Errata and Updates for ASM Exam S (First Edition) Sorted by Page

Note the correction to practice exam 4 question 13 (page 747).

[7/30/2015] On the cover, change "Probability" to "Probabilistic".

[8/1/2015] In volume 2, table of contents, "IV Life Contingencies" should be page 473, not 269. This error does not appear in the one-volume version of the entire manual.

[8/10/2015] On page 4, in equation (1.2), replace $\Pr(X \geq x)$ with $\Pr(X > n)$.

[11/27/2015] On page 89, in the answer to Example 6G, on the first displayed line, change p_k to p_i.

[11/28/2015] On page 90, on the first line, change $\Pr(X > 3 \mid H_1)$ to $\Pr(Y > 3 \mid H_1)$.

[9/27/2016] On page 99, in the solution to exercise 6.2, on the first line, change μ to 4μ.

[9/27/2015] On page 112, in the solution to exercise 7.8, on the last displayed line, change $\sqrt{n}$ to n.

[9/11/2015] On page 128, in exercise 8.26, on the last line, add "the mean of" before $A - B$.

[12/1/2015] On page 155, exercise 10.15 can only be done with a computer.

[12/1/2015] On page 158, in the solution to exercise 10.11, on the first line and on the sixth line, change S^2 to $(n-1)S^2$.

[12/1/2015] On page 159, the solution to exercise 10.15 is incorrect. The distribution of the square root of F is a T distribution with negative and positive tails. The positive square root of the 97.5th percentile of the F distribution is the 98.75th of the T distribution, the value x with $\Pr(T > x) + \Pr(T < -x) = 0.025$. The 98.75th percentile of the T distribution, not given in the tables, is 2.360.

[9/9/2015] On page 159, the solution to exercise 10.17 is incorrect. The correct solution is

Since H_1 hypothesizes higher variance, the higher variance, σ_2^2, goes into the numerator. The F ratio is 15.1/6.4=2.359. There are 4 degrees of freedom in the numerator and 11 in the denominator. The 20% critical value is 1.796, and the 10% critical value is 2.536, so we accept H_0 at 10% but not at 20%. **(D)**

[10/1/2015] On page 162, the last displayed line on the page is missing four exponents of n. It should read

$$\frac{\exp\left(-\sum X_i^2/2\right)\Big/\left(\sqrt{2\pi}\right)^n}{\exp\left(-\sum X_i^2/(2\theta^2)\right)\Big/\theta^n\left(\sqrt{2\pi}\right)^n} = \theta^n \exp\left(\frac{\sum X_i^2}{2}\left(\frac{1}{\theta^2}-1\right)\right)$$

[12/1/2015] On page 169, on the first two lines of the answer to Example 12A, change $\frac{1}{\sqrt{2\pi}}$ to $\frac{1}{(2\pi)^{n/2}}$.

[10/1/2015] On page 169, on the third displayed line of the page, the line starting $\frac{dg}{d\theta}$, there should be a negative sign before 2.

[12/1/2015] On page 182, on the third line of the second paragraph of Section 13.3, replace "and has one mode" with "has one mode, and continuously goes to 0 on both sides of the mode."

[3/21/2016] On page 193, on the fourth displayed line, change $(\theta - \mu^2)$ to $(\theta - \mu)^2$.

[3/21/2016] On page 214, on the first line of the answer to Example 17E, change $F(y) = e^{-y/\theta}$ to $F(y) = 1 - e^{-y/\theta}$.

[9/18/2015] On page 214, in the second line of the last displayed formula on the page, change the final exponent from $n - j - 1$ to $n - j$. On the last line of the page, change $n - j - 1$ to $n - j$.

[12/1/2015] On page 227, on the third line of the warning box, change "more then" to "more than".

[12/1/2015] On page 229, change exercise 18.5 to

Let X be the random variable underlying the first sample and Y the random variable underlying the second sample.

Using the normal approximation, construct the smallest interval with at least 95% confidence for the median of $Y - X$.

[8/5/2015] On page 234, in the answer to Example 19A, 2 lines below the first table, change T to T^+. In the second paragraph after the answer, on the first line, change $n(n+1)/2$ to $n(n+1)/4$.

[8/5/2015] On page 235, replace the second sentence with

In the following discussion, we will discuss the distribution of T^+; for a two-sided test, double the p-value.

In equations (19.1) and (19.2), replace T with T^+.

[8/5/2015] On page 238, in Table 19.1, in the second bullet on the second line, replace T and $f_T(t)$ with T^+ and $f_{T^+}(t)$ respectively. In the third bullet, replace the five Ts with T^+s.

[12/2/2015] On page 244, the solution to exercise 19.1 is incorrect since the test is two-sided. The correct solution is

After subtracting 34, the numbers are $\{-4, 1, 3, 5, 9\}$. The ranks of the absolute values are $\{3, 1, 2, 4, 5\}$. The sum of the ranks of the positive values is $T^+ = 1 + 2 + 4 + 5 = 12$. The sum of the ranks of the negative values is $T^- = 3$. It is a two-sided test, so the statistic is $w = \min(T^+, T^-) = 3$. The statistic T^+ can equal 0, 1, or 2 in one way apiece, and 3 either as $1 + 2$ (the two lowest rank items are positive) or as 3. Similarly T^- can be 3 or less in five ways. So the probability that T is less than or equal to 3 is $10/2^5 = \boxed{\mathbf{0.3125}}$.

[8/10/2015] On page 265, two lines after the four displayed lines, the five points should be $(-7\ln 5/6, 1)$, $(-7\ln 4/6, 3)$, $(-7\ln 3/6, 6)$, $(-7\ln 2/6, 10)$, and $(-7\ln 1/6, 15)$. In the third paragraph, replace the sentences starting with "If it is less steep" with

If it is less steep, then the fitted distribution puts too much weight in that interval. In our example, the fit puts too little weight up to 10 and then about the right weight up to 15. Beyond 15 the fit puts too much weight, since the 100th percentiles are equal to each other. (They are infinity.)

[8/10/2015] On page 266, replace the graph with
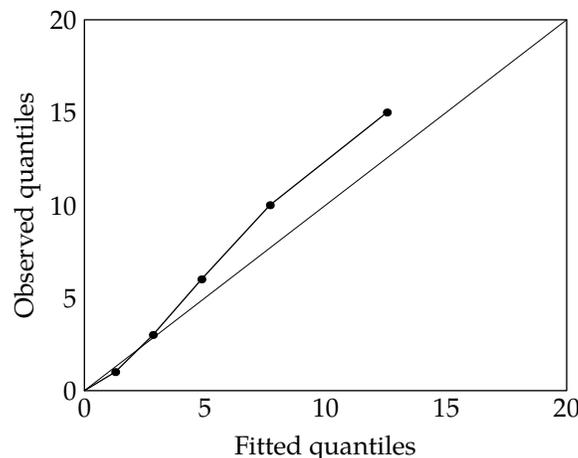
[12/2/2015] On page 268, replace the solution to exercise 22.4 with

The slope of the line is greater than 45° in the interval (3,8), so that is the interval in which the fitted distribution puts too little weight.

