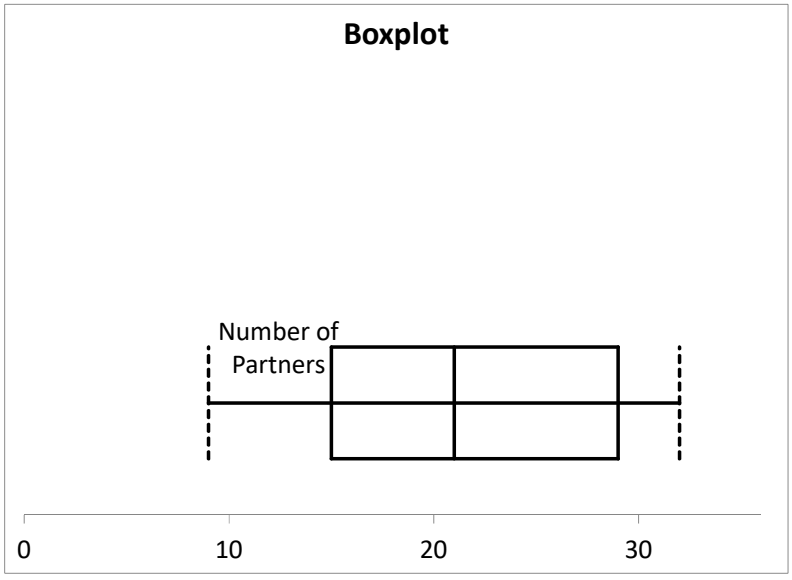
The distribution is left-skewed.

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

3.31 (a), (b)

Five-Number Summary	
Minimum	9
First Quartile	15
Median	21
Third Quartile	29
Maximum	32
Interquartile R	14

(c)

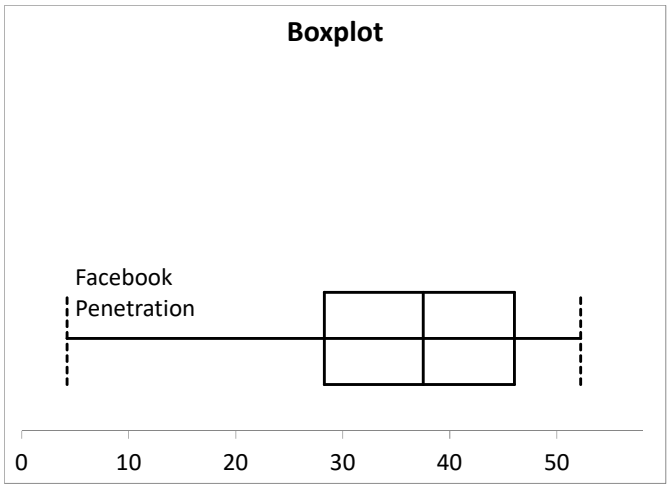


The number of partners is quite symmetrical.

3.32 (a), (b)

Five-Number Summary	
Minimum	4.25
First Quartile	28.29
Median	37.52
Third Quartile	46.04
Maximum	52.24
Interquartile Range	17.75

(c)

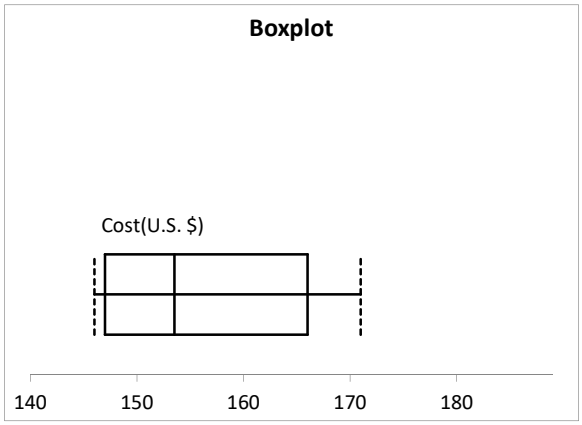


The penetration value is left-skewed.

