

Errata and Updates for ASM Exam MLC (Tenth Edition Second Printing) Sorted by Page

- [11/7/2010] On page 6, in Theorem 2, change $\sum_i \Pr(B_i) = 1$ to $\Pr(\cup_i B_i) = 1$.
- [12/17/2011] On page 6, on the first line of Section 1.3, $\Pr(B \neq 0)$ should be $\Pr(B) \neq 0$.
- [9/27/2011] On page 12, in the solution to exercise 1.3, on the first displayed line, change $E[X + Y]^3$ to $E[(X + Y)^3]$.
- [5/29/2011] On page 14, in the solution to exercise 1.9, 7 lines from the end, change $\frac{3}{2}(7500)$ to $\frac{2}{3}(7500)$.
- [5/29/2011] On page 27, in the solution to exercise 2.8, at the end, delete (C), since the question is not multiple choice.
- [2/22/2011] On page 31, on the last line, change ${}_t q_x$ to ${}_t q_x$.
- [12/20/2011] On page 41, in the solution to exercise 3.6, the second sentence is cut off and should read
It's the usual CAS type of humor—it's not that the answer cannot be determined from the given information (almost never the right answer choice), rather there is too much information provided.
- [10/3/2011] On page 43, in the solution to exercise 3.15, on the second line, in the last two symbols, q should not be in the subscript. Change them to ${}_1q_0$ and ${}_2q_0$.
- [6/3/2011] On page 65, in the solution to exercise 4.37, on the last two displayed lines, add a right parenthesis before the last equals sign on each line.
- [11/11/2010] On page 82, 3rd line of answer to Example 6B part 2, equation (6.2) should be equation (6.6).
- [12/6/2010] On page 88, the formula for $\text{Var}(T(x))$ of generalized deMoivre (9th formula) should have α in the numerator:
$$\frac{\alpha(\omega - x)^2}{(\alpha + 1)^2(\alpha + 2)}$$
- [12/6/2010] On page 100, in the solution to exercise 6.25, in the second bullet, replace $\omega - 10$ with $\theta - 10$.
- [1/12/2011] On page 140, in exercise 8.14, replace the last line of the question with "Calculate $\text{Var}(\min(T(45), 2))$."
- [1/7/2012] On page 143, in exercise 8.28, on the last line, put a period after 97.5.
- [11/11/2010] On page 154, in the solution to exercise 8.27, on the first displayed line, change $e^{\mu x}$ to $e^{-\mu x}$. On the second displayed line, change $e^{\mu_{x+1}}$ to $e^{-\mu_{x+1}}$.
- [11/11/2010] On page 172, in the solution to exercise 9.2, on the 2nd line from the end, change the numerator from $l_{83} - l_{82}$ to $l_{82} - l_{83}$.
- [1/22/2012] On page 177, in the solution to exercise 9.18, on the first displayed line, put 1- before $\frac{900}{1000}$.
- [6/7/2011] On page 183, on the fourth line, delete "actuarial".
- [2/25/2011] On page 202, in the solution to exercise 10.14, on the second displayed line, change ${}_12E_x$ to ${}_{12}E_x$. On the third displayed line, change the denominator from $0.10 + 0.20$ to $0.10 + 0.10$.
- [2/26/2011] On page 203, in the solution to exercise 10.18, on the first line, put parentheses around $\mu + \delta$.
- [1/23/2012] On page 207, in the solution to Quiz 10-1, on the second displayed line, replace $A_{30:\overline{10}|}$ with $A_{30:\overline{10}|}$.
- [12/6/2010] On page 212, on the fourth line of the answer to Example 11D, before the comma, add "divided by 0.16".
- [1/30/2012] On page 216, in exercise 11.4, answer choice (B) should be 375.