[8/2/2015] On page 277, equation (23.4), which appears both in the table and on the third line below the table, is incorrect. The correct equation is

$$\text{Var}(N_j) = \sum_{i=1}^{j-1} \left(\frac{1}{i}\right)\left(1 - \frac{1}{i}\right)$$

[8/10/2015] On page 290, in the solution to exercise 23.22, replace the final answer with 111.

[10/30/2015] On page 291, in the solution to exercise 23.27, replace 2.043 with 2.260. Replace the final answer with 0.0119.

[8/10/2015] On page 293, in the fifth paragraph, on the fourth line, add "at least" after "probability of reentering". Change the displayed line at the end of the paragraph to

$$\mathbf{E}[N] = \sum_{n=0}^{\infty} \Pr(N > n) = \sum_{n=0}^{\infty} p^{n+1} = \frac{p}{1-p}$$

[10/10/2015] On page 297, in the solution to exercise 24.4, on the second to last line, change 1/5 to 1/3.

[9/13/2015] On page 297, in the solution to exercise 24.6, on the second to last line, change the final formula to $(13/15)/(1 - 13/15) = \boxed{6.5}$.

[12/2/2015] On page 303, in exercise 25.8, on the first line, change the second-to-last word to "insured's".

[9/6/2015] On page 305, in the solution to exercise 25.5, on the second-to-last line, change both 0s to 1s: $\pi_1 + \pi_2 = 1$ and $\pi_1 + \frac{5}{3}\pi_1 = 1$.

[1/27/2016] On page 309, on the first line of the third paragraph, change $P_i i$ to P_{ii}.

[4/10/2016] On page 309, on the third line from the end of the page, change the left side of the equation to $(\mathbf{I} - \mathbf{P}_T)\mathbf{S}$.

[7/27/2015] On page 310, on the first displayed line, remove the exponent -1 from the matrix on the right side of the equality.

[8/21/2015] On page 310, replace the answer to Example 26A starting with the fourth line with

$$\mathbf{S} = \begin{pmatrix} 1 & -0.4 \\ -0.6 & 1 \end{pmatrix}^{-1}$$

Applying the inversion formula for a 2×2 matrix to this matrix,

$$d = 1 - (-0.6)(-0.4) = 0.76$$

$$\begin{pmatrix} 1 & -0.4 \\ -0.6 & 1 \end{pmatrix}^{-1} = \begin{pmatrix} \frac{1}{0.76} & \frac{0.4}{0.76} \\ \frac{0.6}{0.76} & \frac{1}{0.76} \end{pmatrix}$$

The total amount of time spent in states 1 and 2, given that one starts in state 2, is

$$s_{21} + s_{22} = \frac{0.6}{0.76} + \frac{1}{0.76} = \boxed{2.1053}$$

[4/10/2016]   On page 315, in question 26.2, on the last line, delete the exponent -1 from $\begin{pmatrix} a_{22}/d & -a_{12}/d \\ -a_{21}/d & a_{11}/d \end{pmatrix}$.

[4/10/2016]   On page 316, in question 26.4, on the last line, delete the exponent -1 from $\begin{pmatrix} a_{22}/d & -a_{12}/d \\ -a_{21}/d & a_{11}/d \end{pmatrix}$.

[1/28/2016]   On page 317, in exercise 26.7, on the fourth line, replace "remains in" with "spends in".

[12/3/2015]   On page 318, change the last sentence of the solution to exercise 26.1 to

We see that $s_{11} = 3$ and $s_{12} = 1$. Thus an expected 3 hours (including 11-12) are spent in state 1, 1 expected hours in state 2, and 1 hour in state 0, for a total of $\boxed{\textbf{5 hours}}$.

[9/17/2015]   On page 318, in the solution to exercise 26.2, on the last displayed line, change the lower right entry in the matrix to 0.4/0.14.

[12/3/2015]   On page 325, in the solution to exercise 27.6, on the fourth line, change the three xs to π_0s.

[9/29/2015]   On page 328, on the first line, change $\pi_2 = 0.2/4.2$ to $\pi_2 = 1.2/4.2$.

[1/28/2016]   On page 331, the solution to exercise 28.5 is incorrect. The correct solution, starting after the first two lines, is

$$P_{45}\pi_4 = P_{54}\pi_5$$
$$0.3\pi_4 = 0.25\pi_5$$
$$\pi_4 = \tfrac{5}{6}\pi_5$$
$$P_{34}\pi_3 = P_{43}\pi_4$$
$$0.6\pi_3 = 0.7\pi_4$$
$$\pi_3 = \tfrac{7}{6}\pi_4 = \left(\tfrac{7}{6}\right)\left(\tfrac{5}{6}\right)\pi_5 = \tfrac{35}{36}\pi_5$$
$$P_{23}\pi_2 = P_{32}\pi_3$$
$$0.5\pi_2 = 0.4\pi_3$$
$$\pi_2 = \tfrac{4}{5}\pi_3 = \left(\tfrac{4}{5}\right)\left(\tfrac{35}{36}\right)\pi_5 = \tfrac{7}{9}\pi_5$$
$$P_{12}\pi_1 = P_{21}\pi_2$$
$$0.8\pi_1 = 0.5\pi_2$$
$$\pi_1 = \tfrac{5}{8}\pi_2 = \left(\tfrac{5}{8}\right)\left(\tfrac{7}{9}\right)\pi_5 = \tfrac{35}{72}\pi_5$$

The stationary probabilities add up to 1, so

$$\pi_5\left(\tfrac{35}{72} + \tfrac{7}{9} + \tfrac{35}{36} + \tfrac{5}{6} + 1\right) = 1$$
$$\pi_5 = \frac{72}{293} = \boxed{\textbf{0.245734}}$$

[7/14/2015]   On page 338, in the solution to exercise 29.2, on the last line, change the final answer from 0.1 to 0.05.

[1/12/2016]   On page 338, in the solution to exercise 29.4, on the first line of the second paragraph, change $0.2+0.8$ to $0.2 + 0.6$. On the first line of the third paragraph, change $0.2 + 0.8 < 0.907 < 0.2 + 0.8 + 0.1$ to $0.2 + 0.6 < 0.907 < 0.2 + 0.6 + 0.2$.

[1/28/2016]   On page 341, the first clause of the third paragraph, "the above list of stochastic processes", is referring to the list of four stochastic processes on page 271.

[12/2/2015] On page 374, in exercise 12.29, on the second line, change the sixth word to "king's".

[8/5/2016] On page 382 of the single-volume manual on the third line, or page 1 of the second volume of the two-volume manual on the sixth line of the Greedy algorithms section, change $\sum_{i=1}^{n} X_i$ to $\min X_i$. Also, three lines from the end of the section, change $\sum_{j=1}^{i} 1/(n-j)^2$ to $\sum_{j=0}^{i-1} 1/(n-j)^2$.

