ERRATA LIST – SOLUTION MANUAL

Page 56 Exercise 3-19 – delete (e)

Page 56 Exercise 3-21 – lines 4-4:

$$\frac{12.3}{3.5} = \frac{n}{m}.$$

In other words, the ratio $\frac{n}{m}$ of girls to boys is 12.3/3.5 = 3.51:1.

Page 58 Exercise 3-32 – line 1: Ryan's apple is $z = \frac{19 - 11.19}{2.848} = 2.74.$

Page 80 Exercise 4-38 (c) – replace 9.2 in middle of line with 9.6

Page 98 Exercise 5-3 (c) and (d) should read:

(c) Using the CDF,

$$\Pr(2 < Y \le 3) \;=\; F(3) - F(2) \;=\; (1 - e^{-3(3)}) - (1 - e^{-3(2)}) \;=\; (e^{-6} - e^{-9}).$$

Using the probability density function,

$$\Pr(2 < Y \le 3) \;=\; \int_2^3 3e^{-3y}dy = -e^{-3y}\Big|_{y=2}^{y=3} \;=\; (e^{-6} - e^{-9}).$$

(d)

$$\Pr(Y > -3) \;=\; \int_{-3}^{\infty} f(y)dy$$

$$= \int_{-3}^{0} f(y)dy + \int_{0}^{\infty} f(y)dy$$

$$\int_{-3}^{0} 0\,dy + \int_{0}^{\infty} 3e^{-3y}dy \;=\; 0 + 1 \;=\; 1.$$

Page 90 Exercise 5-4 (a) – replace line 2 with: $E[\boldsymbol{T}] \;=\; \int_{82}^{90} \frac{1}{8} \cdot \boldsymbol{t}dt \;=\; 86.$

Page 99 – Exercise 5-9 – line 3: replace $u = 1 - x$ with $u = 1 + x$

Page 101 – Exercise 5-17 – replace $f(x) = 1$ with $f(x) = 0$

Page 101 – Exercise 5-18 – line 4 replace with:

with $t \;=\; 1 - 0.5\sqrt{2} \;=\; .2929,$ and $t \;=\; 1 + 0.5\sqrt{2} \;=\; 1.7071.$

Page 102 – Exercise 5-20 (e) should read: $x_5 = \sqrt{\frac{2 - \sqrt{2}}{2}} = 0.5412.$

Page 104 – Exercise 5-30 (b) – replace last 2 lines with:

$$E\left[(\text{Modified Payment})^2\right] = \int_{50}^{90}(1000x)^2 \cdot \frac{1}{60}\,dx + 100{,}000^2\,\frac{20}{60} = 6{,}688{,}888{,}889$$

$$\sigma_{\text{Modified Payment}} = \$16{,}997.$$

Page 105 – Exercise 5-34 – replace formula in line 2 with:

$$E[\text{Loss not Covered}] = \int_{.6}^{2} x \cdot \frac{2.5(0.6)^{2.5}}{x^{3.5}}\,dx + \int_{2}^{\infty}(2)\cdot\frac{2.5(0.6)^{2.5}}{x^{3.5}}\,dx = .93.$$

Page 106 – Exercise 5-37 – replace with:

$$E[\text{Not Paid}] = \int_0^{10} x \cdot \frac{x}{5000}\,dx + 10\cdot \Pr[x>10] = .06\overline{6} + 10\cdot .99 = 9.9\overline{6}.$$

Page 106 – Exercise 5-40 – final answer should be 0.0314.

Page 109 – Exercise 5-50 – line 3 should read:

$$= -\frac{1}{3}\,\frac{1}{(1/3-t)}\,e^{-(1/3-t)x}\Big|_{x=0}^{\infty} = \frac{1}{1-3t}\,(\text{for } t<1/3)$$

Page 111 – Sample Exam 1 (d) – formula should read:

$$f(x) = 3.6x - 2.4x^2 \Rightarrow f'(x) = 3.6 - 4.8x = 0 \Rightarrow x = .75$$

Page 111 – 2 (b) – insert after formula: Since we can only define left and right derivatives of F at 0, we can take $\lim_{x\downarrow 0} f(x) = 3$ as the maximum of $f(x)$. Thus, the mode is $x = 0$.