3.33 (a), (b)

Five-Number Summary	
Minimum	146
First Quartile	147
Median	153.5
Third Quartile	166
Maximum	171
Interquartile Range	19

(c)

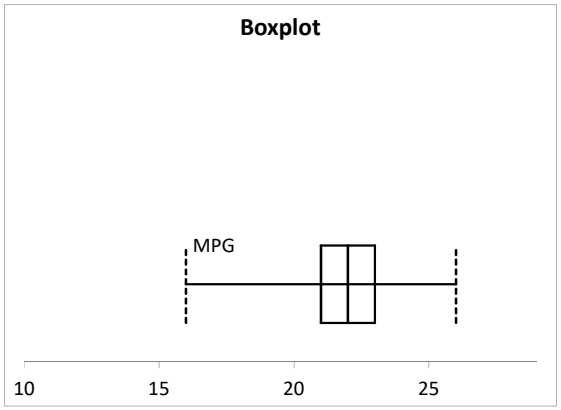


The price is right-skewed.

3.34 (a), (b)

Five-Number Summary	
Minimum	16
First Quartile	21
Median	22
Third Quartile	23
Maximum	26
Interquartile Range	2

(c)

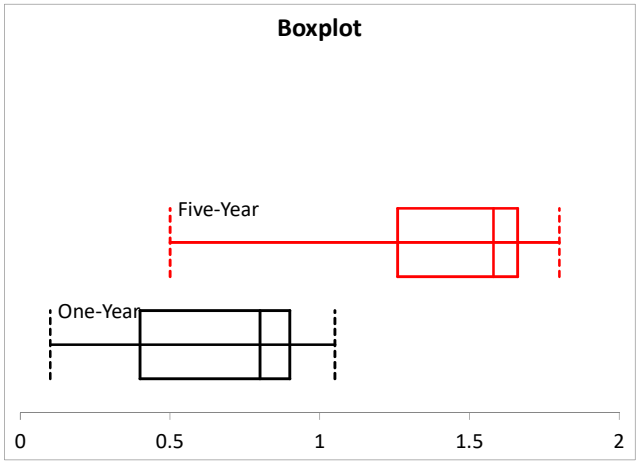


The MPG is left-skewed.

3.35 (a), (b)

Five-Number Summary		
	One-Year	Five-Year
Minimum	0.1	0.5
First Quartile	0.4	1.26
Median	0.8	1.58
Third Quartile	0.9	1.66
Maximum	1.05	1.8
Interquartile R	0.5	0.4

(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:

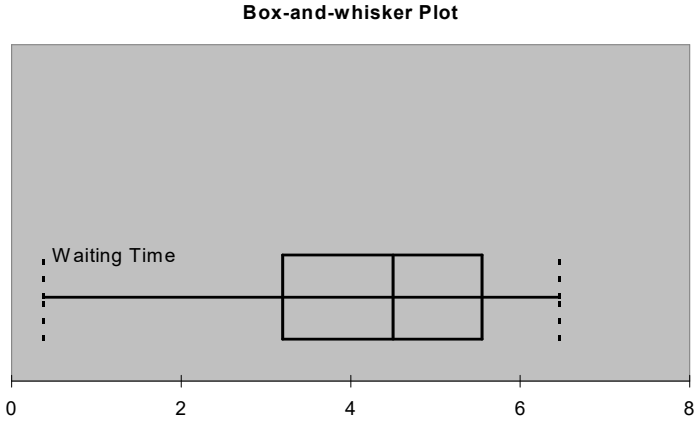
Waiting Time	
Mean	4.286667
Standard Error	0.422926
Median	4.5
Mode	#N/A
Standard Deviation	1.637985
Sample Variance	2.682995
Kurtosis	0.832925
Skewness	-0.83295
Range	6.08
Minimum	0.38
Maximum	6.46
Sum	64.3
Count	15
First Quartile	3.2
Third Quartile	5.55
Interquartile Range	2.35
Coefficient of Variation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

3.36
cont.

