$$E[X] = \sum_k k \cdot P(X=k)$$

Note Title 9/1/2011

$$E[g(X)] = \sum_k g(k) \cdot P(X=k)$$

- $F_{X|Y}(x|y) = F_{XY}(x,y)/F_Y(y)$

$$P(X \le x \mid Y \le y) = \frac{P(X \le x, Y \le y)}{P(Y \le y)} =$$

$$P(X \ge E[X]) \le 1$$

$P(\mu - x \le L \le \mu + x) = 0.75$

r.v. L : document length , $\mu = 1000$

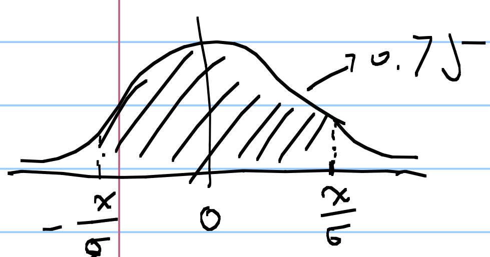
$L \sim N(1000, 200^2)$ $\sigma = 200$

Q : value of x

r.v. $Z = \dfrac{L - 1000}{200} \sim N(0,1)$

$P(\mu - x \le \sigma Z + \mu \le \mu + x)$

$= P\left(-\frac{x}{\sigma} \le Z \le \frac{x}{\sigma}\right) = 0.75$ $\Phi(x) = P(Z \le x)$



$\Rightarrow P\left(Z \le -\frac{x}{\sigma}\right) = \dfrac{1 - 0.75}{2} = 0.125$

or $P\left(Z \le \frac{x}{\sigma}\right) = 0.875$

from table $\Rightarrow -\frac{x}{\sigma} = -1.2$

$\Rightarrow x = 1.2 \times 200 = 240$

$E[X_i] = 0.5 \quad Var[X_i] = \sigma^2 = \frac{1}{12}$

$$\underbrace{P(\sum_{i=1}^{10} X_i > 7)} = P\left(\frac{\sum_{i=1}^{10} X_i - 5}{\sqrt{10(1/12)}} > \frac{7-5}{\sqrt{10(1/12)}}\right)$$

$$Y = \frac{X_1 + X_2 + \cdots + X_n - n\mu}{\sigma\sqrt{n}} = \frac{\Sigma X_i - 5}{\sqrt{10/12}} \sim N(0,1)$$

$$= P\left(Y > \frac{7-5}{\sqrt{10/12}}\right) = 1 - P\left(Y \le \frac{2}{\sqrt{10/12}}\right)$$

$$= 1 - \Phi\left(\frac{2}{\sqrt{10/12}}\right) = 1 - \Phi(2.19) = \Phi(-2.19) = \underline{0.014}$$

$$P(A|B) = \frac{P(AB)}{P(B)}$$

Q: $P(X=1 | Y=1)$? $P(X=2 | Y=1)$?

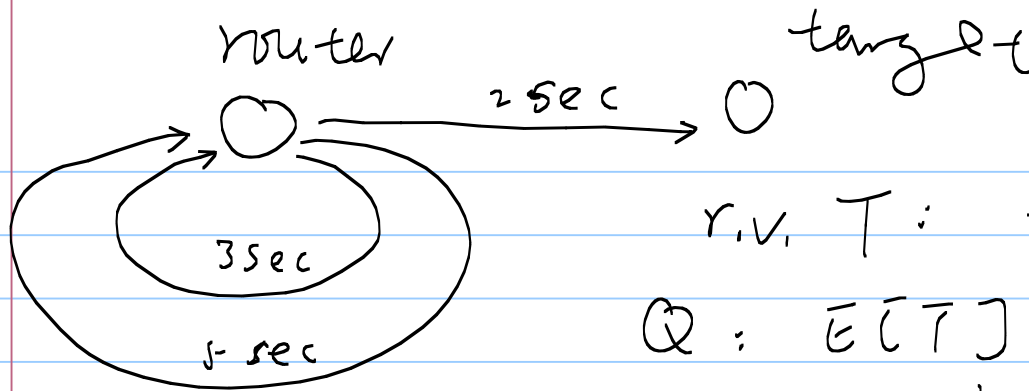
$$P(X=1 | Y=1) = \frac{P(X=1, Y=1)}{P(Y=1)} = \frac{P(1,1)}{}$$

- $Y=X_1+X_2+\cdots+X_N$

fix $N=n$ $Y = X_1 + \cdots + X_n$

$$E_X[Y | N=n] = E[X] \cdot n$$

$$E[Y] = E_N\left[E_X[Y | N=n] \right] = E_N\left[n \cdot E[X] \right] = E[X] \cdot E[N]$$



r.v. T : time to reach target

Q : $E[T]$?

r.v. F : path it takes at first step

$F = \{1, 2, 3\}$

$E[T \mid F=1] = 2$, $E[T \mid F=2] = 3 + E[T]$

$E[T \mid F=3] = 5 + E[T]$

$$E[T] = E[T \mid 1] \cdot P(F=1) + E[T \mid 2] \cdot P(F=2) + E[T \mid 3] \cdot P(F=3)$$

$$= \Big(2 + (3 + E[T]) + (5 + E[T]) \Big) / 3$$

$\Rightarrow$ $E[T] = 10$ sec