Page 113 – 9 replace with:

$F(x) = 1.25 - \dfrac{12.5}{x+10}$ for $0 \le x \le 40$.

The mean is $\mu_X = \int_0^{40}\left[1 - F(x)\right]dx = \int_0^{40}\left[-.25 + \dfrac{12.5}{x+10}\right]dx$

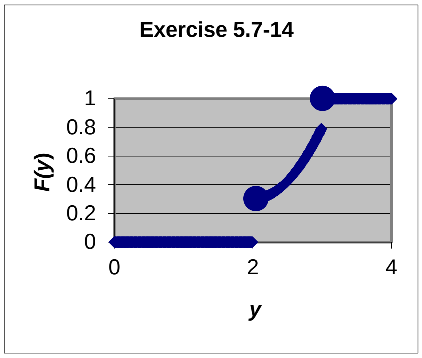
$= (-.25)(40) + 12.5\ln 5 = 10.118,$

the median is m, where $.5 = F(m) \Rightarrow m = \dfrac{20}{3}$, and the mode occurs at $x = 0$.

Page 114 – 13 (a) – replace line 2 with:

$$= 5\int_0^\infty e^{-(5-t)x}dx = \frac{-5}{5-t}\cdot e^{-(5-7)x}\Big|_{x=0}^{x=\infty} = \frac{5}{5-t} \quad \text{if } t<5.$$

Page 114 – 14 – line 2 replace X with Y. Also the axis labels in the graph should be $F(y)$ and y.



Page 117 – 6-1 (d) replace 63.34 with 66.64 in two places.

Page 119 – 6-9 (d) – line 3 – replace with:
$\Pr(1<Z<3) = F(3)-F(1) = e^{-1/5}-e^{-3/5} = .2699.$

Page 110 – 6-13 – replace with:
$\beta=\sigma=10$, so $Q_3-Q_1 = 10\ln(.75)-10\ln(.25) = 10.986.$

Page 122 – 6-26 (a) – replace line 2 with: $\Rightarrow \quad \Pr\left[Z\le z_\alpha\right] = .9$

Page 122 – 6-26 (d) – replace line 1 with:
$.95 = \Pr\left[Z\ge z_\alpha\right] = 1-\Pr\left[Z\le z_\alpha\right]\Rightarrow \Pr\left[Z\le z_\alpha\right]=.05\Rightarrow \alpha = .05$ and

Page 122 – 6-27 (b) – replace line 3 with: $\Rightarrow \quad z_\alpha = z_{.9515} = 1.66$

Page 124 – 6-37 (a) – replace 365,710 with 365,711.

Page 125 – 6-41 (a) last line should be:
$$\Pr(H=60)\approx \Pr\left(\frac{59.5-50}{5}<Z<\frac{60.5-50}{5}\right)=.9821-.9713=.0108.$$

Page 125 – 6-44 – replace (b) and (c) with:

(b) $E[\bar{X}]=75$ and $Var[\bar{X}]=\frac{50^2}{(12)(75)}=\left(\frac{5}{3}\right)^2$.