- [2/7/2011] On page 245, in exercise 12.39, 2–3 lines under the table, replace the sentence “In this group ...” with “This group is drawn from a population in which 80% are non-smokers and 20% are smokers”.
- [6/3/2011] On page 249, in the solution to exercise 12.17, on the second line, remove the bar from ${}^2\bar{A}_x$.
- [3/3/2011] On page 249, in the solution to exercise 12.17, on the 6th line, $A_{25:\overline{5}|}$ should be $A_{25:\overline{5}|}^1$.
- [1/24/2011] On page 257, 3 lines from the bottom, change ${}_5E_{45}$ to ${}_5^2E_{45}$.
- [6/3/2011] On page 263, in the solution to exercise 18.37, on the last two displayed lines, add a right parenthesis before the last equals sign on each line.
- [6/7/2011] On page 264, on the sixth line, delete “actuarial”.
- [12/6/2010] On page 264, three lines above Example 13F, change A_{x+t} to \bar{A}_{x+t} .
- [12/6/2010] On page 265, in the answer to Example 13H, on the first line change $x > 20$ to $t > 20$. On the last three displayed line, change each x (one on each line) to t .
- [6/3/2011] On page 271, in the solution to exercise 13.1, on the second line, change the second ν_{10} to ν_t .
- [12/27/2011] On page 276, in the solution to question 13.22, on the third displayed line, remove the negative sign at the start of the line.
- [11/11/2010] On page 282, first line, change “a a” to “as a”.
- [12/6/2010] On page 282, one line above Example 14B, delete “on”.
- [7/28/2011] On page 299, in the list of additional released exam questions, delete the “,35” in “M-S05:15,35”.
- [12/6/2010] On page 299, in the solution to exercise 14.2, on the fifth and sixth lines, change 7,533,984 to 7,533,964. On the sixth and seventh lines, change 0.962947 to 0.962945. On the eighth and ninth lines, change 0.873422 to 0.873420.
- [12/20/2010] On page 303, in the solution to exercise 14.19, on the last line, the first exponent is missing a parenthesis and should be $-(\mu + \delta)$.
- [11/11/2010] On page 307, in the solution to Quiz 14-3, on the second line, change $A_{40:\overline{5}|}^1$ to $A_{40:\overline{20}|}^1$.
- [12/6/2010] On page 311, two lines from the bottom, change $(\bar{I}\bar{a})_{\overline{1}|}$ to $(\bar{I}\bar{s})_{\overline{1}|}$.
- [8/15/2011] On page 325, in Quiz 16-1, the values given are impossible, since the resulting 10-year pure endowment of 0.6 is greater than $e^{-10\delta}$. Therefore, change \bar{A}_{60} to 0.42.
- [6/6/2011] On page 325, on the third line of the paragraph beginning “Whole life”, replace the expression $e^{-(\delta + \mu_x(t))}$ with $e^{-\left(\delta t + \int_0^t \mu_x(u) du\right)}$.
- [6/6/2011] On page 334, in the solution to exercise 16.5, on the third line, replace μ with $k + \mu_{x+t}$.
- [8/15/2011] On page 338, revise the solution to Quiz 16-1 in line with the revised value of \bar{A}_{60} given above:
 Since $\bar{A}_{50} = \bar{A}_{50:\overline{10}|}^1 + {}_{10}E_{50}\bar{A}_{60}$, we have ${}_{10}E_{50} = (0.22 - 0.01)/0.42 = 0.5$. Then $\bar{A}_{50:\overline{10}|} = 0.01 + 0.5 = 0.51$. Also, since $\bar{A}_x = 1 - \delta \bar{a}_x$, we have $\delta = (1 - 0.22)/13 = 0.06$. Therefore
- $$\bar{a}_{50:\overline{10}|} = \frac{1 - \bar{A}_{50:\overline{10}|}}{\delta} = \frac{1 - 0.51}{0.06} = \boxed{8\frac{1}{6}}$$
- [7/27/2011] On page 349, on the first line of the answer to Example 17H, change “second” to third. It is referring to the equation one line above Example 17H.
- [7/28/2011] On page 366, in the list of additional released exam questions, remove SOA M-F06:4.

