

# Solution # 13

30% smokers      70% non-smokers

$$\mu = .2$$

$$\mu = .1$$

constant mortality

75<sup>th</sup> percentile  $\Rightarrow t q_x = .75$  or  $t p_x = .25$   
future lifetime

Constant force  $\rightarrow t p_x = e^{-\mu t}$

$$\text{Smoker } t p_x^{(SS)} = e^{-.2t}$$

$$\text{non-smoker } t p_x^{(N)} = e^{-.1t}$$

$$.25 = .3 e^{-.2t} + .7 e^{-.1t}$$

$$.25 = .3 (e^{-.1t})^2 + .7 e^{-.1t}$$

substitute  $x = e^{-.1t}$

$$.25 = .3 x^2 + .7 x$$

$$.3 x^2 + .7 x - .25 = 0$$

use quadratic equation

$$x = e^{-.1t} \quad x = .3146$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$.3146 = e^{-.1t}$$

$$= \frac{-.7 \pm \sqrt{.7^2 - (4)(.3)(-.25)}}{2(.3)}$$

$$t = -10 \ln(.3146)$$

$$t = 11.56$$

$$\Rightarrow x = \underline{.3146} \text{ or } -2.648$$