Known typos and errors as of 05/14/06:

We sincerely apologize for each and every error! Please let us know if you find others and we will include them here.

Volume 1

Page 84 The solution to Additional Problem D has an error. It should say:

$$(0.9420)[15.77 - 0.292(13.08)] = 11.26$$

Page 139 The last line of equations in the solution to the Example should end with $0.87216\overline{A}_{65}$.

Page 145 In Section 7.6, the equation has a small error. The reserve symbol should not have a 1 above the x.

Page 163-166 Please note that the Hattendorf material is still on the syllabus!! It has been moved from the Bowers Text to a study note covering the same chapter of Bowers but for a later printing of the second edition. We apologize for any confusion on this matter

Page 164 Just below the table in the first equation, q_x and p_x should be replaced by q_{x+h} and p_{x+h}, respectively.

Page 165 At the bottom of the page, the number (6725) should be replaced by (13,202).

Page 277

-The answers to the past exam questions were omitted. They appear below:

SOLUTIONS to Past SOA-CAS Exam Problems:

1.

$$85\ddot{a}_x = 450 + 0.7(85) + 0.1(85)\ddot{a}_x + 25\ddot{a}_x$$

$$\ddot{a}_x = \frac{450 + 0.7(85)}{85 - (0.1)(85) - 25} = 9.89$$

$$a_x = \ddot{a}_x - 1 = 8.89$$

The Key is B

2.

$$
\begin{aligned}
{}_2AS &= \frac{\left[{}_1AS + G(1-c_1) - e_1\right](1+i) - 1000q_{x+1}^{(d)} - {}_2CV\,q_{x+1}^{(w)}}{p_{x+1}^{(\tau)}} \\
&= \frac{\left[173 + 314(1-0.06) - 2\right](1.1) - 1000(0.09) - 571(0.29)}{0.62} \\
&= 414.82
\end{aligned}
$$

The Key is C

3.

$$
{}_{k+1}AS \cdot p_{x+k}^{(\tau)} = \left[{}_kAS + G(1-c_k) - e_k\right](1+i) - 1000q_{x+k}^{(1)} - q_{x+k}^{(2)} \cdot {}_{k+1}CV
$$

The mortality comes from the single life table (even though there are two decrements), while withdrawal is given in the problem:

$$
q_{40}^{(1)} = 0.00278, \quad q_{40}^{(2)} = 0.2
$$

And we can use the illustrative life table to calculate:

$$
{}_1CV_{40} = \frac{1000}{3} \cdot {}_1V_{40} = \frac{1000}{3}\left(1 - \frac{\ddot{a}_{41}}{\ddot{a}_{40}}\right) = \frac{1000}{3}\left(1 - \frac{14.686}{14.817}\right) = 2.947
$$

$$
\Rightarrow {}_1AS(0.99722)(0.8) = \left[0 + G(0.9) - 1.50\right](1.06) - 1000(0.00278) - 0.2(2.947)
$$

$$
\begin{aligned}
&\Rightarrow {}_1AS(0.79778) = G(0.954) - 4.96 \\
&\Rightarrow {}_1AS = 1.196G - 6.22
\end{aligned}
$$

$$
\begin{aligned}
{}_2AS(0.99702) &= \left[{}_1AS + G(0.9) - 1.50\right](1.06) - 1000(0.00298) \\
\Rightarrow (24)(0.99702) &= [2.096G - 7.72](1.06) - 2.98 \\
\Rightarrow G &= 15.79
\end{aligned}
$$

Key: B

4. Since the policy fee is to be split between first-year and renewal premiums with the fees allocated accordingly, we first want to calculate the level expense-loaded premium necessary to pay the benefit and expenses not covered by the policy fee. We will call this premium K.

$$
K\ddot{a}_{x:\overline{20}|} = 25{,}000\overline{A}_{x:\overline{20}|} + 25{,}000(0.0015 + 0.0005\ddot{a}_{x:\overline{20}|}) + 0.2K + 0.05K\ddot{a}_{x:\overline{20}|}
$$

Note that 5 of the per premium expense for the first year was carved out to go with the renewal amounts to make the annuities we have to deal with more simple. The same was done with the expenses that depend on face amount.

$$\Rightarrow K = \frac{25[405.80 + 1.5 + 0.5(12.522)]}{0.95(12.522) - 0.2}$$

$$\Rightarrow K = 883.99$$

They sneakily made this one of the options, but we need to add the expenses loaded first year policy fee which must pay the first year per-policy expense (15) and must take premium loading into account.

