Engr 371 - W - 2012

A = actual threat
T = threat reported

#1) $P(T|A) = 0.8$ $\quad P(T'|A) = 0.2$

$P(T'|A') = 0.9$ $\quad P(T|A') = 0.1$

$P(A) = 0.6$ $\quad P(A') = 0.4$

a) $P(T) = P(T|A)P(A) + P(T|A')P(A')$

$= (0.8)(0.6) + (0.1)(0.4)$

$= 0.48 + 0.04 = 0.52$ ∴

b) $P(A|T) = \dfrac{P(T|A)P(A)}{P(T)} = \dfrac{(0.8)(0.6)}{(0.5)} = 0.92$ ∴

C & D $\longrightarrow P(A) = 1 \longrightarrow P(A') = 0$

c) $P(T) = P(T|A)P(A) + P(T|A')P(A')$

$= (0.8)(1) + (0.1)(0) = 0.8$ ∴

d) $P(x \geq 1) = P(x=1) + P(x=2)$ or $1 - P(x<1)$ or $1 - P(x=0)$

x = camera threat found

$n = 2$ # of cameras

$p = 0.8$

$1 - \binom{2}{x} 0.8^x 0.2^{2-x} = 1 - \binom{2}{0} 0.8^0 0.2^2 = 1 - 0.04$

$= 0.96$ ∴

#2) a) $\mu = 10 \quad \sigma = 16$

A? $\quad P(X > A) = 0.7$

$$z = \frac{x-10}{\sqrt{16}} = \frac{x-10}{4} \qquad P\left(Z > \frac{A-10}{4}\right) = 0.7$$

$$P(Z > z) = 1 - \phi z$$

$$1 - \phi\left(\frac{A-10}{4}\right) = 0.7 \qquad \phi\left(\frac{A-10}{4}\right) = 0.3$$

From table $\quad \frac{A-10}{4} = 0.52$ $\quad A = 7.92\ldots$

b) $g(x) = \begin{cases} kx & 0 < x < 10 \\ 0 & \text{elsewhere} \end{cases}$

$$\int_{-\infty}^{\infty} f(x)\,dx = 1 \longrightarrow \int_{0}^{10} kx\,dx = 1 \qquad \frac{kx^2}{2}\Big|_0^{10} = 1$$

$$\left[\frac{100k}{2} - 0\right] = 1 \longrightarrow 100k = 2 \longrightarrow k = \frac{1}{50}\ldots$$

c) $P(5 < X < 10) = P(x=6) + P(x=7) + P(x=8) + P(x=9)$

$$\int_5^{10} f(x)\,dx \longrightarrow \int_5^{10} \frac{1}{50}x\,dx = \frac{x^2}{100}\Big|_5^{10} = \left[\frac{100}{100} - \frac{25}{100}\right] = 0.75\ldots$$

#3) $p = 0.1$

$r = 1$

$x = \#\text{parts}$

$$\binom{x-1}{r-1} p^r (1-p)^{x-r}$$

a) $P(14 \le x \le 15) = P(x=14) + P(x=15)$

~~$\binom{x-1}{0}(0.1)^1 (0.9)^{x-1}$~~ $= f(x)$

$f(x) = (0.1)(0.9)^{x-1}$

$P(14 \le x \le 15) = (0.1)(0.9)^{13} + (0.1)(0.9)^{14} = 0.0483 \therefore$

b) $\mu = \frac{r}{p} \longrightarrow \frac{1}{0.1} = 10 \therefore$

c) $p = 0.1$

$r = 2$

$x = \#\text{parts}$

$$\binom{x-1}{1}(0.1)^2 (0.9)^{x-2}$$

$P(14 \le x \le 15) = P(x=14) + P(x=15)$

$f(x) = (x-1)(0.1)^2 (0.9)^{x-2}$

$P(14 \le x \le 15) = f(14) + f(15)$

$= (13)(0.1)^2 (0.9)^{12} + (14)(0.1)^2 (0.9)^{13}$

$= 0.0723 \therefore$

d) Z w/ pmf $f(z)$ μ of Z

$\mu = \sum_z f(z) = (-1)(0.1) + (0)(0.4) + (1)(0.2) + (2)(0.3)$

$= 0.7 \therefore$