Question #25
Answer: D

Annuity benefit: $Z_1 = 12{,}000 \dfrac{1-v^{K+1}}{d}$ for $K = 0,1,2,...$

Death benefit: $Z_2 = Bv^{K+1}$ for $K = 0,1,2,...$

New benefit: $Z = Z_1 + Z_2 = 12{,}000 \dfrac{1-v^{K+1}}{d} + Bv^{K+1}$

$$= \frac{12{,}000}{d} + \left(B - \frac{12{,}000}{d} \right) v^{K+1}$$

$$\text{Var}(Z) = \left(B - \frac{12{,}000}{d} \right)^2 \text{Var}\left(v^{K+1} \right)$$

$$\text{Var}\left(Z\right) = 0 \text{ if } B = \frac{12{,}000}{0.08} = 150{,}000 \,.$$

In the first formula for $\text{Var}\left(Z\right)$, we used the formula, valid for any constants *a* and *b* and random variable *X*,

$$\text{Var}\left(a + bX\right) = b^2 \text{Var}\left(X\right)$$

Question #26
Answer: A

$$\mu_{x+t:y+t} = \mu_{x+t} + \mu_{y+t} = 0.08 + 0.04 = 0.12$$
$$\bar{A}_x = \mu_{x+t} / \left(\mu_{x+t} + \delta \right) = 0.5714$$
$$\bar{A}_y = \mu_{y+t} / \left(\mu_{y+t} + \delta \right) = 0.4$$
$$\bar{A}_{xy} = \mu_{x+t:y+t} / \left(\mu_{x+t:y+t} + \delta \right) = 0.6667$$
$$\bar{a}_{xy} = 1 / \left(\mu_{x+t:y+t} + \delta \right) = 5.556$$

$$\bar{A}_{\overline{xy}} = \bar{A}_x + \bar{A}_y - \bar{A}_{xy} = 0.5714 + 0.4 - 0.6667 = 0.3047$$

Premium = 0.304762/5.556 = 0.0549