Pooled-Variance *t* Test for the Difference Between Two Means

$$t_{STAT} = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad \textbf{(10.1)}$$

Confidence Interval Estimate for the Difference Between the Means of Two Independent Populations

$$(\overline{X}_1 - \overline{X}_2) \pm t_{\alpha/2}\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \quad \textbf{(10.2)}$$

or

$$(\overline{X}_1 - \overline{X}_2) - t_{\alpha/2}\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \le \mu_1 - \mu_2 \le (\overline{X}_1 - \overline{X}_2) + t_{\alpha/2}\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

Paired *t* Test for the Mean Difference

$$t_{STAT} = \frac{\overline{D} - \mu_D}{\frac{S_D}{\sqrt{n}}} \quad \textbf{(10.3)}$$

Confidence Interval Estimate for the Mean Difference

$$\overline{D} \pm t_{\alpha/2}\frac{S_D}{\sqrt{n}} \quad \textbf{(10.4)}$$

or

$$\overline{D} - t_{\alpha/2}\frac{S_D}{\sqrt{n}} \le \mu_D \le \overline{D} + t_{\alpha/2}\frac{S_D}{\sqrt{n}}$$

Z Test for the Difference Between Two Proportions

$$Z_{STAT} = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1 - \bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (10.5)$$

F Test Statistic for Testing the Ratio of Two Variances

$$F_{STAT} = \frac{S_1^2}{S_2^2} \quad (10.7)$$

χ^2 Test for the Difference Between Two Proportions

$$\chi^2_{STAT} = \sum_{\text{all cells}} \frac{(f_o - f_e)^2}{f_e} \quad (11.1)$$

Computing the Estimated Overall Proportion for c Groups

$$\bar{p} = \frac{X_1 + X_2 + \cdots + X_c}{n_1 + n_2 + \cdots + n_c} = \frac{X}{n} \quad (11.3)$$

Confidence Interval Estimate for the Difference Between Two Proportions

$$(p_1 - p_2) \pm Z_{\alpha/2}\sqrt{\left(\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}\right)} \quad (10.6)$$

or

$$(p_1 - p_2) - Z_{\alpha/2}\sqrt{\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}} \leq (\pi_1 - \pi_2) \leq (p_1 - p_2) + Z_{\alpha/2}\sqrt{\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}}$$

Computing the Estimated Overall Proportion for Two Groups

$$\bar{p} = \frac{X_1 + X_2}{n_1 + n_2} = \frac{X}{n} \quad (11.2)$$

Computing the Expected Frequency

$$f_e = \frac{\text{Row total} \times \text{Column total}}{n} \quad (11.4)$$