

Errata for the ASM Study Manual for Exam P, Eighth Edition
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Posted August 6, 2011

In the third line of Problem 21 in Practice Examination 15, the words “and integer” should be “an integer”.

Posted August 6, 2011

In the solution of Problem 6 in Practice Examination 9, in the first line, the words “for and” should be “for any”.

Posted August 6, 2011

In the solution of Problem 1 in Practice Examination 9, the formula in the fifth line should be

$$\Pr(Y_{(1)} = 3) = \Pr(E - F) = \Pr(E) - \Pr(F).$$

instead of

$$\Pr(Y_{(1)} = 3) = \Pr(F) - \Pr(E).$$

Posted August 4, 2011

The solution of Problem 7 in Practice Examination 13 should be rephrased as follows:

Solution.

The event of at least one color not being represented is the complement of the event of all three colors being represented, and all colors being represented simply means that we pick one red ball out of 3, one green ball out of 2, and one yellow ball out of 1. Thus

$$\Pr(\text{At least one color not drawn}) =$$

$$= 1 - \Pr(\text{All colors drawn}) = 1 - \frac{\binom{3}{1} \cdot \binom{2}{1} \cdot \binom{1}{1}}{\binom{6}{3}} = 0.70.$$

You could also argue as follows. We are looking for the probability that all three balls are of the same color, or of two colors only. We have

$$\Pr(3 \text{ balls of one color}) = \Pr(3 \text{ red}) = \frac{1}{\binom{6}{3}} = \frac{3! \cdot 3!}{6!} = \frac{6}{4 \cdot 5 \cdot 6} = \frac{1}{20},$$

and

$$\begin{aligned} \Pr(3 \text{ balls of two colors only}) &= \Pr(2 \text{ red} + 1 \text{ green}) + \Pr(2 \text{ red} + 1 \text{ yellow}) + \\ &+ \Pr(2 \text{ green} + 1 \text{ red}) + \Pr(2 \text{ green} + 1 \text{ yellow}) = \\ &= \frac{\binom{3}{2} \cdot \binom{2}{1}}{\binom{6}{3}} + \frac{\binom{3}{2} \cdot \binom{1}{1}}{\binom{6}{3}} + \frac{\binom{2}{2} \cdot \binom{3}{1}}{\binom{6}{3}} + \frac{\binom{2}{2} \cdot \binom{1}{1}}{\binom{6}{3}} = \frac{13}{20}, \end{aligned}$$

so that the total probability is $\frac{1}{20} + \frac{13}{20} = \frac{7}{10}$.

Answer B.

Posted August 3, 2011

The last sentence of Problem 11 in Practice Examination 16 should be:

Calculate the variance of Y given that $X > 3$ and $Y > 3$.

instead of

Calculate the variance of Y given that and $X > 3$ and $Y > 3$.

Posted August 3, 2011

In Problem 7 in Practice Examination 14, the solution should start with the words

Because you studied this manual

instead of

Because you studied his manual

Posted July 28, 2011

In the formula in the solution of Problem 26 in Practice Examination 17, the formula should be

$$\begin{aligned} f_X(x) = F'_X(x) &= -\frac{d}{dx} \sum_{k=0}^3 \frac{x^k \cdot e^{-x}}{k!} = -\frac{d}{dx} \left(e^{-x} + x e^{-x} + \frac{1}{2} x^2 \cdot e^{-x} + \frac{1}{6} x^3 \cdot e^{-x} \right) = \\ &= -\left(-e^{-x} + (e^{-x} - x e^{-x}) + \left(x e^{-x} - \frac{1}{2} x^2 \cdot e^{-x} \right) + \left(\frac{1}{2} x^2 \cdot e^{-x} - \frac{1}{6} x^3 \cdot e^{-x} \right) \right) = \frac{1}{6} x^3 \cdot e^{-x}. \end{aligned}$$

The formula was missing a minus sign in the second line just after the first parenthesis. The rest of the solution is unaffected.

