Question #61
Answer: C

$$ {}_1V = \left({}_0V + \pi\right)(1+i) - \left(1000 + {}_1V - {}_1V\right) \times q_{75} $$
$$ = 1.05\pi - 1000 q_{75} $$

Similarly,

$$ {}_2V = \left({}_1V + \pi\right) \times 1.05 - 1000 q_{76} $$
$$ {}_3V = \left({}_2V + \pi\right) \times 1.05 - 1000 q_{77} $$

$$ 1000 = {}_3V = \left(1.05^3\pi + 1.05^2 \cdot \pi + 1.05\pi\right) - 1000 \times q_{75} \times 1.05^2 - 1000 \times 1.05 \times q_{76} - 1000 \times q_{77} \quad * $$

$$ \pi = \frac{1000 + 1000\left(1.05^2 q_{75} + 1.05 q_{76} + q_{77}\right)}{(1.05)^3 + (1.05)^2 + 1.05} $$
$$ = \frac{1000^x \left(1 + 1.05^2 \times 0.05169 + 1.05 \times 0.05647 + 0.06168\right)}{3.310125} $$
$$ = \frac{1000 \times 1.17796}{3.310125} = 355.87 $$

* This equation is an algebraic manipulation of the three equations in three unknowns $\left({}_1V,\ {}_2V,\ \pi\right)$. One method – usually effective in problems where benefit = stated amount plus reserve, is to multiply the ${}_1V$ equation by 1.05^2, the ${}_2V$ equation by 1.05, and add those two to the ${}_3V$ equation: in the result, you can cancel out the ${}_1V$, and ${}_2V$ terms. Or you can substitute the ${}_1V$ equation into the ${}_2V$ equation, giving ${}_2V$ in terms of π, and then substitute that into the ${}_3V$ equation.