

Answers to Selected Odd-Numbered Quantitative Problems

Chapter 1

- 1.5. a. ratio
b. ratio
c. ordinal
d. nominal
e. ratio
f. ratio
g. nominal
h. ratio
- 1.7. a. 900 electric contractors
b. 35 electric contractors
c. average score for 35 participants
d. average score for all 900 electric contractors

Chapter 2

No answers given

Chapter 3

- 3.1. 4
- 3.3. 294
- 3.5. -1
- 3.7. 107, 127, 145, 114, 127.5, 143.5
- 3.9. 6.19, 3.055, 4.96, 7.545, 9.37
- 3.11. a. 8
b. 2.041
c. 6.204
d. 2.491
e. 4
f. 0.69, -0.92, -0.11, 1.89, -1.32, -0.52, 0.29
- 3.13. a. 4.598
b. 4.598
- 3.15. 58, 631.295, 242.139

- 3.17. a. .75
b. .84
c. .609
d. .902
- 3.19. a. 2.667
b. 11.060
c. 3.326
d. 5
e. -0.85
f. 37.65%
- 3.21. Between 113 and 137
Between 101 and 149
Between 89 and 161
- 3.23. 2.236
- 3.25. 95%, 2.5%, .15%, 16%
- 3.27. 4.64, 3.59, 1
- 3.29. 185.694, 13.627
- 3.31. a. 44.9
b. 39
c. 44.82
d. 187.2
e. 13.7
- 3.33. a. 38
b. 25
c. 32.857
d. 251
e. 15.843
- 3.35. skewed right
- 3.37. 0.726
- 3.39. no outliers. negatively skewed
- 3.41. 2.5, 2, 2, 7, 1, 3, 2
- 3.43. 38559.6875, 34451, 19757, 36843, 86696, 17729, 44496.5, 77742, 26767.5

- 3.45. a. 392320, 348500
b. 278000, 137920
c. 7387975636, 85953.33406
d. -0.725 , $+0.877$
e. $+1.53$

- 3.47. a. 33.412, 32.5
b. 58.483, 7.647

- 3.49. 10.78%, 6.43%

- 3.51. a. 392 to 446, 365 to 473, 338 to 500
b. 79.7%
c. -0.704

- 3.53. skewed right

- 3.55. 21.93, 18.14

Chapter 4

- 4.1. 15, .60
4.3. {4, 8, 10, 14, 16, 18, 20, 22, 26, 28, 30}
4.5. 20, combinations, .60
4.7. 38,760
4.9. a. .7167
b. .5000
c. .65
d. .5167
4.11. not solvable
4.13. a. .86
b. .31
c. .14
4.15. a. .2807
b. .0526
c. .0000
d. .0000
4.17. a. .0122
b. .0144
4.19. a. .57
b. .3225
c. .4775
d. .5225
e. .6775
f. .0475
4.21. a. .039
b. .571
c. .129
4.23. a. .2286
b. .2297
c. .3231
d. .0000
4.25. not independent
4.27. a. .4054
b. .3261
c. .4074
d. .32

- 4.29. a. .03
b. .2875
c. .3354
d. .9759

- 4.31. .0538, .5161, .4301

- 4.33. .7941, .2059

- 4.35. a. .4211
b. .6316
c. .2105
d. .1250
e. .5263
f. .0000
g. .6667
h. .0000

- 4.37. a. .28
b. .04
c. .86
d. .32
e. .1739
f. .66

- 4.39. a. .5410
b. .7857
c. .70
d. .09
e. .2143

- 4.41. a. .39
b. .40
c. .48
d. not independent
e. not mutually exclusive

- 4.43. a. .3483
b. .5317
c. .4683
d. .0817

- 4.45. a. .2625
b. .74375
c. .60
d. .25625
e. .0875

- 4.47. a. .20
b. .6429
c. .40
d. .60
e. .40
f. .3333

- 4.49. a. .469
b. .164
c. .2360
d. .1934
e. .754

- 4.51. a. .2130
 b. .4370
 c. .2240
 d. .6086
 e. .3914
 f. .8662
- 4.53. a. .276
 b. .686
 c. .816
 d. .59
 e. .4023

