Mar 6/07  Page LM-90, #7 solution, line 4 should be
\[ E[Y^2] = \left(\frac{2}{3}\right)(2 \times 1^2) + \left(\frac{1}{3}\right)(2 \times 2^2) = 4 \rightarrow Var[Y] = 4 - \left(\frac{4}{3}\right)^2 = \frac{20}{9} \]

Feb 5/07  Page LM-97, Example LM-38, should just ask for the mean of the spliced distribution

Feb 21/07  Page LM-111, Example LM-44 solution, last 4 lines should be
The expected gain by the game operator for one play of the game is \( P = \frac{8}{9} \), so that \( P = 9 \).
A player has a net gain if \( N^2 > 9 \), which is equivalent to \( N \geq 4 \). The probability of a player having a net gain on one play of the game is \( P(N \geq 4) = 1 - P(N = 0, 1, 2, 3) \)
\[
= 1 - \frac{1}{1!(1+1)^2} + \frac{2}{2!(1+1)^2+2} + \frac{2(3)}{3!(1+1)^2+3} = \frac{3}{16}
\]

Jan 19/07  Page LM-112, Example LM-44 solution, last line
The answer should be 60.96 .

Jan 19/07  Page LM-113, Example LM-45 solution, last two lines should be
Then \( S(x) = E[S_X(x | \lambda)] = \int_0^\infty \frac{1}{(1+x)^2} \cdot x \cdot 1 \cdot d\lambda = \frac{-1}{(1+x)^2 \ln(1+x)} \bigg|_{\lambda=1}^{x=2} \)
\[
= \frac{1}{\ln(1+x)} \cdot \left[ \frac{1}{1+x} - \frac{1}{(1+x)^2} \right] = \frac{x}{(1+x)^2 \ln(1+x)} \quad \text{for} \quad x > 0 .
\]

Jan 16/07  Page LM-118, #5 solution, last two lines should be
The 95-th percentile of \( X \) is \( c \), where \( P(X \leq c) = P\left(\frac{X-1}{\sqrt{2}} \leq \frac{c-1}{\sqrt{2}}\right) = \Phi\left(\frac{c-1}{\sqrt{2}}\right) = .95 .
\]
From the standard normal table we get \( \frac{c-1}{\sqrt{2}} = 1.645 \), so that \( c = 3.33 \).

Jan 28/07  Page LM-130, Example LM-49(b) solution, 2nd line
\[
\frac{\theta^2}{2} \quad \text{should be} \quad \frac{(\theta - d)^3}{3\theta} \quad \text{in both places}
\]
Jan 30/07  Page LM-148, Example LM-54 solution, last five lines should be
\[ e^{9.6192} \cdot \Phi(-3.47) + 20^2 [1 - \Phi(-2.19)] = 398.8. \]
and \[ Var[Y_L] = 11,451 - 80.0^2 = 5051. \]
We find \[ E[Y_P^2] \] from \[ E[Y_P^2] = \frac{E[Y_L^2]}{1 - F_X(20)} = \frac{11,451}{1 - \Phi(\ln 20 - \mu)} = 11,617, \]
and then \[ Var[Y_P] = 11,617 - (81.16)^2 = 5030. \]

Jan 31/07  Page LM-153, #5 solution, 2nd line, the pdf should be .000025

Jan 31/07  Page LM-154, #5 solution, final two lines should be
\[ E[Y_P^2] = \frac{E[Y_L^2]}{P(X > 2000)} = \frac{225,000}{.075} = 3,000,000. \]
\[ Var[Y_P] = 3,000,000 = 1500^2 = 750,000. \]

Feb 7/07  Page LM-172, Equations 14.3 and 14.5
\[ F_X(d) \] should be \[ F_X(u) \].

Feb 26/07  Page LM-172, Example LM-57 solution, last line
\[ F(5000) \] should be \[ F(25,000) \].

Feb 1/07  Page LM-215, Example LM-69, solution
In line 3, the variance of \( N \) is \[ Var[N] = 1.5 - 1 = .5. \]
In lines 4 and 6, \( 5000/3 \) should be \( 2500/3 \).
In line 6, \( 8750/3 \) should be \( 6250/3 \).

