Population Mean — standard deviation — variance

$$\mu = \frac{\sum_{N}^{i=1} x_i}{N} \qquad \sigma = \sqrt{\frac{\sum (x-\mu)^2}{N}} \qquad \sigma^2 = \frac{\sum (x-\mu)^2}{N}$$

Sample Mean — standard deviation — variance

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

p^{th} percentile position: (p/100) (n+1)

Probability

Complement of Event A: $P(A^c) = P(not\ A) = 1 - P(A)$

For mutually exclusive outcomes: $P(A\ or\ B) = P(A \cup B) = P(A) + P(B)$

Where not mutually exclusive: $P(A\ or\ B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$

For Independent outcomes: $P(A\ and\ B) = P(A \cap B) = P(A)P(B)$

For dependent outcomes: $P(A\_and\_B) = P(A) * P(B/A)$

Normal Distribution

$$z = \frac{x-\mu}{\sigma} \qquad f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-u)^2/2\sigma^2}$$

Lognormal Distribution

$X = \ln Y$, $Y = e^X$

$$f(x) = \frac{1}{\sigma x\sqrt{2\pi}} e^{-\frac{1}{2\sigma^2}(\ln x-\mu)^2} \qquad E(Y) = e^{\mu + \frac{1}{2}\sigma^2} \qquad V(Y) = e^{2\mu+2\sigma^2} - e^{2\mu+\sigma^2}$$

Combinations

$$\binom{n}{x} = nCx = \frac{n!}{x!(n-x)!}$$

Permutations

$$nPx = \frac{n!}{(n-x)!}$$

Binomial – $p(x) = \binom{n}{x} p^x (1-p)^{n-x}$ $\quad \boldsymbol{\mu} = np \quad \sigma^2 = np(1-p)$

Hypergeometric $p(x) = \dfrac{\binom{r}{x}\binom{N-r}{n-x}}{\binom{N}{n}}$

Poisson $P(X = x) = \dfrac{e^{-\lambda}\lambda^x}{x!}$ $\quad \boldsymbol{\mu} = \lambda = np \quad \boldsymbol{\mu} = \boldsymbol{\sigma}^2$

Exponential $f(x) = \lambda e^{-\lambda x}$ $\quad F(x) = 1 - e^{-\lambda x}$

$\mu_x = 1/\lambda = \boldsymbol{\theta}$ $\quad \sigma_x^2 = 1/\lambda^2 = \mu_x^2$