Question #6
Answer: B

$$EPV\ \text{Benefits} = 1000A^{1}_{40:\overline{20|}} + \sum_{k=20}^{\infty} {}_kE_{40} 1000vq_{40+k}$$

$$EPV\ \text{Premiums} = \pi\ddot{a}_{40:\overline{20|}} + \sum_{k=20}^{\infty} {}_kE_{40} 1000vq_{40+k}$$

$$\text{Benefit premiums} \Rightarrow \text{Equivalence principle} \Rightarrow$$

$$1000A^{1}_{40:\overline{20|}} + \sum_{k=20}^{\infty} {}_kE_{40} 1000vq_{40+k} = \pi\ddot{a}_{40:\overline{20|}} + \sum_{20}^{\infty} {}_kE_{40} 1000vq_{40+k}$$

$$\pi = 1000A^{1}_{40:\overline{20|}} / \ddot{a}_{40:\overline{20|}}$$

$$= \frac{161.32 - (0.27414)(369.13)}{14.8166 - (0.27414)(11.1454)}$$

$$= 5.11$$

While this solution above recognized that $\pi = 1000P^{1}_{40:\overline{20|}}$ and was structured to take advantage of that, it wasn't necessary, nor would it save much time. Instead, you could do:

$$EPV \text{ Benefits } = 1000A_{40} = 161.32$$

$$EPV \text{ Premiums } = \pi \ddot{a}_{40:\overline{20}|} + {}_{20}E_{40} \sum_{k=0}^{\infty} {}_kE_{60}\, 1000 v q_{60+k}$$

$$= \pi \ddot{a}_{40:\overline{20}|} + {}_{20}E_{40}\, 1000 A_{60}$$

$$= \pi \left[14.8166 - (0.27414)(11.1454)\right] + (0.27414)(369.13)$$

$$= 11.7612\pi + 101.19$$

$$11.7612\pi + 101.19 = 161.32$$

$$\pi = \frac{161.32 - 101.19}{11.7612} = 5.11$$