- [2/1/2011] On page 380, in equation (18.11), delete the first left parenthesis.
- [7/27/2011] On page 381, the first sentence of the fifth paragraph (starting with “If $I = 1$ ”) skips a step. Replace it with these two sentences:
 If $I = 1$, $Y | I$ is ν^n times a whole life annuity on $(x + n)$, and we know the expected value and variance for this annuity; the expected value is \bar{a}_{x+n} and the variance is $({}^2\bar{A}_{x+n} - \bar{A}_{x+n}^2)/\delta^2$. Therefore, $E[Y | I] = \nu^n \bar{a}_{x+n}$ and $\text{Var}(Y | I) = \nu^{2n}({}^2\bar{A}_{x+n} - \bar{A}_{x+n}^2)/\delta^2$.
- [4/17/2011] On page 381, in the third displayed formula of the page, change ${}_n|\bar{a}_{\overline{1}|}$ to ${}_n|\bar{a}_{\overline{1-n}|}$.
- [6/15/2011] On page 386, in Table 18.1, formula (18.12) should have d instead of d^2 in the denominator.
- [1/13/2011] On page 388, in exercise 18.8(iii), replace 420 with 240.
- [1/13/2011] On page 388, in exercise 18.9(iii), replace 448 with 288.
- [7/28/2011] On page 394, add SOA M-F06:4 to the list of additional released exam questions.
- [1/13/2011] On page 396, in the solution to exercise 18.7, replace the right-hand sides of the last 3 lines as follows: replace 240 with 400; replace 4.8 with 8; replace 17.4 with 19.
- [1/13/2011] On pages 396–397, in the solution to exercise 18.8, replace the first 4 displayed lines with

$$\begin{aligned}\text{Var}(Y) &= \frac{2(\bar{a}_x - {}^2\bar{a}_x)}{\delta} - \bar{a}_x^2 \\ \mathbf{E}[Y^2] &= \frac{2(\bar{a}_x - {}^2\bar{a}_x)}{\delta} \\ 240 &= \frac{2(15 - {}^2\bar{a}_x)}{0.05} \\ 12 &= 2(15 - {}^2\bar{a}_x) \\ {}^2\bar{a}_x &= 9\end{aligned}$$

- [1/13/2011] On page 397, in the solution to exercise 18.9, replace the 4th and 5th lines with

$$\begin{aligned}288 &= \frac{2(15 - {}^2\bar{a}_x)}{0.05} + {}^2\bar{a}_x = 600 - 39({}^2\bar{a}_x) \\ {}^2\bar{a}_x &= \frac{312}{39} = 8\end{aligned}$$

- [7/11/2011] On page 397, in the solution to exercise 18.10, on the 3rd and 2nd lines from the bottom of the page, change 1250 to 125. On the last line, change 625 to 62.5.
- [11/11/2010] On page 406, in the solution to Quiz 18-2, on the last line, change the – before 18.67579 to =.
- [9/8/2011] On page 407, on the 4th line of the second paragraph, change 14/5 to 14/6.
- [11/11/2010] On page 433, in the solution to Quiz 19-2, on the second displayed line, change ${}_{60}E_{10}$ to ${}_{10}E_{60}$.
- [7/29/2011] On page 436, on the 6th line, change $(1+i)^{(1/3)} + 2(1+i)^{2/3}$ to $2(1+i)^{1/3} + (1+i)^{2/3}$.
- [7/14/2011] On page 456, in the solution to exercise 21.8, on the second displayed line, change ${}_5E_x$ to ${}_{10}E_x$.
- [7/28/2011] On page 483, in the list of additional released exam questions, add “,35” after “M-S05:14”
- [7/15/2011] On page 494, the solution to exercise 22.38 is incorrect. Replace the part starting with “The present value of the refund of premium...” to the end with the following, which also includes an easier method:

The present value of the refund of premium benefits, since the premiums are refunded with interest, is the present value of the premiums themselves. If death occurs in year k , the premiums up to that time are a k -year certain annuity-due. So the present value of the refund of premium benefits is

$$\begin{aligned} \text{PV Refund} &= 0.5\pi \sum_{k=1}^{10} {}_{k-1|}q_{20} \ddot{a}_{\overline{k}|} \\ &= 0.5\pi \sum_{k=1}^{10} 0.01(0.99^{k-1}) \left(\frac{1 - 1/1.05^k}{0.05/1.05} \right) \\ &= 0.005(21)\pi \left(\sum_{k=1}^{10} 0.99^{k-1} - \frac{1}{1.05} \sum_{k=1}^{10} \left(\frac{0.99}{1.05} \right)^{k-1} \right) \\ &= 0.105 \left(\frac{1 - 0.99^{10}}{1 - 0.99} - \frac{1}{1.05} \left(\frac{1 - (0.99/1.05)^{10}}{1 - 0.99/1.05} \right) \right) = 0.225609 \end{aligned}$$