Chapter 5

- 5.1. 2.666, 1.8364, 1.3552
- 5.3. 0.956, 1.1305
- 5.5. a. .0036
 b. .1147
 c. .3822
 d. .5838
- 5.7. a. 14, 2.05
 b. 24.5, 3.99
 c. 50, 5
- 5.9. a. .0815
 b. .0008
 c. .227
- 5.11. a. .585
 b. .009
 c. .013
- 5.13. a. .1032
 b. .0000
 c. .0352
 d. .3480
- 5.15. a. .0538
 b. .1539
 c. .4142
 d. .0672
 e. .0244
 f. .3702
- 5.17. a. 6.3, 2.51
 b. 1.3, 1.14
 c. 8.9, 2.98
 d. 0.6, .775
- 5.19. 3.5
 a. .0302
 b. .1424
 c. .0817
 d. .42
 e. .1009
- 5.21. a. .5488
 b. .3293
 c. .1220
- d. .8913
 e. .1912
- 5.23. a. .3012
 b. .0000
 c. .0336
- 5.25. a. .0104
 b. .0000
 c. .1653
 d. .9636
- 5.27. a. .5091
 b. .2937
 c. .4167
 d. .0014
- 5.29. a. .0529
 b. .0294
 c. .4235
- 5.31. a. .1333
 b. .0238
 c. .1143
- 5.33. .0474
- 5.35. a. .124
 b. .849
 c. .090
 d. .000
- 5.37. a. .1607
 b. .7626
 c. .3504
 d. .5429
- 5.39. a. .1108
 b. .017
 c. 5
 d. .1797
 e. .125
 f. .0000
 g. .056
 h. $x = 8(.180), \mu = 8$
- 5.41. a. .2644
 b. .0694
 c. .0029
 d. .7521
- 5.43. a. 5
 b. .0244
- 5.45. a. .0687
 b. .020
 c. .1032
 d. 2.28
- 5.47. .174
- 5.49. a. .3012
 b. .1203
 c. .7065

- 5.51. a. .0002
b. .0595
c. .2330
- 5.53. a. .0907
b. .0358
c. .1517
d. .8781
- 5.55. a. .265
b. .0136
c. .0067
- 5.57. a. .3854
b. .8333
c. .0981
- 5.59. a. .0539
b. .1603
c. .9315
- 6.27. a. .0012
b. .8700
c. .0011
d. .9918
- 6.29. a. .0000
b. .0000
c. .0872
d. .41 minutes
- 6.31. $\mu = 246.31$
a. .1313
b. .5560
- 6.33. 15, 15, .1254
- 6.35. a. .1587
b. .0013
c. .6915
d. .9270
e. .0000

Chapter 6

- 6.1. a. 1/40
b. 220, 11.547
c. .25
d. .3750
e. .6250
- 6.3. 2.97, 0.098, .2941
- 6.5. 981.5, .000294, .2353, .0000, .2353
- 6.7. a. .8944
b. .0122
c. .2144
- 6.9. a. .1788
b. .0329
c. .1476
- 6.11. a. 188.25
b. 244.65
c. 163.81
d. 206.11
- 6.13. 5.932
- 6.15. 2.5
- 6.17. a. $P(x \leq 16.5 \mid \mu = 21 \text{ and } \sigma = 2.51)$
b. $P(10.5 \leq x \leq 20.5 \mid \mu = 12.5 \text{ and } \sigma = 2.5)$
c. $P(21.5 \leq x \leq 22.5 \mid \mu = 24 \text{ and } \sigma = 3.10)$
d. $P(x > 14.5 \mid \mu = 7.2 \text{ and } \sigma = 1.99)$
- 6.19. a. .1170, .120
b. .4090, .415
c. .1985, .196
d. fails test
- 6.21. .0495
- 6.23. a. .1922
b. .6808
- 6.37. a. .0202
b. .9817
c. .1849
d. .4449
- 6.39. .0000
- 6.41. a. .1131
b. .2912
c. .1543
- 6.43. .5319, 41.5, .0213
- 6.45. a. .3050
b. .6413
c. .2985
d. .0045
- 6.47. a. .0129
b. .0951
c. .9934
d. .5713
- 6.49. a. .0025
b. .8944
c. .3482
- 6.51. a. .0655
b. .6502
c. .9993
- 6.53. \$11428.57
- 6.55. a. .5488
b. .2592
c. 1.67 months
- 6.57. 1940, 2018.75, 2269
- 6.59. .0516, 1.07%

Chapter 7

- 7.7. 825
- 7.13. a. .0548
b. .7881
c. .0082
d. .8575
e. .1664
- 7.15. 11.11
- 7.17. a. .9772
b. .2385
c. .1469
d. .1230
- 7.19. .0000
- 7.21. a. .1894
b. .0559
c. .0000
d. 16.4964
- 7.23. a. .1492
b. .9404
c. .6985
d. .1445
e. .0000
- 7.25. .26
- 7.27. a. .1977
b. .2843
c. .9881
- 7.29. a. .1020
b. .7568
c. .7019
- 7.31. 55, 45, 90, 25, 35
- 7.37. a. .3156
b. .00003
c. .1736
- 7.41. a. .0021
b. .9265
c. .0281
- 7.43. a. .0314
b. .2420
c. .2250
d. .1469
e. .0000
- 7.45. a. .8534
b. .0256
c. .0007
- 7.49. a. .6787
b. .0571
c. .0059
- 7.51. .9147