(c) $\Pr[72<X_i<77]=\frac{5}{50}=.1$. That is, only 10% of the time will a randomly selected number be between 72 and 77. On the other hand, for the sample mean,

$$\Pr[72<\bar{X}<77]\approx \Pr\left[\frac{72-75}{5/3}<Z<\frac{77-75}{5/3}\right]=\Pr[-1.8<Z<1.2]=84.9\%.$$

Page 125 – 6-45 (a) – line 2 should be: then $\Pr(98 < \bar{X} < 102) = \Pr\left(\frac{-2}{1.6} < Z < \frac{2}{1.6}\right) = .7888.$

Page 128 – 6-56 (c) – last 3 lines should read:
Then,

$$\begin{aligned}\Pr[S > 5] &= \Pr[4^{th} \text{ insult arrives later than 5 weeks}] \\ &= \Pr[\text{at most 3 insults in a 5 week period}] \\ &= \Pr[Y_5 = 0,1,2,3] = e^{-5}\left(1 + 5 + \frac{5^2}{2!} + \frac{5^3}{3!}\right) = 0.265.\end{aligned}$$

Page 129 – 6-59 (b) – replace formula in line 3 with:

$$E[X^3] = \int_0^\infty x^3 \cdot \frac{1}{2^6 \cdot 5!} \cdot x^5 \cdot e^{-x/2} dx \qquad = \frac{1}{2^6 \cdot 5!} \cdot \overbrace{\int_0^\infty x^8 \cdot e^{-x/2} dx}^{\alpha=9,\ \beta=2}$$

Page 129 – 6-59 (c) – replace lines 1 and 2 with:

$$\text{(c)}\quad E\left[\sqrt{X}\right] = \int_0^\infty \sqrt{x} \cdot \frac{1}{2^6 \cdot 5!} \cdot x^5 \cdot e^{-x/2}\, dx$$

$$= \frac{1}{2^6 \cdot 5!} \cdot \overbrace{\int_0^\infty x^{5.5} \cdot e^{-x/2}\, dx}^{\alpha=6.5,\ \beta=2}$$

Page 129 – 6-61 (b) – replace CHIDIST with CHISQ.DIST

Page 129 – 6-61 (c) – replace GAMMADIST with GAMMA.DIST

Page 129 – 6-62 - line 1 – replace .5 with .05

Page 129 – 6-62 – replace last line with:

$$B(4,2) = B(2,4) = \frac{3! \cdot 1!}{5!} = \frac{1}{20} = .05.$$

Page 130 – 6-64 (b) – replace $\bar{X}$ with $E[X]$

Page 130 – 6-66 (b) - replace $\bar{X}$ with $E[X]$

Page 131 – 6-67 – replace line 1 with: $E[7X - 5X^6] = \int_0^1 \left[7x - 5x^6\right]\left[60x^2(1-x)^3\right] dx$

Page 131 – 6-68 (d) – replace \$242 with \$242.14.

Page 131 – 6-68 (e) - replace $\bar{Y}$ with $E[Y]$

Page 131 – 6-69 – last line – replace with:
$.95 = 1 - 6(1 - x_{.95})^5 + 5(1 - x_{.95})^6$ implies that the 95th percentile is $x_{.95} = .5818.$

Page 133 – 6-73 (d) – delete line 3 (redundant)

Page 135 – 9 – line 2 – replace total losses with total payout
Page 136 – 12 – last line – replace ln 5 with ln 4

Page 139 – 7-1 (b) – At end add the phrase, "Or, recognize from (a) that X is a Poisson random variable with mean equal to 3.

Page 140 – 7-5 – table labels modified as shown below:

			C		
		0	**1**	**2**	$p_B(b)$
	0	water Gaterade cola $\frac{{}_4C_3 \cdot {}_6C_0 \cdot {}_2C_0}{{}_{12}C_3}$	$\frac{12}{220}$	$\frac{4}{220}$	$\frac{20}{220}$
B	**1**	$\frac{36}{220}$	$\frac{48}{220}$	$\frac{6}{220}$	$\frac{90}{220}$
	2	$\frac{60}{220}$	$\frac{30}{220}$	0	$\frac{90}{220}$
	3	$\frac{20}{220}$	0	0	$\frac{20}{220}$
$p_C(c)$		$\frac{120}{220}$	$\frac{90}{220}$	$\frac{10}{220}$	**1.00**