Equating the premiums with the benefits,

$$\begin{aligned} 7.78379\pi &= 9716.212 + 0.225609\pi \\ \pi &= \frac{9716.212}{7.78379 - 0.225609} = \boxed{1285.523} \end{aligned}$$

An easier way to solve this question is to equate the accumulated premiums at time 10 to the present value of the annuity, 17,500. The nonrefundable premiums are accumulated with mortality and interest, and the refundable premiums are accumulated with interest only, so

$$\pi = \frac{17,500}{0.5(\ddot{s}_{20:\overline{10}|} + \ddot{s}_{\overline{10}|})}$$

We computed $\ddot{a}_{20:\overline{10}|}$ above, and accumulating with mortality and interest,

$$\ddot{s}_{20:\overline{10}|} = 7.78379 \left(\frac{1.05^{10}}{0.99^{10}} \right) = 14.01949$$

while

$$\ddot{s}_{\overline{10}|} = \frac{1.05^{10} - 1}{0.05/1.05} = 13.20679$$

so the premium is $17,500 / (0.5(14.01949 + 13.20679)) = \boxed{1285.523}$.

[2/6/2011] On page 512, on the last line of the solution to exercise 23.6, in the first symbol in the numerator, the 0 should be inside the angle as follows: ${}^2\ddot{A}_{x:\overline{20}|}$.

[2/14/2011] On page 517, 3 lines above equation (24.5), change ${}^2i = i + i^2$ to ${}^2i = 2i + i^2$.

[6/21/2011] On page 532, in the caption for Figure 25.2, change fuction to function.

[2/9/2011] On page 537, on the last four lines of the answer to Example 25J, the exponents should be δ/μ instead of μ/δ . Make four corrections, one on each line.

[3/9/2011] On page 549, on the second line of the third paragraph, change “a m thly annuity be” to “an m thly annuity can be”.

[2/18/2011] On page 571, in the solution to exercise 27.11, on the second-to-last line, change $P_{45:\overline{10}|}^1$ to $P_{40:\overline{10}|}^1$.

[2/10/2011] On page 572, in the solution to exercise 27.14, on the second to last line, change “is paid” to “are paid”.

- [11/11/2010] On page 575, in the solution to Quiz 27-2, on the second displayed line, a vertical line is missing after the 10 in the numerator. The numerator should be ${}_{10|\bar{A}}_{20}$.
- [8/15/2011] On page 579, on the third displayed line below Table 28.2, change the denominator to ${}_{h-k}P_{x+k:\overline{n-k}|}$ and change $h < k$ to $k < h$.
- [3/12/2011] On page 580, on the first line of Section 28.2, delete the second “the”.
- [2/11/2011] On page 590, in exercise 28.16(iii), \ddot{a}_{40} should be $\ddot{a}_{40:\overline{10}|}$.
- [4/3/2011] On page 593, in the solution to exercise 28.6, at the end of the second sentence of the first bullet, change “, or 1/5” to “is 1/5”.
- [2/11/2011] On page 596, in the solution to exercise 28.16, on the last line of the page, change the last denominator from $1 - 0.7$ to $1 - 0.3$.

- [2/17/2011] On page 597, in the solution to exercise 28.16, replace the last two lines with

The accumulated cost of insurance, since no insurance is provided in the first 10 years, is $q_{50}/p_{50} = 0.04/0.96 = 0.041667$. The retrospective reserve is $0.627969 - 0.041667 = \mathbf{0.586302}$.