Chapter 8

- 8.1. a. $24.11 \leq \mu \leq 25.89$
b. $113.17 \leq \mu \leq 126.03$
c. $3.136 \leq \mu \leq 3.702$
d. $54.55 \leq \mu \leq 58.85$
- 8.3. $45.92 \leq \mu \leq 48.08$
- 8.5. $66, 62.75 \leq \mu \leq 69.25$
- 8.7. $5.3, 5.13 \leq \mu \leq 5.47$
- 8.9. $2.852 \leq \mu \leq 3.760$
- 8.11. $23.036 \leq \mu \leq 26.030$
- 8.13. $42.18 \leq \mu \leq 49.06$
- 8.15. $120.6 \leq \mu \leq 136.2, 128.4$
- 8.17. $15.631 \leq \mu \leq 16.545, 16.088$
- 8.19. $2.26886 \leq \mu \leq 2.45346, 2.36116, .0923$
- 8.21. $36.77 \leq \mu \leq 62.83$
- 8.23. $7.53 \leq \mu \leq 14.66$
- 8.25. a. $.316 \leq p \leq .704$
b. $.777 \leq p \leq .863$
c. $.456 \leq p \leq .504$
d. $.246 \leq p \leq .394$
- 8.27. $.38 \leq p \leq .56$
 $.36 \leq p \leq .58$
 $.33 \leq p \leq .61$
- 8.29. a. $.4287 \leq p \leq .5113$
b. $.2488 \leq p \leq .3112$
- 8.31. a. .266
b. $.247 \leq p \leq .285$
- 8.33. $.5935 \leq p \leq .6665$
- 8.35. a. $18.46 \leq \sigma^2 \leq 189.73$
b. $0.64 \leq \sigma^2 \leq 7.46$
c. $645.45 \leq \sigma^2 \leq 1923.10$
d. $12.61 \leq \sigma^2 \leq 31.89$
- 8.37. $9.71 \leq \sigma^2 \leq 46.03, 18.49$
- 8.39. $14,084,038.51 \leq \sigma^2 \leq 69,553, 848.45$
- 8.41. a. 2522
b. 601
c. 268
d. 16,577
- 8.43. 106
- 8.45. 1,083
- 8.47. 97
- 8.49. $12.03, 11.78 \leq \mu \leq 12.28, 11.72 \leq \mu \leq 12.34,$
 $11.58 \leq \mu \leq 12.48$
- 8.51. $29.133 \leq \sigma^2 \leq 148.235, 25.911 \leq \sigma^2 \leq 182.529$
- 8.53. $9.19 \leq \mu \leq 12.34$
- 8.55. $2.307 \leq \sigma^2 \leq 15.374$
- 8.57. $36.231 \leq \mu \leq 38.281$

810 Appendix B Answers to Selected Odd-Numbered Quantitative Problems

- 8.59. $.542 \leq p \leq .596$, .569
 8.61. $5.892 \leq \mu \leq 7.542$
 8.63. $.726 \leq p \leq .814$
 8.65. $34.11 \leq \mu \leq 53.29$, $101.44 \leq \sigma^2 \leq 821.35$
 8.67. $-0.20 \leq \mu \leq 5.16$, 2.48
 8.69. 543
 8.71. $.0026 \leq \sigma^2 \leq .0071$

Chapter 9

- 9.1. a. $z = 2.77$, reject
 b. .0028
 c. 22.115, 27.885
 9.3. a. $z = 1.59$, reject
 b. .0559
 c. 1212.04
 9.5. $z = 1.84$, fail to reject
 9.7. $z = 1.46$, fail to reject
 9.9. $z = 2.99$, .0014, reject
 9.11. $t = 0.56$, fail to reject
 9.13. $t = 2.44$, reject
 9.15. $t = 1.59$, fail to reject
 9.17. $t = -3.31$, reject
 9.19. $t = -2.02$, fail to reject
 9.21. fail to reject
 9.23. $z = -1.66$, fail to reject
 9.25. $z = -1.89$, fail to reject
 9.27. $z = 1.22$, fail to reject,
 $z = 1.34$, fail to reject
 9.29. $z = -3.11$, reject
 9.31. a. $\chi^2 = 22.4$, fail to reject
 b. $\chi^2 = 42$, reject
 c. $\chi^2 = 2.64$, fail to reject
 d. $\chi^2 = 2.4$, reject
 9.33. $\chi^2 = 21.7$, fail to reject
 9.35. $\chi^2 = 17.34$, reject
 9.37. a. $\beta = .8159$
 b. $\beta = .7422$
 c. $\beta = .5636$
 d. $\beta = .3669$
 9.39. a. $\beta = .3632$
 b. $\beta = .0122$
 c. $\beta = .0000$
 9.41. $z = -0.48$, fail to reject, .6293, .1492, .0000
 9.43. $t = -1.98$, reject
 9.45. $\chi^2 = 32.675$, fail to reject
 9.47. $z = -1.34$, fail to reject
 9.49. $z = -3.72$, reject
 9.51. $t = -5.70$, reject

