Ewa Kubicka http://www.math.louisville.edu/~ewa/
Course MLC/MFE seminars: http://www.math.ilstu.edu/actuary/prepcourses.html
Course MLC Casualty/Property Manual: http://www.neas-seminars.com/registration/

Practice Problem for exam MLC for the week after 06/23/07.

Moon and Anna are modeling the future lifetime of people who are 60 and at least 20 pounds overweight.

(i) Moon uses a double decrement model:

x	$l_x^{(\tau)}$	$d_x^{(1)}$	$d_x^{(2)}$
60	1000	80	50
61	870	100	40
62	730	110	70

(ii) Anna uses a non-homogeneous Markov model:

(a) The states are 1 (alive), 2 (death due to course 1 – heart failure), 3 (death due to course 2 – other than heart failure).

(b) Q_n is a transition matrix from age n to age n+1.

(iii) The two models produce equal probabilities of decrement.

Calculate $\left(Q_{61}^{(1,2)} + Q_{61}^{(1,3)}\right) \times Q_{61}^{(2,2)}$.

A) below 0.1
B) between 0.1 and 0.15
C) between 0.15 and 0.20
D) between 0.20 and 0.25
E) above 0.25

Solution. (like problem #4 in Nov05 Exam M)

$$Q_{61}^{(1,2)} = \frac{100}{870} = 0.1149;$$
$$Q_{61}^{(1,3)} = \frac{40}{870} = 0.0460;$$

Since once dead, this state can not be changed, $Q_{61}^{(2,2)} = 1$,
$\left(Q_{61}^{(1,2)} + Q_{61}^{(1,3)}\right) \times Q_{61}^{(2,2)}$= (0.1149 + 0.0460)(1) = **0.1609**.
Note: the transition matrix is as follows:

$$Q_{61} = \begin{bmatrix} 0.8391 & 0.1149 & 0.0460 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

ANSWER: C.

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