Question #78
Answer: A

$$\delta = \ln(1.05) = 0.04879$$

$$\bar{A}_x = \int_0^{\omega-x} {}_t p_x \mu_{x+t} e^{-\delta t} dt$$

$$= \int_0^{\omega-x} \frac{1}{\omega - x} e^{-\delta t} dt \quad \text{for the given mortality function}$$

$$= \frac{1}{\omega - x} \bar{a}_{\overline{\omega-x}|}$$

From here, many formulas for the reserve could be used. One approach is:

Since

$$\bar{A}_{50} = \frac{\bar{a}_{\overline{50}|}}{50} = \frac{18.71}{50} = 0.3742 \text{ so } \bar{a}_{50} = \left(\frac{1 - \bar{A}_{50}}{\delta} \right) = 12.83$$

$$\bar{A}_{40} = \frac{\bar{a}_{\overline{60}|}}{60} = \frac{19.40}{60} = 0.3233 \text{ so } \bar{a}_{40} = \left(\frac{1 - \bar{A}_{40}}{\delta} \right) = 13.87$$

$$\bar{P}\left(\bar{A}_{40}\right) = \frac{0.3233}{13.87} = 0.02331$$

$$\text{reserve} = \left[\bar{A}_{50} - \bar{P}\left(\bar{A}_{40}\right) \bar{a}_{50} \right] = \left[0.3742 - (0.02331)(12.83) \right] = 0.0751.$$