

Question #186

Answer: A

Let Y be the present value of payments to 1 person.

Let S be the present value of the aggregate payments.

$$E[Y] = 500\ddot{a}_x = 500 \frac{(1 - A_x)}{d} = 5572.68$$

$$\sigma_Y = \sqrt{\text{Var}[Y]} = \sqrt{(500)^2 \frac{1}{d^2} ({}^2A_x - A_x^2)} = 1791.96$$

$$S = Y_1 + Y_2 + \dots + Y_{250}$$

$$E(S) = 250E[Y] = 1,393,170$$

$$\sigma_S = \sqrt{250} \times \sigma_Y = 15.811388 \sigma_Y = 28,333$$

$$0.90 = \Pr(S \leq F) = \Pr\left[\frac{S - 1,393,170}{28,333} \leq \frac{F - 1,393,170}{28,333}\right]$$

$$\approx \Pr\left[N(0,1) \leq \frac{F - 1,393,170}{28,333}\right]$$

$$0.90 = \Pr(N(0,1) \leq 1.28)$$

$$F = 1,393,170 + 1.28(28,333)$$

=1.43 million