- 9.53. $\chi^2 = 106.47$, reject
 9.55. $t = -2.80$, reject
 9.57. $z = 3.96$, reject
 9.59. $t = 4.50$, reject
 9.61. $\chi^2 = 45.866$, reject

Chapter 10

- 10.1. a. $z = -1.01$, fail to reject
 b. -2.41
 c. .1562
 10.3. a. $z = 5.48$, reject
 b. $4.04 \leq \mu_1 - \mu_2 \leq 10.02$
 10.5. $-1.86 \leq \mu_1 - \mu_2 \leq -0.54$
 10.7. $z = -2.32$, fail to reject
 10.9. $z = -2.27$, reject
 10.11. $t = -1.05$, fail to reject
 10.13. $t = -4.64$, reject
 10.15. a. $1905.38 \leq \mu_1 - \mu_2 \leq 3894.62$
 b. $t = -4.91$, reject
 10.17. $t = 2.06$, reject
 10.19. $t = 4.95$, reject, $2258.05 \leq \mu_1 - \mu_2 \leq 5541.95$
 10.21. $t = 3.31$, reject
 10.23. $26.29 \leq D \leq 54.83$
 10.25. $-3415.6 \leq D \leq 6021.2$
 10.27. $6.58 \leq D \leq 49.60$
 10.29. $63.71 \leq D \leq 86.29$
 10.31. a. $z = 0.75$, fail to reject
 b. $z = 4.83$, reject
 10.33. $z = -3.35$, reject
 10.35. $z = -0.94$, fail to reject
 10.37. $z = 2.35$, reject
 10.39. $F = 1.80$, fail to reject
 10.41. $F = 0.81$, fail to reject
 10.43. $F = 1.53$, fail to reject
 10.45. $z = -2.38$, reject
 10.47. $t = 0.85$, fail to reject
 10.49. $t = -5.26$, reject
 10.51. $z = -1.20$, fail to reject
 10.53. $F = 1.24$, fail to reject
 10.55. $-3.201 \leq D \leq 2.313$
 10.57. $F = 1.31$, fail to reject
 10.59. $t = 2.97$, reject
 10.61. $z = 6.78$, reject
 10.63. $3.553 \leq D \leq 5.447$
 10.65. $t = 6.71$, reject

10.67. $.142 \leq p_1 - p_2 \leq .250$

10.69. $z = 8.86$, reject

10.71. $t = 4.52$, reject

Chapter 11

11.5. $F = 11.07$, reject

11.7. $F = 13.00$, reject

11.9. 4, 50, 54, 145.8975, 19.4436, $F = 7.50$, reject

11.11. $F = 10.10$, reject

11.13. $F = 11.76$, reject

11.15. 4 levels; sizes 18, 15, 21, and 11; $F = 2.95$, $p = .04$; means = 226.73, 238.79, 232.58, and 239.82.

11.17. HSD = 0.896, groups 3 & 6 significantly different

11.19. HSD = 1.586, groups 1 & 2 significantly different

11.21. HSD = 10.27, groups 1 & 3 significantly different

11.23. HSD_{1,3} = .0381, groups 1 & 3 significantly different

11.25. HSD_{1,3} = 1.764, HSD_{2,3} = 1.620, groups 1 & 3 and 2 & 3 significantly different

11.29. $F = 1.48$, fail to reject

11.31. $F = 3.90$, fail to reject

11.33. $F = 15.37$, reject

11.37. 2, 1, 4 row levels, 3 column levels, yes
 $df_{row} = 3$, $df_{col} = 2$, $df_{int.} = 6$, $df_{error} = 12$, $df_{total} = 23$

11.39. $MS_{row} = 1.047$, $MS_{col} = 1.281$, $MS_{int.} = 0.258$, $MS_{error} = 0.436$,
 $F_{row} = 2.40$, $F_{col} = 2.94$, $F_{int.} = 0.59$,
fail to reject any hypothesis

11.41. $F_{row} = 87.25$, reject; $F_{col} = 63.67$, reject; $F_{int.} = 2.07$,
fail to reject

11.43. $F_{row} = 34.31$, reject; $F_{col} = 14.20$, reject;
 $F_{int.} = 3.32$, reject

11.45. no significant interaction or row effects; significant
column effects.

11.47. $F = 8.82$, reject; HSD = 3.33 groups 1 & 2, 2 & 3, and
2 & 4 significantly different.