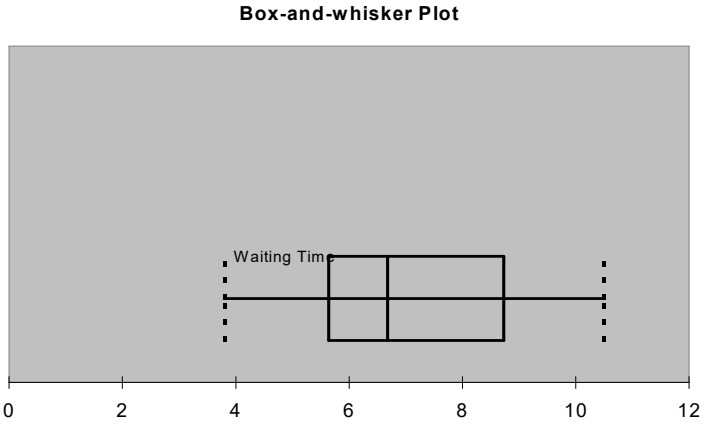
Box-and-whisker Plot	
Five-number Summary	
Minimum	0.38
First Quartile	3.2
Median	4.5
Third Quartile	5.55
Maximum	6.46

(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) $\mu = \dfrac{\sum_{i=1}^{50} X_i}{N} = \dfrac{514}{50} = 10.28$ $\sigma^2 = \dfrac{\sum_{i=1}^{N} (X_i - \mu)^2}{N} = \dfrac{204.92}{50} = 4.0984$

$\sigma = \sqrt{\sigma^2} = 2.0245$

(b) 64% 94% 100%

(c) These percentages are lower than the empirical rule would suggest.

3.40 (a) 68% (b) 95% (c) not calculable 75% 88.89%

(d) $\mu - 4\sigma$ to $\mu + 4\sigma$ or -2.8 to 19.2

3.41 (a) $\mu = 1.436$ $\sigma^2 = 0.9069$

$\sigma = \sqrt{\sigma^2} = 0.9523$

(b) On average, the cigarette tax is \$1.44. The average distances between the cigarette tax in each of the 50 states and the population mean cigarette tax is \$ 0.95.

3.42 Excel output:

Kilowatt Hours	
Mean	12999.22
Standard Error	546.9863
Median	13255
Mode	#N/A
Standard Deviation	3906.264
Sample Variance	15258895
Kurtosis	0.232784
Skewness	0.468115
Range	18171
Minimum	6396
Maximum	24567
Sum	662960
Count	51

3.42 cont. (a) mean = 12999.2158, variance = 14959700.52, std. dev. = 3867.7772

(b) 64.71%, 98.04% and 100% of these states have average per capita energy consumption within 1, 2 and 3 standard deviations of the mean, respectively.

(c) This is consistent with the 68%, 95% and 99.7% according to the empirical rule.

(d) Excel output:

Kilowatt Hours	
Mean	12857.74
Standard Error	539.0489
Median	12999
Mode	#N/A
Standard Deviation	3811.651
Sample Variance	14528684
Kurtosis	0.464522
Skewness	0.494714
Range	18171
Minimum	6396
Maximum	24567
Sum	642887
Count	50

(d) (a) mean = 12857.7402, variance = 14238110.67, std. dev. = 3773.3421

(b) 66%, 98% and 100% of these states have average per capita energy consumption within 1, 2 and 3 standard deviation of the mean, respectively.

(c) This is consistent with the 68%, 95% and 99.7% according to the empirical rule.

3.43 (a) $\mu = \$126.5$ billion $\sigma = \$81.3682$ billion

(b) On average, the market capitalization for this population of 30 companies is \$126.5 billion. The average distances between the market capitalization and the mean market capitalization for this population of 30 companies \$81.37 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 could 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) $cov(X,Y) = 4473270.3$

(b) $S_X^2 = 956812.1336,\ S_Y^2 = 33480836.07$

$$r = \frac{\text{cov}(X,Y)}{S_X S_Y} = 0.7903$$

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

3.49 (a) $cov(X,Y) = 133302.7571$

(b) $S_X^2 = 194992743.3,\ S_Y^2 = 183.7904762$

$$r = \frac{\text{cov}(X,Y)}{S_X S_Y} = 0.7042$$

(c) There is a strong positive linear relationship between the GDP and social media use.