Posted July 28, 2011

In the solution of Problem 16 in Practice Examination 17, the word “bad” in the first sentence should be replaced by “bag”.

Posted July 28, 2011

The second sentence of the solution of Problem 12 in Practice Examination 16

should be:

Box 1 contains 1 blue and 4 red marbles, box 2 contains 2 blue and 3 red marbles and box 3 contains 3 blue and 2 red marbles.

instead of

Box 1 contains 1 blue and 4 red marbles, box 2 contains 2 blue and 3 red marbles and box 3 contains 3 red and 2 blue marbles.

The rest of the solution is unaffected by this typo.

Posted July 26, 2011

In Problem 9 in Practice Examination 14, the third condition should be:

(ii) The future lifetimes follow a Weibull distribution with $\alpha = 1.5$ and $\beta = 2.0$ for smokers, and $\alpha = 2.0$ and $\beta = 2.0$ for nonsmokers.

Also, the survival function of the Weibull distribution should be given as

$$s_T(t) = e^{-\left(\frac{t}{\alpha}\right)^\beta}.$$

Posted March 10, 2011

The second sentence of the solution of Problem 10 in Practice Examination 1 should be:

As the policy has a deductible of 1 (thousand), the claim payment is

$$Y = \begin{cases} 0, & \text{when there is no damage, with probability 0.94,} \\ \max(0, X - 1), & \text{when } 0 < X < 15, \text{ with probability 0.04,} \\ 14, & \text{in the case of total loss, with probability 0.02.} \end{cases}$$

Posted January 25, 2011

The last two sentences of the solution of Problem 11 in Practice Examination 16 should be replaced by

But the memoryless property of the exponential distribution tells us that Y and $(Y - 3|Y > 3)$ have the same distribution. Note, however, that

$(Y|Y > 3) = 3 + (Y - 3|Y > 3)$, so that

$$\text{Var}(Y|Y > 3) = \text{Var}(Y - 3|Y > 3) = \text{Var}(Y).$$

This implies that

$$\text{Var}(Y|\{X > 3\} \cap \{Y > 3\}) = \text{Var}(Y|Y > 3) = \text{Var}(Y) = \frac{1}{2^2} = 0.25.$$

Answer A.

Posted January 15, 2011

In Problem 16 in Practice Examination 6, the calculation of the second moment of X should be:

$$E(X^2) = \frac{1}{4} \cdot 0^2 + \frac{3}{4} \cdot \underbrace{(1+1)}_{\text{Second moment of } T} = \frac{3}{2}.$$

instead of

$$E(X^2) = E(X) = \frac{1}{4} \cdot 0^2 + \frac{3}{4} \cdot \underbrace{(1+1)}_{\text{Second moment of } T} = \frac{3}{2}.$$

Posted July 24, 2010

In the solution of Problem 21 in Practice Examination 6, the statement under the first expression on the right-hand side of the third to last formula should be:

number of ways to
pick ordered samples
of size 2 from
population of size n

instead of

number of ways to
pick ordered samples
of size $n-2$ from
population of size n

Posted July 17, 2010

Practice Examinations: An Introduction on page 109, the third sentence of the last section should be:

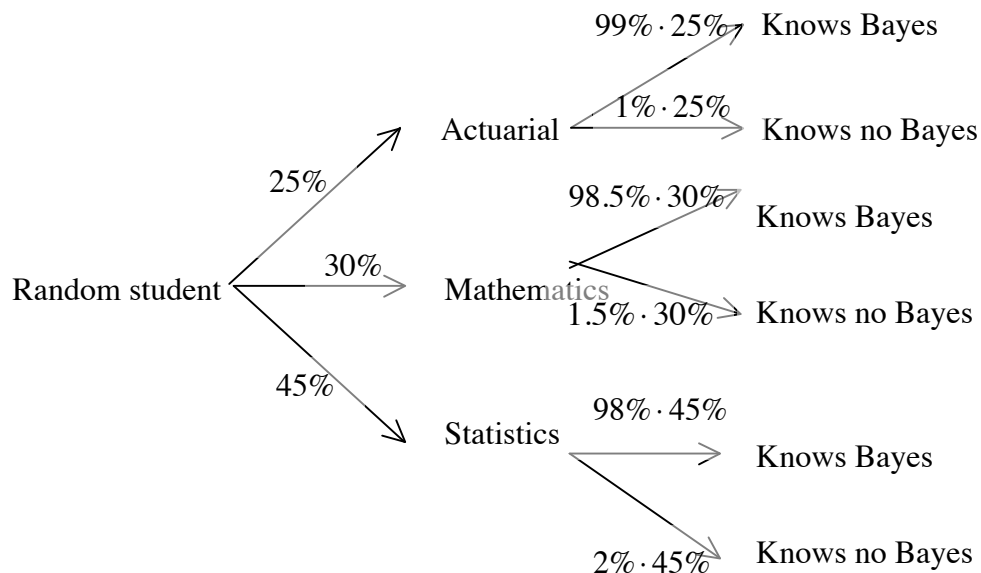
Practice examinations 6-20 are meant to be more challenging.

Posted July 3, 2010

In the solution of Problem 1, Practice Examination 5, at the end of the first part of the fourth sentence of the solution, $5/6$ is a typo, it should be $5/36$, as used in the formula for $\Pr(Y = 6)$.

Posted June 9, 2010

In the alternative solution of Problem 28, Practice Examination 11, the probability tree diagram should be:



Some numbers in the diagram were mistyped.

Posted January 5, 2010

In the description of the gamma distribution in Section 2, the condition for the range of its MGF should be $t < \beta$, not $0 < t < \beta$.

Posted January 1, 2010

The Course P/1 syllabus updated for 2010 no longer contains direct references to chi-square, beta, Pareto, Weibull, and lognormal distributions. My interpretation of this change is that you do not need to memorize the details of chi-square, beta, Pareto and Weibull distributions, but you still should familiarize yourself with them. Since lognormal has a direct connection to normal, I think you should know that connection.

Posted November 20, 2009

Answers A and B in Problem 10, Practice Examination 9, have the symbol τ mistyped as r in the numerator, and they should be:

$$\text{A. } f_Y(y) = \frac{\tau \theta y^{\tau-1}}{(y + \theta)^{\tau+1}} \quad \text{B. } f_Y(y) = \frac{\alpha \theta^\alpha \tau y^{\tau-1}}{(y^\tau + \theta)^{\alpha+1}}$$

Posted November 17, 2009

In Problem 17 in Practice Examination 14, answer choice A should be

$$f_Y(y) = \begin{cases} 0 & y < 0, \\ e^{1-e^2} (e^{ey} + e^{-ey}) & 0 < y < e, \\ e^{1-e^2} \cdot e^{-ey} & y \geq e. \end{cases}$$

and answer choice D should be:

$$f_Y(y) = \begin{cases} 0 & y < 0, \\ e^{e^2-1} (e^{ey} + e^{-ey}) & 0 < y < e, \\ e^{e^2-1} \cdot e^{-ey} & y \geq e. \end{cases}$$

The last sentence of the solution should be:

Therefore, we can take

$$f_Y(y) = \begin{cases} 0 & y < 0, \\ e^{1-e^2} (e^{ey} + e^{-ey}) & 0 < y < e, \\ e^{1-e^2} \cdot e^{-ey} & y \geq e. \end{cases}$$

Posted September 2, 2009

In Problem 17 in Practice Examination 17, this statement

and $f_N(n+1) > f_N(n)$ for $n = 0, 1, 2, 3, 4$.

should be removed.

