**Question #173**
**Answer: B**

Calculate the probability that both are alive or both are dead.
P(both alive) = ${}_k p_{xy} = {}_k p_x \cdot {}_k p_y$
P(both dead) = ${}_k q_{\overline{xy}} = {}_k q_x \, {}_k q_y$
P(exactly one alive) = $1 - {}_k p_{xy} - {}_k q_{\overline{xy}}$
Only have to do two year's worth so have table

| Pr(both alive) | Pr(both dead) | Pr(only one alive) |
|---|---|---|
| 1 | 0 | 0 |
| (0.91)(0.91) = 0.8281 | (0.09)(0.09) = 0.0081 | 0.1638 |
| (0.82)(0.82) = 0.6724 | (0.18)(0.18) = 0.0324 | 0.2952 |

$$EPV\ Annuity = 30,000\left(\frac{1}{1.05^0} + \frac{0.8281}{1.05^1} + \frac{0.6724}{1.05^2}\right) + 20,000\left(\frac{0}{1.05^0} + \frac{0.1638}{1.05^1} + \frac{0.2952}{1.05^2}\right) = 80,431$$

Alternatively,

$$\ddot{a}_{xy} = 1 + \frac{0.8281}{1.05} + \frac{0.6724}{1.05^2} = 2.3986$$

$$\ddot{a}_x = \ddot{a}_y = 1 + \frac{0.91}{1.05} + \frac{0.82}{1.05^2} = 2.6104$$

$$EPV = 20,000\,\ddot{a}_x + 20,000\,\ddot{a}_y - 10,000\,\ddot{a}_{xy}$$

(it pays 20,000 if *x* alive and 20,000 if y alive, but 10,000 less than that if both are alive)

$$= (20,000)(2.6104) + (20,000)(2.6104) - (10,000)2.3986 \quad = 80,430$$