CHAPTER 6

6.1 PHStat output:

Normal Probabilities				
Common Data				
Mean	0			
Standard Deviation	1			
			Probability for a Range	
Probability for X <=			From X Value	1.57
X Value	1.57		To X Value	1.84
Z Value	1.57		Z Value for 1.57	1.57
P(X<=1.57)	0.9417924		Z Value for 1.84	1.84
			P(X<=1.57)	0.9418
Probability for X >			P(X<=1.84)	0.9671
X Value	1.84		P(1.57<=X<=1.84)	0.0253
Z Value	1.84			
P(X>1.84)	0.0329		Find X and Z Given Cum. Pctage.	
			Cumulative Percentage	95.00%
Probability for X<1.57 or X >1.84			Z Value	1.644854
P(X<1.57 or X >1.84)	0.9747		X Value	1.644854

(a) $P(Z < 1.57) = 0.9418$
(b) $P(Z > 1.84) = 1 - 0.9671 = 0.0329$
(c) $P(1.57 < Z < 1.84) = 0.9671 - 0.9418 = 0.0253$
(d) $P(Z < 1.57) + P(Z > 1.84) = 0.9418 + (1 - 0.9671) = 0.9747$

6.2 PHStat output:

Normal Probabilities				
Common Data				
Mean	0			
Standard Deviation	1			
			Probability for a Range	
Probability for X <=			From X Value	1.57
X Value	-1.57		To X Value	1.84
Z Value	-1.57		Z Value for 1.57	1.57
P(X<=-1.57)	0.0582076		Z Value for 1.84	1.84
			P(X<=1.57)	0.9418
Probability for X >			P(X<=1.84)	0.9671
X Value	1.84		P(1.57<=X<=1.84)	0.0253
Z Value	1.84			
P(X>1.84)	0.0329		Find X and Z Given Cum. Pctage.	
			Cumulative Percentage	84.13%
Probability for X<-1.57 or X >1.84			Z Value	0.999815
P(X<-1.57 or X >1.84)	0.0911		X Value	0.999815

(a) $P(-1.57 < Z < 1.84) = 0.9671 - 0.0582 = 0.9089$

6.2 cont.
(b) $P(Z < -1.57) + P(Z > 1.84) = 0.0582 + 0.0329 = 0.0911$
(c) If $P(Z > A) = 0.025$, $P(Z < A) = 0.975$. $A = +1.96$.
(d) If $P(-A < Z < A) = 0.6826$, $P(Z < A) = 0.8413$. So 68.26% of the area is captured between $-A = -1.00$ and $A = +1.00$.

6.3 (a) Partial PHStat output:

Normal Probabilities				
Common Data				
Mean	**0**			
Standard Deviation	**1**			
			Probability for a Range	
Probability for X <=			**From X Value**	**1.57**
X Value	**1.08**		**To X Value**	**1.84**
Z Value	**1.08**		**Z Value for 1.57**	**1.57**
P(X<=1.08)	**0.8599289**		**Z Value for 1.84**	**1.84**
			P(X<=1.57)	**0.9418**
Probability for X >			**P(X<=1.84)**	**0.9671**
X Value	**-0.21**		**P(1.57<=X<=1.84)**	**0.0253**
Z Value	**-0.21**			
P(X>-0.21)	**0.5832**		**Find X and Z Given Cum. Pctage.**	
			Cumulative Percentage	**84.13%**
Probability for X<1.08 or X >-0.21			**Z Value**	**0.999815**
P(X<1.08 or X >-0.21)	**1.4431**		**X Value**	**0.999815**

$P(Z < 1.08) = 0.8599$

(b) $P(Z > -0.21) = 1.0 - 0.4168 = 0.5832$

(c) Partial PHStat output:

Probability for X<-0.21 or X >0	
P(X<-0.21 or X >0)	**0.9168**

$P(Z < -0.21) + P(Z > 0) = 0.4168 + 0.5 = 0.9168$

(d) Partial PHStat output:

Probability for X<-0.21 or X >1.08	
P(X<-0.21 or X >1.08)	**0.5569**

$P(Z < -0.21) + P(Z > 1.08) = 0.4168 + (1 - 0.8599) = 0.5569$

6.4 PHStat output:

Normal Probabilities				
Common Data				
Mean	**0**			
Standard Deviation	**1**			
			Probability for a Range	
Probability for X <=			**From X Value**	**-1.96**
X Value	**-0.21**		**To X Value**	**-0.21**
Z Value	**-0.21**		**Z Value for -1.96**	**-1.96**
P(X<=-0.21)	**0.4168338**		**Z Value for -0.21**	**-0.21**
			P(X<=-1.96)	**0.0250**
Probability for X >			**P(X<=-0.21)**	**0.4168**
X Value	**1.08**		**P(-1.96<=X<=-0.21)**	**0.3918**
Z Value	**1.08**			
P(X>1.08)	**0.1401**		**Find X and Z Given Cum. Pctage.**	
			Cumulative Percentage	**84.13%**
Probability for X<-0.21 or X >1.08			**Z Value**	**0.999815**
P(X<-0.21 or X >1.08)	**0.5569**		**X Value**	**0.999815**

(a) $P(Z > 1.08) = 1 - 0.8599 = 0.1401$
(b) $P(Z < -0.21) = 0.4168$
(c) $P(-1.96 < Z < -0.21) = 0.4168 - 0.0250 = 0.3918$
(d) $P(Z > A) = 0.1587$, $P(Z < A) = 0.8413$. $A = +1.00$.

6.5 (a) Partial PHStat output:

Common Data	
Mean	**100**
Standard Deviation	**10**
Probability for X <=	
X Value	**70**
Z Value	**-3**
P(X<=70)	**0.0013499**
Probability for X >	
X Value	**75**
Z Value	**-2.5**
P(X>75)	**0.9938**

$$Z = \frac{X-\mu}{\sigma} = \frac{75-100}{10} = -2.50$$

$P(X > 75) = P(Z > -2.50) = 1 - P(Z < -2.50) = 1 - 0.0062 = 0.9938$

(b) $$Z = \frac{X-\mu}{\sigma} = \frac{70-100}{10} = -3.00$$

$P(X < 70) = P(Z < -3.00) = 0.00135$

6.5 cont. (c) Partial PHStat output:

Common Data	
Mean	100
Standard Deviation	10
Probability for X <=	
X Value	80
Z Value	-2
P(X<=80)	0.0227501
Probability for X >	
X Value	110
Z Value	1
P(X>110)	0.1587
Probability for X<80 or X >110	
P(X<80 or X >110)	0.1814

$$Z = \frac{X-\mu}{\sigma} = \frac{80-100}{10} = -2.00 \qquad Z = \frac{X-\mu}{\sigma} = \frac{110-100}{10} = 1.00$$

$P(X < 80) = P(Z < -2.00) = 0.0228$

$P(X > 110) = P(Z > 1.00) = 1 - P(Z < 1.00) = 1.0 - 0.8413 = 0.1587$

$P(X < 80) + P(X > 110) = 0.0228 + 0.1587 = 0.1815$

(d) $P(X_{lower} < X < X_{upper}) = 0.80$

$P(-1.28 < Z) = 0.10$ and $P(Z < 1.28) = 0.90$

$$Z = -1.28 = \frac{X_{lower} - 100}{10} \qquad Z = +1.28 = \frac{X_{upper} - 100}{10}$$

$X_{lower} = 100 - 1.28(10) = 87.20$ and $X_{upper} = 100 + 1.28(10) = 112.80$

6.6 (a) Partial PHStat output:

Common Data				
Mean	50			
Standard Deviation	4			
			Probability for a Range	
Probability for X <=			From X Value	42
X Value	42		To X Value	43
Z Value	-2		Z Value for 42	-2
P(X<=42)	0.0227501		Z Value for 43	-1.75
			P(X<=42)	0.0228
Probability for X >			P(X<=43)	0.0401
X Value	43		P(42<=X<=43)	0.0173
Z Value	-1.75			
P(X>43)	0.9599		Find X and Z Given Cum. Pctage.	
			Cumulative Percentage	5.00%
Probability for X<42 or X >43			Z Value	-1.644854
P(X<42 or X >43)	0.9827		X Value	43.42059

$P(X > 43) = P(Z > -1.75) = 1 - 0.0401 = 0.9599$

6.6 cont.