11.49. $df_{treat} = 5$, $MS_{treat} = 42.0$, $df_{error} = 36$,
 $MS_{error} = 18.194$, $F = 2.31$

11.51. 1 treatment variable, 3 levels; 1 blocking variable, 6 levels;
 $df_{treat} = 2$, $df_{block} = 5$, $df_{error} = 10$

11.53. $F_{treat} = 31.51$, reject; $F_{blocks} = 43.20$, reject;
HSD = 8.757, no pairs significant

11.55. $F_{rows} = 38.21$, reject; $F_{col} = 0.23$, fail to reject;
 $F_{inter} = 1.30$, fail to reject

11.57. $F = 7.38$, reject

11.59. $F = 0.46$, fail to reject

11.61. $F_{treat} = 13.64$, reject

12.5. 0.975, 0.985, 0.957

12.7. $\hat{y} = 144.414 - 0.898x$

12.9. $\hat{y} = 15.460 - 0.715x$

12.11. $\hat{y} = 600.186 - 72.328x$

12.13. $\hat{y} = 13.625 + 2.303x_1 - 1.169x_2 + 3.951x_3 - 1.381x_4 + 2.739x_5 - 4.140x_6$

12.15. 18.6597, 37.5229, 51.8948, 62.6737, 86.0281, 118.3648,
122.8561, 6.3403, -8.5229, -5.8948, 7.3263, 1.9720,
-6.3648, 5.1439

12.17. 4.0259, 11.1722, 9.7429, 12.6014, 10.4576; 0.9741, 0.8278,
-0.7429, 2.3986, -3.4575

12.19. 4.7244, -0.9836, -0.3996, -6.7537, 2.7683, 0.6442;
No apparent violations

12.21. The error terms appear to be non independent

12.23. Violation of the homoscedasticity assumption

12.25. SSE = 272.0, $s_e = 7.376$, 6 out of 7 and 7 out of 7

12.27. SSE = 19.8885, $s_e = 2.575$

12.29. $s_e = 4.391$

12.31. $\hat{y} = 118.257 - 0.1504x_1$, $s_e = 40.526$

12.33. $r^2 = .972$

12.35. $r^2 = .685$

12.37. $\hat{y} = -599.3674 + 19.2204x_1$, $s_e = 13.539$, $r^2 = .688$

12.39. $t = -13.18$, reject

12.41. $t = -2.56$, fail to reject

12.43. F is significant at $\alpha = .05$, $t = 2.874$, reject at $\alpha = .05$

12.45. $38.523 \leq y \leq 70.705$, $10.447 \leq y \leq 44.901$

12.47. $0.97 \leq E(y_{10}) \leq 15.65$

12.49. $\hat{y} = 1366461.25 - 678.9643x_1$, $\hat{y}(2010) = 1743.04$

12.51. $r = -.94$

12.53. a. $\hat{y} = -11.335 + 0.355x_1$

b. 7.48, 5.35, 3.22, 6.415, 9.225, 10.675, 4.64, 9.965, -2.48,
-0.35, 3.78, -2.415, 0.745, 1.325, -1.64, 1.035

c. SSE = 32.4649

d. $s_e = 2.3261$

e. $r^2 = .608$

f. $t = 3.05$, reject

12.55. a. $20.92 \leq E(y_{60}) \leq 26.8$

b. $20.994 \leq y \leq 37.688$

12.57. $r^2 = .826$

12.59. $\hat{y} = -0.863565 + 0.92025x_1$, $r^2 = .405$

12.61. $r = .8998$

12.63. $\hat{y} = -39.0071 + 66.3627x_1$, $r^2 = .906$, $s_e = 21.13$

12.65. $\hat{y} = 3670.082 - 6.62083x_1$, $s_e = 1337.556$, $r^2 = .24$,
 $t = -1.26$, fail to reject

