

Question #240

Answer: D

Let G denote the premium.

Expected present value (EPV) of benefits = $1000\bar{A}_{40:\overline{20}|}$

EPV of premiums = $G\ddot{a}_{40:\overline{10}|}$

$$\begin{aligned}\text{EPV of expenses} &= (0.04 + 0.25)G + 10 + (0.04 + 0.05)G a_{40:\overline{9}|} + 5a_{40:\overline{19}|} \\ &= 0.29G + 10 + 0.09G a_{40:\overline{9}|} + 5a_{40:\overline{19}|} \\ &= 0.2G + 10 + 0.09G\ddot{a}_{40:\overline{10}|} + 5a_{40:\overline{19}|}\end{aligned}$$

(The above step is getting an $\ddot{a}_{40:\overline{10}|}$ term since all the answer choices have one. It could equally well have been done later on).

Equivalence principle:

$$G \ddot{a}_{40:\overline{10}|} = 1000 \bar{A}_{40:\overline{20}|} + 0.2G + 10 + 0.09G \ddot{a}_{40:\overline{10}|} + 5a_{40:\overline{19}|}$$

$$G \left(\ddot{a}_{40:\overline{10}|} - 0.2 - 0.09 \ddot{a}_{40:\overline{10}|} \right) = 1000 \bar{A}_{40:\overline{20}|} + 10 + 5a_{40:\overline{19}|}$$

$$G = \frac{1000 \bar{A}_{40:\overline{20}|} + 10 + 5a_{40:\overline{19}|}}{0.91 \ddot{a}_{40:\overline{10}|} - 0.2}$$