Example (Slide 11)

$(18, 0.1)$

$$P(X=2) = \binom{18}{2} 0.1^2 (1-0.1)^{18-2}$$

$$= 0.284$$

$$P(X \geq 4) = 1 - P(X \leq 3) =$$

$$= 1 - \binom{18}{3} 0.1^3 (1-0.1)^{18-3} =$$

$$= 0.832$$

$$E[x] = \sum x_i p(x_i) = \sum(1 \times p + 0 \times (1-p))$$

$$\sum_{i=1}^{n} p = np$$

$$Var[x] = E[x^2] - (E[x])^2 =$$

$$= np - n^2p^2 = np(1-p)$$

Problem 9.1

$E[x] = 7$

$Var(x) = 2.1$

$P(x > 12)$?

$np = 7$

$$np(1-p) = 2.1 \Rightarrow (1-p) = \frac{2.1}{7} = 0.3 \Rightarrow$$

$p = 0.7$

$$np = 7 \Rightarrow n = \frac{7}{0.7} = 10$$

$$P(x=4) = \binom{10}{4} 0.7^4 (1-0.7)^{10-4} = 0.037$$

Problem 9.2

1) $\bar{T} = \frac{1}{p} = \frac{1}{0.05} = 20$ yrs

$P(H > 8) = 1 - P(H \leq 8) = 1 - 0.95^{20}$

$= 0.3585$

2) $P(T > 3) = 1 - P(T \leq 3) =$

$= 1 - \sum_{n=1}^{3} (1 - 0.05)^{n-1} 0.05 = 0.8574$

3) $P(T=5 \mid T > 3) = \frac{P(T=5)}{P(T>3)}$

$= \frac{0.95^{5-1} \, 0.05^{1}}{0.8574} = 0.048$

Problem 9.3

1) $p = \frac{1}{T} = \frac{1}{50} = 0.02$

$P(T=5) = 0.98^{5-1}(1-0.98) = 0.018$

2) $P(T \leq 5) = \sum_{n=1}^{5} p\,(1-p)^{n-1}$

$= \sum_{n=1}^{5} (0.02)(0.98)^{n-1} = 0.096$