[10/4/2015] On page 383, delete exercise 33.3. The solution provided is wrong, and I am unaware of any easy way of solving this exercise.

[7/20/2015] On page 384, replace the solution to exercise 33.1 with

A total of 16 trains arrive per hour, so expected waiting time is 1/16 of an hour, or 3.75 minutes. The probability that an express arrives first is $10/(10 + 6) = 0.625$. Then the expected amount of time in minutes to arrive at your destination is $3.75 + 0.625(15) + 0.375(28) = \boxed{\textbf{23.625}}$.

[11/7/2015] On page 385, in the solution to exercise 33.8, change the final answer from 4.6230 to 5.4563.

[10/21/2015] On page 386 in the solution to exercise 33.11 of the single-volume manual, or page 385 exercise 33.9 of the first volume of the two-volume manual, on the last line, replace 16 with $13\frac{1}{3}$.

[10/11/2015] On page 393 in Table 34.1, in the second bullet, on the second line, replace "are positive integers" with "are 1".

[12/6/2015] On page 394, in exercises 34.8 and 34.9, change the second and third bullets to

- For a good driver, claims are submitted in a Poisson process at an annual rate of 0.2.

- For a bad driver, claims are submitted in a Poisson process at an annual rate of 0.4.

[12/5/2015] On page 397, change the solution to exercise 34.8 to

Let X_{1i} be the Poisson process for the ith good driver, $1 \leq i \leq 30$, and X_{2i} the Poisson process for i^{th} bad driver, $1 \leq i \leq 20$. Then claims from all drivers, $Y = \sum_{i=1}^{30} X_{1i} + \sum_{i=1}^{20} X_{2i}$, is itself a Poisson process. The monthly parameter for Y is $\big(30(0.2) + 20(0.4)\big)/12 = 7/6$. The probability of at least one claim is $1 - e^{-7/6} = \boxed{\textbf{0.6886}}$.

[12/5/2015] On page 402, on the first line of Quiz 35-1, add "expected" between "The" and "number of customers".

[12/5/2015] On page 422, in the box on top of the page, on the last line, change μ_{ij} to q_{ij}.

[12/5/2015] On page 422, in the solution to exercise 36.1, on the second line, change $1 = e^{-1.5}$ to $1 - e^{-1.5}$.

[12/5/2015] On page 427, in the second bullets of exercises 37.2 and 37.3, change "4 per hour" to "15 minutes".

[12/5/2015] On page 431, on the third line of the second paragraph of Section 38.1, change $P_{ii}(t) = 1 - e^{-\lambda_i t}$ to $P_{ii}(t) = e^{-\lambda t}$.

[2/17/2016] On page 433, in Example 38C, change "backward" to "forward".

[12/5/2015] On page 438, in the third bullet of exercise 38.8, change 2 to $1\frac{2}{3}$.

[9/2/2015] On page 440, the solution to exercise 38.3 is the probability at time 2. The correct solution for time 0.5 is

$$P_{02}(0.5) = (2)(3)\left(\frac{e^{-0.5(2)}}{(3-2)(0-2)} + \frac{e^{-0.5(3)}}{(2-3)(0-3)} + \frac{e^{-0.5(0)}}{(2-0)(3-0)}\right) = \boxed{\textbf{0.342622}}$$

[12/5/2015] On page 442, in the solution to exercise 38.8, on the fourth line, change 0.5 to 0.6.

[2/17/2016] On page 442, in the solution to exercise 38.9, on the fourth line, change δ_2 to λ_2.

[10/12/2015] On page 448, on the second to last line of the page, change {2,5} to {4,5}.

[9/24/2015] On page 450, in the solution to exercise 39.3, replace the last paragraph with the following two paragraphs:

If the first number is 4, the second number must be 5, and then all minimal path sets are blocked.

We have exhausted all unique possibilities, and found the following minimal cut sets: $\{1, 2\}$, $\{1, 3\}$, $\{1, 5\}$, $\{2, 3\}$, $\{2, 5\}$, $\{3, 4\}$, $\{4, 5\}$.

[8/2/2016] On page 455, on the third displayed line, change the last summation index from $i < j$ to $i < j < k$.

[12/6/2015] On page 456, replace the answer to Example 40E with

As discussed in Example 39D, the minimal cut sets are $C_1 = \{1, 2\}$, $C_2 = \{1, 3, 5\}$, $C_3 = \{2, 3, 4\}$, and $C_4 = \{4, 5\}$. The probability of j components failing is $(1 - p)^j$. So the first lower bound is

$$r(\mathbf{p}) \geq 1 - \sum \Pr(F_i) = 1 - 2(1 - p)^2 - 2(1 - p)^3$$

since two minimal cut sets have 2 components and two have 3 components. For the six unions of 2 minimal cut sets, $C_1 \cup C_2$, $C_1 \cup C_3$, $C_1 \cup C_4$, $C_2 \cup C_4$, $C_3 \cup C_4$ have 4 components and $C_2 \cup C_3$ has 5. So

$$r(\mathbf{p}) \leq 1 - 2(1 - p)^2 - 2(1 - p)^3 + 5(1 - p)^4 + (1 - p)^5$$

For example, if $p = 0.8$, then $0.904 \leq r(\mathbf{p}) \leq 0.91232$.

[9/29/2015] On page 459, in exercise 40.7 of the one-volume manual, or page 4 exercise 4 of the second volume of the two-volume manual, on the first line, change "20 nodes" to "50 nodes". Also change 0.2 to 0.1.

[7/27/2015] On page 460, the solution to exercise 40.6 uses probability 0.8 instead of 0.9. Here is a solution with probability 0.9:

There are two minimal path sets, $\{1, 2, 5\}$ and $\{3, 4, 5\}$. The probability of one failed component on each one is $1 - 0.9^3 = 0.271$. The probability of both minimal path sets failing is as least 0.271^2, so the probability that the system functions is no more than $1 - 0.271^2 = \boxed{\mathbf{0.926559}}$.

There are five minimal cut sets, $\{1, 3\}$, $\{1, 4\}$, $\{2, 3\}$, $\{2, 4\}$, and $\{5\}$. The probability that each of the first four has a functioning component is $1 - 0.1^2 = 0.99$ and the probability that $\{5\}$ has a functioning component is 0.9. The probability that all five minimal cut sets have a functioning component is at least $(0.99^4)(0.9) = \boxed{\mathbf{0.864536}}$.

By the way, the exact reliability can be calculated as follows. The structure function is

$$\phi(\mathbf{x}) = x_5\big(1 - (1 - x_1 x_2)(1 - x_3 x_4)\big) = x_5(x_1 x_2 + x_3 x_4 - x_1 x_2 x_3 x_4)$$

so the reliability is

$$r(\mathbf{p}) = 2(0.9^3) - 0.9^5 = 0.867510$$

[2/29/2016] On page 461, in exercise 40.7 of the one-volume manual, on the first line, change 0.2 to 0.1.