$$G_1 = 883.99 + \frac{15}{1 - 0.25} = 903.99$$ **Key: C**

5. For renewal years, the same base premium K is required to cover all but the policy fee (3) plus we need 3/(0.95) to cover the policy fee.

$$G_2 = 883.99 + \frac{3}{1 - 0.05} = 887.15$$ **Key: B**

6. Now we assume instead that a level policy fee g is collected each year:

$$g\ddot{a}_{x:\overline{20}|} = 12 + 3\ddot{a}_{x:\overline{20}|} + 0.2g + 0.05g\ddot{a}_{x:\overline{20}|}$$

$$g = \frac{12 + 3(12.522)}{(0.95)(12.522) - 0.2} = 4.24$$ **Key: D**

7.

$$G = K + g = 883.99 + 4.24 = 888.23$$ **Key: B**

Volume 2

Page 11

-3/4 of the way down the page, the inequality should read

$$ {}_kP_n^{(i)} \leq {}_kQ_n^{(i,i)} $$

Page 11

-Question 4 should read: "Find the benefit reserve ${}_1V$ for a policyholder that is Active at $t = 1$."

Page 13

-In the solutions to Problems 4 and 5, we evaluated the premiums at the wrong time period when calculating the benefit reserve. One future premium is due "right now" and one is due in one year. This affects the final answer slightly.

Page 14-15

-The solution to the Example **Long Term Care 2** has a mistake. Please replace the example and solution with the following:

EXAMPLE: Long Term Care 2

CARECO-LTC has decided to add a death benefit to their product. If the policyholder dies while active, they will receive 50,000 for the period in which they enter the Dead state. They will receive 25,000 if they die while disabled.

Find the additional premium necessary to fund the death benefit.

SOLUTION:

Recall that the state probability vectors for each time period were given by

Year	π_n
0	$(1, 0, 0)$
1	$(0.70, 0.20, 0.10)$
2	$(0.55, 0.24, 0.21)$
3	$(0.46, 0.23, 0.31)$

Death benefit payable in Period 2 can only occur as a transition from alive to dead and occurs with probability 0.1. The APV of 2nd-period death benefit is

$$\left(\frac{1}{1.04}\right)(0.1)(50{,}000) = 4808$$

The present value of both types of death benefits for entering the dead state in Period 3 is

$$\left(\frac{1}{1.04}\frac{1}{1.06}\right)\Big[(0.7)(0.1)(50{,}000) + (0.2)(0.2)(25{,}000)\Big] = 4082$$

The present value of 4th period death benefits is

$$\left(\frac{1}{1.04}\frac{1}{1.06}\frac{1}{1.08}\right)\Big[(0.55)(0.1)(50{,}000) + (0.24)(0.2)(25{,}000)\Big] = 3318$$

The present value of death benefit for dying upon transition from the 4th period to the 5th is

$$\left(\frac{1}{1.04}\frac{1}{1.06}\frac{1}{1.08}\frac{1}{1.08}\right)\Big[(0.46)(0.1)(50{,}000) + (0.23)(0.2)(25{,}000)\Big] = 2683$$

(Note that it makes sense that we need to calculate the APV of 4 different possible times of death since 4 premiums are paid.) So the total actuarial present value of all death benefits is

$$4808 + 4082 + 3318 + 2683 = 14{,}891$$

$$2.558P = 14{,}891 \quad \Rightarrow P =?$$

Page 18

-Problem 6: This question should ask for ${}_3Q^{(1,0)}$ instead of ${}_3Q^{(2,1)}$.

Page 66

-The example involving percentiles for discrete distributions has an error. According to the definition, the 60th percentile can be any number in the interval [40,000, 100,000]. The 50th percentile is exactly 40,000. The best way to think about percentiles for discrete distributions is described in the graphs on Page 35 of the **Loss Models** text.

Page 176
-In the solution to the example, the second long equation should be:

$$E\left[L_0\right] = 10{,}000 A_{65} - 500 \ddot{a}_{65} = -550.45$$

Page 183
-Question 6: The question should be asking for ${}_{30}p_{10}$ instead of ${}_{10}p_{30}$.

Page 223
-Question 25: The question should refer to a 20-year **deferred** whole life annuity due.