Chapter 12

12.1. -0.927

12.3. 0.645

Chapter 13

13.1. $\hat{y} = 25.03 - 0.0497x_1 + 1.928x_2$, 28.586

13.3. $\hat{y} = 121.62 - 0.174x_1 + 6.02x_2 + 0.00026x_3 + 0.0041x_4$, 4

- 13.5. Per capita consumption = $-7,629.627 + 116.2549$ paper consumption $- 120.0904$ fish consumption $+ 45.73328$ gasoline consumption
- 13.7. 9, fail to reject null overall at $\alpha = .05$, only $t = 2.73$ for x_1 , significant at $\alpha = .05$, $s_e = 3.503$, $R^2 = .408$, adj. $R^2 = .203$
- 13.9. Per capita consumption = $-7,629.627 + 116.2549$ paper consumption $- 120.0904$ fish consumption $+ 45.73328$ gasoline consumption; $F = 14.319$ with p -value = .0023; $t = 2.67$ with p -value = .032 for gasoline consumption. The p -values of the t statistics for the other two predictors are insignificant.
- 13.11. $\hat{y} = 3.981 + 0.07322x_1 - 0.03232x_2 - 0.003886x_3$, $F = 100.47$ significant at $\alpha = .001$, $t = 3.50$ for x_1 significant at $\alpha = .01$, $s_e = 0.2331$, $R^2 = .965$, adj. $R^2 = .955$
- 13.13. 3 predictors, 15 observations, $\hat{y} = 657.053 + 5.710x_1 - 0.417x_2 - 3.471x_3$, $R^2 = .842$, adjusted $R^2 = .630$, $s_e = 109.43$, $F = 8.96$ with $p = .0027$, x_1 significant at $\alpha = .01$, x_3 significant at $\alpha = .05$
- 13.15. $s_e = 9.722$, $R^2 = .515$, adjusted $R^2 = .404$
- 13.17. $s_e = 6.544$, $R^2 = .005$, adjusted $R^2 = .000$
- 13.19. model with x_1, x_2 : $s_e = 6.333$, $R^2 = .963$, adjusted $R^2 = .957$
model with x_1 : $s_e = 6.124$, $R^2 = .963$, adjusted $R^2 = .960$
- 13.21. heterogeneity of variance
- 13.23. $2, \hat{y} = 203.3937 + 1.1151x_1 - 2.2115x_2$, $F = 24.55$, reject, $R^2 = .663$, adjusted $R^2 = .636$
- 13.25. $\hat{y} = 362 - 4.75x_1 - 13.9x_2 + 1.87x_3$; $F = 16.05$, reject; $s_e = 37.07$; $R^2 = .858$; adjusted $R^2 = .804$; x_1 only significant predictor
- 13.27. Employment = $71.03 + 0.4620$ Naval Vessels $+ 0.02082$ Commercial
 $F = 1.22$, fail to reject; $R^2 = .379$; adjusted $R^2 = .068$; no significant predictors
- 13.29. Corn = $-2718 + 6.26$ Soybeans $- 0.77$ Wheat;
 $F = 14.25$, reject; $s_e = 862.4$; $R^2 = .803$; adjusted $R^2 = .746$; Soybeans was a significant predictor
- for French Quarter (dummy variable) significant at $\alpha = .01$, $s_e = 4.02$, $R^2 = .671$, adj. $R^2 = .573$
- 14.13. Step 1: x_2 entered, $t = -7.53$, $r^2 = .794$
Step 2: x_3 entered, $t_2 = -4.60$, $t_3 = 2.93$, $R^2 = .876$
- 14.15. 4 predictors, x_4 and x_5 are not in model.
- 14.17. Step 1: Dividends in the model, $t = 6.69$, $r^2 = .833$
Step 2: Net income and dividends in model, $t = 2.24$ and $t = 4.36$, $R^2 = .897$
- 14.19.
- | | y | x_1 | x_2 |
|-------|-------|-------|-------|
| x_1 | -.653 | | |
| x_2 | -.891 | .650 | |
| x_3 | .821 | -.615 | -.688 |
- 14.21.
- | | Net Income | Dividends |
|--------------|------------|-----------|
| Dividends | .682 | |
| Underwriting | .092 | -.522 |
- 14.23. $\hat{y} = 564 - 27.99x_1 - 6.155x_2 - 15.90x_3$, $R^2 = .809$, adjusted $R^2 = .738$, $s_e = 42.88$, $F = 11.32$ with $p = .003$, x_3 only significant predictor x_1 is a non-significant indicator variable
- 14.25. The procedure stopped at step 1 with only log x in the model, $= -13.20 + 11.64 \log x$, $R^2 = .9617$
- 14.27. The procedure went 2 steps, step 1: silver entered, $R^2 = .5244$, step 2: aluminum entered, $R^2 = .8204$, final model: gold = $-50.19 + 18.9$ silver $+ 3.59$ aluminum
- 14.29. The procedure went 3 steps, step 1: food entered, $R^2 = .84$, step 2: fuel oil entered, $R^2 = .95$, step 3: shelter entered, $R^2 = .96$, final model: All = $-1.0615 + 0.474$ food $+ 0.269$ fuel oil $+ 0.249$ shelter
- 14.31. Grocery = $76.23 + 0.08592$ Housing $+ 0.16767$ Utility $+ 0.0284$ Transportation $- 0.0659$ Healthcare, $F = 2.29$ not significant; $s_e = 4.416$; $R^2 = .315$; Adjusted $R^2 = .177$; Utility only significant predictor.