[9/7/2015] On page 461, in the solution of exercise 40.7 of the two-volume manual, or page 463 in the solution of exercise 40.9 of the one-volume manual, replace the last four lines with

The four minimal cut sets have 3 components apiece. Their probabilities of failing are $(0.3^2)(0.2) = 0.018$ for the two minimal cut sets having 1 and 2 and $(0.3)(0.2^2) = 0.012$ for the other two minimal cut sets. The a lower bound for the reliability function is

$$r(\mathbf{p}) \geq (1 - 0.0018)^2(1 - 0.012)^2 = \boxed{0.941319}$$

[2/29/2016] On page 462 of the one-volume manual, or page 464 of the two-volume manual, in the solution to exercise 40.3, on the second line, a $1-$ is missing. It should read

$$r(\mathbf{p}) = p_1 p_2 \big(1 - (1 - p_3)(1 - p_4)\big) = 0.564$$

[7/27/2015] On pages 463 and 465 of the two-volume manual, or pages 465 and 467 of the one-volume manual, change equation (41.1) to:

$$\mathbf{E}[\text{system life}] = \int_0^{\infty} r\big(\bar{\mathbf{F}}(\mathbf{t})\big) \, \mathrm{d}t \qquad\qquad ((41.1))$$

[8/11/2015] On page 475, 7 lines from the bottom, delete the "s" after d_x.

[8/5/2015] On page 477, in the answer to Example 42D, replace the end of the answer, after "the probability we desire" with "is $1 - l_{81}/l_{80.5} = 1 - 920/960 = \boxed{0.041667}$."

[2/29/2016] On page 483, in exercise 42.10, in the first bullet, change $k \leq T_x \leq k+1$ to $k \leq T_x < k+1$.

[2/29/2016] On page 490, 4 lines below Example 43F, in the definition of certain-and-life annuity, change "if alive" to "is alive".

[12/8/2015] On page 490, in Example 43G, on the third line, change $i = 0.04$ to $i = 0.06$. Change the answer to

The present value of a 10-year certain annuity-due of 1 is

$$\frac{1 - 1/1.06^{10}}{0.06/1.06} = 7.8017$$

The APV of our annuity is

$$200\big(7.8017 + (0.45120)(8.5693)\big) = \boxed{2333.63}$$

[2/29/2016] On page 495, in exercise 43.9, three lines from the end, add "on an individual age 60" after "An insurance".

[3/12/2016] On page 497, in exercise 43.16, in the table, l_{64} should be 69,800 with a comma.

[9/2/2015] On page 498, in exercise 43.19, on the second-to-last line, delete "3-year".

[3/12/2016] On page 504, in the solution to exercise 43.9, on the second displayed line, change the left side from $_3p_{60}$ to $_3p_{60}\, q_{63}$.

[12/7/2015] On page 505, in the solution to exercise 43.15, on the first displayed line, change $\mathbf{E}[Z]$ to $\mathbf{E}[Z/1000]$. On the second displayed line, change $\mathbf{E}[Z^2]$ to $\mathbf{E}[(Z/1000)^2]$.

[9/24/2015] On page 512, in the last full paragraph of the page, what is called "whiskers" should be called "fences". Replace the paragraph, starting with the fourth line "Additional lines", with

Additional lines, called "fences" are placed above and below the box. Dashed vertical lines between the rectangle and the additional lines, sometimes called "whiskers", are drawn. Different authors

and programs put the fences in different places. SAS and R put the top line at the maximum of the sample and the bottom line at the minimum of the sample. Another method, called the Tukey method, is to first calculate the first and third quartiles, Q_1 and Q_3 respectively. Then let $h = 1.5(Q_3 - Q_1)$, and place the lower fence at the lowest data point greater than $Q_1 - h$ and the upper fence at the highest data point less than $Q_3 + h$. Outliers, sample points above and below the fences, are plotted individually, vertically above the center. Both authors seem to use the Tukey method. de Jong & Heller makes the widths of all the rectangles equal, but Rosenberg & Guszcza varies the widths based on the number of observations in each category.

[3/15/2016] On page 516, in the solution to exercise 44.3, on the second and third lines, change 3.65285 with 3.62853 (once on each line).

[9/20/2015] On page 519, on the line above the enumerated list, change $\sum_{i=1}^{n} \varepsilon_i$ to $\sum_{i=1}^{n} \varepsilon_i^2$.

[10/7/2015] On page 520, two lines above formula (45.3), change "covariance" to "correlation".

[9/24/2015] On page 527, in exercise 45.14, in the table's header, change X_2 to X_1 and X_3 to X_2.

[9/25/2015] On page 528, in exercise 45.16, on the first line, change x_1 to x_2. On the second line, change x_2 to x_3.

[12/7/2015] On page 528, in exercise 45.17, in the first column of the table, change x_2, x_3, x_4 to x_1, x_2, x_3 respectively. In the matrix for $(\mathbf{X'X})^{-1}$, change second row second column entry from 1.2 to 12.

[12/7/2015] On page 533, in the solution to exercise 45.17, change the last two lines to

$$\hat{\boldsymbol{\beta}} = (\mathbf{X'X})^{-1}\mathbf{X'y} = \frac{1}{30}\begin{pmatrix} 60.5 \\ -27 \\ -8.25 \\ 31.75 \end{pmatrix}$$

$$y(1, 1, 1) = \tfrac{1}{30}(60.5 - 27 - 8.25 + 31.75) = \boxed{\textbf{1.9}}$$

[9/26/2015] On page 534, the solution to exercise 45.20 is incomplete. Remove the yellow box around 12.3154 and add the following paragraph to the end of the solution:

Let w_i be the weights. Then $\sum w_i Y_i = \hat{\beta}_0 \sum w_i + \hat{\beta}_1 \sum w_i X_i$. It follows that $\bar{Y}' = \hat{\beta}_0 \bar{w} + \hat{\beta}_1 \bar{X}'$, where $\bar{w}$ is the average of the weights. We calculate the average of the weights:

$$\bar{w} = \frac{\frac{1}{\sqrt{0.5}} + 1 + 1 + \frac{1}{\sqrt{1.5}}}{4} = 1.057678$$

Then

$$\hat{\beta}_0 = \frac{\bar{Y}' - \hat{\beta}_1 \bar{X}'}{\bar{w}} = \frac{273.99 - 12.3154(11.192)}{1.057678} = \boxed{\textbf{128.7277}}$$

[5/1/2016] On page 536, on the last two lines of the page, change i^{th} to $i + 1^{\text{st}}$, once on each line.

[9/29/2015] On page 537, in Table 46.1, in the second and third bullets, change $\bar{y}_i$ to $\bar{y}$.

[12/8/2015] On page 542, in the solution to exercise 46.4, on the fifth line, put a hat over both β_1s.

[10/4/2015] On page 543, in the solution to exercise 46.10, change 2.101 to 2.131 and 2.552 to 2.602.

