Question #60
Answer: C

$A_{60} = 0.36913 \qquad d = 0.05660$

${}^2A_{60} = 0.17741$

and $\sqrt{{}^2A_{60} - A_{60}^2} = 0.202862$

Expected Loss on one policy is $E\left[L(\pi)\right] = \left(100{,}000 + \frac{\pi}{d}\right)A_{60} - \frac{\pi}{d}$

Variance on one policy is $\text{Var}\left[L(\pi)\right] = \left(100{,}000 + \frac{\pi}{d}\right)^2 \left({}^2A_{60} - A_{60}^2\right)$

On the 10000 lives,

$E[S] = 10{,}000E\left[L(\pi)\right]$ and $\text{Var}[S] = 10{,}000\ \text{Var}\left[L(\pi)\right]$

The π is such that $0 - E[S]/\sqrt{\text{Var}[S]} = 2.326$ since $\Phi(2.326) = 0.99$

$$\frac{10{,}000\left(\frac{\pi}{d} - \left(100{,}000 + \frac{\pi}{d}\right)A_{60}\right)}{100\left(100{,}000 + \frac{\pi}{d}\right)\sqrt{{}^2A_{60} - A_{60}^2}} = 2.326$$

$$\frac{100\left(\frac{\pi}{d} - \left(100{,}000 + \frac{\pi}{d}\right)\right)(0.36913)}{\left(100{,}000 + \frac{\pi}{d}\right)(0.202862)} = 2.326$$

$$\frac{0.63087\frac{\pi}{d} - 36913}{100{,}000 + \frac{\pi}{d}} = 0.004719$$

$$0.63087\frac{\pi}{d} - 36913 = 471.9 = 0.004719\frac{\pi}{d}$$

$$\frac{\pi}{d} = \frac{36913 + 471.9}{0.63087 - 0.004719}$$

$$= 59706$$

$$\pi = 59706 \times d = 3379$$