

**Question # 41****Answer: D**

The prospective reserve at age 60 per 1 of insurance is  $A_{60}$ , since there will be no future premiums. Equating that to the retrospective reserve per 1 of coverage, we have:

$$A_{60} = P_{40} \frac{\ddot{s}_{40:\overline{10}|}}{{}_{10}E_{50}} + P_{50}^{Mod} \ddot{s}_{50:\overline{10}|} - {}_{20}k_{40}$$

$$A_{60} = \frac{A_{40}}{\ddot{a}_{40}} \times \frac{\ddot{a}_{40:\overline{10}|}}{{}_{10}E_{40} {}_{10}E_{50}} + P_{50}^{Mod} \frac{\ddot{a}_{50:\overline{10}|}}{{}_{10}E_{50}} - \frac{A_{40:20}^1}{{}_{20}E_{40}}$$

$$0.36913 = \frac{0.16132}{14.8166} \times \frac{7.70}{(0.53667)(0.51081)} + P_{50}^{Mod} \frac{7.57}{0.51081} - \frac{0.06}{0.27414}$$

$$0.36913 = 0.30582 + 14.8196 P_{50}^{Mod} - 0.21887$$

$$1000 P_{50}^{Mod} = 19.04$$

Alternatively, you could equate the retrospective and prospective reserves at age 50. Your equation would be:

$$A_{50} - P_{50}^{Mod} \ddot{a}_{50:\overline{10}|} = \frac{A_{40}}{\ddot{a}_{40}} \times \frac{\ddot{a}_{40:\overline{10}|}}{{}_{10}E_{40}} - \frac{A_{40:10}^1}{{}_{10}E_{40}}$$

$$\begin{aligned} \text{where } A_{40:10}^1 &= A_{40} - {}_{10}E_{40} A_{50} \\ &= 0.16132 - (0.53667)(0.24905) \\ &= 0.02766 \end{aligned}$$

$$0.24905 - (P_{50}^{Mod})(7.57) = \frac{0.16132}{14.8166} \times \frac{7.70}{0.53667} - \frac{0.02766}{0.53667}$$

$$1000 P_{50}^{Mod} = \frac{(1000)(0.14437)}{7.57} = 19.07$$

Alternatively, you could set the expected present value of benefits at age 40 to the expected present value of benefit premiums. The change at age 50 did not change the benefits, only the pattern of paying for them.

$$A_{40} = P_{40} \ddot{a}_{40:\overline{10}|} + P_{50}^{Mod} {}_{10}E_{40} \ddot{a}_{50:\overline{10}|}$$

$$0.16132 = \left( \frac{0.16132}{14.8166} \right) (7.70) + (P_{50}^{Mod}) (0.53667) (7.57)$$

$$1000 P_{50}^{Mod} = \frac{(1000)(0.07748)}{4.0626} = 19.07$$