1 Some useful formulæ

1.1 Chapter 6

margin of error: \[ m = z^*(\frac{\sigma}{\sqrt{n}}) \]

Where \( z^* \) is the critical z-value (bottom of table D)

test statistic: For \( H_0 : \mu = \mu_0 \):
\[ z = \frac{(\bar{x} - \mu_0)}{\frac{\sigma}{\sqrt{n}}} \]

1.2 Chapter 7

margin of error for the mean of a single population:
\[ m = t^* \times SE_{\bar{x}}, \text{ where} \]
\[ SE_{\bar{x}} = \frac{s}{\sqrt{n}} \quad \text{and} \]
\( t^* \) is the critical t-value for (n-1) degrees of freedom for the appropriate confidence level (table D) and \( s \) is the sample standard deviation.

test statistic for the mean of a single population: For \( H_0 : \mu = \mu_0 \):
\[ t = \frac{(\bar{x} - \mu_0)}{SE_{\bar{x}}} \]

Where \( t \) follows the Student’s t-distribution with (n-1) degrees of freedom

margin of error for the difference in means (two populations): for the estimated difference in means \( \mu_1 - \mu_2 \) approximated by \( \bar{x}_1 - \bar{x}_2 \):
\[ m = t^* \times \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \]

where \( t^* \) is the critical t-value for the appropriate degrees of freedom (table D) and \( s_1, s_2 \) are the sample standard deviations.

test statistic for the difference in means in two populations

Where \( H_0 : \mu_1 = \mu_2 \):
\[ t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \]

were the degrees of freedom can either be taken as the smaller of \( n_1 - 1 \) and \( n_2 - 1 \), or calculated by software.
1.3 Chapter 8

Large Sample Confidence interval for a Population Proportion

\[ SE_\hat{p} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \]
\[ m = z^* \times SE_\hat{p} \]
and where \( \hat{p} = \frac{X}{n} \) is the sample proportion.

Large Sample Significance Test for a Population Proportion

\[ H_0: p = p_0 \]
\[ z = \frac{\hat{p} - p_0}{SE_\hat{p}} \]

Large-Sample Confidence Interval for Comparing Two Proportions

\[ m = z^* \times \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} \]
where \( \hat{p}_1 = \frac{X_1}{n_1} \) is the proportion of successes from population 1, and \( \hat{p}_2 = \frac{X_2}{n_2} \) is the proportion of successes from population 2.

Large Sample Significance Test for Comparing Two Proportions

The \( z \) test statistic for \( H_0: p_1 = p_2 \) is
\[ z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})(\frac{1}{n_1} + \frac{1}{n_2})}} \]
where \( \hat{p} \) is the pooled sample proportion
\[ \hat{p} = \frac{X_1 + X_2}{n_1 + n_2} \]

Please let me know of any typos or apparent errors in the above. Many thanks!
-Bob