Chapter 15

Chapter 14

- 14.1. Simple Model: $\hat{y} = -147.27 + 27.128x$, $F = 229.67$ with $p = .000$, $s_e = 27.27$, $R^2 = .97$, adjusted $R^2 = .966$
Quadratic Model: $\hat{y} = -22.01 + 3.385x_1 + 0.9373x_2$, $F = 578.76$ with $p = .000$, $s_e = 12.3$, $R^2 = .995$, adjusted $R^2 = .993$, for x_1 : $t = 0.75$, for x_2 : $t = 5.33$
- 14.3. $\hat{y} = 1012 - 14.1x + 0.611x^2$; $R^2 = .947$; $s_e = 605.7$; adjusted $R^2 = .911$; $t(x) = -0.17$, fail to reject; $t(x^2) = 1.03$, fail to reject
- 14.5. $\hat{y} = -28.61 - 2.68x_1 + 18.25x_2 - 0.2135x_1^2 - 1.533x_2^2 + 1.226x_1x_2$; $F = 63.43$, reject; $s_e = 4.669$, $R^2 = .958$; adjusted $R^2 = .943$; no significant t ratios. Model with no interaction term: $R^2 = .957$
- 14.7. $\hat{y} = 13.619 - 0.01201x_1 + 2.988x_2$, $F = 8.43$ significant at $\alpha = .01$, $t = 3.88$ for x_2 , (dummy variable) significant at $\alpha = .01$, $s_e = 1.245$, $R^2 = .652$, adj. $R^2 = .575$
- 14.9. x_1 and x_2 are significant predictors at $\alpha = .05$
- 14.11. Price = $7.066 - 0.0855$ Hours $+ 9.614$ Probability $+ 10.507$ French Quarter, $F = 6.80$ significant at $\alpha = .01$, $t = 3.97$
- 15.1. MAD = 1.367, MSE = 2.27
- 15.3. MAD = 3.583, MSE = 15.765
- 15.5. a. 44.75, 52.75, 61.50, 64.75, 70.50, 81
b. 53.25, 56.375, 62.875, 67.25, 76.375, 89.125
- 15.7. $\alpha = .3$: 9.4, 9, 8.7, 8.8, 9.1, 9.7, 9.9, 9.8
 $\alpha = .7$: 9.4, 8.6, 8.1, 8.7, 9.5, 10.6, 10.4, 9.8
- 15.9. $\alpha = .2$: 332, 404.4, 427.1, 386.1, 350.7, 315, 325.2, 362.6, 423.5, 453, 477.4, 554.9
 $\alpha = .9$: 332, 657.8, 532, 253, 213.4, 176.1, 347, 495.5, 649.9, 578.9, 575.4, 836; MAD $_{\alpha=.2}$ = 190.8; MAD $_{\alpha=.9}$ = 168.6
- 15.11. Members = $145392.3 - 64.6354$ year, $R^2 = 91.44\%$, $s_e = 215.1158$, $F = 117.4$ reject
- 15.13. TC: 136.78, 132.90, 128.54, 126.43, 124.86, 122, 119.08, 116.76, 114.61, 112.70, 111.75, 111.36
SI: 93.30, 90.47, 92.67, 98.77, 111.09, 100.83, 113.52, 117.58, 112.36, 92.08, 99.69, 102.73
- 15.15. $D = 1.276$, reject the null hypothesis—significant autocorrelation
- 15.17. $D = 2.49$, no significant autocorrelation