[10/4/2015] On page 544, in the solution to exercise 46.13, on the first line, change ESS to SSE. On the second line, change $\mathbf{Y'Y} - \hat{\beta}\mathbf{X'Y}$ to $\mathbf{y'y} - \hat{\beta}'\mathbf{X'y}$. On the third line, change $\hat{\beta}_3$ to $\hat{\beta}_2$.

[10/14/2015] On page 544, in the solution to exercise 46.15, on the third line, change 1.12752 to 1.13152. On the last line, change 1.12752 to 1.13152 and change 1.06185 to 1.06373.

[10/19/2015] On page 546, on the third line of formula (47.4), change TSS to SST.

[8/27/2015] On page 547, in formula (47.5), move the exponent on the x_j^2 outside the parentheses; the last denominator should be $\sum_{i=1}^{n}(x_{ij} - \bar{x}_j)^2$

[8/3/2015] On page 548, in Table 47.1, on the line staring with "**Variance inflation factor**", replace the rest of the line with "Let R_j^2 be R^2 for regression of $\mathbf{x_j}$ on other explanatory variables."

[9/20/2015] On page 548, in formula (47.6), the denominator should be $\sum_{i=1}^{n}(x_{i1} - \bar{\mathbf{x}})^2$.

[10/19/2015] On page 548, in exercise 47.1, in the second bullet. $\hat{y}$ should be $\hat{y}_i$.

[8/11/2015] On page 549, in exercise 47.4, the second and third column headings in the table should be interchanged; the second column is df, the third column is Sum of Squares.

[10/26/2015] On page 556, in exercise 47.26, on the fourth line, change $\mathbf{x}_3$ to $\mathbf{x}_2$.

[10/27/2015] On page 556, in exercise 47.27, on the sixth line, change x_4 to x_3.

[7/30/2015] On page 559, in exercise 47.32, on the third line, $A0$ should be A_0. On the fourth line, $B0$ should be B_0.

[9/13/2015] On page 560, the numbers in exercise 47.36 are impossible. On the second-to-last line, change 0.352 to 1.435.

[8/11/2015] On page 563, the solution to exercise 47.16 is incorrect. The correct solution is

Since $s = \sqrt{\text{SSE} / (n - (p + 1))}$, it follows that SSE $= (n - (p+1))s^2$. The SSE of the 5-variable model is $44(3.85^2) = 652.19$. For the restricted model, SSE $= 45(4.02^2) = 727.22$. Then the F statistic is

$$F_{1,44} = \frac{(\text{SSE}_{\text{UR}} - \text{SSE}_{\text{R}})/q}{\text{SSE}_{\text{UR}} / (n - (p + 1))} = \frac{727.22 - 652.19}{652.19/44} = \boxed{5.062}$$

[10/26/2015] On page 564, the solution to exercise 47.24 is incorrect. The correct solution is

The standard error is the square root of the SSE divided by number of degrees of freedom, so the SSE is the number of degrees of freedom times the square of the standard error.

$$\text{SSE}_{\text{UR}} = 22(1.15^2) = 29.095$$
$$\text{SSE}_{\text{R}} = 24(1.21^2) = 35.138$$

The F statistic is

$$F_{2,22} = \frac{(35.138 - 29.095)/2}{29.095/22} = 2.285$$

This is between the critical values at 20% (1.733) and 10% (2.561), so **(E)** is correct.

[10/26/2015] On page 564, in the solution to exercise 47.25, on the third displayed line, change 0.7208 to 0.72018. On the last line, change both 0.7208s to 0.72018 and change the final answer to 67.95.

[10/26/2015] On page 565, in the solution to exercise 47.26, on the third line, change $\mathbf{x}_3$ to $\mathbf{x}_2$ and change $\beta + 0$ to β_0.

[3/12/2016] On page 565, in the solution to exercise 47.29, on the fifth line, the denominator should be 69,843/3.

[10/11/2015] On page 566, in the solution to exercise 47.32, on the third line, change $q = 6$ to $q = 3$.

[9/13/2015] On page 567, the solution to the revised exercise 47.36 is

We will use equation (47.5). There are 35 degrees of freedom and 4 variables and an intercept, so $n = 35 + 5 = 40$. So $\sum_{i=1}^{n}(x_{ij} - \bar{x})^2$, which is the sample variance multiplied by $n - 1$, is $(1.435)(39) = 55.965$.

$$s_{\hat{\beta}_j}^2 = \frac{s^2 \, \text{VIF}_j}{\sum_{i=1}^{n}(x_{ij} - \bar{x})^2}$$

$$1.78342^2 = \frac{10.842^2 \, \text{VIF}_j}{55.965}$$

$$\text{VIF}_j = \frac{178.00}{10.842^2} = \boxed{1.514}$$

[12/10/2015] On page 567, replace the solution to exercise 47.37 with

We wish to use equation (47.5). Since $s_{\hat{\beta}_j}^2 = s^2$ times the jj coefficient of $(\mathbf{X}'\mathbf{X})^{-1}$, it follows that $s_{\hat{\beta}_1}^2 / s^2 = 0.0161$. The first column of the $\mathbf{X}$ matrix is all 1s, so the upper left entry of $\mathbf{X}'\mathbf{X}$ is $n = 5$. The 01 entry of $\mathbf{X}'\mathbf{X}$ is $\sum x_{i1} = 61$. Also, the 11 entry of $\mathbf{X}'\mathbf{X}$ is $\sum x_{i1}^2 = 919$. Therefore, the denominator of equation (47.5) is

$$\sum_{i=1}^{n}(x_{i1} - \bar{x})^2 = \sum_{i=1}^{n} x_{i1}^2 - 2\bar{x}_1 \sum_{i=1}^{n} x_{i1} + n\bar{x}_1^2 = 919 - \frac{61^2}{5} = 174.8$$

We now have everything we need in equation (47.5), after dividing both sides by s^2:

$$0.0161 = \frac{\text{VIF}_1}{174.8}$$

$$\text{VIF}_1 = \boxed{2.814}$$

[12/10/2015] On page 575, in the solution to exercise 48.7, on the second displayed line, change 21 to 20. On the third and fourth displayed lines, change $\frac{8}{7}$ to $\frac{6}{5}$. On the fourth displayed line, change 0.278595 to 0.242525. On the fifth displayed line, change N to n and then put parentheses around $n - (p + 1)$.

[8/11/2015] On page 575, the solution to exercise 48.9 is incorrect. The correct solution is

The AIC is $-2l + 2q$, where q is the number of parameters, which is the number of variables plus the intercept and the variance, $p + 2$. The resulting AICs are

$$-2(-15.785) + 2(4) = 39.570$$
$$-2(-14.472) + 2(5) = 38.944$$
$$-2(-13.015) + 2(5) = 36.030$$
$$-2(-12.012) + 2(6) = 36.024$$
$$-2(-11.197) + 2(7) = 34.394$$

The $\boxed{\textbf{fifth model}}$ has the lowest AIC and is therefore preferred.