Posted July 1, 2009

In Section 2, the general definition of a percentile should be

the 100- p -th *percentile* of the distribution of X is the number x_p which satisfies both of

the following inequalities: $\Pr(X \leq x_p) \geq p$ and $\Pr(X \geq x_p) \geq 1 - p$.

Posted June 18, 2009

The last formula in the solution of Problem 19 of Practice Examination 5 should be

$\Pr(X \geq 10) \leq \frac{1}{4^2} = \frac{1}{16}$ **instead of** $\Pr(X \geq 10) < \frac{1}{4^2} = \frac{1}{16}$.

Posted June 17, 2009

In the statement of Problem 9 in Practice Examination 7, $\Pr(X > 800)$ should be

$\Pr(X \geq 800)$, and in the solution, all inequalities should be changed accordingly

Posted June 17, 2009

In the statement of Problem 9 in Practice Examination 7, $\Pr(X > 800)$ should be $\Pr(X \geq 800)$, and in the solution, all inequalities should be changed accordingly.

Posted April 23, 2009

In Problem 20, Practice Examination 14, the first sentence of the solution should be:

Let us define the following random variables:

X : time until death of Dwizeel by causes other than their private plane crash,

Y : time until death of Satellite Component by causes other than their private plane crash,

Z : time until death of Dwizeel and Satellite Component as a result of their private plane crash.

The solution has the words “of” mistyped as “od.”

Posted April 23, 2009

In Problem 9, Practice Examination 14, the Greek letter τ in the statement of the problem should be replaced by the Greek letter α .

Posted April 6, 2009

In the text of Problem 4 in Practice Examination 11, the sentence:

We put that chip aside and pick a second chip from the same contained.

should be:

We put that chip aside and pick a second chip from the same container.

Posted April 6, 2009

In the text of Problem 7 in Practice Examination 3, the word “whwther” should be “whether”.

Posted March 19, 2009

The solution of Problem 3 in Practice Examination 8 should be:

Let E be the event that a new insured is accident-free during the second policy year, and F be the event that a new insured is accident-free during the first policy year, and let G be the event that this new insured was accident-free the last year, before the policy was issued. Note that for any year only the previous year affects a given year, but not the year before that. Therefore

$$\begin{aligned}
\Pr(E) &= \Pr\left((E \cap F \cap G) \cup (E \cap F \cap G^C) \cup (E \cap F^C \cap G) \cup (E \cap F^C \cap G^C)\right) = \\
&= \Pr(E \cap F \cap G) + \Pr(E \cap F \cap G^C) + \Pr(E \cap F^C \cap G) + \Pr(E \cap F^C \cap G^C) = \\
&= \Pr(G) \cdot \Pr(F|G) \cdot \Pr(E|F \cap G) + \Pr(G^C) \cdot \Pr(F|G^C) \cdot \Pr(E|F \cap G^C) + \\
&\quad + \Pr(G) \cdot \Pr(F^C|G) \cdot \Pr(E|F^C \cap G) + \Pr(G^C) \cdot \Pr(F^C|G^C) \cdot \Pr(E|F^C \cap G^C) = \\
&= 0.7 \cdot 0.8 \cdot 0.8 + 0.3 \cdot 0.6 \cdot 0.8 + 0.7 \cdot (1 - 0.8) \cdot 0.6 + 0.3 \cdot (1 - 0.6) \cdot 0.6 = 0.748.
\end{aligned}$$

Answer E.

Posted March 5, 2009

The first sentence of Problem 16 in Practice Examination 6 should end with $t < 1$, instead of $t > 1$.