- 15.19. 1 lag: Housing Starts = $-8.87 + 1.06 \text{ lag } 1$; $R^2 = 89.2\%$;
 $s_e = 48.52$
 2 lags: Housing Starts = $13.66 + 1.0569 \text{ lag } 2$;
 $R^2 = 75.9\%$; $s_e = 70.84$
- 15.21. a. 100, 139.9, 144, 162.6, 200, 272.8, 310.7, 327.1, 356.6, 376.9, 388.8, 398.9
 b. 32.2, 45, 46.4, 52.3, 64.4, 87.8, 100, 105.3, 114.8, 121.3, 125.1, 128.4
- 15.23. 100, 103.2, 124.8
- 15.25. 121.6, 127.4, 131.4
- 15.27. a. Linear: $= 9.96 - 0.14 x$, $R^2 = 90.9\%$,
 Quadratic: $= 10.4 - 0.252 x + .00445 x_2$, $R^2 = 94.4\%$
 b. MAD = .3385
 c. MAD ($\alpha = .3$) = .4374, MAD ($\alpha = .7$) = .2596
 d. $\alpha = .7$ did best
 e. 100.28, 101.51, 99.09, 99.12
- 15.29. 100, 104.8, 114.5, 115.5, 114.1
- 15.31. $\text{MAD}_{\text{moving}} = 540.44$, $\text{MAD}_{a=2} = 846.43$
- 15.33. Jan. 95.35, Feb. 99.69, March 106.75, April 103.99,
 May 100.99, June 106.96, July 94.53, Aug. 99.60,
 Sept. 104.16, Oct. 97.04, Nov. 95.75, Dec. 95.19
- 15.35. Laspeyres: 105.2, 111.0; Paasche: 105.1, 110.8
- 15.37. $\text{MSE}_{\text{mu}} = 123.4$; $\text{MSE}_{\text{wmu}} = 79.39$
- 15.39. 98.07, 103.84, 97.04, 101.05
- 15.43. $D = 0.84$, reject
- 15.45. $D = 0.98$, reject
- 17.11. $z = -3.78$, reject
- 17.13. $z = -2.59$, reject
- 17.15. $z = -3.20$, reject
- 17.17. $z = -1.75$, reject
- 17.19. $K = 21.21$, reject
- 17.21. $K = 2.75$, fail to reject
- 17.23. $K = 18.99$, reject
- 17.25. $\chi^2 = 13.8$, reject
- 17.27. $\chi^2 = 14.8$, reject
- 17.29. 4, 5, $S = 2.04$, fail to reject
- 17.31. $r_s = .893$
- 17.33. $r_s = -.95$
- 17.35. $r_s = -.398$
- 17.37. $r_s = -.855$
- 17.39. $U = 20$, p -value = .2344, fail to reject
- 17.41. $K = 7.75$, fail to reject
- 17.43. $r_s = -.81$
- 17.45. $z = -0.40$, fail to reject
- 17.47. $z = 0.96$, fail to reject
- 17.49. $U = 45.5$, p -value = .739, fail to reject
- 17.51. $z = -1.91$, fail to reject
- 17.53. $R = 21$, fail to reject
- 17.55. $z = -2.43$, reject
- 17.57. $K = 17.21$, reject
- 17.59. $K = 11.96$, reject

Chapter 16

- 16.1. $\chi^2 = 18.095$, reject.
- 16.3. $\chi^2 = 2.001$, fail to reject, $\lambda = 0.9$.
- 16.5. $\chi^2 = 198.48$, reject.
- 16.7. $\chi^2 = 2.45$, fail to reject
- 16.9. $\chi^2 = 3.398$, fail to reject
- 16.11. $\chi^2 = 0.00$, fail to reject
- 16.13. $\chi^2 = 34.97$, reject
- 16.15. $\chi^2 = 6.43$, reject
- 16.17. $\chi^2 = 3.93$, fail to reject
- 16.19. $\chi^2 = 1.652$, fail to reject
- 16.21. $\chi^2 = 14.91$, reject
- 16.23. $\chi^2 = 7.25$, fail to reject
- 16.25. $\chi^2 = 59.63$, reject
- 16.27. $\chi^2 = 54.63$, reject

Chapter 17

- 17.1. $R = 11$, fail to reject
- 17.3. $\alpha/2 = .025$, p -value = .0264, fail to reject
- 17.5. $R = 27$, $z = -1.08$, fail to reject
- 17.7. $U = 26.5$, p -value = .6454, fail to reject
- 17.9. $U = 11$, p -value = .0156, fail to reject

Chapter 18

- 18.5. $\bar{\bar{x}} = 4.51$, UCL = 5.17, LCL = 3.85
 $\bar{R} = 0.90$, UCL = 2.05, LCL = 0
- 18.7. $p = .05$, UCL = .1534, LCL = .000
- 18.9. $\bar{c} = 1.34375$, UCL = 4.82136, LCL = .000
- 18.11. Chart 1: nine consecutive points below centerline, four out of five points in the outer 2/3 of the lower region
 Chart 2: eight consecutive points above the centerline
 Chart 3: in control
- 18.15. $p = .104$, LCL = 0.000, UCL = .234
- 18.17. $\bar{c} = 2.13889$, UCL = 6.52637, LCL = .0000
- 18.19. $\bar{\bar{x}} = 14.99854$, UCL = 15.02269, LCL = 14.97439
 $\bar{R} = .05$, UCL = .1002, LCL = .0000
- 18.21. $\bar{c} = 0.64$, UCL = 3.04, LCL = .0000
- 18.23. $p = 0.06$, LCL = 0.000, UCL = .1726

Chapter 19 (On Wiley Web site)

- 19.1. a. 390
 b. 70
 c. 82, 296
 d. 140

814 Appendix B Answers to Selected Odd-Numbered Quantitative Problems

19.3. 60, 10

19.7. 31.75, 6.50

19.9. Lock in = 85, 182.5, 97.5

19.11. a. 75,000

b. Avoider

c. >75,000

19.13. 244.275, 194.275

19.15. 21012.32, 12.32

19.17. b. 267.5, 235

c. 352.5, 85

19.19. a. 2000, 200

b. 500

19.21. 875,650

19.23. Reduction: .60, .2333, .1667

Constant: .10, .6222, .2778

Increase: .0375, .0875, .8750, 21425.55, 2675.55