

Question #77

Answer: E

Level benefit premiums can be split into two pieces: one piece to provide term insurance for n years; one to fund the reserve for those who survive.

Then,

$$P_x = P_{x:\overline{n}|}^1 + P_{x:\overline{n}|}^{\cdot 1} nV$$

And plug in to get

$$0.090 = P_{x:\overline{n}|}^1 + (0.00864)(0.563)$$

$$P_{x:\overline{n}|}^1 = 0.0851$$

Another approach is to think in terms of retrospective reserves. Here is one such solution:

$$\begin{aligned} nV &= \left(P_x - P_{x:\overline{n}|}^1 \right) \ddot{s}_{x:\overline{n}|} \\ &= \left(P_x - P_{x:\overline{n}|}^1 \right) \frac{\ddot{a}_{x:\overline{n}|}}{nE_x} \\ &= \left(P_x - P_{x:\overline{n}|}^1 \right) \frac{\ddot{a}_{x:\overline{n}|}}{P_{x:\overline{n}|}^1 \ddot{a}_{x:\overline{n}|}} \\ &= \frac{\left(P_x - P_{x:\overline{n}|}^1 \right)}{\left(P_{x:\overline{n}|}^1 \right)} \end{aligned}$$

$$0.563 = \left(0.090 - P_{x:\overline{n}|}^1 \right) / 0.00864$$

$$\begin{aligned} P_{x:\overline{n}|}^1 &= 0.090 - (0.00864)(0.563) \\ &= 0.0851 \end{aligned}$$