- [11/11/2010] On page 601, on the second displayed line at the end, the subscript should be fixed so that the symbol is $\ddot{a}_{x+k:\overline{n-k}|}$.
- [2/12/2012] On page 606, in question 29.8, on the second line from the end of the question, change i from 0.025 to 0.03.
- [10/5/2011] On page 630, in exercise 30.18(i), “full” should be “fully”. Also, the first column of the table represents the number of survivors on July 1, 2009.
- [2/26/2011] On page 633, in the solution to exercise 30.4, on the second and third displayed lines of the page, replace 0.379487 with 0.017446. On the third displayed line of the page, replace 0.415487 with 0.053446. On the second line from the end, replace 0.2656 with 0.0396. On the last line, replace the equation with $0.053446/0.0396 = \mathbf{1.3497}$.
- [10/5/2011] On page 658, in the solution to exercise 31.23, on the third line, change π_{45} to π_{19} .
- [2/16/2011] On page 660, in the solution to exercise 31.34, on the last line of the first paragraph, change q_{x+2} to q_{x+1} .
- [4/12/2011] On page 670, in Example 32G, on the first line, change “at the moment of” to “at the end of the year of”.
- [8/14/2011] On page 670, on the four displayed lines after “The fractional premium for the endowment insurance”, there are two errors. Before the first line, add:

$$A_{45:\overline{20}|} = A_{45:\overline{20}|}^1 + A_{45:\overline{20}|}^{\frac{1}{2}} = 0.09 + 0.25 = 0.34$$

On the line for $\ddot{a}_{45:\overline{20}|}^{(4)}$, replace 0.3475558 with 0.342001. Replace the last line with

$$P_{45:\overline{20}|}^{(4)} = \frac{0.34}{11.3743} = 0.029892$$

On the last line of the answer, change 0.030324 to 0.029892.

- [1/23/2011] On page 671, in the answer to Example 32H, on the third line, change the exponent -0.05 to -0.5 .
- [2/17/2011] On page 684, in the solution to exercise 32.18, on the first line, change pi to π .
- [11/13/2011] On page 685, on the last line of the solution to exercise 32.21, the left side should be ${}_2V(\bar{A}_{40:\overline{10}|})$.
- [3/25/2011] On page 688, in the solution to exercise 32.30, on the second, third, fifth, and sixth lines, the 1.1 in the denominator (under $e^{-0.1}$ in lines 2 and 3 and under $e^{-0.08}$ in lines 4 and 5) should be 1.1^{10} .

- [4/8/2011] On page 689, on the second line from the end of the solution to Quiz 32-1, add “500” before “ $e^{0.6}$ ”.
- [4/1/2011] On page 704, one line below the second-to-last displayed line, change $\Pr(T(xy)) > t$ to $\Pr(T(xy) > t)$.
- [11/11/2010] On page 721, 1 line and 4 lines after Quiz 35-1 (once apiece), replace $T(\bar{xy})$ with $T(\overline{xy})$.
- [2/22/2011] On page 723, in Table 35.1, add minus signs on the left of lines 4 and 8.
- [3/7/2011] On page 730, in the solution to exercise 35.6, the final answer should be 0.086538.
- [10/22/2011] On page 731, in the solution to exercise 35.17, on the first line, replace $q_x q_y$ with ${}_t q_x {}_t q_y$.
- [4/8/2011] On page 736, in the fourth displayed equation of the page, change the condition $T(xy) > a$ to $T(y) > a$ and the condition $T(xy) \leq a$ to $T(y) \leq a$.
- [4/1/2011] On page 736, 2 lines above equation (36.3), change ${}_a p_{xy}$ to ${}_a p_y$ and ${}_a q_{xy}$ to ${}_a q_y$.
- [3/22/2011] On page 736, in equation (36.3), change $(1 - \frac{a}{2})$ to $(1 - \frac{a}{b})$.
- [2/22/2011] On page 738, on the third line of the answer to Example 36E, change $\omega = 50$ to $\omega - x = 50$.
- [3/28/2011] On page 739, in the answer to Example 36H, change the highlighted number (fifth line) from 400 to 200.
- [9/27/2011] On page 781, in exercise 38.23, replace the first sentence with

For two independent lives, (30) and (50), a continuous life annuity pays 100 per year to (50) after the death of (30), but only until (50) reaches age 80.