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 ($116,706), followed by the managers ($90,950), the quality engineers ($78,819), and then the Green Belts ($64,794). The middle rank salary for the Master Black Belt ($117,078) is also the highest, followed by the managers ($89,500), the quality engineers ($75,000), and then the Green Belts ($59,700). The overall spread between the highest and lowest salary for the managers ($689,600) is the highest, followed by the quality engineers ($679,608), the Master Black Belt ($206,000), and then the Green Belts ($101,525). However, the average spread of the salary around the mean of the quality engineers ($33,191) is the highest, followed by the Master Black Belt ($31,064), the managers ($30,004), and then the Green Belts ($25,911). Relative dispersion (CV) for Quality Engineers is highest at 42% and lowest for Master Black Belts at 27%.

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 1st quartile = 18 3rd quartile = 63

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

(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.

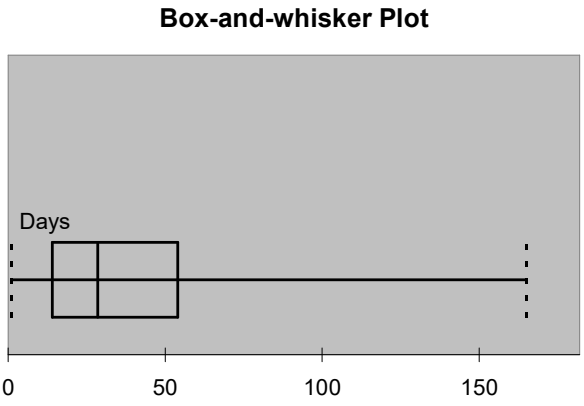
3.65 Excel output:

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%

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



The distribution is right-skewed.

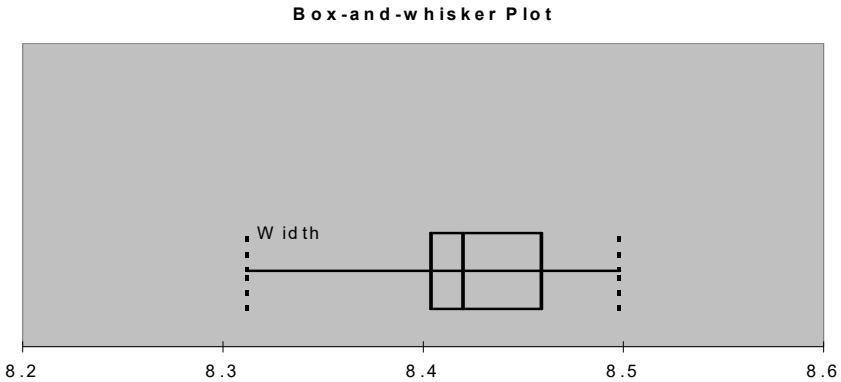
(d) Half of all customer complaints that year were resolved in less than a month (median = 28.5 days), 75% of them within 54 days. There were five complaints that were particularly difficult to settle which brought the overall mean up to 43 days. No complaint took longer than 165 days to resolve.

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.

(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.

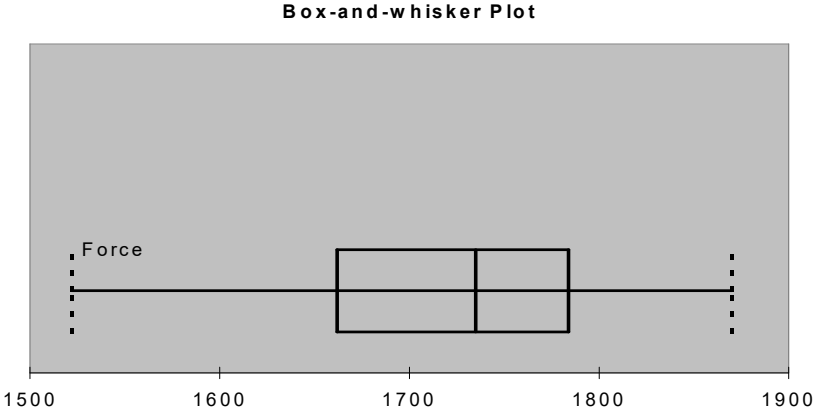
3.67 Excel output:

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.

