Formula Sheet

$$\bar{x} = \frac{\sum x}{n} = \frac{\sum xf}{n}$$

$$SS(x) = \sum (x-\bar{x})^2 = \sum x^2 - n(\bar{x})^2 = \sum x^2 - \frac{(\sum x)^2}{n} = \sum x^2 f - \frac{(\sum xf)^2}{n}$$

$$s^2 = \frac{SS(x)}{n-1} \qquad s = \sqrt{s^2} \qquad z = \frac{x-\mu}{s}$$

Chebyshev's Theorem: $1 - \frac{1}{y^2}$

$$SS(xy) = \sum (x-\bar{x})(y-\bar{y}) = \sum xy - \frac{(\sum x)(\sum y)}{n}$$

$$SSE = \sum (y-\hat{y})^2$$

$$b_1 = \frac{SS(xy)}{SS(x)} = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2} \qquad b_0 = \frac{\sum y - (b_1 \cdot \sum x)}{n} = \bar{y} - (b_1 \cdot \bar{x})$$

$$r = \frac{SS(xy)}{\sqrt{SS(x)SS(y)}}$$

$${}_nP_k = \frac{n!}{(n-k)!} \qquad {}_nC_k = \frac{{}_nP_k}{k!} = \frac{n!}{(n-k)!\,k!}$$

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

Law of Total Probability: $P(B) = P(B|A_1)P(A_1) + P(B|A_2)P(A_2) + \ldots + P(B|A_k)P(A_k)$

Bayes' Theorem: $P(A_j|B) = \frac{P(B|A_j)P(A_j)}{P(B)} = \frac{P(B|A_j)P(A_j)}{\sum_{i=1}^{k} P(B|A_i)P(A_i)}$

$$\mu = \sum xP(x) \qquad E(x) = n \cdot p$$

$$\sigma^2 = \sum (x-\mu)^2 P(x) = \sum x^2 P(x) - \mu^2 \qquad \sigma^2 = n \cdot p \cdot q \qquad \sigma = \sqrt{\sigma^2}$$

$$P(x) = {}_nC_x p^x q^{n-x} \qquad P(x) = \frac{\mu^x e^{-\mu}}{x!} \qquad P(x) = \frac{{}_MC_x \ \cdot \ {}_{(N-M)}C_{(n-x)}}{{}_NC_n}$$

$$y = f(x) = \frac{e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}}{\sigma\sqrt{2\pi}}$$

$$\sigma_{\overline{x}} = \frac{\sigma_x}{\sqrt{n}} \qquad E = z(\alpha/2) \cdot \sigma_{\overline{x}}$$

$$p' = \frac{x}{n} \qquad \mu_{p'} = p \qquad \sigma_{p'} = \sqrt{\frac{p(1-p)}{n}} \qquad E = z(\alpha/2) \cdot \sqrt{\frac{p'(1-p')}{n}}$$

$$n = (z(\alpha/2))^2 \cdot \frac{p(1-p)}{E^2} \qquad z = \frac{p' - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

$$df = n-1 \qquad E = t(\alpha/2) \cdot \frac{s}{\sqrt{n}} \qquad t = \frac{\overline{x} - \mu}{s/\sqrt{n}}$$

$$\overline{d} = \frac{\sum d}{n} = \overline{x_1} - \overline{x_2} \qquad \mu_{\overline{d}} = \mu_d \qquad s_d = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}} \qquad E = t(\alpha/2) \cdot \frac{s_d}{\sqrt{n}} \qquad t = \frac{\overline{d} - \mu_d}{s_d/\sqrt{n}}$$

$$\mu_{\overline{x_1} - \overline{x_2}} = \mu_{x_1} - \mu_{x_2} \qquad s_{\overline{x_1} - \overline{x_2}} = \sqrt{\frac{{s_1}^2}{n_1} + \frac{{s_2}^2}{n_2}} \qquad E = t(\alpha/2) \cdot s_{\overline{x_1} - \overline{x_2}} \qquad t = \frac{(\overline{x_1} - \overline{x_2}) - (\mu_1 - \mu_2)}{s_{\overline{x_1} - \overline{x_2}}}$$

$$df = \frac{\left(\frac{{s_1}^2}{n_1} + \frac{{s_2}^2}{n_2}\right)^2}{\frac{{s_1}^4}{{n_1}^2(n_1-1)} + \frac{{s_2}^4}{{n_2}^2(n_2-1)}}$$

$$E = z(\alpha/2)\sqrt{\frac{{p_1}'(1-{p_1}')}{n_1} + \frac{{p_2}'(1-{p_2}')}{n_2}} \qquad {P_p}' = \frac{x_1 + x_2}{n_1 + n_2} \qquad z = \frac{{p_1}' - {p_2}'}{\sqrt{{P_p}'(1-{P_p}')\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$\chi^2 = \sum \frac{(f_i - e_i)^2}{e_i} \qquad df = k-1$$