Page 142 – 7-9 – replace with this simpler solution:

Let $p_1(2)$ be the marginal probability that $N_1 = 2$. Then the conditional probability function for N_2 given that $N_1 = 2$ is given by,

$$p_2(n_2 \mid 2) = \Pr\left[N_2 = n_2 \mid N_1 = 2\right] = \frac{p(2, n_2)}{p_1(2)} = \frac{3}{4}\left(\frac{1}{4}\right)\frac{e^{-2}\left(1-e^{-2}\right)^{n_2-1}}{p_1(2)}; \; n_2 = 1, 2, 3, \ldots$$

The only variable part in this expression is $\left(1-e^{-2}\right)^{n_2-1}$, and since this is a geometric-type probability distribution, we can conclude that N_2 can be interpreted as the trial number of the first success in a series of independent Bernoulli trials with probability q of failure equal to $\left(1-e^{-2}\right)$. Therefore the probability of success is $p = 1 - q = e^{-2}$, and $E\left[N_2 \mid N_1 = 2\right] = \frac{1}{p} = e^2$. (E)

Page 144 – 7-16 – add at end: Note: An easier solution can be obtained using formulas from Section 8.3.

Page 144 – 7-18 – add at end: See note above for 7-16.

Page 146 – 7-23 – add at end: Note: This also follows directly using the Property (2) of Properties of Correlations in Section 7.3.

Page 149 – 7-32 – following the diagram add, "The diagram illustrates $g(1/4)$."

Page 151 – 7-41 (a) – first line should read:

(a) $$f_X(x) = \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \frac{1}{4\pi}\,dy = \frac{\sqrt{4-x^2}}{2\pi} \text{ for } -2 \le x \le 2, \text{ zero otherwise.}$$

Page 153 – 7-48 – last line to be replaced by:

$$= \frac{2}{9}\left(1-e^{-1}\right)\underbrace{\left[-e^{-y}(y+1)\right]_{y=0}^{3}}_{\text{using integration by parts}} = \frac{2}{9}(1-e^{-1})(1-4e^{-3}) = .1125$$

Page 155 – 7-53 (d) – replace line 1 with:

(d) $$f_X(x) = \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \frac{1}{\pi}\,dy = \frac{2\sqrt{1-x^2}}{\pi}; \quad -1 \le x \le 1.$$

Page 159 – 7-66 – replace solution with:

$$\begin{aligned}
M_{W,Z}(t_1,t_2) &\overset{\text{defn}}{=} E\left[e^{t_1 W + t_2 Z}\right] \\
&= E\left[e^{t_1(X+Y)+t_2(Y-X)}\right] \\
&= E\left[e^{(t_1-t_2)X+(t_2+t_1)Y}\right] \\
&= E\left[e^{(t_1-t_2)X}e^{(t_2+t_1)Y}\right] \\
&= \overbrace{E\left[e^{(t_1-t_2)X}\right]E\left[e^{(t_2+t_1)Y}\right]}^{\text{Since } X \text{ and } Y \text{ independent}} \\
&= M_X(t_1-t_2)\cdot M_Y(t_2+t_1) = e^{\frac{(t_1-t_2)^2}{2}}\cdot e^{\frac{(t_2+t_1)^2}{2}} = e^{t_1^2+t_2^2}. \qquad \text{(E)}
\end{aligned}$$

Page 160 – 4 – correct and reorder as follows for (h) – (k):

(h) $E[XY] = 3.7576 = 124/33.$

(i) $V[X] = .19835$ and $V[Y] = .6336.$

(j) $Cov(X,Y) = -4/363.$

(k) $\rho = -.03108.$

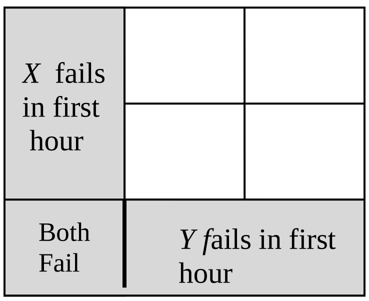
Page 162 – 12 – replace with:

Let $G \sim Exp(\beta = 6)$ denote the random wait time for a good driver to file a claim and let $B \sim Exp(\beta = 3)$ denote the random wait time for a bad driver to file a claim.

$$
\begin{aligned}
\Pr(G<3 \cap B<2) &= \Pr(G<3)\cdot\Pr(B<2) \\
&= (1-e^{-3/6})\cdot(1-e^{-2/3}) \\
&= (1-e^{-1/2})\cdot(1-e^{-2/3}) \\
&= 1-e^{-2/3}-e^{-1/2}+e^{-7/6}. \quad \text{(C)}
\end{aligned}
$$

Page 162 – 13 – replace first sentence with:
Let $P = \text{premiums} \sim Exp(\beta = 2)$ and $C = \text{claims} \sim Exp(\beta = 1)$.

Page 164 – 16 – diagram:



Page 167 – 8-3 (b) – Delete "Method 2."

Page 168 – 8-6 (c) – Final answer is .4024.

Page 170 – 8-12 line 2 should read:

$$f_X(x) = \int_0^x f_S(s)\cdot f_T(x-s)\,ds = \lambda^2 \cdot \int_0^x e^{-\lambda s}\cdot e^{-\lambda(x-s)}\,ds$$

Page 171 – 8-15 – line 2 – replace "first" with "second" and replace last two lines to read:

Let X be the time until failure of the first generator and Y the time until failure of the second. Let $S = X + Y$. Then $S \sim \Gamma(2,10)$, so $Var[S] = \alpha\beta^2 = 200$. (E)

Page 172 – 8-16 – Replace first line with: Let S denote the sum of the roll of two fair dice.

Page 172 – 8-17 – last line should read: simulated outcomes 8, 10, 11, 8, and 10.

Page 173 – 8-21 (b) – last 2 lines should read:

(b) The mean of the simulated outcomes is 5.2034 and the sample standard deviation is 3.939.

Page 175 – 8-23 (d) – last line should read:

$$PV = 100{,}000\int_0^\infty e^{-.06x}\left(\frac{1}{20}e^{-x/20}\right)dx = 5000\int_0^\infty e^{-.11x}dx = \frac{5000}{.11} = 45{,}455$$

Page 176-7 – 8-26 (c) – line 1 – replace with:

(c) Let $T = \min\left[X_1,\ldots,X_n\right]$. Then $f_T(t) = \dfrac{n(10-t)^{n-1}}{10^n}$; $0 \le t \le 10$.

Page 176 – 8-26 (c) – replace with:

(c) Let $T = \min\left[X_1,\ldots,X_n\right]$. Then $f_T(t) = \dfrac{n(10-t)^{n-1}}{10^n}$; $0 \le t \le 10$.

$$E[T] = \int_0^{10} t \cdot \frac{n(10-t)^{n-1}}{10^n}\,dt$$

$$= \frac{n}{10^n}\underbrace{\left[-\frac{t(10-t)^n}{n} - \frac{(10-t)^{n+1}}{n(n+1)}\right]_{t=0}^{10}}_{\text{using integration by parts}} = \frac{n}{10^n}\cdot\frac{10^{n+1}}{n(n+1)} = \frac{10}{n+1}.$$

$$E[T^2] = \int_0^{10} t^2 \cdot \frac{n(10-t)^{n-1}}{10^n}\,dt$$

$$= \frac{n}{10^n}\underbrace{\left[-\frac{t^2(10-t)^n}{n} - \frac{2t(10-t)^{n+1}}{n(n+1)} - \frac{2(10-t)^{n+2}}{n(n+1)(n+2)}\right]_{t=0}^{10}}_{\text{using integration by parts}}$$

$$= \frac{n}{10^n}\cdot\frac{2\cdot 10^{n+2}}{n(n+1)(n+2)} = \frac{2\cdot 10^2}{(n+1)(n+2)}.$$