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



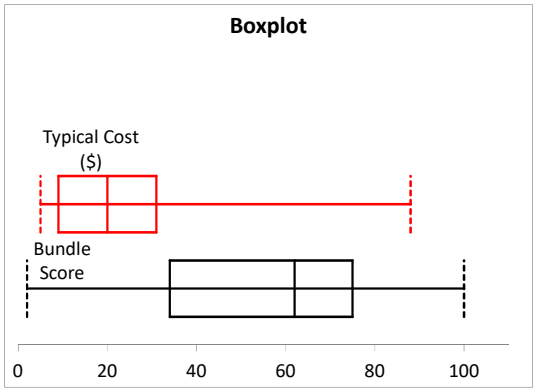
The distribution is skewed to the left.

(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.

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

(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:

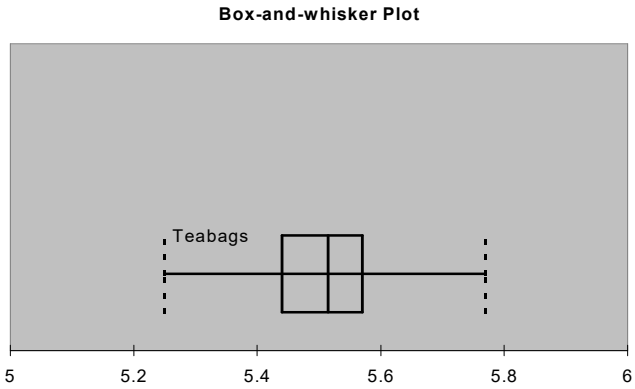
Teabags	
Mean	5.5014
Standard Error	0.014967
Median	5.515
Mode	5.53
Standard Deviation	0.10583
Sample Variance	0.0112
Kurtosis	0.127022
Skewness	-0.15249
Range	0.52
Minimum	5.25
Maximum	5.77
Sum	275.07
Count	50
First Quartile	5.44
Third Quartile	5.57
Interquartile Range	0.13
CV	1.9237%

(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 (d) cont.



The data is slightly left skewed.

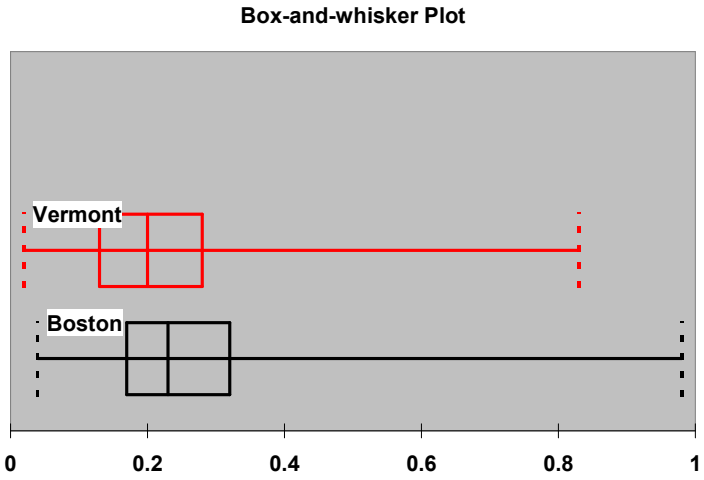
(e) On average, the weight of the teabags is quite close to the target of 5.5 grams. Even though the mean weight is close to the target weight of 5.5 grams, the standard deviation of 0.106 indicates that about 75% of the teabags will fall within 0.212 grams around the target weight of 5.5 grams. The 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)