[8/11/2015] On page 576, the solution to exercise 48.10 is incorrect. The correct solution is

The BIC is $-2l + q \ln n$, where $q = p + 2$ is the number of parameters, which is the number of variables plus the intercept and variance parameters. In this case, $\ln 70 = 4.248$ so we get

$$- 2(-120.1) + 4(4.248) = 257.194$$
$$- 2(-119.5) + 5(4.248) = 260.242$$
$$- 2(-118.2) + 5(4.248) = 257.642$$
$$- 2(-112.6) + 6(4.248) = 250.691$$
$$- 2(-109.8) + 7(4.248) = 249.339$$

The $\boxed{\textbf{fifth model}}$ has the lowest BIC and is therefore preferred.

[8/4/2015] On page 577, delete the second sentence of the footnote. $\hat{\varepsilon} = \mathbf{M}\varepsilon$ is true, and $\hat{\varepsilon} = \mathbf{M}\mathbf{y}$ is also true.

[8/5/2015] On page 578, in the paragraph beginning "To check that the variance is constant", on the second line, replace "$\mathbf{y}$" with "the fitted values $\widehat{\mathbf{y}}$".

[10/11/2015] On page 580, in the answer to Example 49C, change $\dfrac{-1.492}{1 - 0.719}^2$ to $\dfrac{-1.492}{1 - 0.288}^2$. Change the final answer from 53.046 to 51.500.

[10/24/2015] On page 581, in Table 49.1, the line for Partial residual plot should be "Plot $\hat{\varepsilon}_i^* = \hat{\varepsilon}_i + \hat{\beta}_j x_{ij}$ against x_{ij}.

[3/12/2016] On page 585, in the solution to exercise 49.7, on the third line, change -0.500 to -0.802.

[8/16/2015] On page 585, replace the second and third lines of the solution to exercise 49.8 with:

$$\sum_{j=1}^{3}(x_j - \bar{x})^2 = (-9)^2 + 4^2 + 13^2 = 266$$

$$h_{33} = \frac{1}{n} + \frac{(x_3 - \bar{x})^2}{\sum_{j=1}^{n}(x_j - \bar{x})^2} = \frac{1}{3} + \frac{169}{266} = \boxed{0.9687}$$

[12/10/2015] On page 585, in the solution to exercise 49.9, replace the last line with

That means that $a = 51 - 27.60 = \boxed{23.40}$ and $b = 51 + 27.60 = \boxed{78.60}$

[3/12/2016] On page 585, in the solution to exercise 49.11, change the third through fifth displayed lines to

$$74.8084(1 - h_{11})^2 = 58.1254 h_{11}$$
$$74.8084 h_{11}^2 - 207.7422 h_{11} + 74.8084 = 0$$
$$h_{11} = \boxed{0.4252}, 2.3518$$

On the last line, change 2.3638 to 2.3518.

[8/12/2015] On page 586, the solution to exercise 49.12 is incorrect. The correct solution is

Determine $\hat{\beta}_0$ and $\hat{\beta}_1$.

$$\hat{\beta}_1 = \frac{1750 - (70)(160)/7}{920 - 70^2/7} = 0.6818$$

$$\hat{\beta}_0 = \frac{160}{7} - 0.6818\left(\frac{70}{7}\right) = 16.0390$$

Calculate the squared residuals from the second set.

$$\hat{\varepsilon}_8 = 36 - 16.0390 - 0.6818(18) = 7.6883$$
$$\hat{\varepsilon}_9 = 44 - 16.0390 - 0.6818(20) = 14.3247$$
$$\hat{\varepsilon}_{10} = 25 - 16.0390 - 0.6818(14) = -0.5844$$
$$\text{SSPE} = 7.6883^2 + 14.3247^2 + (-0.5844)^2 = \boxed{264.6480}$$

[10/28/2015] On page 591, six lines from the bottom, change "paremetrizations" to "parametrizations".

[10/11/2015] On page 593, on the third displayed line on the page, "ln" is missing before $\frac{\pi}{1-\pi}$. The line should read:

$$\ln f(y) = \ln \binom{n}{ny} + n(1-y)\ln(1-\pi) + ny\ln\pi = \ln \binom{n}{ny} + n\ln(1-\pi) + ny\ln\frac{\pi}{1-\pi}$$

[8/13/2015] On page 598, delete the sentence one line after equation (52.2) beginning with "Thus the estimate". Also delete footnote 1. The estimate of β is not just a weighted least squares estimate, because $\mathbf{W}$ is itself a function of $\boldsymbol{\beta}$ through $\boldsymbol{\mu}$. Thus it is only a weighted least squares estimate if $V(\mu)$ is independent of μ. However, the only $V(\mu)$ that is independent of μ for the six common distributions discussed in this course is the normal distribution, and in that case $\boldsymbol{\beta}$ is the unweighted least squares estimate.

[10/7/2015] On page 599, in exercise 52.3, change "inverse gamma" to "inverse Gaussian".

[2/2/2016] On pages 599–600, in the solution to exercise 52.1, on the first displayed line, change the last numerator from e^{2x} to e^x. On the last displayed line, remove the exponent 2 from the numerator.

[7/30/2015] On page 601, in the lesson title, change "Predication" to "Prediction". Change this in the table of contents and in the running headers on pages 602 and 604 as well.

[7/30/2015] On page 601, in footnote 2, on the second line, add "is suggested" between "normal distribution" and "by de Jong & Heller".

[9/24/2015] On page 601 of the supplement, the first displayed line should be

$$f(x) \approx y_0 + \dot{f}(y)(x - x_0)$$

Change the sentence after that displayed line to

So we set $x_1 = x_0 - y/\dot{f}(x)$.

[8/10/2015] On page 602, in exercise 53.3, in the fourth bullet, replace $(\mathbf{X}'\mathbf{X})^{-1}$ with $(\mathbf{X}'\mathbf{W}\mathbf{X})^{-1}$.

[9/20/2015] On page 602 of the supplement, on the last line of the page, change $\{-0.1, 0.1\}$ to $\{-0.25, 0.25\}$.

[8/10/2015] On page 603, in the solution to exercise 53.3, delete the first sentence.

[9/30/2015] On page 605, on the third line, change $\hat{\beta}$ (inside the expression $g(\mathbf{x}'\hat{\beta}) = \mathbf{y}$) to $\check{\beta}$.

[9/26/2015] On page 607, on the last line, add "ln" before $\dfrac{16}{18}$.

[5/2/2016] On page 608, on the sixth line of the first paragraph of Section 54.2, change "scaler" to "scalar".

[10/12/2015] On page 608, on the second line of the paragraph beginning **Likelihood ratio test**, delete "ln" from $2\ln(\hat{l} - \tilde{l})$.

[10/13/2015] On page 609, on the first line, delete ϕ from $\phi(\mathbf{X'WX})^{-1}$.

[10/27/2015] In the Fisher scoring supplement, on page 609, replace the last line of the solution to exercise 52.9 with

Using the current values of β, $g(\mu) = 52 + 11(20) = 272$. So $\mu = \ln 272$ and the weight is $\exp(1/\ln 272) = \boxed{\mathbf{1.1953}}$.