(b) $P(X < 42) = P(Z < -2.00) = 0.0228$

(c) $P(X < A) = 0.05$,

$Z = -1.645 = \dfrac{A - 50}{4}$ $\quad$ $A = 50 - 1.645(4) = 43.42$

(d) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	80.00%
Z Value	0.841621
X Value	53.36648

$P(X_{lower} < X < X_{upper}) = 0.60$

$P(Z < -0.84) = 0.20$ and $P(Z < 0.84) = 0.80$

$Z = -0.84 = \dfrac{X_{lower} - 50}{4}$ $\quad$ $Z = +0.84 = \dfrac{X_{upper} - 50}{4}$

$X_{lower} = 50 - 0.84(4) = 46.64$ and $X_{upper} = 50 + 0.84(4) = 53.36$

6.7

(a) $P(X > 32) = P(Z > 0.12) = 0.4522$

Probability for X >	
X Value	32
Z Value	0.12
P(X>32)	0.4522

(b) $P(10 < X < 20) = P(-2.08 < Z < -1.08) = 0.1213$

Probability for a Range	
From X Value	10
To X Value	20
Z Value for 10	-2.08
Z Value for 20	-1.08
P(X<=10)	0.0188
P(X<=20)	0.1401
P(10<=X<=20)	0.1213

(c) $P(X < 10) = P(Z < -2.08) = 0.0188$

Probability for X <=	
X Value	10
Z Value	-2.08
P(X<=10)	0.0187628

(d) $P(X < A) = 0.99$ $\quad$ $Z = 2.3263 = \dfrac{A - 30.8}{10}$ $\quad$ $A = 54.0635$

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	99.00%
Z Value	2.326348
X Value	54.06348

Note: The above answers are obtained using PHStat. They may be slightly different when Table E.2 is used.

6.8 Partial PHStat output:

Common Data	
Mean	50
Standard Deviation	12

Probability for X <=	
X Value	30
Z Value	-1.666667
P(X<=30)	0.0477904

Probability for X >	
X Value	60
Z Value	0.8333333
P(X>60)	0.2023

Probability for X<30 or X >60	
P(X<30 or X >60)	0.2501

Probability for a Range	
From X Value	34
To X Value	50
Z Value for 34	-1.333333
Z Value for 50	0
P(X<=34)	0.0912
P(X<=50)	0.5000
P(34<=X<=50)	0.4088

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	20.00%
Z Value	-0.841621
X Value	39.90055

(a) $P(34 < X < 50) = P(-1.33 < Z < 0) = 0.4088$

(b) $P(X < 30) + P(X > 60) = P(Z < -1.67) + P(Z > 0.83)$
$= 0.0475 + (1.0 - 0.7967) = 0.2508$

(c) $P(X > \text{A}) = 0.80$ $P(Z < -0.84) \cong 0.20$ $Z = -0.84 = \dfrac{A - 50}{12}$

$A = 50 - 0.84(12) = 39.92$ thousand miles or 39,920 miles

(d) Partial PHStat output:

Common Data	
Mean	50
Standard Deviation	10

Probability for X <=	
X Value	30
Z Value	-2
P(X<=30)	0.0227501

Probability for X >	
X Value	60
Z Value	1
P(X>60)	0.1587

Probability for X<30 or X >60	
P(X<30 or X >60)	0.1814

Probability for a Range	
From X Value	34
To X Value	50
Z Value for 34	-1.6
Z Value for 50	0
P(X<=34)	0.0548
P(X<=50)	0.5000
P(34<=X<=50)	0.4452

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	20.00%
Z Value	-0.841621
X Value	41.58379

The smaller standard deviation makes the Z-values larger.

(a) $P(34 < X < 50) = P(-1.60 < Z < 0) = 0.4452$

(b) $P(X < 30) + P(X > 60) = P(Z < -2.00) + P(Z > 1.00)$
$= 0.0228 + (1.0 - 0.8413) = 0.1815$

(c) $A = 50 - 0.84(10) = 41.6$ thousand miles or 41,600 miles

6.9 Partial PHStat output:

Probability for X >	
X Value	15
Z Value	0.6
P(X>15)	0.2743

(a) $P(X > 15) = PZ > 0.6) = 0.2743$

Partial PHStat output:

Probability for a Range	
From X Value	10
To X Value	12
Z Value for 10	-1.9
Z Value for 12	-0.9
P(X<=10)	0.0287
P(X<=12)	0.1841
P(10<=X<=12)	0.1553

(b) $P(10 < X < 12) = P(-1.9< Z < -0.9) = 0.1553$

Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	97.50%
Z Value	1.9600
X Value	17.71993

(c) $P(X_{\text{lower}} < X < X_{\text{upper}}) = 0.95$

$P(Z < -1.96) = 0.0250$ and $P(Z < 1.96) = 0.9750$

$$Z = -1.96 = \frac{X_{\text{lower}} - 13.8}{2} \qquad Z = +1.96 = \frac{X_{\text{upper}} - 13.8}{2}$$

$X_{\text{lower}} = 9.8801$ and $X_{\text{upper}} = 17.7199$

6.10 PHStat output:

Common Data	
Mean	73
Standard Deviation	8

Probability for X <=	
X Value	91
Z Value	2.25
P(X<=91)	0.9877755

Probability for X >	
X Value	81
Z Value	1
P(X>81)	0.1587

Probability for X<91 or X >81	
P(X<91 or X >81)	1.1464

Probability for a Range	
From X Value	65
To X Value	89
Z Value for 65	-1
Z Value for 89	2
P(X<=65)	0.1587
P(X<=89)	0.9772
P(65<=X<=89)	0.8186

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	95.00%
Z Value	1.644854
X Value	86.15883

6.10 cont.

(a) $P(X < 91) = P(Z < 2.25) = 0.9878$

(b) $P(65 < X < 89) = P(-1.00 < Z < 2.00) = 0.9772 - 0.1587 = 0.8185$

(c) $P(X > A) = 0.05$ $P(Z < 1.645) = 0.9500$

$Z = 1.645 = \dfrac{A - 73}{8}$ $A = 73 + 1.645(8) = 86.16\%$

(d) Option 1: $P(X > A) = 0.10$ $P(Z < 1.28) \cong 0.9000$

$Z = \dfrac{81 - 73}{8} = 1.00$

Since your score of 81% on this exam represents a Z-score of 1.00, which is below the minimum Z-score of 1.28, you will not earn an "A" grade on the exam under this grading option.

Option 2: $Z = \dfrac{68 - 62}{3} = 2.00$

Since your score of 68% on this exam represents a Z-score of 2.00, which is well above the minimum Z-score of 1.28, you will earn an "A" grade on the exam under this grading option. You should prefer Option 2.

6.11 PHStat output:

(a) $P(X < 321) = P(Z < -1.50) = 0.0668$

Probability for X<=	
X Value	321
Z Value	-1.5
P(X<=321)	0.0668

(b) $P(320 < X < 471) = P(-1.52 < Z < 1.50) = 0.8689$

Probability for a Range	
From X Value	320
To X Value	471
Z Value for 320	-1.52
Z Value for 471	1.5
P(X<=320)	0.0643
P(X<=471)	0.9332
P(320<=X<=471)	0.8689

(c) $P(X > 471) = P(Z > 1.50) = 0.0668$

Probability for X >	
X Value	471
Z Value	1.5
P(X>471)	0.0668

(d) $P(X < A) = 0.01$ $P(Z < -2.3263) = 0.01$

$A = 396 - 50(2.3263) = 279.6826$

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	1.00%
Z Value	-2.3263
X Value	279.6826

6.12 (a) $P(X > 60) = P(Z > 1.1429) = 0.1265$

Probability for X >	
X Value	60
Z Value	1.1428571
P(X>60)	0.1265

(b) $P(15 < X < 30) = P(-2.0714 < Z < -1) = 0.1395$

Probability for a Range	
From X Value	15
To X Value	30
Z Value for 15	-2.0714
Z Value for 30	-1
P(X<=15)	0.0192
P(X<=30)	0.1587
P(15<=X<=30)	0.1395

(c) $P(X < 15) = P(Z < -2.0714) = 0.0192$

Probability for X<=	
X Value	15
Z Value	-2.0714
P(X<=15)	0.0192

(d) $P(X < A) = 0.99$ $Z = 2.3263$ $A = 76.5689$

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	99.00%
Z Value	2.3263
X Value	76.5689

6.13 (a) Partial PHStat output:

Probability for a Range	
From X Value	21.99
To X Value	22
Z Value for 21.99	-2.4
Z Value for 22	-0.4
P(X<=21.99)	0.0082
P(X<=22)	0.3446
P(21.99<=X<=22)	0.3364

$P(21.99 < X < 22.00) = P(-2.4 < Z < -0.4) = 0.3364$

(b) Partial PHStat output:

Probability for a Range	
From X Value	21.99
To X Value	22.01
Z Value for 21.99	-2.4
Z Value for 22.01	1.6
P(X<=21.99)	0.0082
P(X<=22.01)	0.9452
P(21.99<=X<=22.01)	0.9370

$P(21.99 < X < 22.01) = P(-2.4 < Z < 1.6) = 0.9370$

6.13 cont. (c) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	98.00%
Z Value	2.05375
X Value	22.0123

$P(X > A) = 0.02$ $Z = 2.05$ $A = 22.0123$

(d) (a) Partial PHStat output:

Probability for a Range	
From X Value	21.99
To X Value	22
Z Value for 21.99	-3
Z Value for 22	-0.5
P(X<=21.99)	0.0013
P(X<=22)	0.3085
P(21.99<=X<=22)	0.3072

$P(21.99 < X < 22.00) = P(-3.0 < Z < -0.5) = 0.3072$

(d) (b) Partial PHStat output:

Probability for a Range	
From X Value	21.99
To X Value	22.01
Z Value for 21.99	-3
Z Value for 22.01	2
P(X<=21.99)	0.0013
P(X<=22.01)	0.9772
P(21.99<=X<=22.01)	0.9759

$P(21.99 < X < 22.01) = P(-3.0 < Z < 2) = 0.9759$

(c) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	98.00%
Z Value	2.05375
X Value	22.0102

$P(X > A) = 0.02$ $Z = 2.05$ $A = 22.0102$

6.14 With 39 values, the smallest of the standard normal quantile values covers an area under the normal curve of 0.025. The corresponding Z value is -1.96. The middle (20th) value has a cumulative area of 0.50 and a corresponding Z value of 0.0. The largest of the standard normal quantile values covers an area under the normal curve of 0.975, and its corresponding Z value is +1.96.

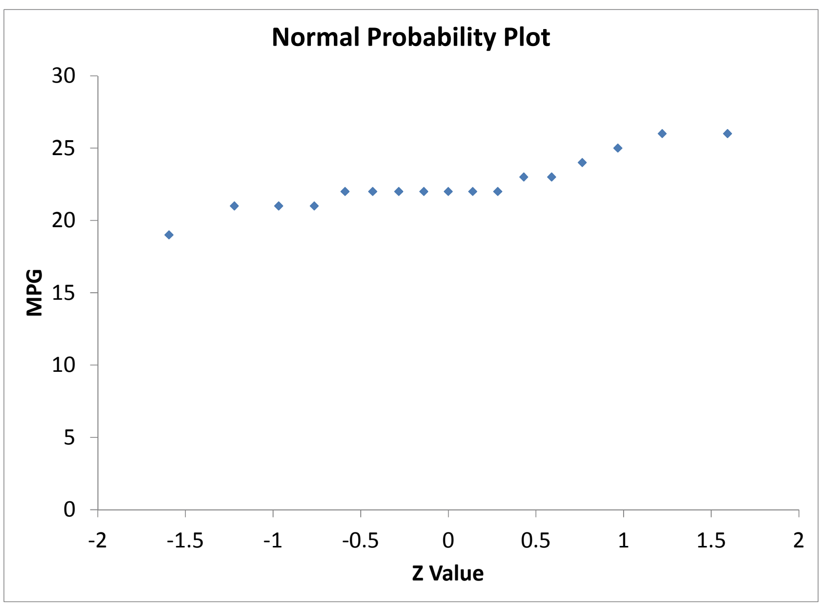
6.15 Area under normal curve covered: 0.1429 0.2857 0.4286 0.5714 0.7143 0.8571
Standardized normal quantile value: – 1.07 – 0.57 – 0.18 + 0.18 + 0.57 + 1.07

6.16 (a) Excel output:

MPG	
Mean	22.52941
Standard Error	0.446536
Median	22
Mode	22
Standard Deviation	1.841115
Sample Variance	3.389706
Kurtosis	0.340209
Skewness	0.525947
Range	7
Minimum	19
Maximum	26
Sum	383
Count	17
First Quartile	21.5
Third Quartile	23.5
Interquartile Range	2
CV	8.17%
6*std.dev	11.04669
1.33*std.dev	2.448683

The mean is about the same as the median. The range is smaller than 6 times the standard deviation and the interquartile range is smaller than 1.33 times the standard deviation.

(b)



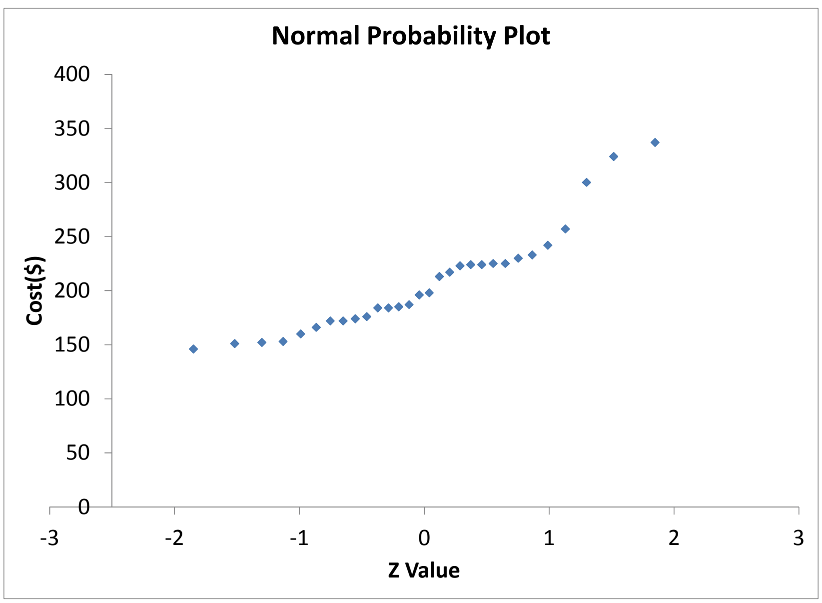
The normal probability plot indicates departure from normal distribution. The kurtosis is 0.3402, indicating a distribution that is slightly more peaked than a normal distribution, with more values in the tails. The skewness of 0.5259 indicates a slightly right-skewed distribution.

6.17 Excel output:

Cost($)	
Mean	207.6667
Standard Error	8.912388
Median	197
Mode	225
Standard Deviation	48.81516
Sample Variance	2382.92
Kurtosis	1.160659
Skewness	1.141341
Range	191
Minimum	146
Maximum	337
Sum	6230
Count	30
First Quartile	172
Third Quartile	225
Interquartile Range	53
6 * std.dev	292.8909
1.33 * std.dev	64.92416

(a) The mean is higher than the median. The range is smaller than 6 times the standard deviation. The interquartile range is smaller than 1.33 times the standard deviation.

(b)



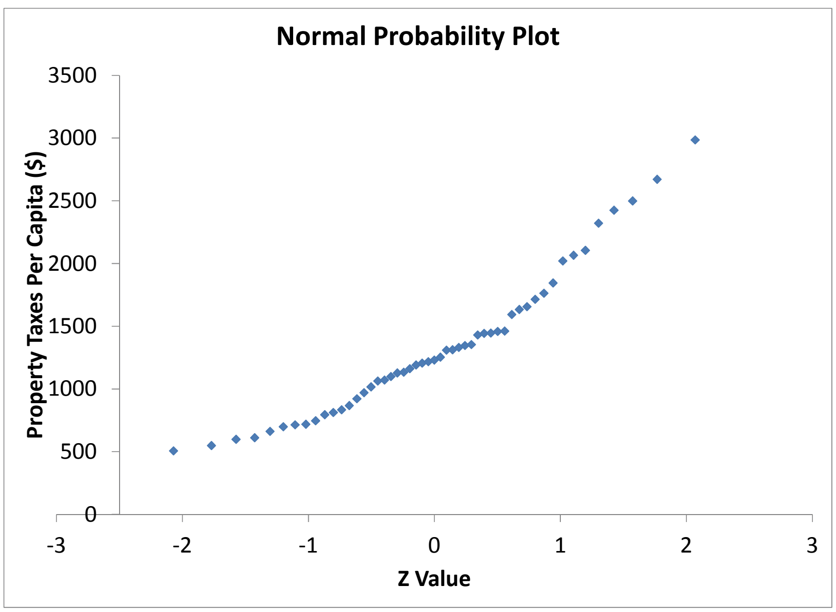
According to the normal probability plot, the data appear to be right skewed. The kurtosis is 1.1607 indicating a distribution that is slightly more peaked than a normal distribution, with more values in the tails. The skewness of 1.1413 indicates a right-skewed distribution.

