Binominal

$P(x=k) = C_k^n \cdot p^k \cdot q^{n-k} = \frac{n!}{k!(n-k)!} \cdot p^k \cdot q^{n-k}$ Mean $= \mu = np$ Variance : $\sigma^2 = n \cdot p \cdot q$

Standard deviation: $\sigma = \sqrt{n \cdot p \cdot q}$

Poisson $P(x=k) = \frac{\mu^k \cdot e^{-\mu}}{k!}$

Mean: $E(x) = \mu$ Variance : $\sigma^2 = \mu$

Standard deviation : $\sigma = \sqrt{\mu}$

Hypergeometric

$P(x=k) = \frac{C_k^M \cdot C_{n-k}^{N-M}}{C_n^N}$

Mean: $\mu = n\left(\frac{M}{N}\right)$

M → successes

N−M → failures

Variance : $\sigma^2 = n\left(\frac{M}{N}\right)\left(\frac{N-M}{N}\right)\left(\frac{N-n}{N-1}\right)$

n → size of the random sample space

Variance of a Sample

$s^2 = \frac{\sum(x_i - \bar{x})^2}{n-1} = \frac{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}{n-1}$

Variance of Population

$\sigma^2 = \frac{\sum(x_i - \mu)^2}{N}$

Correlation coefficient : $r = \frac{s_{xy}}{s_x \cdot s_y}$

Covariance ; $s_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{n-1}$

or

$s_{xy} = \frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{n-1}$

Regression line: $y = a + bx$

$b = r\frac{s_y}{s_x}$, $a = \bar{y} - b\bar{x}$

Normal Distribution , $N(\mu, \sigma^2)$: $f(x) = \frac{1}{\sigma\sqrt{2\pi}} \cdot e^{\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$ for $-\infty < x < \infty$

$P(a < X < b) = \int_b^a f(x).dx$

Standardizing the value x

$z = \frac{x-\mu}{\sigma}$, or in a sample , $z = \frac{x - \bar{x}}{s}$

Session 2) $\mu = 3$ hours $\sigma = 0.30$ hours $\mu =$

a) $P(x = 3.3) =$ $z = \frac{3.3 - 3}{0.30} = 1$

$P(x < 3) = 0.8485$

$P(x > 3) = 1 - 0.84 = 0.15$

$P(3 < x < 3.3) = 0.84 - 0.5 = \underline{0.34}$

b) $z = \frac{3.6 - 3}{0.30} = 2$

$P(x\ 3.6) = 0.97$

$P(x > 3.6 = 1 - 0.97 = 0.026$

c) $z_1 = \frac{2.4 - 3}{0.30} = -2$ $z_2 = \frac{3.3 - 3}{0.30} = 1$

$P(x < 2.4) = 0.2$

$P(x > 2.4) = 1 - 0.2 = 0.8$

$P(x < 3) = 0.8485$