- **Sample Mean**: $\bar{X} = \dfrac{\sum X_k}{n}$

Variance:

$$s^2 = \frac{\sum (X_i - \bar{X})^2}{n-1} = \frac{\sum x^2 - n\left(\bar{X}\right)^2}{n-1}$$

- **Locating Percentiles:** $P\alpha$

$$R\alpha = \frac{\alpha}{100}(n+1) = i.d$$

$$P\alpha = X_{(i)} + d\left(X_{(i+1)} - X_{(i)}\right)$$

- **Coefficient of variation**: $v = s/\bar{X}$
- **Coefficient of skew ness**:

$$SK = \frac{3(\bar{X} - m)}{s}$$

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

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A^{\backslash}) = 1 - P(A)$$

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

$$P(A_1 \cap A_2 \cdots A_{k-1} \cap A_k) =$$

$$P(A_1)\,P(A_2|A_1)\,P(A_3|A_1 \cap A_2)\cdots P(A_k|A_1 \cap A_2 \cdots A_{k-1})$$

- **Total Rule of Probability:**

$$P(A) = \sum_{i=1}^{k} P(A|B_i)P(B_i)$$

- **Bayes'Rule:**

$$P(A|B_r) = \frac{P(A|B_r)P(B_r)}{P(A)} = \frac{P(A|B_r)P(B_r)}{\sum_{i=1}^{k} P(A|B_i)P(B_i)}$$

$$E(X) = \sum x f(x) \text{ or } \int_{-\infty}^{\infty} x f(x)dx$$

$$\sigma^2 = \sum [x-\mu]^2 f(x) \text{ or } \int_{-\infty}^{\infty} [x-\mu]^2 f(x)dx$$

$$\sigma^2 = E(x^2) - [E(x)]^2$$

$$\mu_{g(x)} = E[g(x)] = \sum g(x)f(x) \text{ or } \int_{-\infty}^{\infty} g(x)f(x)dx$$

$$\sigma^2_{g(x)} = E[g(x) - \mu_{g(x)}]^2$$

$$F(X) = P(X \le x) = \sum_{t=-\infty}^{x} f(t) \text{ or } \int_{-\infty}^{x} f(t)dt$$

Binomial distribution

$$b(x;n,p) = \binom{n}{x} p^x q^{n-x},$$

$$\mu = np \quad, q = 1-p, \ \sigma^2 = npq$$

Poisson distribution

$$p(x;\lambda,t) = \Pr[X = x] = \frac{(\lambda t)^x e^{-\lambda t}}{x!},$$

$$E(X) = Var(X) = \lambda t$$

Geometric Distribution

$$g(x;p) = p\,q^{x-1}, \mu = \frac{1}{p}, \sigma^2 = \frac{q}{p^2},$$

Hypergeometric Distribution:

$$h(x,n,k,N) = P(X = x) = \frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}}$$

$$\mu = E(X) = \frac{nK}{N},$$

$$\sigma^2 = \frac{nK}{N}(1-\frac{K}{N})\left(\frac{N-n}{N-1}\right)$$

The gamma function

$$\Gamma(\alpha) = \int_0^{\infty} x^{\alpha-1} e^{-x} dx \ , \alpha > 0$$

$$\Gamma(n) = (n-1)\Gamma(n-1)$$

if n is positive integer, $\Gamma(n) = (n-1)!$

The Exponential Distribution:

$$f(x) = \begin{cases} \frac{1}{\beta} e^{-x/\beta}, & x > 0 \\ 0 & , o.w \end{cases}$$

$$\mu = \beta, \quad \sigma^2 = \beta^2$$

The gamma distribution

$$f(x) = \begin{cases} \frac{1}{\Gamma(\alpha)\beta^{\alpha}} x^{\alpha-1} e^{-x/\beta}, & x > 0 \\ 0 & , o.w \end{cases}$$

$$\mu = \alpha\beta, \ \sigma^2 = \alpha\beta^2$$