Solution #140

$$Var(Y) = E[Y^2] - E[Y]^2$$

$$E[Y^n] = \sum_{K=0}^{\infty} {}_{K|}q_x \cdot y^n$$

$Pr(K=0) = {}_{0|}q_x = q_x = (1-0.9) = 0.1$

$Pr(K=1) = {}_{1|}q_x = p_x(1-p_{x+1}) = 0.9\left(1 - \frac{0.9^2}{0.9}\right) = 0.09$

Since the annuitant only needs to survive 2 full years to receive the third and final payment, we need to find $Pr(K \geq 2)$, not $Pr(K=2)$

$Pr(K \geq 2) = {}_2p_x = 0.9^2 = 0.81$

Probability	Y	Y^2
0.1	1.00	1.00^2
0.09	1.87	1.87^2
0.81	2.72	2.72^2

$E[Y] = 0.1(1) + 0.09(1.87) + 0.81(2.72) = 2.4715$

$E[Y^2] = 0.1(1^2) + 0.09(1.87^2) + 0.81(2.72^2) = 6.407$

$Var(Y) = 6.407 - 2.4715^2$

$= 0.30$ B