Errata and Updates for ASM Exam MLC (Fourteenth Edition Third Printing) Sorted by Date

Practice Exam 7:25 (page 1429) is defective,

[10/26/2016] On page 1635, in the solution to question 21(d), on the last line, change $\left(1-\left(\frac{18}{20}\right)\right)^{0.5}$ to $\left(1-\left(\frac{18}{20}\right)^{0.5}\right)$.

[10/26/2016] On page 1637, replace the solution to question 24 with the following:

The net premium would be lower but is not payable once the system is in state 1. The net premium reserve is the expected present value of future benefits, and in state 1 this is unchanged, so the net premium reserve would be the same.

[10/26/2016] On page 1684, in the solution to question 24(c), two lines from the end, change 0.28324 to 0.28422. On the last line, change the final answer from 283.24 to 284.22. In part (d), on the last line, change 283.24 to 284.22 and change −3.8164 to −2.8327.

[10/26/2016] On page 1684, in the solution to question 25(a), on the last line, change 266.0965 to 265.3224.

[10/26/2016] On page 1685, in the solution to question 26(b), additional precision is needed on the second-to-last line, or else the answers to (b) and (c) are the same. Change 13.5873 on that line and on the last line to 13.58728, and change the final answer to 15.35257. In (c), change the final answer to 15.35254.

[10/21/2016] On page 1332, in exercise 67.9(i), add "at time 10" between "value" and "is".

[10/21/2016] On page 1699, in the solution to question 25(c), change the final answer 5,213.21 to 5,110.99.

[10/18/2016] On page 800, in the solution to exercise 39.63, on the second line, change $+d$ to $-d$.

[10/6/2016] On page 1060, in the solution to exercise 52.4, on the third displayed line of the page, change ${}_{30|}q_{40}^{(W)}$ to ${}_{30|10}q_{40}^{(W)}$.

[10/2/2016] On page 1673, in the solution to question 26, on the eighth line of the page, for $l_{52}^{(\tau)}$, change 98,010 to 100,000. On the ninth line, change 92,208 to 100,000.

[9/24/2016] On page 1689, in the solution to question 37, on the line for age 30 in the table, exchange 8,950,901 and 9,501,381.

[9/23/2016] On page 1302, in the solution to exercise 65.17, on the third through fifth lines, every subscript 50 should be replaced with subscript $50+t$, so they look like this:

$$\sum_{k=0}^{\infty} v^{k+1}\,{}_kp_{50+t}\left(10{,}000q_{50+t+k} + 10{,}000(0.001)\right) = 10{,}000(A_{50+t} + 0.001v\ddot{a}_{50+t})$$

$$= 10{,}000A_{50+t} + 10v\left(\frac{1-A_{50+t}}{d}\right) = 250 + 9750A_{50+t}$$

where we've used that at $i = 0.04$, $v/d = (1/1.04)(1.04/0.04) = 25$, as well as $\ddot{a}_{50+t} = (1 - A_{50+t})/d$. Thus the

[9/21/2016] On page 1313, in the solution to exercise 66.3, on the displayed line, change ${}_{10}E_{64}$ to ${}_{10}E_{54}$.

[9/14/2016] On page 1358, in the solution to exercise 68.2, on the fourth line, change "the actual profit was 5" to "the actual profit was −5."

[9/12/2016] n page 103, in the solution to exercise 5.21, on the sixth line, change $v = \left(\frac{60-t}{50}\right)$ to $\mathrm{d}v = \left(\frac{60-t}{50}\right)\mathrm{d}t$.

[9/12/2016] On page 1164, in exercise 58.45, on the first line, change 8ill to Bill.

[9/12/2016] On page 1180, in the solution to exercise 58.46(a)(ii), a v^t is missing. The correct solution is

$$\int_0^\infty v^t \, {}_tp_x \, {}_tp_y \, \mu_{y+t} \, \mathrm{d}t$$

[8/28/2016] On page 702, in exercise 36.6, change the last line to

Calculate the net premium reserve at the beginning of year 2, after the premium has been paid.

[8/28/2016] On page 1223, in the table, change the retirement probability for age 62 from 0.02892 to 0.02692.

[7/29/2016] On page 1109, in the solution to exercise 55.13, on the second displayed line, change $\mathring{e}_{65:65}$ to $\mathring{e}_{65:55}$.

[7/19/2016] On page 977, in the solution to exercise 47.28, on the second line, change ${}_{40}p_{40}^{(\tau)}$ to ${}_{20}p_{40}^{(\tau)}$.