6.18 Excel output:

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

(a) Because the mean is slightly larger than the median, the interquartile range is slightly less than 1.33 times the standard deviation, and the range is much smaller than 6 times the standard deviation, the data appear to deviate from the normal distribution.

(b)



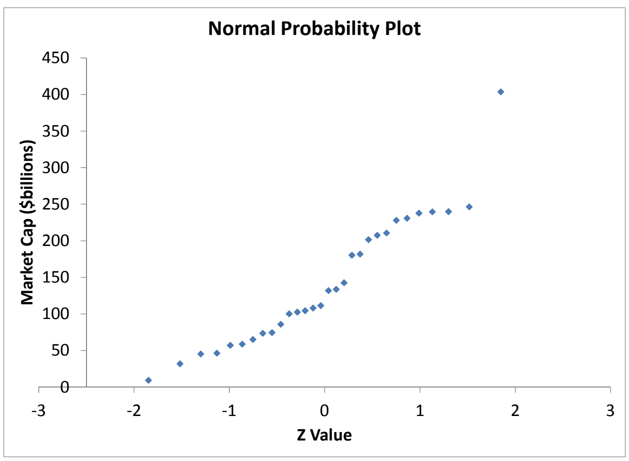
The normal probability plot suggests that the data appear to be right-skewed. The kurtosis is 0.5395 indicating a distribution that is slightly more peaked than a normal distribution, with more values in the tails. A skewness of 0.9183 indicates a right-skewed distribution.

6.19 Excel output:

Market Cap ($billions)	
Mean	142.93
Median	121.6
Mode	#N/A
Standard Deviation	86.86023
Range	394.6
Minimum	9.1
Maximum	403.7
Sum	4287.9
Count	30
First Quartile	73.4
Third Quartile	210.5
Interquartile Range	137.1
6 * std.dev	521.1614
1.33 * std.dev	115.5241

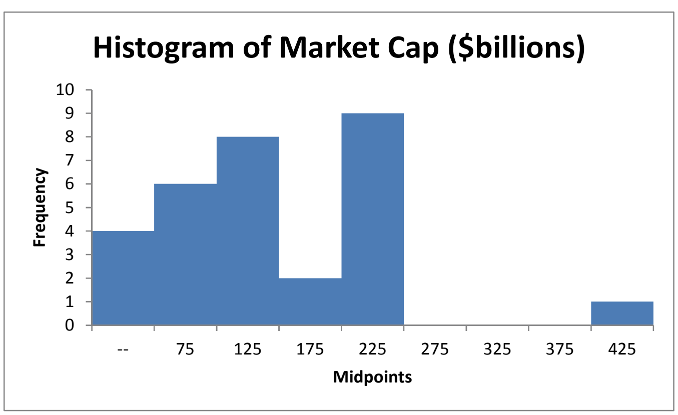
(a) The mean is greater than the median; the range is smaller than 6 times the standard deviation and the interquartile range is greater than 1.33 times the standard deviation. The data do not appear to be normally distributed.

(b)



The normal probability plot suggests that the data are skewed to the right.

(c)



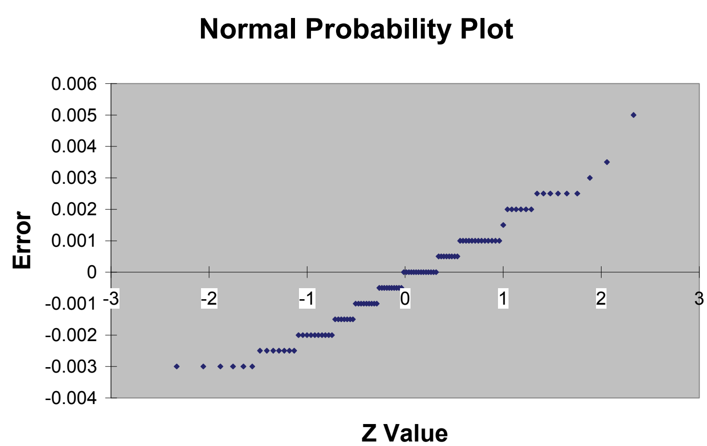
The histogram suggests that the data are skewed to the right.

6.20 Excel output:

Error	
Mean	-0.00023
Median	0
Mode	0
Standard Deviation	0.001696
Sample Variance	2.88E-06
Range	0.008
Minimum	-0.003
Maximum	0.005
First Quartile	-0.0015
Third Quartile	0.001
1.33 Std Dev	0.002255
Interquartile Range	0.0025
6 Std Dev	0.010175

(a) Because the interquartile range is close to 1.33S and the range is also close to 6S, the data appear to be approximately normally distributed.

(b)



The normal probability plot suggests that the data appear to be approximately normally distributed.

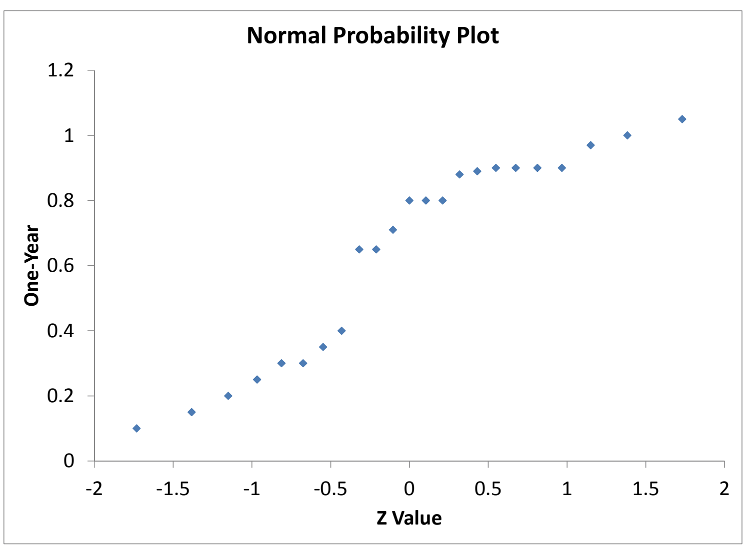
6.21 Excel output:

	One-Year	*Five-Year*
Mean	0.645652	1.276087
Standard Error	0.064859	0.085282
Median	0.8	1.41
Mode	0.9	1.2
Standard Deviation	0.311051	0.408998
Sample Variance	0.096753	0.167279
Kurtosis	-1.34232	0.635713
Skewness	-0.51054	-1.11364
Range	0.95	1.5
Minimum	0.1	0.35
Maximum	1.05	1.85
Sum	14.85	29.35
Count	23	23
First Quartile	0.3	1.05
Third Quartile	0.9	1.54
Interquartile Range	0.6	0.49
CV	48.18%	32.05%
6 * std.dev	1.866308	2.453989
1.33 * std.dev	0.413698	0.543967

One-year CD:

(a) The mean is smaller than the median; the range is smaller than 6 times the standard deviation and the interquartile range is slightly greater than 1.33 times the standard deviation. The data do not appear to be normally distributed.

(b)

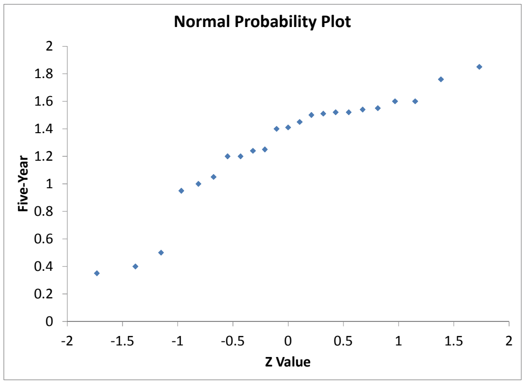


The normal probability plot suggests that the data are left skewed. The kurtosis is -1.3423 indicating a distribution that is less peaked than a normal distribution, with fewer values in the tails. The skewness of -0.5105 indicates that the distribution is left-skewed.

6.21 **Five-Year CD:**

cont. (a) The mean is slightly smaller than the median; the range is smaller than 6 times the standard deviation and the interquartile range is roughly equal to 1.33 times the standard deviation. The data appear to deviate from the normal distribution.

