EXAM MLC QUESTIONS OF THE WEEK

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Week of January 15/07

Actuary A uses UDD in each year of age as the fractional age assumption in a life table. Actuary B uses the constant force of mortality in each year of age assumption in the same life table. Actuary A calculates $q_{x+.5}$ to be .4750, and Actuary B calculates the probability to be .5101 . Find q_x.

The solution can be found below.

Week of January 15/07 - Solution

Let $q_x = a$ and $q_{x+1} = b$. Then, according to Actuary A, ${}_{.5}q_{x+.5} = \frac{.5a}{1-.5a}$, and ${}_{.5}q_{x+1} = .5b$, so that ${}_{.5}p_{x+.5} = (1 - \frac{.5a}{1-.5a})(1-.5b) = (\frac{1-a}{1-.5a})(1-.5b) = .5250$.

According to Actuary B, ${}_{.5}p_{x+.5} = (p_x)^{.5}(p_{x+1}^{.5}) = (1-a)^{.5}(1-b)^{.5} = .4899$, so that $(1-a)(1-b) = 1-a-b+ab = .2400$. It follows that $ab = a+b-.76$.

$(\frac{1-a}{1-.5a})(1-.5b) = .5250 \rightarrow 1-a-.5b+.5ab = .525-.2625a$
$\rightarrow ab = 1.475a+b-.95 = .2400$.

We then get $1.475a+b-.95 = a+b-.76$, so that $a = q_x = .4$,
and $b = .6$.