[4/7/2016] On page 610, in Example 54D, third bullet, remove the "a" before $\hat{\beta}_0$. In the answer to Example 54D, change the displayed line to

$$S = \frac{6.257(15.2 - 13.75)^2 + 0.114(-0.2 - 0)^2 + 2(-0.829)(15.2 - 13.75)(-0.2 - 0)}{6.971} = \boxed{\mathbf{1.972}}$$

[1/25/2016] On page 611, two lines below equation (54.7), change $h(y) = 3y^{2/3}$ to $h(y) = (3/2)y^{2/3}$.

[10/24/2015] On page 613, two lines below formula (54.3), delete ϕ from $\phi(\mathbf{X'WX})^{-1}$.

[9/17/2016] On page 616, replace the second and third lines of the solution to exercise 54.2 with

$$\Delta = 2\big(10\ln(10/7) + 12\ln(1) + 15\ln(15/20) + 18\ln(18/19) + 20\ln(20/25) - (10-7) - (12-12) - (15-20) - (18-19) - (20-25)\big) = 3.6$$

[9/21/2016] On page 633, in exercise 56.12, in the table, change 0.222 to 0.220 and change 0.054 to 0.056.

[1/8/2016] On page 634, in the solution to exercise 56.1, change 12.42 to 0.42.

[10/14/2015] On page 634, in the solution to exercise 56.7, the final answer should be $(0.5, 0.6]$. Sensitivity decreases, and specificity increases, only when the threshold is strictly greater than a value.

[3/12/2016] On page 634, in the solution to exercise 56.8, on the third line, change "$\pi < 0.4$ for two nonevents" to "$\pi < 0.4$ for three nonevents".

[3/12/2016] On page 635, in the solution to exercise 56.12, change the solution, starting with "For New York" on the fourth line, to

For New York, the odds of the first two categories are $0.946/(1 - 0.946) = 17.51852$, so for Chicago the odds of the first two categories are $17.51852(2.31125/2.62319) = 15.85262$. The probability of the first two categories for Chicago is $15.85262/16.85262 = 0.93916$. The probability of medium risk for Chicago is $0.93916 - 0.698 = \boxed{\mathbf{0.241}}$.

[8/18/2016] On page 640, on the 7th line of the page, the line for m_6, change the + before 30.875 to =.

[10/29/2015] On page 642, in the second table preceding exercises 57.2–3, change 116.375 to 127.625 and 121.5 to 127.125.

[8/30/2015] On page 643, the solution to exercise 57.1 is incorrect. The correct solution is

Sum up Aug. 2013 to June 2014, add half of July 2013 and July 2014, and divide by 12.

$$\frac{93 + 116 + 132 + 97 + 105 + 153 + 132 + 147 + 92 + 135 + 146 + 0.5(106 + 107)}{12} = \boxed{\mathbf{121.2083}}$$

[3/12/2016] On page 643, the solutions to exercises 57.2–3 are incorrect. The correct solution for exercise 57.2 is:

The series minus trend is

	Q1	Q2	Q3	Q4
2011			27.375	−33.125
2012	−4.125	1.125	34.5	−38.75
2013	−2.5	2.875		

The column averages are −3.3125, 2, 30.9375, −35.9375, adding up to −6.3125. The seasonal adjustment factor for third quarter is $30.9375 + 6.3125/4 = \boxed{32.515625}$.

The correct solution to exercise 57.3 is:

The series divided by trend is

	Q1	Q2	Q3	Q4
2011			1.21426	0.73943
2012	0.96703	1.00894	1.27059	0.70588
2013	0.98182	1.01995		

The column averages are 0.97443, 1.01444, 1.24242, and 0.72266. Their average is 0.98849. The seasonal adjustment factor for third quarter is $1.24242 + (1 − 0.98849) = \boxed{1.25394}$.

[10/26/2015] On page 647, in equation (58.8), x_t in the numerator should be x_{t+k}. Make the same correction to the formula in Table 58.1 on page 648.

[10/4/2015] On page 647, in equation (58.9), the denominator should be under a square root sign:

$$r_k(x, y) = \frac{c_k(x, y)}{\sqrt{c_0(x, x)c_0(y, y)}}$$

Make the same correction to the formula in Table 58.1 on page 648.

[8/5/2016] On page 649, in the heading for the last formula of Table 58.1, change cvf to ccf.

[3/12/2016] On page 650, in the solution to exercise 58.4, on the second line, switch the numerator and denominator so that it is

$$\frac{\sum_{t=3}^{21}(y_t - \bar{y})(y_{t-2} - \bar{y})}{\sum_{t=1}^{21}(y_t - \bar{y})^2}$$

[10/14/2015] On pages 654 and later, change "Holt-Winston" to "Holt-Winters". This phrase is found in the title of Section 59.2 and the resulting running headers and table of contents entry for this section, on page 655 two lines below formula (59.6), on the last line of page 655, two lines above formula (59.9) on page 656, on page 658 in the caption of Table 59.2 and above formulas (59.7), (59.8), (59.9), and the last formula in the table, and in exercises 59.11–59.14, the heading to exercises 59.15–59.16, and exercise 59.17.

[10/7/2015] On page 654, on the last line of the page, change a_{t-1} to a_{t-2}.

[11/12/2015] On page 656, on the second line of R code, change "β and γ" to "α, β, and γ".

[8/17/2015] On page 662, in the solution to exercise 59.09, replace 0.4^5 with 0.0256 (or 0.4^4) and replace the final answer with −0.3773. It is not one of the five answer choices.

[8/17/2015] On page 663, replace the solution to exercise 59.10 with

The following table summarizes the calculation.

t	x_t	$a_t = 0.1x_t + 0.9a_{t-1}$	$x_t - \hat{x}_{t\mid t-1}$
1	80	80.9	−1
2	81	80.91	"0.1
3	89	81.719	"8.09
4	74		−7.719

The mean forecast error as defined in the problem is

$$\frac{1}{4}(-1 + 0.1 + 8.09 - 7.719) = \boxed{-0.13225} \qquad \textbf{(B)}$$

You would've ended up with the same answer choice if by mistake you summed up $x_t - a_t$ instead of $x_t - \hat{x}_{t\mid t-1}$.

[12/13/2015] On page 663, in the solution to exercise 59.11, on the fourth line, change 110 to 100.

[12/13/2015] On page 663, in the solution to exercise 59.14, on the first line, replace β_n and the two β_{n-1}s with b_n and b_{n-1} respectively.

[8/5/2015] On page 671, in Table 61.1, on the third line, replace "**AR(q)**" with "**AR(p)**".

[10/12/2015] On page 672, in exercise 61.6, on the last line, change x_{57} to x_{55}.

[12/13/2015] On page 672, in exercise 61.8, on the sixth and seventh lines, change y to x.