Mar 1/07  Page LM-267, #2 solution
In line 9, the second moment should be \[ 2(100^2) = 20,000. \]
Also, \( 10,000 \) should be \( 20,000 \) in lines 10 and 11, and \( 8187.2 \) should be \( 16,374.6 \) in lines 10 and 11. A similar comment applies to lines 16 and 17. The variance of \( S \) should be \( 327,492. \)
Feb 27/07  Page LM-290, #7 answers should
A) Less than .26  B) At least .26 but less than .27  C) B) At least .28 but less than .28
D) At least .28 but less than .29  E) At least .29

Apr 4/07  Page ME-11, Example ME-4, Solution, line 1, denominator should be 60 (not 50)

Apr 4/07  Page ME-15, Example ME-5, the alternative hypothesis should be  $H_1 : \mu \neq 5.0$
   The solution should be changed as follows:
   First line should have $\bar{X} = \frac{330}{6} = 5.5$
   2\textsuperscript{nd} line should have $5.5 - 5.0$ in numerator (not 6.5-5.0)
   .74 should be changed to .247 in the rest of the solution.
   $\Phi(.247) = .5975$
   In the 2\textsuperscript{nd} last line, .23 should be .4025 and .46 should be .805

Mar 3/07  Page ME-48, #2 solution line 3, $\frac{7}{108}$ should be $\frac{5}{108}$

Mar 10/07  Page ME-92, #10, the interval should be (2.71,3.10)

Mar 29/07  Page ME-101, #20 solution, line 10, $S_{s0}(3)$ should be $S_{s0}(2)$

Apr 9/07  Page ME-111, Loglogistic example, line 6 should be \( \left( \frac{21}{\theta} \right)^\gamma = 3 \)
   This changes the value of \( \gamma \) to 1.53 and the value of \( \theta \) to 10.2.
   The probability \( P[X > 10] \) is .51

Mar 21/07  Page ME-126, 3\textsuperscript{rd} paragraph, line 4, should say “does not involve the parameter ...”

Mar 216/07 Page ME-153, #2 solution, line 4, the denominator should be 9, and the answer should be 31.56

Mar 27/07  Page ME-166, #6 line 3, $\alpha$ should be $\theta$

Mar 21/07  Page ME-196, solution to #10 should be
   If $\hat{\theta}$ is an estimator of the parameter $\theta$, the mean square error of $\hat{\theta}$ is
   \( MSE(\hat{\theta}) = E[(\theta - \hat{\theta})^2] \). The variance of $\hat{\theta}$ is \( Var(\hat{\theta}) = E[(\theta - E(\hat{\theta}))^2] \).
   These will be the same if \( E(\hat{\theta}) = \theta \), which is the same as saying that $\hat{\theta}$ is an
   unbiased estimator. Answer: D
A portfolio of insureds consists of two types of insureds. Losses from the two types are:

\[ M = \max \{ x_1, \ldots, x_n, \theta \} \]

A variation on the Beta prior and Negative Binomial model distributions

The parametrization of the negative binomial distribution in the Exam C table has parameters \( r \) and \( \beta \), both > 0. A variation on this parametrization is to keep the parameter \( r \), but use the parameter \( q \), where \( q = \frac{1}{1 + \beta} \) so that \( 0 < q < 1 \). The probability function of the negative binomial for \( k = 0, 1, 2, \ldots \) is

\[
p_k = \binom{k + r - 1}{k} \frac{\beta^k}{(1 + \beta)^{k+1}} = \frac{r(r+1)\cdots(r+k-1)}{k!} \left( \frac{1}{1 + \beta} \right)^r \left( \frac{\beta}{1 + \beta} \right)^k = \frac{\Gamma(r+k)}{\Gamma(r)\Gamma(k+1)} q^k (1-q)^k.
\]

Suppose that we use this parametrization, and that we assume that \( q \) is a prior parameter with a beta distribution with parameters \( a \) and \( b \), with prior density \( \pi(q) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} q^{a-1}(1-q)^{b-1} \).

Assume that the conditional distribution of \( X \) given \( q \) is negative binomial with known parameter \( r \), and with parameter \( q \), so that the model distribution has probability function

\[
f(x | q) = \frac{\Gamma(r+x)}{\Gamma(r)\Gamma(x+1)} q^r (1-q)^x \quad \text{for} \quad x = 0, 1, 2, \ldots.
\]

The joint distribution of \( X \) and \( q \) has joint density

\[
f(x, q) = f(x | q) \pi(q) = \frac{\Gamma(r+x)}{\Gamma(r)\Gamma(x+1)} q^r (1-q)^x \cdot \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} q^{a-1}(1-q)^{b-1}
\]

\[
= \frac{\Gamma(r+x)}{\Gamma(r)\Gamma(x+1)} \cdot \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} q^{a+r-1}(1-q)^{b+x-1}.
\]

This is proportional, in \( q \), to \( q^{a+r-1}(1-q)^{b+x-1} \), which implies that the posterior distribution of \( q \) is beta, with parameters \( a' = a + r \) and \( b' = b + x \).