[7/13/2016] On page 835, in exercise 41.38, on the first line, change "insurance of 1" to "insurance of 1000".

[6/27/2016] On page 903, on the third displayed line of the answer to Example 45G, change the first subscript to $x+5$. Change $\bar{a}_{x+t}^{12}$ to $\bar{a}_{x+t}^{11}$. After these two changes, the line will read

$${}_5V^{(1)} = 10{,}000\bar{A}_{x+5}^{12} + 1000\bar{a}_{x+5}^{11} = \frac{10{,}000}{3} + \frac{100{,}000}{9} = \boxed{\mathbf{14{,}444.44}}$$

[6/14/2016] On page 352, in Section 17.2, on the line below the timeline, change "annuity-due" to "annuity-immediate".

[5/22/2016] On page 813, in the solution to exercise 40.15, on the first line, change 2–10 to 2–20.

[5/2/2016] On page 1224, on the third line of the answer to Example 61G, change "57 and 58" to "58 and 59".

[5/1/2016] On page 1805, in the solution to question 3(c), replace the first line with

$${}_sq_{xy} = 1 - {}_sp_x \, {}_sp_y$$

[4/25/2016] On page 443, in exercise 20.4(i), change $0 \le 0 \le 105$ to $0 \le x \le 105$

[4/25/2016] On page 1743, in the solution to question 5, on the third line from the end, change ${}_4A_{\overline{80:90}} - {}_5A_{\overline{80:90}}$ to ${}_5A_{\overline{80:90}} - {}_4A_{\overline{80:90}}$

[4/17/2016] On page 1613, replace the solution to question 25 with

(a) The direct way to do this is to integrate t times the density function for the husband's survival, which is ${}_tp_x^{00}\,\mu^{02} + {}_tp_x^{01}\,\mu^{13}$, since the husband may die either by going from state 0 to state 2 or from state 1 to state 3. In carrying out the integrations, we will use $\int_0^\infty te^{-ct}\,\mathrm{d}t = 1/c^2$.

$$\int_0^\infty t \, {}_tp_x^{00}\mu^{02}\,\mathrm{d}t = \int_0^\infty 0.03te^{-0.05t}\,\mathrm{d}t = \frac{0.03}{0.05^2} = 12$$

$$\begin{aligned}\int_0^\infty {}_tp_x^{00}\,\mu^{01}\int_0^\infty (t+u)\,{}_up_{x+t}^{11}\mu^{13}\,\mathrm{d}u\,\mathrm{d}t &= \int_0^\infty 0.02e^{-0.05t}\int_0^\infty (t+u)(0.04)e^{-0.04u}\,\mathrm{d}u\,\mathrm{d}t\\ &= \int_0^\infty 0.02e^{-0.05t}\left(\frac{1}{0.04}+t\right)\mathrm{d}t\end{aligned}$$

$$= \frac{1}{2(0.05)} + \frac{0.02}{0.05^2} = 10 + 8 = 18$$

Expected survival time is $12 + 18 = \boxed{\mathbf{30}}$.

However, a faster way to get the answer is to calculate expected time in state 0 and state 1, which in each case is the reciprocal of the constant force of transition out of the state. Expected time in state 0 is $1/0.05 = 20$. Expected time in state 1 is $1/0.04 = 25$. The probability of going to state 1, given that one exits state 0, is $0.02/0.05 = 0.4$. This is because the forces of transition out of state 0 are 0.02 and 0.03. The probabilities of going to the two states coming out of state 0 are proportional to the forces of transition to those states.

So life expectancy for the husband, amount of time in states 0 and 1, is $20 + 0.4(25) = \boxed{\mathbf{30}}$.

(b) The direct way is similar to (a), except we replace the integral for going from state 0 to state 2 with a double integral for going from state 0 to state 3 via state 2. This is similar to the double integral we did in part (a), except 0.02 and 0.04 are both replaced with 0.03, so the last two lines become

$$\int_0^\infty 0.03e^{-0.05t}\left(\frac{1}{0.03} + t\right)\mathrm{d}t = \frac{1}{0.04} + \frac{0.03}{0.05^2} = 20 + 12 = 32$$

Adding this to the integral for going from state 0 to state 3 via state 1, which is 18, we get $18 + 32 = \boxed{\mathbf{50}}$.