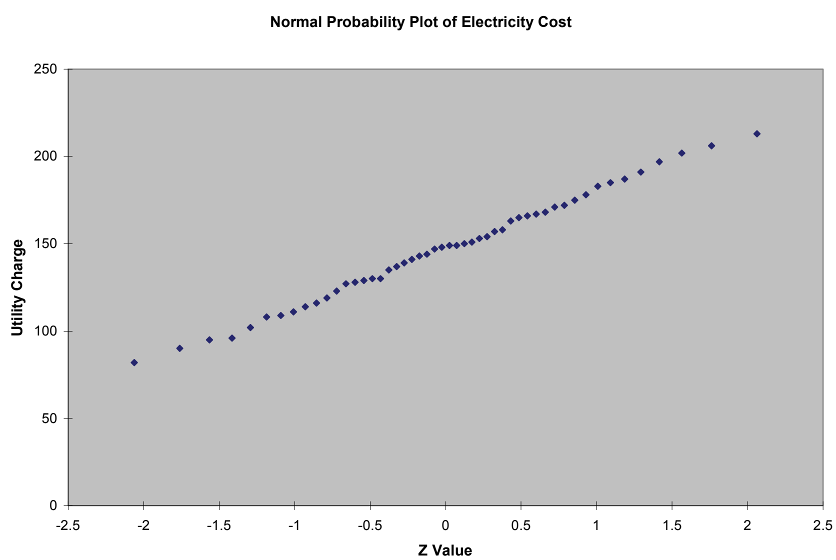
(b)



The normal probability plot suggests that the data are left skewed. The kurtosis is 0.6357 indicating a distribution that is slightly more peaked than a normal distribution, with more values in the tails. The skewness of -1.1136 indicates that the distribution is left-skewed.

6.22 (a) Five-number summary: 82 127 148.5 168 213 mean = 147.06
range = 131 interquartile range = 41 standard deviation = 31.69
The mean is very close to the median. The five-number summary suggests that the distribution is quite symmetrical around the median. The interquartile range is very close to 1.33 times the standard deviation. The range is about $50 below 6 times the standard deviation. In general, the distribution of the data appears to closely resemble a normal distribution.
Note: The quartiles are obtained using PHStat without any interpolation.

(b)



The normal probability plot confirms that the data appear to be approximately normally distributed.

6.23 (a) $P(5 < X < 7) = (7 - 5)/10 = 0.2$
(b) $P(2 < X < 3) = (3 - 2)/10 = 0.1$
(c) $\mu = \dfrac{0+10}{2} = 5$ (d) $\sigma = \sqrt{\dfrac{(10-0)^2}{12}} = 2.8868$

6.24 (a) $P(0 < X < 20) = (20 - 0)/120 = 0.1667$
(b) $P(10 < X < 30) = (30 - 10)/120 = 0.1667$
(c) $P(35 < X < 120) = (120 - 35)/120 = 0.7083$
(d) $\mu = \dfrac{0+120}{2} = 60$ $\sigma = \sqrt{\dfrac{(120-0)^2}{12}} = 34.6410$

6.25 (a) $P(25 < X < 30) = (30 - 25)/(40 - 20) = 0.25$
(b) $P(X < 35) = (35 - 20)/(40 - 20) = 0.75$
(c) $\mu = \dfrac{20+40}{2} = 30$ $\sigma = \sqrt{\dfrac{(40-20)^2}{12}} = 5.7735$

6.26 (a) $P(X < 19) = (19 - 18)/(24 - 18) = 0.1667$
(b) $P(X < 23) = (23 - 18)/(24 - 18) = 0.8333$
(c) $P(20 < X < 22) = (22 - 20)/(24 - 18) = 0.3333$
(d) $\mu = \dfrac{(18+24)}{2} = 21$ $\sigma = \sqrt{\dfrac{(24-18)^2}{12}} = 1.7321$

6.27 (a) $P(X < 70) = (70 - 64)/(74 - 64) = 0.6$
(b) $P(65 < X < 70) = (70 - 65)/(74 - 64) = 0.5$
(c) $P(X > 65) = (74 - 65)/(74 - 64) = 0.9$
(d) $\mu = \dfrac{(64+74)}{2} = 69$ $\sigma = \sqrt{\dfrac{(74-64)^2}{12}} = 2.8868$

6.28 (a) PHStat output:
Exponential Probabilities

Data	
Mean	**10**
X Value	**0.1**

Results	
P(<=X)	**0.6321**

$P(\text{arrival time} < 0.1) = 1 - e^{-\lambda x} = 1 - e^{-(10)(0.1)} = 0.6321$
(b) $P(\text{arrival time} > 0.1) = 1 - P(\text{arrival time} \le 0.1) = 1 - 0.6321 = 0.3679$

6.28 cont. (c) PHStat output:

Exponential Probabilities

Data	
Mean	**10**
X Value	**0.2**

Results	
P(<=X)	**0.8647**

P(0.1 < arrival time < 0.2) = P(arrival time < 0.2) – P(arrival time < 0.1)
= 0.8647 – 0.6321 = 0.2326

(d) P(arrival time < 0.1) + P(arrival time > 0.2) = 0.6321 + 0.1353 = 0.7674

6.29 (a) PHStat output:

Exponential Probabilities

Data	
Mean	**30**
X Value	**0.1**

Results	
P(<=X)	**0.9502**

P(arrival time $<$ 0.1) = $1-e^{-\lambda x} = 1-e^{-(30)(0.1)}$ = 0.9502

(b) P(arrival time > 0.1) = 1 – P(arrival time $\leq$ 0.1) = 1 – 0.9502 = 0.0498

(c) PHStat output:

Exponential Probabilities

Data	
Mean	**30**
X Value	**0.2**

Results	
P(<=X)	**0.9975**

P(0.1 < arrival time < 0.2) = P(arrival time < 0.2) – P(arrival time < 0.1)
= 0.9975 – 0.9502 = 0.0473

(d) P(arrival time < 0.1) + P(arrival time > 0.2) = 0.9502 + 0.0025 = 0.9527

6.30 (a) PHStat output:

Data	
Mean	5
X Value	0.3
Results	
P(<=X)	0.7769

$P(\text{arrival time} < 0.3) = 1 - e^{-(5)(0.3)} = 0.7769$

(b) $P(\text{arrival time} > 0.3) = 1 - P(\text{arrival time} < 0.3) = 0.2231$

(c) PHStat output:

Data	
Mean	5
X Value	0.5
Results	
P(<=X)	0.9179

$P(0.3 < \text{arrival time} < 0.5) = P(\text{arrival time} < 0.5) - P(\text{arrival time} < 0.3)$
$= 0.9179 - 0.7769 = 0.1410$

(d) $P(\text{arrival time} < 0.3 \text{ or } > 0.5) = 1 - P(0.3 < \text{arrival time} < 0.5) = 0.8590$

6.31 (a) PHStat output:

Exponential Probabilities

Data	
Mean	50
X Value	0.05

Results	
P(<=X)	0.9179

$P(\text{arrival time} \le 0.05) = 1 - e^{-(50)(0.05)} = 0.9179$

(b) PHStat output:

Exponential Probabilities

Data	
Mean	50
X Value	0.0167

Results	
P(<=X)	0.5661

$P(\text{arrival time} \le 0.0167) = 1 - 0.4339 = 0.5661$

6.31 cont. (c) PHStat output:

Exponential Probabilities

Data	
Mean	60
X Value	0.05

Results	
P(<=X)	0.9502

Exponential Probabilities

Data	
Mean	60
X Value	0.0167

Results	
P(<=X)	0.6329

If $\lambda = 60$, $P(\text{arrival time} \leq 0.05) = 0.9502$,
$P(\text{arrival time} \leq 0.0167) = 0.6329$

(d) PHStat output:

Exponential Probabilities

Data	
Mean	30
X Value	0.05

Results	
P(<=X)	0.7769

Exponential Probabilities

Data	
Mean	30
X Value	0.0167

Results	
P(<=X)	0.3941

If $\lambda = 30$, $P(\text{arrival time} \leq 0.05) = 0.7769$
$P(\text{arrival time} \leq 0.0167) = 0.3941$

6.32 (a) PHStat output:

Exponential Probabilities

Data	
Mean	2
X Value	1

Results	
P(<=X)	0.8647

$P(\text{arrival time} \leq 1) = 0.8647$

(b) PHStat output:

Exponential Probabilities

Data	
Mean	2
X Value	5

Results	
P(<=X)	0.999955

$P(\text{arrival time} \leq 5) = 0.99996$

(c) PHStat output:

Exponential Probabilities

Data	
Mean	1
X Value	1

Results	
P(<=X)	0.6321

Exponential Probabilities

Data	
Mean	1
X Value	5

Results	
P(<=X)	0.993262

If $\lambda = 1$, $P(\text{arrival time} \leq 1) = 0.6321$,
$P(\text{arrival time} \leq 5) = 0.9933$

6.33 (a) PHStat output:

Exponential Probabilities

Data	
Mean	15
X Value	0.05

Results	
P(<=X)	0.5276

$P(\text{arrival time} \le 0.05) = 1 - e^{-(15)(0.05)} = 0.5276$

(b) PHStat output:

Exponential Probabilities

Data	
Mean	15
X Value	0.25

Results	
P(<=X)	0.9765

$P(\text{arrival time} \le 0.25) = 0.9765$

(c) PHStat output:

Exponential Probabilities

Data	
Mean	25
X Value	0.05

Results	
P(<=X)	0.7135

Exponential Probabilities

Data	
Mean	25
X Value	0.25

Results	
P(<=X)	0.9981

If $\lambda = 25$, $P(\text{arrival time} \le 0.05) = 0.7135$,
$P(\text{arrival time} \le 0.25) = 0.9981$

6.34 (a) PHStat output:

Exponential Probabilit	
Data	
Mean	0.2
X Value	3
Results	
P(<=X)	0.4512

P(next call arrives in $<$ 3) = 0.4512

(b) PHStat output:

Exponential Probabilit	
Data	
Mean	0.2
X Value	6
Results	
P(<=X)	0.6988

P(next call arrives in $>$ 6) = 1 - 0.6988 = 0.3012

(c) PHStat output:

Exponential Probabilit	
Data	
Mean	0.2
X Value	1
Results	
P(<=X)	0.1813

P(next call arrives in $<$ 1) = 0.1813

6.35 (a) PHStat output:

Exponential Probabilities	
Data	
Mean	0.05
X Value	14
Results	
P(<=X)	0.5034

$P(X < 14) = = 1 - e^{-(1/20)(14)} = 0.5034$

6.35 cont. (b) PHstat output:

Exponential Probabilities

Data	
Mean	0.05
X Value	21

Results	
P(<=X)	0.6501

$P(X > 21) = = 1 - \left(1 - e^{-(1/20)(21)}\right) = 0.3499$

(c) PHStat output:

Exponential Probabilities

Data	
Mean	0.05
X Value	7

Results	
P(<=X)	0.2953

$P(X < 7) = = 1 - e^{-(1/20)(7)} = 0.2953$

6.36 (a) PHStat output:

Exponential Probabilities

Data	
Mean	8
X Value	0.25

Results	
P(<=X)	0.8647

$P(\text{arrival time} \leq 0.25) = 0.8647$

(b) PHStat output:

Exponential Probabilities

Data	
Mean	8
X Value	0.05

Results	
P(<=X)	0.3297

$P(\text{arrival time} \leq 0.05) = 0.3297$

6.36 cont. (c) PHStat output:

Exponential Probabilities

Data	
Mean	15
X Value	0.25

Results	
P(<=X)	0.9765

Exponential Probabilities

Data	
Mean	15
X Value	0.05

Results	
P(<=X)	0.5276

If $\lambda = 15$, $P(\text{arrival time} \le 0.25) = 0.9765$,
$P(\text{arrival time} \le 0.05) = 0.5276$

6.37 (a) PHStat output:

Exponential Probabilities	
Data	
Mean	0.6944
X Value	1
Results	
P(<=X)	0.5006

$P(X < 1) = 1 - e^{-(0.6944)(1)} = 0.5006$

(b) PHStat output:

Exponential Probabilities	
Data	
Mean	0.6944
X Value	2
Results	
P(<=X)	0.7506

$P(X < 2) = 1 - e^{-(0.6944)(2)} = 0.7506$

6.37 cont. (c) PHStat output:

Exponential Probabilities	
Data	
Mean	0.6944
X Value	3
Results	
P(<=X)	0.8755

$P(X > 3) = 1 - \left(1 - e^{-(0.6944)(3)}\right) = 0.1245$

(d) The time between visitors is similar to waiting line (queuing) where the exponential distribution is most appropriate.

6.38 Using the tables of the normal distribution with knowledge of μ and σ along with the transformation formula, we can find any probability under the normal curve.

6.39 Using Table E.2, first find the cumulative area up to the larger value, and then subtract the cumulative area up to the smaller value.

6.40 Find the Z value corresponding to the given percentile and then use the equation $X = \mu + z\sigma$.

6.41 The normal distribution is bell-shaped; its measures of central tendency are all equal; its middle 50% is within 1.33 standard deviations of its mean; and 99.7% of its values are contained within three standard deviations of its mean.

6.42 Both the normal distribution and the uniform distribution are symmetric but the uniform distribution has a bounded range while the normal distribution ranges from negative infinity to positive infinity. The exponential distribution is right-skewed and ranges from zero to infinity.

6.43 If the distribution is normal, the plot of the Z values on the horizontal axis and the original values on the vertical axis will be a straight line.

6.44 The exponential distribution is used to determine the probability that the next arrival will occur within a given length of time.

6.45 (a) Partial PHStat output:

Probability for a Range	
From X Value	0.75
To X Value	0.753
Z Value for 0.75	-0.75
Z Value for 0.753	0
P(X<=0.75)	0.2266
P(X<=0.753)	0.5000
P(0.75<=X<=0.753)	0.2734

$P(0.75 < X < 0.753) = P(-0.75 < Z < 0) = 0.2734$

(b) Partial PHStat output:

Probability for a Range	
From X Value	0.74
To X Value	0.75
Z Value for 0.74	-3.25
Z Value for 0.75	-0.75
P(X<=0.74)	0.0006
P(X<=0.75)	0.2266
P(0.74<=X<=0.75)	0.2261

$P(0.74 < X < 0.75) = P(-3.25 < Z < -0.75) = 0.2266 - 0.00058 = 0.2260$

(c) Partial PHStat output:

Probability for X >	
X Value	0.76
Z Value	1.75
P(X>0.76)	0.0401

$P(X > 0.76) = P(Z > 1.75) = 1.0 - 0.9599 = 0.0401$

(d) Partial PHStat output:

Probability for X <=	
X Value	0.74
Z Value	-3.25
P(X<=0.74)	0.000577

$P(X < 0.74) = P(Z < -3.25) = 0.00058$

(e) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	7.00%
Z Value	-1.475791
X Value	0.747097

$P(X < A) = P(Z < -1.48) = 0.07$ $A = 0.753 - 1.48(0.004) = 0.7471$

6.46 (a) Partial PHStat output:

Probability for a Range	
From X Value	1.9
To X Value	2
Z Value for 1.9	-2
Z Value for 2	0
P(X<=1.9)	0.0228
P(X<=2)	0.5000
P(1.9<=X<=2)	0.4772

$P(1.90 < X < 2.00) = P(-2.00 < Z < 0) = 0.4772$

(b) Partial PHStat output:

Probability for a Range	
From X Value	1.9
To X Value	2.1
Z Value for 1.9	-2
Z Value for 2.1	2
P(X<=1.9)	0.0228
P(X<=2.1)	0.9772
P(1.9<=X<=2.1)	0.9545

$P(1.90 < X < 2.10) = P(-2.00 < Z < 2.00) = 0.9772 - 0.0228 = 0.9544$

(c) Partial PHStat output:

Probability for X<1.9 or X >2.1	
P(X<1.9 or X >2.1)	0.0455

$P(X < 1.90) + P(X > 2.10) = 1 - P(1.90 < X < 2.10) = 0.0456$

(d) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	1.00%
Z Value	-2.326348
X Value	1.883683

$P(X > A) = P(Z > -2.33) = 0.99$ $A = 2.00 - 2.33(0.05) = 1.8835$

(e) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	99.50%
Z Value	2.575829
X Value	2.128791

$P(A < X < B) = P(-2.58 < Z < 2.58) = 0.99$

$A = 2.00 - 2.58(0.05) = 1.8710$ $B = 2.00 + 2.58(0.05) = 2.1290$

6.47 (a) Partial PHStat output:

Probability for a Range	
From X Value	1.9
To X Value	2
Z Value for 1.9	-2.4
Z Value for 2	-0.4
P(X<=1.9)	0.0082
P(X<=2)	0.3446
P(1.9<=X<=2)	0.3364

$P(1.90 < X < 2.00) = P(-2.40 < Z < -0.40) = 0.3446 - 0.0082 = 0.3364$

(b) Partial PHStat output:

Probability for a Range	
From X Value	1.9
To X Value	2.1
Z Value for 1.9	-2.4
Z Value for 2.1	1.6
P(X<=1.9)	0.0082
P(X<=2.1)	0.9452
P(1.9<=X<=2.1)	0.9370

$P(1.90 < X < 2.10) = P(-2.40 < Z < 1.60) = 0.9452 - 0.0082 = 0.9370$

(c) Partial PHStat output:

Probability for a Range	
From X Value	1.9
To X Value	2.1
Z Value for 1.9	-2.4
Z Value for 2.1	1.6
P(X<=1.9)	0.0082
P(X<=2.1)	0.9452
P(1.9<=X<=2.1)	0.9370

$P(X < 1.90) + P(X > 2.10) = 1 - P(1.90 < X < 2.10) = 0.0630$

(d) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	1.00%
Z Value	-2.326348
X Value	1.903683

$P(X > A) = P(Z > -2.33) = 0.99$ $A = 2.02 - 2.33(0.05) = 1.9035$

(e) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	99.50%
Z Value	2.575829
X Value	2.148791

$P(A < X < B) = P(-2.58 < Z < 2.58) = 0.99$

$A = 2.02 - 2.58(0.05) = 1.8910$ $B = 2.02 + 2.58(0.05) = 2.1490$

6.48 (a) Partial PHStat output:

Probability for X<=	
X Value	1000
Z Value	-1.0780
P(X<=1000)	0.1405

$P(X < 1000) = P(Z < -1.0780) = 0.1405$

(b)

Probability for a Range	
From X Value	2500
To X Value	3000
Z Value for 2500	1.9220
Z Value for 3000	2.922
P(X<=2500)	0.9727
P(X<=3000)	0.9983
P(2500<=X<=3000)	0.0256

$P(2500 < X < 3000) = P(1.9220 < Z < 2.922) = 0.0256$

(c)

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	90.00%
Z Value	1.2816
X Value	2179.7758

$P(X < A) = P(Z < 1.2816) = 0.90$ $A = 1539 + 500(1.2816) = \$2,179.7758$

(d)

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	90.00%
Z Value	1.2816
X Value	2179.7758

$P(A < X < B) = P(-1.2816 < Z < 1.2816) = 0.80$

$A = 1539 - 1.28(500) = \$898.2242$

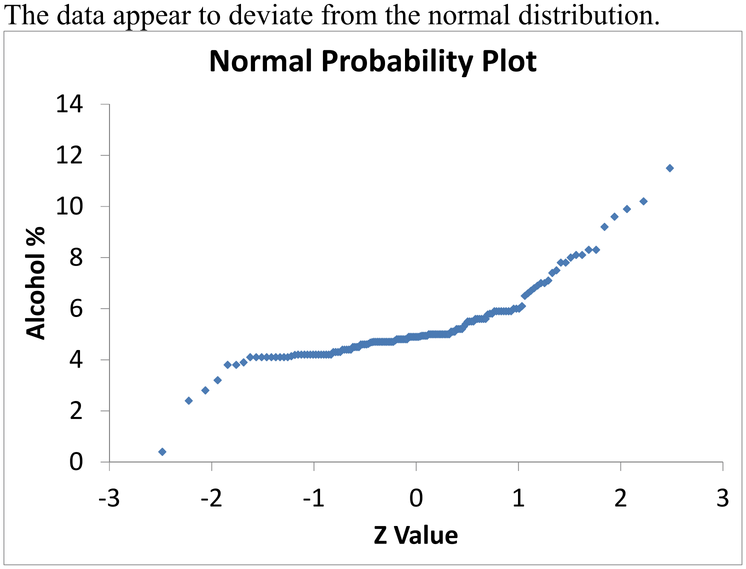
$B = 1539 + 1.28(500) = \$ 2,179.7758$

6.49 Excel output:

	Alcohol %	Calories	arbohydrate
Mean	5.235592	154.3092	11.96395
Standard Error	0.115999	3.616004	0.399234
Median	4.9	150	12.055
Mode	4.2	110	12
Standard Deviation	1.430127	44.58109	4.922091
Sample Variance	2.045263	1987.473	24.22698
Kurtosis	4.370843	2.960631	1.238173
Skewness	1.434988	1.211924	0.478508
Range	11.1	275	30.2
Minimum	0.4	55	1.9
Maximum	11.5	330	32.1
Sum	795.81	23455	1818.52
Count	152	152	152
First Quartile	4.4	129	8.3
Third Quartile	5.6	166	14.5
Interquartile Range	1.2	37	6.2
6 * std dev	8.580762	267.4865	29.53255
1.33 * std dev	1.902069	59.29285	6.546381

Alcohol %:

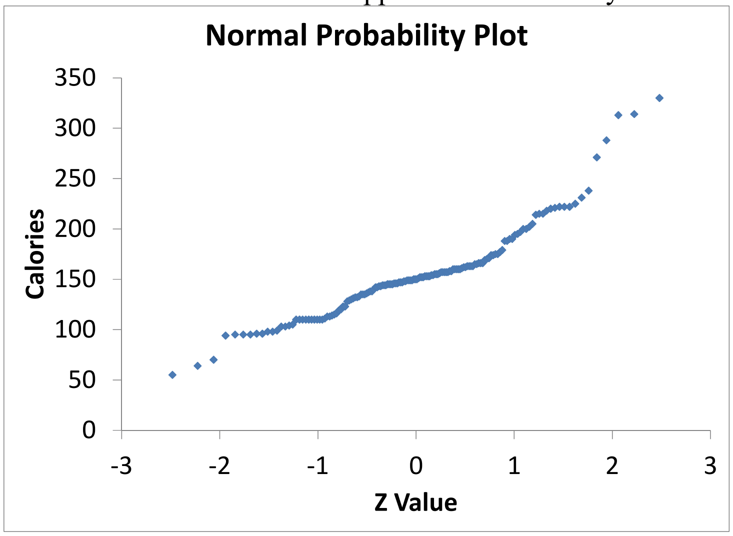
The mean is slightly greater than the median; the range is larger than 6 times the standard deviation and the interquartile range is smaller than 1.33 times the standard deviation. The data appear to deviate from the normal distribution.



The normal probability plot suggests that data are not normally distributed. The kurtosis is 4.3708 indicating a distribution that is more peaked than a normal distribution, with more values in the tails. The skewness of 1.4350 suggests that the distribution is right-skewed.

6.49 **Calories:**
cont.

The mean is approximately equal to the median; the range is slightly greater than 6 times the standard deviation and the interquartile range is much smaller than 1.33 times the standard deviation. The data appear to deviate away from the normal distribution.

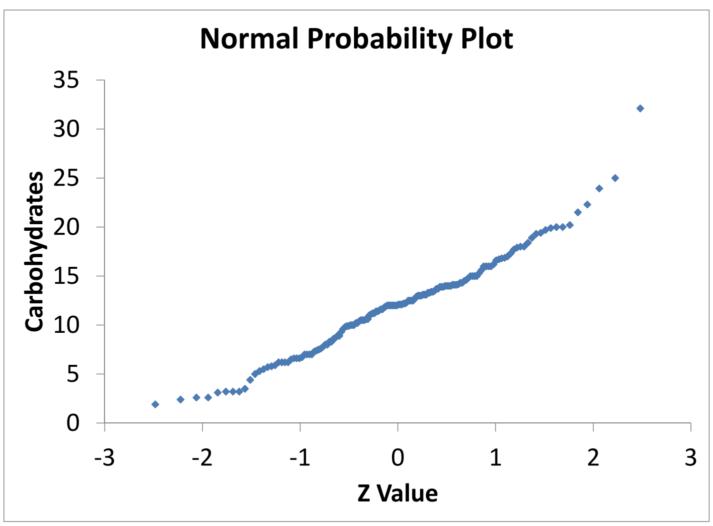


The normal probability plot suggests that the data are somewhat right-skewed. The kurtosis is 2.9606 indicating a distribution that is more peaked than a normal distribution, with more values in the tails. The skewness of 1.2119 suggests that the distribution is right-skewed.

Carbohydrates:

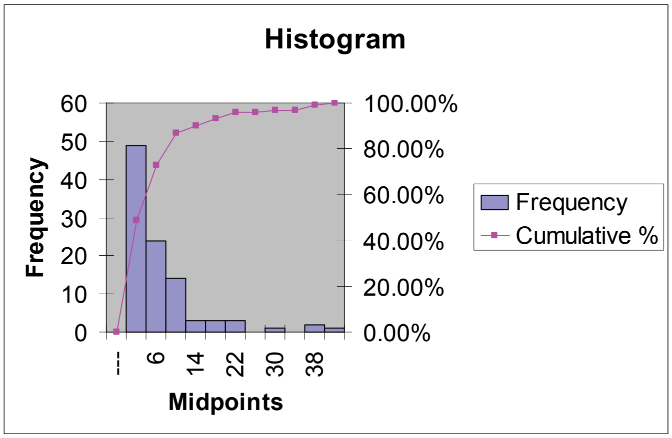
(a) The mean is approximately equal to the median; the range is approximately equal to 6 times the standard deviation and the interquartile range is approximately equal to 1.33 times the standard deviation. The data appear to be normally distributed.

