MATH 3630 - Actuarial Mathematics I
Fall 2010 - Valdez
Homework No. 2
due Monday, 6:15 PM, 27 September 2010

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A mortality table is constructed according to a constant force assumption:

$$\mu_x = 0.001, \quad \text{for } x > 0.$$

1. Calculate the columns of values for ℓ_x, d_x, q_x and p_x for ages 20, 21 and 22. Use a radix of 10,000.
2. Extend the table above to include the columns of values for T_x^*, Y_x^* and L_x^*, also for ages 20, 21 and 22.

With radix $l_0 = 10000$, $l_x = l_0 e^{-\int_0^x \mu_z dz} = 10000 e^{-.001x}$

(1)

x	l_x	d_x	q_x	p_x
19	9812			
20	9802	10	.0010	.9990
21	9792	10	.0010	.9990
22	9782	10	.0010	.9990

these results are not surprising since we have constant force for all ages leading to equal annual probabilities

(2) $T_x^* = \int_x^\infty l_z\,dz = \frac{10000}{.001} e^{-.001x} = \overbrace{10{,}000{,}000}^{10^7} e^{-.001x}$

$$Y_x^* = \int_x^\infty T_z^*\,dz = 10^{10} e^{-.001x}$$

$$L_x^* = \int_x^{x+1} l_z\,dz = 10^7 e^{-.001x}\left(-e^{-.001} + 1\right)$$

x	T_x^*	Y_x^*	L_x^*
20	9,801,987	9,801,986,733	9,797
21	9,792,190	9,792,189,646	9,787
22	9,782,402	9,782,402,351	9,778