

# EXAM MLC QUESTION OF THE WEEK

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## Week of March 10/08

3. A mortality model has constant mortality probability  $q_y = q$  for all  $y$ . The annual effective rate of interest is  $i$ . A 10-year fully discrete term insurance with face amount 1 is issued to  $(x)$ .

Find  $\sum_{k=1}^{10} {}_kV$  for this policy in terms of  $q$  and  $i$ .

**The solution can be found below.**

## **Week of March 10/08 - Solution**

$$\ddot{a}_{x:\overline{10}|} = 1 + vp_x + v^2 {}_2p_x + \cdots + v^9 {}_9p_x = 1 + vp + v^2 p^2 + \cdots + v^9 p^9 = \frac{1-v^{10}p^{10}}{1-vp}.$$

$$A_{1:\overline{x}:\overline{10}|} = vq_x + v^2 {}_1|q_x + \cdots + v^{10} {}_9|q_x = vq + v^2 pq + \cdots + v^{10} p^9 q$$

$$= vq[1 + vp + v^2 p^2 + \cdots + v^9 p^9] = vq\left[\frac{1-v^{10}p^{10}}{1-vp}\right]. \quad P_{1:\overline{x}:\overline{10}|} = \frac{A_{1:\overline{x}:\overline{10}|}}{\ddot{a}_{x:\overline{10}|}} = vq.$$

$$vq(1+i) - q = p {}_1V \rightarrow 0 = p {}_1V \rightarrow {}_1V = 0.$$

Same equation continues for  $k = 2, 3, \dots$ , so  ${}_kV = 0$  for all  $k$ .