Then,

$$Var[T] = \frac{2\cdot 10^2}{(n+1)(n+2)} - \frac{10^2}{(n+1)^2}$$

$$= \frac{10^2}{(n+1)}\left[\frac{2}{n+2} - \frac{1}{n+1}\right] = \frac{10^2 n}{(n+1)^2(n+2)}.$$

Next, let $S = \max\left[X_1,\ldots,X_n\right]$. Then $f_S(s) = \dfrac{ns^{n-1}}{10^n}$; $0 \le s \le 10$.

$E[S] = \displaystyle\int_0^{10} s \cdot \frac{ns^{n-1}}{10^n}\,ds = \frac{n}{10^n}\cdot\frac{10^{n+1}}{(n+1)} = \frac{10n}{n+1}$, and

$E[S^2] = \displaystyle\int_0^{10} s^2 \cdot \frac{ns^{n-1}}{10^n}\,ds = \frac{n}{10^n}\cdot\frac{10^{n+2}}{(n+2)} = \frac{10^2 n}{n+2}$.

(These integrals don't require integration by parts!) Then,

$$Var[S] = \frac{10^2 n}{n+2} - \frac{10^2 n^2}{(n+1)^2}$$

$$= 10^2 n\left[\frac{1}{n+2} - \frac{n}{(n+1)^2}\right] = \frac{10^2 n}{(n+1)^2(n+2)}.$$

Note that S and T have the same variance, which might have been anticipated from the symmetry between the two random variables with an underlying uniform distribution.

Page 184 – 8-47 (b) – final answer should be 3.227 million.

Page 184 – 8-47 (c) – Insert after solution: Note: Graphing calculator used to evaluate the definite integral.

Page 186 – 8-55 – first line after table should read:
$\Pr[L<1 \mid N=0] = 1$ and $\Pr[L<1 \mid N=1] = 1$. Given $N=2$, let X be the driver's loss

Page 189 – 8-66 – replace **Note:** with:
Note: If the continuity correction is omitted then the resulting calculations,

$\Pr\left[Z > \frac{156-150}{\sqrt{150}}\right] = .3121$, or $\Pr\left[Z > \frac{157-150}{\sqrt{150}}\right] = .2843$, produce incorrect answers (D) and (B), respectively. These answers were calculated directly from the standard normal tables without interpolation.

Page 191 – 1 – last line should read: $f_Y(y) = 3\left(\frac{1}{2}\ln y\right)^2 \cdot \frac{1}{2y} = \frac{3(\ln y)^2}{8y};\ 1 \le y \le e^2$

Page 192 – 4 – top line of page (line 5 of solution) should read:
The claim amounts, X_A and X_B are constants, so $\mu_{X_A} = 200$ and $\mu_{X_B} = 100$, with

Page 194 -10 – add at end: Note: This can also be calculated as
$E\left[Max(X,Y)\right] - E\left[Min(X,Y)\right]$

Page 194 – 12 – add at end: Note: Because the wording of the problem was ambiguous, the answer (D) was also accepted.

Page 221 - 11-3 – replace $Y_{(20)}$ with $Y_{(1)}$ in two places

Page 232 – 11-39 (b) – replace $\sigma_X = \sqrt{100 \cdot .8 \cdot .2} = 4$ with $\sigma_X = \sqrt{100 \cdot 0.5 \cdot 0.5} = 5$

Page 234 – 11-45 – line 3 – replace with:

$$.05 = \Pr\left[\bar{X} \ge A \mid \mu = 0\right] = \Pr\left[Z \ge \frac{A-0}{\sqrt{25/n}}\right] \Rightarrow \frac{A}{\sqrt{25/n}} = 1.645$$