Question #158
Answer: D

$$100{,}000\left(IA\right)^{1}_{40:\overline{10}|} = 100{,}000\, v\, p_{40}\left[\left(IA\right)^{1}_{41:\overline{10}|} - 10 v^{10}\, {}_{9}p_{41}\, q_{50}\right] + A^{1}_{40:\overline{10}|}(100{,}000) \quad [\text{see comment}]$$

$$= 100{,}000 \frac{0.99722}{1.06}\left[0.16736 - \frac{10\left(\frac{8{,}950{,}901}{9{,}287{,}264}\right)}{1.06^{10}} \times (0.00592)\right]$$

$$+ (0.02766 \times 100{,}000)$$

=15,513

Where $A^{1}_{40:\overline{10}|} = A_{40} - {}_{10}E_{40}\, A_{50}$

$$= 0.16132 - (0.53667)(0.24905)$$
$$= 0.02766$$

Comment: the first line comes from comparing the benefits of the two insurances. At each of age 40, 41, 42,…,49 $\left(IA\right)^{1}_{40:\overline{10}|}$ provides a death benefit 1 greater than $\left(IA\right)^{1}_{41:\overline{10}|}$. Hence the $A^{1}_{40:\overline{10}|}$ term. But $\left(IA\right)^{1}_{41:\overline{10}|}$ provides a death benefit at 50 of 10, while $\left(IA\right)^{1}_{40:\overline{10}|}$ provides 0. Hence a term involving ${}_{9|}q_{41} = {}_{9}p_{41}\, q_{50}$. The various *v*'s and *p*'s just get all expected present values at age 40.