**Hypothesis testing – population mean**

$$z = \frac{\bar{x} - \mu_0}{\sigma}\sqrt{n}$$

$$z = \frac{\bar{x} - \mu_0}{s}\sqrt{n}$$

$$t = \frac{\bar{x} - \mu_0}{\hat{s}}\sqrt{n}$$

**Hypothesis testing - population proportion**

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1 - p_0)}{n}}}$$

**Hypothesis testing - population variance**

$$\chi^2 = \frac{(n-1)\hat{s}^2}{\sigma_0^2}$$

**Hypothesis testing – two population means**

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - 1)\hat{s}_1^2 + (n_2 - 1)\hat{s}_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

**Hypothesis testing – two population proportions**

$$\bar{p} = \frac{m_1 + m_2}{n_1 + n_2}$$

$$n = \frac{n_1 \times n_2}{n_1 + n_2}$$

$$z = \frac{\frac{m_1}{n_1} - \frac{m_2}{n_2}}{\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}}$$

**Hypothesis testing – two population variances**

$$F = \frac{\hat{s}_1^2}{\hat{s}_2^2}$$

**$\chi^2$ independence test**

$$\chi^2 = \sum \frac{(observed - expected)^2}{expected}$$

$$v = (number\ of\ rows - 1) \times (number\ of\ columns - 1)$$

**$\chi^2$ goodness of fit test**

$$\chi^2 = \sum \frac{(observed - expected)^2}{expected}$$

$$v = r - k - 1$$

where r = number of classes, k = number of parameters estimated from the sample