Summary of Useful Equations

Chapter 8

Chi-square:

$$X^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

Degrees of Freedom:

$$\text{df} = (\#\text{ of categories}) - 1 - (\#\text{ of estimated parameters})$$

Expected counts in a two-way contingency table:

$$E = \frac{(\text{row total}) \times (\text{column total})}{(\text{table total}})$$

Degrees of Freedom in a two-way contingency table:

$$\text{df} = (\#\text{ of rows} - 1)(\#\text{ of columns} - 1)$$

Chapter 9

One-way ANOVA:

$$\begin{aligned}
g &= \text{number of groups} \\
n_i &= \text{sample size of the } i\text{th sample} \\
N &= \text{combined sample size} \\
\bar{x}_i &= \text{sample mean of the } i\text{th sample} \\
\bar{x} &= \text{grand mean} \\
SS_{\text{among}} &= \sum_{i=1}^{g} n_i(\bar{x}_i - \bar{x})^2 \\
SS_{\text{within}} &= \sum_{i=1}^{g} (n_i - 1)s_i^2 \\
df_{\text{among}} &= g - 1 \\
df_{\text{within}} &= N - g \\
MS_{\text{among}} &= SS_{\text{among}}/df_{\text{among}} \\
MS_{\text{within}} &= SS_{\text{within}}/df_{\text{within}} \\
F &= MS_{\text{among}}/MS_{\text{within}} \\
\hat{\sigma} &= \sqrt{MS_{\text{within}}}
\end{aligned}$$

Chapter 10

Correlation Coefficient:

$$r = \frac{1}{n-1} \sum_{i=1}^{n} \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)$$

Simple Linear Regression:

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

$$b_1 = r \frac{s_y}{s_x}$$

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