

Formulas for Exam #4

* Z-test:
$$Z = \frac{\bar{X}_1 - \bar{X}_2 - (u_1 - u_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

C.I.
$$\left(\bar{X}_1 - \bar{X}_2 - Z_{\alpha/2} \cdot \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}, \bar{X}_1 - \bar{X}_2 + Z_{\alpha/2} \cdot \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \right)$$

* T-test:
$$t = \frac{\bar{X}_1 - \bar{X}_2 - (u_1 - u_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

C.I.
$$\left(\bar{X}_1 - \bar{X}_2 - t_{\alpha/2} \cdot \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}, \bar{X}_1 - \bar{X}_2 + t_{\alpha/2} \cdot \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \right)$$

* proportion-test:
$$Z = \frac{\hat{p}_1 - \hat{p}_2 - (p_1 - p_2)}{\sqrt{\bar{p} \cdot \bar{q} \cdot \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}, \quad \bar{p} = \frac{X_1 + X_2}{n_1 + n_2}$$

C.I.
$$\left(\hat{p}_1 - \hat{p}_2 - Z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}, \hat{p}_1 - \hat{p}_2 + Z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}} \right)$$

* Chi-square test:
$$\chi^2 = \sum_{i=1}^m \frac{(O_i - E_i)^2}{E_i}, \quad \begin{array}{l} E_i: \text{expected outcome} \\ O_i: \text{observed outcome} \end{array}$$

* t-test for the correlation coefficient r:

$$t = r \cdot \sqrt{\frac{n-2}{1-r^2}} \quad \text{with d.f.} = n-2.$$