Posted March 2, 2009

The properties of the cumulant moment-generating function should be:

The cumulant generating function has the following properties:

$$\begin{aligned}
\psi_X(0) &= 0, & \frac{d}{dt} \ln E(e^{tX}) \Big|_{t=0} &= \frac{E(Xe^{tX})}{E(e^{tX})} \Big|_{t=0} = E(X), \\
\frac{d^2}{dt^2} \psi_X(t) \Big|_{t=0} &= \frac{d}{dt} \frac{E(Xe^{tX})}{E(e^{tX})} \Big|_{t=0} = \frac{E(X^2 e^{tX}) E(e^{tX}) - E(Xe^{tX}) E(Xe^{tX})}{(E(e^{tX}))^2} \Big|_{t=0} = \text{Var}(X), \\
\frac{d^3}{dt^3} \psi_X(t) \Big|_{t=0} &= E\left((X - E(X))^3\right),
\end{aligned}$$

but for $k > 3$,

$$\frac{d^k}{dt^k} \psi_X(t) \Big|_{t=0} = \psi_X^{(k)}(0) < E\left((X - E(X))^k\right).$$

Also, if X and Y are independent (we will discuss this concept later),

$$\psi_{aX+b}(t) = \psi_X(at) + bt, \text{ and } \psi_{X+Y}(t) = \psi_X(t) + \psi_Y(t).$$

Posted January 13, 2009

In Practice Examination 8, Problem 24, the calculation of the expected value had a typo, an extra, unnecessary p in the second line, and it instead should be:

$$\begin{aligned}
E(X) &= \sum_{k=1}^{+\infty} k \cdot \Pr(X = k) = 1 \cdot \Pr(X = 1) + \sum_{k=2}^{+\infty} k \cdot \Pr(X = k) = \\
&= p + \sum_{k=1}^{+\infty} (k+1) \cdot \Pr(X = k+1) = p + \sum_{k=1}^{+\infty} k \cdot \Pr(X = k+1) + \sum_{k=1}^{+\infty} \Pr(X = k+1) = \\
&= p + \sum_{k=1}^{+\infty} k \cdot \underbrace{(1-p) \cdot \Pr(X = k)}_{=\Pr(X=k+1)} + \left(\underbrace{\left(\sum_{k=0}^{+\infty} \Pr(X = k+1) \right)}_{\text{this sum is equal to 1}} - \Pr(X = 0+1) \right) = \\
&= p + (1-p) \cdot \sum_{k=1}^{+\infty} k \cdot \Pr(X = k) + (1 - \Pr(X = 1)) = \\
&= p + (1-p) \cdot E(X) + (1-p) = 1 + (1-p) \cdot E(X).
\end{aligned}$$

Posted November 8, 2008

Problem 11 in Practice Examination 13 had several typos, and it should be:

Mr. Warrick Beige is gambling at the newly opened *You Was Robbed* casino in Nevada. In the game he is playing, first he has to choose one of two coins: coin A or coin B. Both coins are unfair. Coin A has the probability of heads of 0.60, and coin B has the probability of heads of 0.40. Mr. Beige pays \$20 to enter the game. He chooses a coin randomly, but the chances of picking the coins are not equal. He has 40% chance of picking coin A and 60% chance of picking coin B. Then he tosses the coin chosen. If the result is heads, he is paid \$250. If the result is tails, he pays \$200. For an additional payment of x dollars, Mr. Beige can test a coin chosen: he can toss it once and based on the result, either walk away and get \$20 paid initially back (he will do this if the first toss results in tails), or toss the same coin again (he will do this if the first toss results in heads). Assuming that Mr. Beige values all gambles based on the expected value of the payoff (i.e., he is *risk-neutral*), calculate the value of x such that Mr. Beige is indifferent between testing a coin and not testing it.

- A. \$6.40 B. \$4.00 C. \$2.50 D. \$0.00 E. -\$2.00

Solution.

We begin by labelling the events:

A : Coin A is picked,

B : Coin B is picked,

H_1 : First toss results in heads,

T_1 : First toss results in tails,

H_2 : Second toss results in heads,

T_2 : Second toss results in tails.

We know that $\Pr(A) = 0.40$, $\Pr(B) = 0.60$, $\Pr(H_1|A) = 0.60$, and $\Pr(H_1|B) = 0.40$.