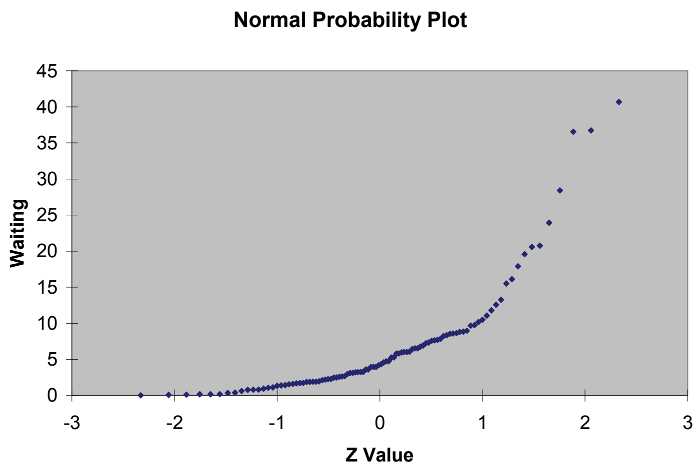
(b)



The normal probability plot suggests that the data are approximately normally distributed. The kurtosis is 1.2382 indicating a distribution that is slightly more peaked than a normal distribution, with more values in the tails. The skewness of 0.4785 indicates that the distribution deviates slightly from the normal distribution.

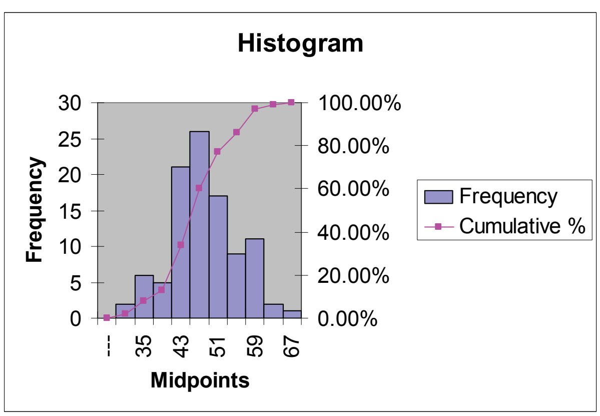
6.50 (a) Waiting time will more closely resemble an exponential distribution.
(b) Seating time will more closely resemble a normal distribution.
(c)



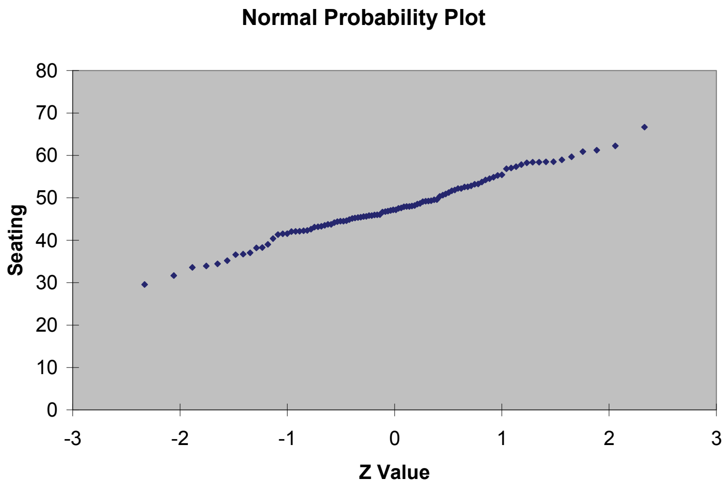


Both the histogram and normal probability plot suggest that waiting time more closely resembles an exponential distribution.

(d)



6.50 cont.



Both the histogram and normal probability plot suggest that seating time more closely resembles a normal distribution.

6.51 (a) PHStat output:

Probability for X >	
X Value	0
Z Value	-0.6705
P(X>0)	0.7487

$P(X > 0) = P(Z > 0) = 0.7487$

(b) PHStat output:

Probability for X >	
X Value	10
Z Value	-0.1705
P(X>10)	0.5677

$P(X > 10) = P(Z > -0.1705) = 0.5677$

(c)

Probability for X<=	
X Value	-20
Z Value	-1.6705
P(X<=-20)	0.0474102

$P(X < -20) = P(Z < -1.6705) = 0.0474$

(d)

Probability for X<=	
X Value	-30
Z Value	-2.1705
P(X<=-30)	0.0150

$P(X < -30) = P(Z < -2.1705) = 0.0150$

6.51 cont. (e) (a)

PHStat output:

Probability for X >	
X Value	0
Z Value	-0.530333
P(X>0)	0.7021

$P(X > 0) = P(Z > -0.5303) = 0.7021$

(b) PHStat output:

Probability for X >	
X Value	10
Z Value	-0.1970
P(X>10)	0.5781

$P(X > 10) = P(Z > -0.1970) = 0.5781$

(c)

Probability for X <=	
X Value	-20
Z Value	-1.1970
P(X<=-20)	0.1157

$P(X < -20) = P(Z < -1.1970) = 0.1157$

(d)

Probability for X <=	
X Value	-30
Z Value	-1.5303
P(X<=-30)	0.0630

$P(X < -30) = P(Z < -1.5303) = 0.0630$

6.52 (a) Partial PHStat output:

Probability for X <=	
X Value	2
Z Value	-1.720769
P(X<=2)	0.0426464

$P(X < 2) = P(Z < -1.7208) = 0.0426$

(b) Partial PHStat output:

Probability for a Range	
From X Value	1.5
To X Value	2.5
Z Value for 1.5	-2.105385
Z Value for 2.5	-1.336154
P(X<=1.5)	0.0176
P(X<=2.5)	0.0907
P(1.5<=X<=2.5)	0.0731

$P(1.5 < X < 2.5) = P(-2.1054 < Z < -1.3362) = 0.0731$

6.52 cont. (c) Partial PHStat output:

Probability for X >	
X Value	1.8
Z Value	-1.874615
P(X>1.8)	0.9696

$P(X > 1.8) = P(Z > -1.8746) = 0.9696$

(d) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	1.00%
Z Value	-2.326348
X Value	1.212748

$P(A < X) = 0.01$ $Z = -2.3263$ $A = 1.2127$

(e) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	2.50%
Z Value	-1.959964
X Value	1.689047

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	97.50%
Z Value	1.959964
X Value	6.784953

$P(A < X < B) = 0.95$ $Z = -1.9600$ $A = 1.6890$

$Z = 1.96$ $B = 6.7850$

(f) (a) $P(X < 2) = (2 - 1)/(9 - 1) = 0.125$

(b) $P(1.5 < X < 2.5) = (2.5 - 1.5)/(9 - 1) = 0.125$

(c) $P(X > 1.8) = (9 - 1.8)/(9 - 1) = 0.9$

6.53 (a) Partial PHStat output:

Probability for X <=	
X Value	2
Z Value	-3.249412
P(X<=2)	0.0005782

$P(X < 2) = P(Z < -3.2494) = 0.0006$

(b) Partial PHStat output:

Probability for a Range	
From X Value	1.5
To X Value	2.5
Z Value for 1.5	-3.543529
Z Value for 2.5	-2.955294
P(X<=1.5)	0.0002
P(X<=2.5)	0.0016
P(1.5<=X<=2.5)	0.0014

$P(1.5 < X < 2.5) = P\ -3.5435 < Z < -2.9553) = 0.0014$

6.53 cont. (c) Partial PHStat output:

Probability for X >	
X Value	1.8
Z Value	-3.367059
P(X>1.8)	0.9996

$P(1.8 < X) = P$ -3.3671$< Z) = 0.9996$

(d) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	1.00%
Z Value	-2.326348
X Value	3.569209

$P(A < X) = 0.99$ $Z = -2.3263$ $A = 3.5692$

(e) Partial PHStat output:

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	2.50%
Z Value	-1.959964
X Value	4.192061

Find X and Z Given Cum. Pctage.	
Cumulative Percentage	97.50%
Z Value	1.959964
X Value	10.85594

$P(A < X < B) = 0.99$ $Z = -1.9600$ $A = 4.1921$

$Z = 1.9600$ $B = 10.8559$

(f) (a) $P(X < 2) = (2 - 1)/(14 - 1) = 0.0769$

(b) $P(1.5 < X < 2.5) = (2.5 - 1.5)/(14 - 1) = 0.0769$

(c) $P(1.8 < X) = (14 - 1.8)/(14 - 1) = 0.9385$

(d) $A = 1 + (14 - 1)*0.01 = 1.13$