Question #55
Answer: B

$l_x = \omega - x = 105 - x$
$\Rightarrow {}_t p_{45} = l_{45+t} / l_{45} = (60-t)/60$

Let *K* be the curtate future lifetime of (45). Then the sum of the payments is 0 if $K \le 19$ and is *K* – 19 if $K \ge 20$.

$${}_{20|}\ddot{a}_{45} = \sum_{K=20}^{60} 1 \times \left(\frac{60-K}{60}\right) \times 1$$

$$= \frac{(40+39+...+1)}{60} = \frac{(40)(41)}{2(60)} = 13.6\overline{6}$$

Hence,

$$\text{Prob}\left(K - 19 > 13.6\overline{6}\right) = \text{Prob}\left(K > 32.6\overline{6}\right)$$

$$= \text{Prob}(K \ge 33) \text{ since } K \text{ is an integer}$$

$$= \text{Prob}(T \ge 33)$$

$$= {}_{33}p_{45} = \frac{l_{78}}{l_{45}} = \frac{27}{60}$$

$$= 0.450$$