For the faster way, the expected amount of time in state 2 is $1/0.03 = 33\frac{1}{3}$, and the probability of going from state 0 to state 2 is $0.03/0.05 = 0.6$, so the expected amount of time in state 2 for one in state 0 is $0.6(33\frac{1}{3}) = 20$. Total expected time in states 0, 1, and 2 is $20+0.4(25)+0.6(33\frac{1}{3}) = \boxed{\mathbf{50}}$.

[4/8/2016] On page 1308, on the first displayed line, change 1399.19 to 1390.19.

[4/5/2016] On page 1512, in question 26(iv), delete "for at most 10 years". In part (c) of the question, change v^k to $v^{0.25k}$.

[4/5/2016] On page 1685, in the solution to question 26(a), on the second to last line, on the right side, replace $G(0.03\ddot{a}_{40:\overline{30|}} + 0.27)$ with $4G(0.03\ddot{a}_{40:\overline{30|}} + 0.27)$. On the last line, change 15.35302 to 15.35306.

[4/5/2016] On page 1686, in the solution to question 27(b), replace 60,957 with 81,688.

[4/1/2016] On page 1530, in the solution to question 17, change the upper right entry of the matrix from 0 to p_{03}.

[3/29/2016] On page 1760, in the solution to question 11, on the first line, change $Y = \mathrm{Var}(1.06Z)$ to $Y = 1.06Z$.

[3/25/2016] On page 1284, in equation (65.3), the lower limit of the sum should be $j = 0$ instead of $j = 1$.

[3/23/2016] On page 1642, in the solution to question 7, on the first line, replace ${}_2q'^{(2)}_{60}$ with ${}_2q'^{(1)}_{60}$. On the last line, replace 0.89442 with 0.89443.

[3/22/2016] On page 1140, in the solution to exercise 57.5, on the third-to-last line, change $0.05/\bigl(0.005+2(0.03)\bigr)$ to $0.005/\bigl(0.005 + 2(0.03)\bigr)$

[3/11/2016] On page 711, in the solution to exercise 36.13, on the third displayed line, $a_{x:\overline{10|}}$ should be $\ddot{a}_{x:\overline{10|}}$.

[2/29/2016] On page 371, in the solution to exercise 17.1 (b)(ii), on the first line, change the first summation subscript $n - 1$ to $n = 1$.

[2/15/2016] On page 1285, Example 65B assumes that the full 30% first year expense is considered precontract expense. This assumption is inconsistent with the assumptions used in Example 65A. Here is a version of the example using the assumption that only the excess over the renewal expense is considered precontract:

In the 5-year term example, you have determined that with a premium of 2200, the NPV at 10% is 165.52.

You would like to adjust the premium so that the profit margin is 3%.

You are given that at 10%, $a^{(\tau)}_{[50]:\overline{5}|} = 2.72267$ and $\ddot{a}^{(\tau)}_{[50]:\overline{5}|} = 3.39504$.

Determine the premium needed.

Answer: Let G be the premium needed. Then the present value of premiums is $G\ddot{a}_{x:\overline{5}|} = 3.39504G$.

Calculating the effect of one unit of premium on the NPV is more complicated. Each unit of premium is accumulated to the end of the year at the *assumed rate* of 6% as part of the profit calculation, and then discounted from the end of the year to issue at the NPV rate as part of the NPV calculation. You see what's happening? You lose profit because you accumulate at 6% but discount at 10%. Percent-of-premium expenses are treated the same way, and since expenses decrease profit, reducing them increases profit. However, *precontract expenses are not accumulated and discounted*, so they are not reduced and profit is not increased. By isolating the precontract expenses the NPV is lower than it would otherwise be.

In the term insurance example, annual expenses are 5% and precontract expenses are 25%. After expenses and discounting with interest to the beginning of the year, one unit of premium causes the following changes to the profits in years 0–5:

Year	0	1	2	3	4	5
Increase in profit	−0.25	$\frac{1.06(0.95)}{1.1}$	$\frac{1.06(0.95)}{1.1}$	$\frac{1.06(0.95)}{1.1}$	$\frac{1.06(0.95)}{1.1}$	$\frac{1.06(0.95)}{1.1}$

The present value of the sum of these is

$$\frac{1.06(0.95)}{1.1}\ddot{a}_{x:\overline{5}|} - 0.25 = 2.858005$$

Now let's solve for a 3% profit margin. For a 3% profit margin, we need

$$165.52 + 2.858005(G - 2200) = 0.03(3.39504G)$$

Let's solve for G.

$$\begin{aligned} 165.52 + 2.858005G - 5716.01 &= 0.101851G \\ 2.756154G &= 6122.091 \\ G &= \boxed{\mathbf{2221.24}} \end{aligned}$$

□

[2/10/2016] On page 96, in exercise 5.34(ii), change two ts to xs, so that it reads

$$S_0(x) = 1 - \frac{x}{\omega}, \qquad 0 \le x \le \omega$$

[2/9/2016] On page 189, in Table 10.1, on the line for Deferred term insurance, second column, first row, change $K_x \le n$ to $K_x < n$.