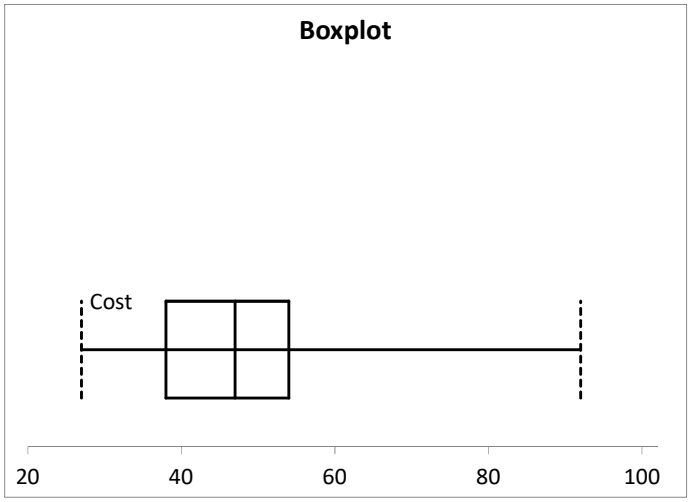
Both distributions are right skewed.

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	
Minimum	27
First Quartile	38
Median	47
Third Quartile	54
Maximum	92

(b)



The distribution of the price is right-skewed because of a few extremely expensive restaurants.

(c) $r = 0.6573$. There is a moderate positive linear relationship between the price and rating of the restaurants. The higher priced restaurants tend to receive higher rating than the lower priced restaurants.

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

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

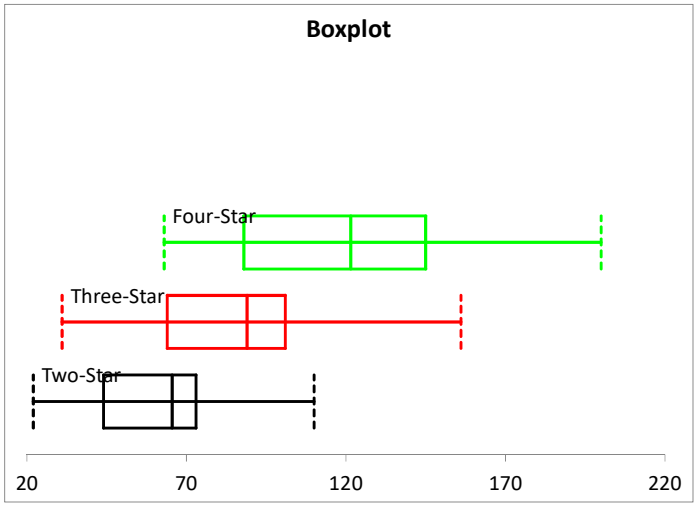
(d) There is a rather weak positive linear relationship between calories and protein with a correlation coefficient of 0.46. The positive linear relationship between calories and cholesterol is quite weak at .178.

3.73 (a),(b) PHStat output:

	Two-Star	*Three-Star*	*Four-Star*
Mean	60.78846	85.28846	119.8077
Median	65.5	89	121.5
Mode	73	101	64
Standard Deviation	19.4466	26.00779	35.06187
Sample Variance	378.1701	676.4054	1229.335
Kurtosis	-0.04925	0.005502	-0.66151
Skewness	0.064656	0.09198	0.250662
Range	88	125	137
Minimum	22	31	63
Maximum	110	156	200
Sum	3161	4435	6230
Count	52	52	52
First Quartile	44	64	88
Third Quartile	73	101	145
Interquartile Range	29	37	57
CV	31.99%	30.49%	29.27%

(c) The average prices of the two-star, three-star and four-star hotels are 60.79, 85.29 and 119.81 English pounds, respectively while the middle rank prices are 65.5, 89 and 121.5 English pounds, respectively. The difference in prices between the lowest and highest price hotels of the two-star, three-star and four-star hotels are 88, 125 and 137 English pounds, respectively while the difference in prices among the middle 50% hotels are 29, 37 and 57 English pounds, respectively. The average spread of the prices around the mean for the two-star, three-star and four-star hotels are 19.45, 26.01 and 35.06 English 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 31.99%, 30.49% and 29.27%, respectively.

