$F(x) = P(X \le x) = \sum_{t \le x} f(t)$, for $-\infty < x < \infty$

$P(a < X < b) = F(b) - F(a)$

$F(x) = P(X \le x) = \int_{-\infty}^{x} f(t)\,dt$, for $-\infty < x < \infty$

$\mu = E(X) = \sum_x xf(x)$

$\mu = E(X) = \int_{-\infty}^{\infty} xf(x)\,dx$

$f(x, y) \ge 0$ for all (x, y)

$\sum_x \sum_y f(x, y) = 1$

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f(x, y)\,dxdy = 1$$

$g(x) = \sum_y f(x, y)$

$$h(y) = \sum_x f(x, y)$$

$$g(x) = \int_{y=-\infty}^{\infty} f(x, y)dy$$

$h(y) = \int_{x=-\infty}^{\infty} f(x, y)dx$

$P(X = x, Y = y) = P(X = x) \times P(Y = y)$

$f(x, y) = f(x)_X \times f(y)_Y$

$f(x, y) = g(x)h(y)$

$$f(y|x) = \frac{P(X = x, \ Y = y)}{P(X = x)}$$

or

$$f(y|x) = \frac{f(x, \ y)}{g(x)}$$

$P(X = x, Y = y) = P(X = x) \times P(Y = y)$

$f(x, y) = f(x)_X \times f(y)_Y$

$\mu_g(X,Y) = E[g(X, Y)] = \sum_x \sum_y g(x, y)f(x, y)$

$\mu_g(X,Y) = E[g(X, Y)] = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} g(x, y)f(x, y)dx\,dy$

$E(Y|X) = \int_{y=-\infty}^{y=+\infty} yf(y|x)dy$

$E(X|Y) = \int_{x=-\infty}^{x=+\infty} xf(x|y)dx$

$E(Y) = \sum_y \sum_x yf(x, y) = \sum_y yh(y)$

$E(Y) = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} yf(x, y)dx\,dy = \int_{-\infty}^{+\infty} yh(y)$

$E(X) = \sum_x \sum_y xf(x, y) = \sum_x xg(x)$

$E(X) = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} xf(x, y)dx\,dy = \int_{-\infty}^{+\infty} xg(x)$

$E(X) = \sum_x \sum_y xf(x, y) = \sum_x xg(x)$

$E(X) = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} xf(x, y)dx\,dy = \int_{-\infty}^{+\infty} xg(x)$

$E(Y) = \sum_y \sum_x yf(x, y) = \sum_y yh(y)$

$E(Y) = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} xf(x, y)dx\,dy = \int_{-\infty}^{+\infty} yh(y)$

$\mu_g(X) = E[g(X)] = \sum_x g(x)f(x)$

$\mu_g(X) = E[g(X)] = \int_{-\infty}^{+\infty} g(x)f(x)$

$\sigma^2 = E[(X - \mu)^2] = \Sigma\,(x - \mu)^2 f(x)$

$\sigma^2 = E[(X - \mu)^2] = \int_{x=-\infty}^{x=+\infty} (x - \mu)^2 f(x)\,dx$

$\sigma^2 = E(X^2) - \mu^2$ or $\sigma^2 = E(X^2) - \{E(X)\}^2$

$$\sigma_{XY} = E\,[(X - \mu_X)(Y - \mu_Y)] \\ = \sum_x \sum_y (x - \mu_X)(y - \mu_Y)\,f(x, y)$$

$$\sigma_{XY} = E[(X - \mu_X)(Y - \mu_Y)] \\ = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} (x - \mu_x)(y - \mu_Y)\,f(x, y)\,dx\,dy$$

$\sigma_{XY} = E(XY) - \mu_x\mu_Y$

$SST = \sum_{i=1}^{k}\sum_{j=1}^{n} (y_{ij} - \bar{y}_{i..})^2$

$SSA = n\sum_{i=1}^{k} (\bar{y}_{i.} - \bar{y}_{i..})^2$

$SSE = \sum_{i=1}^{k}\sum_{j=1}^{n} (y_{ij} - \bar{y}_{i.})^2$

$$s_1^2 = \frac{SSA}{k-1}$$

$$s^2 = \frac{SSE}{k(n-1)}$$

$$f_{cal} = \frac{s_1^2}{s^2}$$

$f_{tab} = f_\alpha[k - 1, k(n - 1)]$

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2}\sqrt{n(\sum y^2) - (\sum y)^2}}$$

$$t_{cal} = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$$

$\hat{y} = b_0 + b_1 x$

$$b_1 = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$b_0 = \bar{y} - b_1\bar{x}$

$$b_0 = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$$

$$t_{cal} = \frac{\bar{d} - \mu_d}{\frac{s_d}{\sqrt{n}}}$$