- [2/14/2011] On page 788, the solution to exercise 38.23 is incorrect. The correct solution is

The expected present value of one unit of this reversionary annuity is

$$\bar{a}_{30|50:\overline{30}|} = \bar{a}_{50:\overline{30}|} - \bar{a}_{30:50:\overline{30}|}$$

Let's calculate the two annuities.

$$\bar{a}_{30:50:\overline{30}|} = \frac{1 - e^{-0.085(30)}}{0.005 + 0.03 + 0.05} = 10.84610$$

$$\bar{a}_{50:\overline{30}|} = \frac{1 - e^{-0.08(30)}}{0.03 + 0.05} = 11.36603$$

The answer is $100(11.36603 - 10.84610) = \boxed{51.99}$.

- [11/11/2010] On page 793, on the second to last line, change (i) to (1).
- [11/11/2010] On page 798, in Table 39.1 two lines below formula (39.8), change $omega_x$ to ω_x .
- [3/9/2011] On page 822, in the solution to exercise 40.3, on the fourth displayed line, change $e^{0.01(20)}$ to $e^{-0.01(20)}$. On the fifth displayed line, change $e^{-0.01(20)}$ to $e^{0.01(20)}$.
- [7/29/2011] On page 841, delete SOA M-F06:24 from the list of additional released exam questions.
- [2/23/2011] On page 860, in the solution to exercise 42.13, five lines from the end, change $e^{-0.015}$ to $e^{-0.15}$.
- [2/25/2011] On page 864, in the solution to Quiz 42-1, on the first displayed line, put a superscript (τ) on ${}_5 p_{60}$: ${}_5 p_{60}^{(\tau)}$.
- [2/25/2011] On page 876, in the solution to exercise 43.13, on the 6th line, replace $0.8\mu_x^{(\tau)}$ with $0.2\mu_x^{(\tau)}$. On the 7th line, replace $0.2\mu_x^{(\tau)}$ with $0.8\mu_x^{(\tau)}$.
- [3/21/2011] On page 877, in the solution to exercise 43.15, on the second line, ${}_t p p_x^{(\tau)}$ should be ${}_t p_x^{(\tau)}$.
- [7/5/2011] On page 881, in the title of Section 44.1 and in the next two paragraphs, “double decrement” should be replaced by “multiple decrement” wherever it appears. It appears four times.

- [7/5/2011] On page 883, in Quiz 44-1(iii), replace “if” with “is”.
- [7/29/2011] On page 897, add SOA M-F06:24 to the list of additional released exam questions.
- [7/5/2011] On page 904, in the solution to Quiz 44-1, on the left side of the first line, the superscript (1) should be (2).
- [3/21/2011] On page 941, in the solution to exercise 46.9, on the last line, change $1 - 0.09\ddot{a}_{40:\overline{10}}$ to $(1 - 0.09)\ddot{a}_{40:\overline{10}}$.
- [3/21/2011] On page 945, on the first line of the footnote, change “form” to “from”.
- [3/4/2011] On page 970, in the answer to Example‘48C, on the third line, change e_5 to e_4 .
- [11/11/2010] On page 991, on the 8th line, change “will not Gone” to “will not be Gone”.
- [11/11/2010] On page 1010, 6th line of answer to Example 50B, change “ar” to “are”.
- [3/28/2011] On page 1053, in the solution to exercise 53.1, 2 lines from the end, delete the word “at” before “exactly”.
- [3/11/2011] On page 1075, in Example 55D, on the second line, change 1100 to 1600.
- [7/19/2011] On page 1165, in question 21(iv), delete “actuarial”.
- [8/7/2011] On page 1197, in the solution to question 22, on the last line, a right parenthesis is missing from the numerator, after 0.104251.
- [7/19/2011] On page 1201, in the solution to question 6, on the second line, change the integrand to μ_{x+s} ds.
- [11/11/2010] On page 1207, in the solution to question 24, “non-smokers” refers to the group with $\mu = 0.05$, and “smokers” refers to the group with $\mu = 0.15$.
- [4/29/2011] On page 1221, in the solution to question 5, on the fourth displayed line, change ${}_5|\ddot{a}_{60}$ to ${}_5|\ddot{a}_{55}$.
- [7/19/2011] On page 1240, in the solution to question 24, 4 lines from the bottom, change the first numerator from $\bar{a}_{\overline{10}|0.1}$ to $\bar{a}_{\overline{10}|0.1}$.
- [5/4/2011] On page 1249, in the solution to question 18, on the third line from the bottom, change ${}_2E_{50}$ to ${}_2E_{[50]}$.
- [7/19/2011] On page 1250, in the solution to question 20, on the second line at the end, change ${}_{10}p_x = 0.2$ to ${}_{10}p_x - 0.2$.
- [7/19/2011] On page 1251, in the solution to question 24, on the last line, change ${}_{10}L$ to ${}_{30}L$.
- [7/19/2011] On page 1256, in the solution to question 11, on the last line of the page, change 0.000890 to 0.001780.
- [7/19/2011] On page 1259, the solution to question 22 is correct, but here is a more straightforward solution, using the prospective formula for reserves.

