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 05-08-10.

The number of coins Lucky Tom finds in successive blocks as he walks to work follows a homogeneous Markov model:

(i) States 0, 1, 2 correspond to 0, 1, 2 coins founds in a block.

(ii) The transition matrix is

$$Q = \begin{pmatrix} 0.2 & 0.5 & 0.3 \\ 0.1 & 0.6 & 0.3 \\ 0.1 & 0.5 & 0.4 \end{pmatrix}$$

(iii) Tom found one coin in the first block today.

Calculate the probability that Tom will find at least 3 more coins in the next two blocks today.

(A) 0.43
(B) 0.45
(C) 0.47
(D) 0.49
(E) 0.51

Solution. (#16, Exam MLC, May 07)

In order to find at least 3 coins in the next two blocks, Tom must either find 1 and then 2 coins, or 2 and then 1 coin, or 2 and then 2 coins. The probabilities are as follows.

$P(1,2 \text{ coins}) = Q^{(1,1)}Q^{(1,2)} = (0.6)(0.3) = 0.18.$

$P(2,1 \text{ coins}) = Q^{(1,2)}Q^{(2,1)} = (0.3)(0.5) = 0.15.$

$P(2,2 \text{ coins}) = Q^{(1,2)}Q^{(2,2)} = (0.3)(0.4) = 0.12.$

We start from state 1 since the first block contains only one coin.

The total probability is = 0.18 + 0.15 + 0.12 = **0.45**.

ANSWER: B.

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