Therefore, the probability of getting heads in the first toss is

$$\begin{aligned}\Pr(H_1) &= \Pr(H_1|A) \cdot \Pr(A) + \Pr(H_1|B) \cdot \Pr(B) = \\ &= 0.40 \cdot 0.60 + 0.60 \cdot 0.40 = 0.24 + 0.24 = 0.48.\end{aligned}$$

Therefore, Mr. Beige's expected gain on this game without testing first is
 $-\$20 + 0.48 \cdot \$250 + 0.52 \cdot (-\$200) = -\4.00 .

Note that the two coin tosses are independent, and hence

$$\begin{aligned}\Pr(H_2|H_1) &= \frac{\Pr(H_1 \cap H_2)}{\Pr(H_1)} = \frac{\Pr(H_1 \cap H_2|A) \cdot \Pr(A) + \Pr(H_1 \cap H_2|B) \cdot \Pr(B)}{\Pr(H_1)} = \\ &= \frac{\Pr(H_1|A) \cdot \Pr(H_2|A) \cdot \Pr(A) + \Pr(H_1|B) \cdot \Pr(H_2|B) \cdot \Pr(B)}{\Pr(H_1)} = \\ &= \frac{0.6 \cdot 0.6 \cdot 0.4 + 0.4 \cdot 0.4 \cdot 0.6}{0.48} = 0.5.\end{aligned}$$

For now, let us disregard the cost x of testing the coin, and calculate the expected net payoff of the game without that additional fee. If Mr. Beige's coin test results in tails, his payoff for the game will be zero. Thus the expected net payoff for the case when he tests the coin (disregarding the fee of x dollars) is

$$\begin{aligned}-\$20 + \$20 \cdot \Pr(H_1^c) + \$250 \cdot \Pr(H_1) \cdot \Pr(H_2|H_1) - \$200 \cdot \Pr(H_1) \cdot \Pr(T_2|H_1) &= \\ = -\$20 + \$20 \cdot 0.52 + \$250 \cdot 0.48 \cdot 0.50 - \$200 \cdot 0.48 \cdot 0.50 &= \$2.40.\end{aligned}$$

This means that Mr. Beige's expected payoff changes from $-\$4$ to $\$2.40$ as a result of testing the coin. In order for him to be indifferent between the two choices, the additional fee should be set at the difference of these two amounts, equal to his gain in the expected payoff of the game, i.e., $\$6.40$.

Answer A.

Posted November 4, 2008

The answer choices in Problem 18, Practice Examination 16, should be:

A. 0.3333 B. 0.4875 C. 0.6075 D. 1.3333 E. 2.1251

They were mislabeled as A, B, B, C, E.

Posted September 1, 2008

In the solution of Problem 16 in Practice Examination 2, the left-hand side of the second formula should be $E(X^2)$, not $E(X)$.

Posted August 5, 2008

In the solution of Problem 10 in Practice Examination 8, the phrase

Then the total number of claims among 10 less than \$1,050 follows the binomial distribution with probability of success $p = 0.8413$

should be

Then the total number of claims among 10 less than \$1,050 follows the binomial distribution with probability of success $p = 0.5793$.

Posted July 24, 2008

In the solution of Problem 6 of Practice Examination 7, the phrase

Therefore, recalling that for a discrete random variable, whose only possible values are possible integers,

should be

Therefore, recalling that for a discrete random variable, whose only possible values are positive integers,

Posted July 23, 2008

In the solution of Problem 5 in Practice Examination 3 the expression

$\text{Var}(X_2) = 40,000$ **should be** $\text{Var}(X_2) = 250,000$.

Posted July 11, 2008

The formula at end of the third sentence of the solution of Problem 8 in Practice

Examination 11 should be $\frac{0.26}{9} \approx 2.8889\%$ **instead of** $\frac{1.26}{9} \approx 2.89\%$.