The expected present value of the benefits at time 19 is the sum of the EPV of the death benefit and the survivorship benefit:

$$\bar{A}_{x+19:\overline{1}} = 1000 \int_0^1 e^{-0.07t} 0.02 dt + 1000e^{-0.07} = 1000 \left(\frac{2e^{-0.07}}{7} + e^{-0.07} \right) = 951.71$$

The expected present value of the premiums at time 19 is, using $\bar{a}_{x:\overline{n}} = (1 - \bar{A}_{x:\overline{n}})/\delta$,

$$P\bar{a}_{x+19:\overline{1}} = 30 \left(\frac{1 - 0.95171}{0.05} \right) = 28.97$$

So the reserve is $951.71 - 28.97 = \boxed{922.74}$. (D)

- [5/7/2011] On page 1260, in the solution to question 23, on the second line, change ${}_tq_{60}$ to ${}_tp_{60}$.

[11/5/2011] On page 1265, in the solution to question 6, on the first displayed line, remove the bar from \bar{A}_{x+10} . On the third displayed line, change + to -.

[5/4/2011] On page 1266, in the solution to question 8, on 6, 4, and 3 lines from the end, replace 1.96 with 1.645. 3 lines before the end, there are several errors; the line should read

$$\sqrt{x} = \frac{-1.645\sqrt{18.25} \pm \sqrt{(1.645^2)(18.25) + 4(18.25)(499.5)}}{2(18.25)} = 5.04, -5.43$$

[7/19/2011] On page 1267, in the solution to question 10, on the last line, change ${}_tq_0^{(2)}$ to ${}_5q_0^{(2)}$.

[7/28/2011] On pages 1283 and 1284, in the solution to question 15, on the last line of page 1283, remove the line from the presubscript of ${}_9p_{40}$ at the end of the line, so that it becomes ${}_9p_{40}$. Make the same correction on page 1284, four lines from the end of the solution.

[7/29/2011] On page 1286 in the solution to question 27, on the first line, $\mu_{50}^{(1)}$ should be $\mu_{50}^{(1)}(t)$.

[4/10/2011] On page 1288, in the solution to question 38, on the second line, change the second denominator to 1.06^2 .

[7/29/2011] On page 1311, in the solution to question 1, on the second displayed line, q_{45} should be $q_{45}^{(s)}$.

[3/28/2011] On page 1357, replace the last line of the solution to question 15 with

The reserve per survivor is 0.13661, and under de Moivre ${}_{10}p_{60} = 0.75$, so 750 policies are expected to survive and the expected reserve is $750(0.13661) = \boxed{102.46}$. (A)

The CAS answer key has (D) as the answer. Apparently, they multiplied 0.13661 by the 1000 original purchasers, obtaining 136.61. However, reserves are conditioned on survival to the duration of the reserve, so the CAS answer is not correct.

[7/28/2011] On page 1360, the lesson number for SOA Spring 2005 question 35 should be 22 instead of 14. The lesson number for SOA Fall 2006 question 4 should be 18 instead of 17. The lesson number for Fall 2006 question 24 should be 44 instead of 41. The lesson number for SOA Spring 2007 question 29 should be 16 instead of 33.