Question #150
Answer: A

$$ {}_t p_x = \exp\left[-\int_0^t \frac{ds}{100-x-s}\right] = \exp\left[\ln(100-x-s)\Big|_0^t\right] = \frac{100-x-t}{100-x} $$

$$ \overset{\circ}{e}_{\overline{50:60}} = \overset{\circ}{e}_{50} + \overset{\circ}{e}_{60} - \overset{\circ}{e}_{50:60} $$

$$ \overset{\circ}{e}_{50} = \int_0^{50} \frac{50-t}{50}\,dt = \frac{1}{50}\left[50t - \frac{t^2}{2}\right]_0^{50} = 25 $$

$$ \overset{\circ}{e}_{60} = \int_0^{40} \frac{40-t}{40}\,dt = \frac{1}{40}\left[40t - \frac{t^2}{2}\right]_0^{40} = 20 $$

$$ \overset{\circ}{e}_{50:60} = \int_0^{40} \left(\frac{50-t}{50}\right)\left(\frac{40-t}{40}\right)dt = \int_0^{40} \frac{1}{2000}\left(2000 - 90t + t^2\right)dt $$

$$ = \frac{1}{2000}\left(2000t - 45t^2 + \frac{t^3}{3}\Big|_0^{40}\right) = 14.67 $$

$$ \overset{\circ}{e}_{\overline{50:60}} = 25 + 20 - 14.67 = 30.33 $$