Posted June 28, 2008

In the solution of Problem 18, Practice Examination 15, the sentence

In the table used for Course P/1, $\Phi(1.39) = 0.9177$ and $\Phi(1.39) = 0.9192$.

should be

From the standard normal distribution table, $\Phi(1.39) = 0.9177$ and $\Phi(1.40) = 0.9192$.

Posted June 25, 2008

In Practice Examination 14, Problem 13, answer choice C should be 20762, and the final steps of its calculation should be:

In the table of the standard normal distribution we find $\Phi(0.67) = 0.7486$ and

$\Phi(0.68) = 0.7517$. Using linear interpolation, we obtain the 75-th percentile of the standard normal distribution to be

$$z_{0.75} \approx 0.67 + \frac{0.75 - 0.7486}{0.7517 - 0.7486} \cdot (0.68 - 0.67) \approx 0.6745.$$

The maximum amount paid is the 75-th percentile of the distribution of $(Y|X = 1200)$, and that is calculated as

$$20280 + z_{0.75} \cdot \sqrt{510000} \approx 20280 + 0.6745 \cdot \sqrt{510000} \approx 20761.6893.$$

Answer C.

Posted June 15, 2008

Formula on page 49 should be

$$\begin{aligned}s_T(t) &= \Pr(T > t) = \Pr(\min(T_1, T_2, \dots, T_n) > t) = \\ &= \Pr(\{T_1 > t\} \cap \{T_2 > t\} \cap \dots \cap \{T_n > t\}) = e^{-\lambda_1 t} \cdot e^{-\lambda_2 t} \cdot \dots \cdot e^{-\lambda_n t} = e^{-(\lambda_1 + \dots + \lambda_n)t}.\end{aligned}$$

instead of

$$\begin{aligned}s_T(t) &= \Pr(T > t) = \Pr(\min(T_1, T_2, \dots, T_n) > t) = \\ &= \Pr(\{T_1 > t\} \cap \{T_2 > t\} \cap \dots \cap \{T_n > t\}) = e^{-\lambda_1 t} \cdot e^{-\lambda_1 t} \cdot \dots \cdot e^{-\lambda_n t} = e^{-(\lambda_1 + \dots + \lambda_n)t}.\end{aligned}$$

Posted February 7, 2008

The discussion of the lack of memory property of the geometric distribution should have the formula

$$\Pr(X = n + k | X \geq n) = \Pr(X = k)$$

corrected to:

$$\Pr(X = n + k | X > n) = \Pr(X = k).$$

Posted January 6, 2008

On page 24, the formula in the middle of the page should be:

$$F_{X_2}(x) = \begin{cases} 0, & x < 0, \\ x^2, & 0 \leq x < 1, \\ 1, & x \geq 1, \end{cases}$$

The left hand side was mistyped as $F_{X_1}(x)$ instead of $F_{X_2}(x)$.

Posted November 23, 2007

In Problem No. 18 of Practice Examination 16, the sentence

Find the coefficient of variation of $X + Y$.

should be:

Find the expected value of $X + Y$.

Posted November 23, 2007

In the solution of Problem No. 18 of Practice Examination 16, answer B should be changed to 0.4875, answer C should be changed to 0.6075, and in the solution, the

variance of Y should be $\frac{217}{12}$, resulting in the coefficient of variation of

$$\frac{\sqrt{\frac{217}{12}}}{7} \approx 0.6074929.$$

Posted November 14, 2007

The answer choice in Problem No. 20 of Practice Examination 13 should be D, not C.

Posted November 13, 2007

In the solution of Problem No. 26 of Practice Examination 5, the sentence:

Of the five numbers, 1 can never be the median.

should be

Of the five numbers, neither 1 nor 5 can ever be the median.

Posted October 30, 2007

In the solution of Problem No. 17 in Practice Examination 16, the answer choice is D.