(d)



The prices of the two-star, three-star and four-star hotels are all right-skewed.

3.73 cont. (e) Covariance Matrix

	Two-Star	*Three-Star*	*Four-Star*
Two-Star	378.1701		
Three-Star	443.0034	676.4054	
Four-Star	450.3507	778.8605	1229.335

(f) Correlation coefficient matrix

	Two-Star	*Three-Star*	*Four-Star*
Two-Star	1		
Three-Star	0.875911	1	
Four-Star	0.660499	0.851548	1

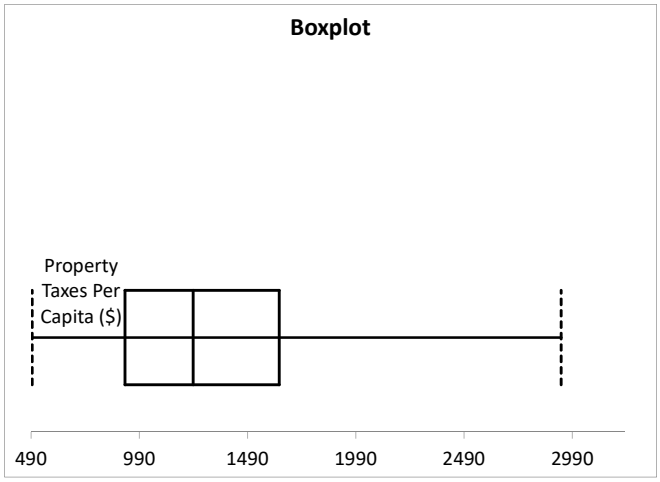
(g) The correlation coefficient is more valuable for expressing the relationship because it does not depend on the units used.

(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	1323.784314
Median	1239
Mode	#N/A
Standard Deviation	563.0223198
Sample Variance	316994.1325
Kurtosis	0.515126714
Skewness	0.887871277
Range	2443
Minimum	495
Maximum	2938
Sum	67513
Count	51
First Quartile	924
Third Quartile	1636
Interquartile Range	712
CV	42.53%

3.74 (c)
cont.

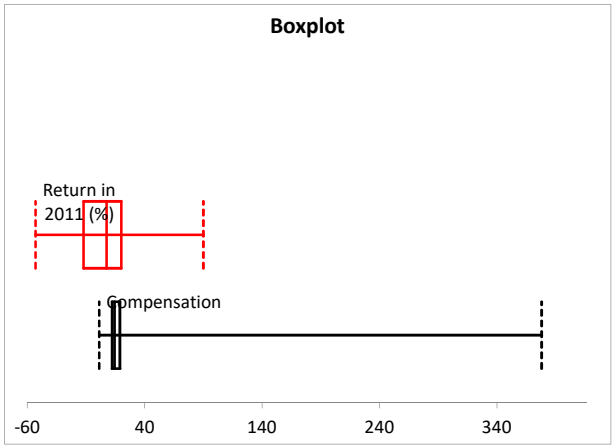


(d) The distribution of the property taxes per capita is right-skewed with an average value of $1,323.78 thousands, a median of $1,239 thousands and an average spread around the mean of $563.02 thousands. There is an outlier in the right tail at $2938 thousands while the standard deviation is about 42.53% of the average. Twenty-five percent of the states have property taxes that fall below $924 thousands while twenty-five percent have property taxes higher than $1,636 thousands.

3.75 (a), (b)

	Compensation	*Return in 2011 (%)*
Mean	19.82628866	6.051546392
Median	14.4	7.5
Mode	11.9	9
Standard Deviation	28.78223545	26.21053505
Sample Variance	828.4170773	686.9921479
Kurtosis	126.7757125	0.209607861
Skewness	10.53178517	0.29002976
Range	376.8	143
Minimum	1.2	-53
Maximum	378	90
Sum	3846.3	1174
Count	194	194
First Quartile	12.3	-12
Third Quartile	18.8	20
Interquartile Range	6.5	32
CV	145.17%	433.12%

3.75 cont. (c)



The data are extremely right-skewed.