If there are \( n \) observations of \( x \) available, say \( x_1, x_2, \ldots, x_n \), then the joint density of \( x_1, x_2, \ldots, x_n, q \) is proportional to \( q^{a+nr-1}(1-q)^{b+\sum x_i-1} \). Again this implies that the posterior distribution of \( q \) is beta, with parameters \( a' = a + nr \) and \( b' = b + \sum x_i \).

Under this parametrization, the beta distribution is a conjugate prior for the negative binomial.
In the last two lines of page 190, the 2nd moment should have 3 instead of 2 in the denominator, and the 2nd empirical moment should be 155,333.

The top of page 191 should be

The empirical estimate of the variance of $X$ is 106,933.

In the semiparametric empirical Bayes credibility model, we use the empirical estimate of $E[X^2]$ for $\mu$, so that $\hat{\mu} = 220$. We also know that $Var[X] = v + a$, so using the empirical estimate of $Var[X]$ gives 106,933 = $\hat{\nu} + \hat{a}$. But we also know that, for this model, $\hat{\nu} - \hat{a} = \mu^2$, so using our sample estimate of $\mu$, we have $\hat{\nu} - \hat{a} = 220^2$. We can then solve the two equations 106,933 = $\hat{\nu} + \hat{a}$ and $\hat{\nu} - \hat{a} = 220^2$ to get $\hat{\nu} = 77,667$ and $\hat{a} = 29,267$.

We can now find the estimated loss in the 3rd year for a policy that had losses of $Y_1 = 150$ in the first year and $Y_2 = 0$ in the second year. The estimate is $\hat{Z}Y + (1 - \hat{Z})\hat{\mu}$, where $\hat{Z} = \frac{2}{2 + \frac{\hat{\nu}}{\hat{a}}} = .4298$ and $\hat{\mu} = 220$. The credibility premium is

$$(.4298)(75) + (.5702)(220) = 158.$$
Apr 4/07 Page SI-47, Example SI-12 (continued), $d_2$ should be -.27.
The call option price should be 12.5, and the put option price should be 15.82.

Apr 4/07 Page SI-47, 3rd line from bottom,
…”data quantile ..” should be “…data point ..”

May 11/07 Page SI-48, Example SI-13, solution
Some of the quantiles are incorrect.
.835 should be 1.036, .575 should be .674, and .136 should be .126.

Apr 4/07 Page SI-51, Problem 5 solution,
$E[S_2 | S_2 > 80]$ , should be $121 \cdot \frac{\Phi(1.01)}{\Phi(0.45)} = 151.6$
$E[S_2 | S_2 > 125]$ , should be $121 \cdot \frac{\Phi(0.23)}{\Phi(-0.34)} = 212.3$

Apr 4/07 Page SI-51, Problem 6 solution,
$E[S_1 | S_1 < 80]$ , should be $110 \cdot \frac{\Phi \left( \frac{\ln 80 - \ln 100 - (\ln 1.1 + 0.16)}{0.4} \right)}{\Phi \left( \frac{\ln 80 - \ln 100 - (\ln 1.1 - 0.16)}{0.4} \right)} = 110 \cdot \frac{\Phi(-1.00)}{\Phi(-0.60)} = 63.6$
$E[S_2 | S_1 < 80] = \Phi \left( \frac{\ln 100 - \ln 125 + (\ln 1.1 + 0.16)}{0.4} \right) = 110 \cdot \frac{\Phi(-0.12)}{\Phi(-0.52)} = 165.0$
and $E[S_2 | S_1 > 80] = \Phi \left( \frac{\ln 100 - \ln 125 + (\ln 1.1 - 0.16)}{0.4} \right) = 110 \cdot \frac{\Phi(-0.12)}{\Phi(-0.52)} = 165.0$

May 12/07 Page SI-51, Problem 8 solution, answer should be 8.3 (not 5.6)
May 12/07  Page SI-52, Problem 10 solution, in line 1, 1/16 should be 6.25%  
In line 3, .434 should be .489 and .157 should be .156.
(ii) Observations other than 0 and 1 have been deleted from the data.

May 8/07  Page  PE-216, #8, Answer E should be 768

May 8/07  Page  PE-225, #8 solution, last line should be 
           \[ = 18 + 25(6) + 100(6) = 768. \]
           Answer: E