[12/13/2015] On page 673, in the solution to exercise 61.5, on the third line, change 0.2 to −0.2 and 10,−1 to −10,1.

[10/12/2015] On page 673, in the solution to exercise 61.6, on the last line, change $\hat{x}_{57\mid54}$ to $\hat{x}_{55\mid54}$.

[10/22/2015] On pages 675 and 678, in formula (62.5), change the upper bound of the summation in the numerator on the second line from $k - q$ to $q - k$.

[8/5/2015] On page 680, in exercise 62.15, replace all nine ys with xs.

[12/17/2015] On page 682, in the solution to exercise 62.8, change the final answer from −0.43 to 0.43.

[8/5/2015] On page 684, in the solution to exercise 62.15, the checkmarks and Xs should be reversed, since the question is asking which statements are not compatible.

[3/12/2016] On page 684, in the solution to exercise 62.16, on the seventh line, change $\hat{w}_6$ from 3.7 to −3.7.

[12/17/2015] On page 685, in the solution to exercise 62.19, on the second to last line, in the last parentheses, change $0.3\textbf{B}$ to $0.3\textbf{B}^2$.

[10/22/2015] On page 689, in formula (62.5), change the upper bound of the summation in the numerator on the second line from $k - q$ to $q - k$.

[10/12/2015] On page 690, in exercise 63.6, on the second line, change ϕ_1 to α_1.

[3/12/2016] On page 692, in the solution to exercise 63.7, on the second line, change the denominator from $1 - \beta^2$ to $1 - \alpha^2$.

[10/12/2015] On page 697, in exercise 64.5, on the first line, change $-\beta_1 w_{t-1}$ to $+\beta_1 w_{t-1}$.

[10/12/2015] On page 697, in exercise 64.7, on the second line, change $(1 - 0.4\textbf{B})$ to $(1 + 0.4\textbf{B})$.

[3/12/2016] On page 698, in the solution to exercise 64.4, on the last line, change the equals sign to a negative sign: "...is −0.3 + ...".

[10/12/2015] On page 698, in the solution to exercise 64.7, on the first line, change $\beta_1 = -0.4$ to $\beta_1 = 0.4$. On the third, fourth, and fifth lines, change $-0.4w_1$, $-0.4w_2$, and $-0.4w_3$ to $+0.4w_1$, $+0.4w_2$, and $+0.4w_3$.

[6/19/2016] On page 722, in question 20, in the first bullet, change "an inverse gamma" to "a gamma".

[10/23/2015] On page 733, in question 8, in the table, change 86.2 to 172.4 and change 84.0 to 168.0.

[10/23/2015] On page 741, in question 36, in the table, change 2432.5 to 4865.0 and change 2428.3 to 4856.6.

[5/2/2016] On page 747, in question 13, in the fourth and sixth bullets, remove the parentheses and the inversion sign -1 from **X′WX**.

[5/2/2016] On page 753, in question 34, on the third line, change $\text{Var}(Y)$ to $\text{Var}(Y_3)$.

[10/14/2015] On page 755, in question 35, change "Holt-Winston" to "Holt-Winters".

[10/23/2015] On page 755, in question 40, change the answer choices to

  - (A) Less than 0.93
  - (B) At least 0.93, but less than 0.95
  - (C) At least 0.95, but less than 0.97
  - (D) At least 0.97, but less than 0.99
  - (E) At least 0.99

[10/28/2015] On page 774, in question 13, change the last line to "Calculate l."

[4/11/2016] On page 803, in the solution to question 5, on the last two lines (once apiece) change 487.22 to 478.22.

[10/23/2015] On page 804, in the solution to question 8, change $2(86.2 - 84.0)$ to $172.4 - 168.0$.

[10/23/2015] On page 809, in the solution to question 36, on the first line, change $2(2432.5 - 2428.3)$ to $4865.0 - 4856.6$.

[10/12/2015] On page 813, in the solution to question 6, the strict and nonstrict inequalities on α need to be reversed. On the second line, $\alpha \le 2$ should be $\alpha < 2$ and $\alpha > 7$ should be $\alpha \ge 7$. On the fourth line, $2 < \alpha \le 6$ should be $2 \le \alpha < 6$. On the first line of the fourth paragraph, $6 < \alpha \le 7$ should be $6 \le \alpha < 7$. The final answer is $6 - \epsilon$ for ϵ arbitrarily small.

[5/2/2016] On page 814, in the solution to question 13, remove the parentheses and the inversion sign -1 from **X′WX**. After "matrix", add "of the sixth bullet".

[10/28/2015] On page 815, the correct answer key for question 18 is (E). Make this correction in the answer key on page 811 as well.

[9/24/2015] On page 819, the solution to question 39 is incorrect. Replace the solution, starting with the fourth line, with

$$w_{20} = y_{20} - \hat{y}_{20} = 13 - 7.4 = 5.6$$

The predicted value of y_{21} is
$$\hat{y}_{21|20} = 0.2(13) + 0.5(5.6) = 5.4$$

The predicted value of x_{21} is

$$\hat{x}_{21|20} = 1065 + 5.4 = \boxed{1070.4} \qquad \textbf{(D)}$$

[10/23/2015] On page 819, in the solution to question 40, on the first line, remove the negative sign in the exponent of $e^{-x'\beta}$. On the last line, change $e^{-2.5093} = 0.0813$ to $1 - e^{-2.5093} = 0.9187$.

[2/8/2016] On page 823, in the solution to question 7, on the first line, change 0.420 to 0.320.

[10/29/2015] On page 833, in the solution to question 19, in statement 2, change "now" to "know".

[9/24/2016] On page 890, in the solution to question 37, on the line for age 30 in the table, exchange 8,950,901 and 9,501,381.

[9/27/2015] On page 843, the first eight questions are misnumbered. Insert "Question 1 is not on the current Exam S syllabus", and renumber question 1–7 to questions 2–8.

[5/2/2016] On page 869, in the solution to question 24, on the third displayed line, the integrand should be divided by α^n:

$$\int_0^\alpha \frac{n\,y^n\,\mathrm{d}y}{\alpha^n}$$

[5/6/2016] On page 873, in the solution to question 25, change S_2^1 to S_1^2 and change σ_2^1 to σ_1^2.

[7/28/2015] On page 904, in the solution to question 5, on the second displayed line, change $\left(\dfrac{\theta}{(\alpha-1)^2}\right)$ to $\left(\dfrac{\theta}{\alpha-1}\right)^2$.

[10/15/2015] On page 905, in the solution to question 8, on the second displayed line, change $\left(\frac{x}{\theta}\right)^{99}$ to $\left(\frac{x^{99}}{\theta^{100}}\right)$.

[10/24/2015] On page 917, on the first line of Section B.23, change `s15-LC` to `sp15-LC`.

[10/24/2015] On page 918, on the first line of Section B.24, change `S15-ST` to `sp15-ST`.

[10/28/2015] On page 924, on the fifth line, add the word "not" between "have" and "provided". On the sixth line, delete the "s" between "Lessons" and "45".