# Poisson Dist.

Note Title 10/13/2008

$$p(y) = \frac{\lambda^y e^{-\lambda}}{y!} \qquad y = 0, 1, 2, \ldots$$

$$\sum_{y=0}^{\infty} p(y) = \sum_{y=0}^{\infty} \frac{\lambda^y e^{-\lambda}}{y!} = e^{-\lambda} \underbrace{\sum_{y=0}^{\infty} \frac{\lambda^y}{y!}}_{= e^{\lambda}}$$

$$= e^{-\lambda} \cdot e^{\lambda} = 1$$

$$\mu = E(Y) = \lambda$$

$$\sigma^2 = V(Y) = \lambda$$

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$$E(Y) = \sum_y y \cdot p(y)$$

$$= \sum_{y=1}^{\infty} \cancel{y} \cdot \frac{\lambda^y e^{-\lambda}}{\cancel{y!}\ (y-1)!} = \sum_{y=1}^{\infty} \lambda \cdot \frac{\lambda^{y-1} e^{-\lambda}}{(y-1)!}$$

$$z = y - 1$$

$$= \lambda \underbrace{\sum_{z=0}^{\infty} \frac{\lambda^z e^{-\lambda}}{z!}}_{1} = \lambda$$

(5.) half-hour = time frame. $Y$ = # of visits made to a location in 30 minutes.

$\lambda = 1$

(a) $P(Y=0) = 0.3679$

(b) $P(Y=1) = 0.3679$

(c) $P(Y=2) = 0.1837$

(d) $P(Y \geq 1) = 1 - P(Y=0) = 1 - 0.3679$

$= 0.6321$

(6.) $\lambda = 5$ per sq. foot

(a) $P(Y=0) = 0.0067$

(b) Each of the 10 areas are independent.

$P(Y=0)$ In each is $0.0067$

$P(Y=0)$ in all is $(P(Y=0))^{10} = (0.0067)^{10}$

(c) For this to happen, at least one out of the 10 has to be larger than 0.

This is the complement event from part (b).

$1-(P(Y=0))^{10} = 1-(0.0067)^{10}$

(d) 3 out of 10 have to be $Y \geq 1$

7 out of 10 have to be $Y=0$

$\binom{10}{7}(0.0067)^7(1-0.0067)^3$

$= 7.4142 \times 10^{-14}$