[2/6/2016] On page 349, in Table 17.2, on the row for "Deferred temporary life annuity" in the second column, on the last line of the box, change $K_x \ge \min(n+m, K_x+1)$ to $k \ge \min(n+m, K_x+1)$.

[1/16/2016] On page 1656, in the solution to question 13, line 5 to 2 from the end with

$$\begin{aligned}
\mathbf{E}[YZ \mid T_{45} > 20] &= 1164.676\,\mathbf{E}[Z \mid T_{45} > 20] = 1164.676e^{-20\delta}(1000\bar{A}_{65})\\
\mathbf{E}[YZ] &= 1164.676e^{-20\mu}e^{-20\delta}(1000\bar{A}_{65})\\
&= 1164.67\,{}_{20}E_{45}(1000\bar{A}_{65})\\
&= 1164.67\,\mathbf{E}[Z]\\
&= (1164.676)(50.4741) = 58{,}786
\end{aligned}$$

[12/21/2015] On page 1361, on the last line, change "Uninsured" to "Uninsurable".

[10/28/2015] On page 847, in the solution to exercise 41.35, change the final answer from 0.1425 to 0.1415 in two places.

[10/24/2015] On page 1809, on the first line of Section B.27, change `s15-LC` to `sp15-LC`.

[10/22/2015] On page 1130, in the solution to exercise 56.16, on the displayed line, change the left side to ${}_{10}q^{\ 1}_{50:40}$.

[10/15/2015] On page 1224, on the eighth line of the answer to Example 61G, change "to age 65" to "from age 65 to age 60".

[10/12/2015] On page 889, in exercise 44.16, on the second-to-last line, change ${}_2p_1^{12}$ to ${}_2p_0^{12}$.

[9/10/2015] On page 946, in the solution to exercise 46.1, on the last line, change the first denominator to ${}_8p_{80}^{(\tau)}$.

[8/30/2015] On page xiv, the following version of the table replaces the table in the introduction. The analysis of the distribution of points for the written answer questions was improved.

		Number of Questions				Points		
Topic	Lessons	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015
Survival distribution	2–8	3	2	1	3	4	4	2
Insurances	10–15	0	2	2	1	3	2	6
Annuities	17–22	4	2	1	3	2	5	0
Premiums	24–32	5	2	3	6	17	18	20
Reserves	34–41	3	5	5	4	14	8	24
Markov chains	43–45	3	3	3	3	9	12	15
Multiple decrement models	46–51	2	1	2	0	2	2	6
Multiple life models	53–59	2	2	2	1	7	8	2
Pensions	61	1	0	1	1	11	11	8
Interest rate models	62–63	2	2	2	1	7	0	0
Profit tests	64–68	5	4	3	2	20	26	13
Total		30	25	25	25	96	96	96

[8/30/2015] On page 892, on the second-to-last line of the solution to exercise 44.7, change (44.8) to (44.9).

[8/25/2015] On page 1661, in the solution to question 25(c), on the second to last line, put a minus sign in front of $\frac{0.02}{0.015}$. Change the last line to

$$= -\frac{4}{3}e^{-0.8125}\left(e^{-0.0075(15^2)} - e^{-0.0075(5^2)}\right) = \boxed{\mathbf{0.381059}}$$

[8/23/2015] On page 1429, question 25 is defective since it is missing the expected present value of the retirement annuity. Answers to (b) and (c) should be multiplied by that expected present value.

[8/16/2015] On page 577, in the solution to exercise 28.10, change a_{41} to a_{40} in two places: on the second line and on the seventh line.

[8/7/2015] On page 352, on the first line of Section 17.2, replace "life annuity-due" with "whole life annuity-immediate".

[8/5/2015] On page 253, in the warning box at the beginning of Section 12.1, on the second to last line, replace sect:AbarNormalApprox with 12.4.