(d) The average total compensation is $ 19.83 million. Half of the CEOs have a total compensation of less than $ 14.4 million. One-quarter of the CEOs have a total compensation of less than $12.3 million while another one-quarter have a total compensation in excess of $ 18.8 million. The spread of the total compensation among all CEOs is $ 376.8 million. The middle 50% of the total compensation is spread over $ 6.5 million. The average spread of the total compensation around the mean is $ 28.78 million.

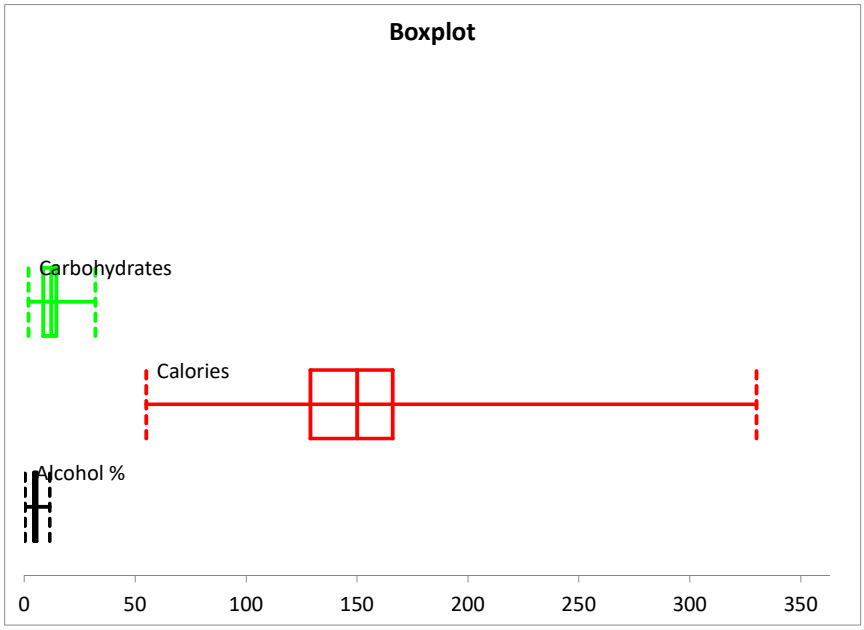
(e) Correlation coefficient between compensation and the investment return in 2011, $r = 0.1457$.

(f) There does not appear to be any linear relationship between compensation and the investment return in 2011.

3.77 Excel output:

	Alcohol %	*Calories*	*Carbohydrates*
Mean	5.220066667	153.86	12.01813333
Median	4.9	150	12.1
Mode	4.2	110	12
Standard Deviation	1.424349373	44.54317414	4.916061935
Sample Variance	2.028771136	1984.094362	24.16766495
Kurtosis	4.785926262	3.080305228	1.257285767
Skewness	1.493310085	1.239384302	0.478165742
Range	11.1	275	30.2
Minimum	0.4	55	1.9
Maximum	11.5	330	32.1
Sum	783.01	23079	1802.72
Count	150	150	150
First Quartile	4.4	129	8.6
Third Quartile	5.6	166	14.5
Interquartile Range	1.2	37	5.9
CV	27.29%	28.95%	40.91%

3.77
cont.



The amount of % alcohol is right skewed and average at 5.2201%. Half of the beers have % alcohol below 4.9%. 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 0.4%. The average scatter of alcohol content around the mean is 1.4243%.
The number of calories is right-skewed and average at 153.86. Half of the beers have calories below 150. The middle 50% of the beers have calories spread over a range of 37. The highest number of calories is 330 while the lowest is 55. The average scatter of calories around the mean is 44.5432.
The number of carbohydrates is right-skewed from the boxplot and average at 12.0181, which is slightly lower than median at 12.1. Half of the beers have carbohydrates below 12.1. 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 4.9161.