Exam Formal Sheet

QUA 207 Fall 2018

Standard Error of the Mean

$$\sigma_{\overline{X}} = \frac{\sigma}{\sqrt{n}} \qquad \textbf{(7.3)}$$

Standard Error of the Proportion

$$\sigma_p = \sqrt{\frac{\pi(1-\pi)}{n}} \qquad \textbf{(7.7)}$$

Confidence Interval for the Mean (σ Known)

$$\overline{X} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

or

$$\overline{X} - Z_{\alpha/2}\frac{\sigma}{\sqrt{n}} \le \mu \le \overline{X} + Z_{\alpha/2}\frac{\sigma}{\sqrt{n}} \qquad \textbf{(8.1)}$$

Confidence Interval Estimate for the Proportion

$$p \pm Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$$

or

$$p - Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}} \le \pi \le p + Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}} \qquad \textbf{(8.3)}$$

Sample Size Determination for the Proportion

$$n = \frac{Z_{\alpha/2}^2\,\pi(1-\pi)}{e^2} \qquad \textbf{(8.5)}$$

***t* Test for the Mean (σ Unknown)**

$$t_{STAT} = \frac{\overline{X} - \mu}{\dfrac{S}{\sqrt{n}}} \qquad \textbf{(9.2)}$$

Z Test for the Proportion in Terms of the Number of Events of Interest

$$Z_{STAT} = \frac{X - n\pi}{\sqrt{n\pi(1-\pi)}} \qquad \textbf{(9.4)}$$

$$S_P^2 = \frac{(n_1-1)\ S_1^2 + (n_2-1)\ S_2^2}{(n_1-1) + (n_2-1)}$$

$$S_D^2 = \frac{\sum(D_i - \overline{D})^2}{(n-1)}, \quad \overline{D} = \frac{\sum D_i}{n}$$

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

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

or

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

Finding Z for the Sampling Distribution of the Mean

$$Z = \frac{\overline{X} - \mu_{\overline{X}}}{\sigma_{\overline{X}}} = \frac{\overline{X} - \mu}{\dfrac{\sigma}{\sqrt{n}}} \qquad \textbf{(7.4)}$$

Finding Z for the Sampling Distribution of the Proportion

$$Z = \frac{p - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}} \qquad \textbf{(7.8)}$$

Confidence Interval for the Mean (σ Unknown)

$$\overline{X} \pm t_{\alpha/2}\frac{S}{\sqrt{n}}$$

or

$$\overline{X} - t_{\alpha/2}\frac{S}{\sqrt{n}} \le \mu \le \overline{X} + t_{\alpha/2}\frac{S}{\sqrt{n}} \qquad \textbf{(8.2)}$$

Sample Size Determination for the Mean

$$n = \frac{Z_{\alpha/2}^2\,\sigma^2}{e^2} \qquad \textbf{(8.4)}$$

Z Test for the Mean (σ Known)

$$Z_{STAT} = \frac{\overline{X} - \mu}{\dfrac{\sigma}{\sqrt{n}}} \qquad \textbf{(9.1)}$$

Z Test for the Proportion

$$Z_{STAT} = \frac{p - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}} \qquad \textbf{(9.3)}$$

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

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

Paired *t* Test for the Mean Difference

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

Paired *t* Test for the Mean Difference

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

$\sqrt{n}$

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

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

F Test Statistic for Testing the Ratio of Two Variances

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

Confidence Interval Estimate for the Difference Between Two Proportions

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

or

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

χ^2 Test for the Difference Between Two Proportions

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

Computing the Estimated Overall Proportion for Two Groups

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

Computing the Estimated Overall Proportion for c Groups

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

Computing the Expected Frequency

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

Computational Formula for the Slope, b_1

$$b_1 = \frac{SSXY}{SSX} \quad \textbf{(12.3)}$$

Computational Formula for the Y Intercept, b_0

$$b_0 = \bar{Y} - b_1\bar{X} \quad \textbf{(12.4)}$$

$$SSXY = \sum_{i=1}^{n} (X_i - \bar{X})(Y_i - \bar{Y}) = \sum_{i=1}^{n} X\,Y - \frac{\left(\sum_{i=1}^{n} X_i\right)\left(\sum_{i=1}^{n} Y_i\right)}{n}$$

$$SSX = \sum_{i=1}^{n} (X_i - \bar{X})^2 = \sum_{i=1}^{n} X^2 - \frac{\left(\sum_{i=1}^{n} X_i\right)^2}{n}$$

Computational Formula for SST

$$SST = \sum_{i=1}^{n}(Y_i - \bar{Y})^2 = \sum_{i=1}^{n} Y_i^2 - \frac{\left(\sum_{i=1}^{n} Y_i\right)^2}{n} \quad \textbf{(12.10)}$$

Computational Formula for SSR

$$SSR = \sum_{i=1}^{n}(\hat{Y}_i - \bar{Y})^2 = b_0\sum_{i=1}^{n} Y_i + b_1\sum_{i=1}^{n} X_iY_i - \frac{\left(\sum_{i=1}^{n} Y_i\right)^2}{n} \quad \textbf{(12.11)}$$

Computational Formula for SSE

$$SSE = \sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2 = \sum_{i=1}^{n} Y_i^2 - b_0\sum_{i=1}^{n} Y_i - b_1\sum_{i=1}^{n} X_iY_i \quad \textbf{(12.12)}$$

Testing a Hypothesis for a Population Slope, β_1, Using the t Test

$$t_{STAT} = \frac{b_1 - \beta_1}{S_{b_1}} \quad \textbf{(12.16)}$$

Confidence Interval Estimate of the Slope, β_1

$$b_1 \pm t_{\alpha/2}S_{b_1}$$

$$b_1 - t_{\alpha/2}S_{b_1} \le \beta_1 \le b_1 + t_{\alpha/2}S_{b_1} \quad \textbf{(12.18)}$$

Testing for the Existence of Correlation

$$t_{STAT} = \frac{r - \rho}{\sqrt{\frac{1 - r^2}{n - 2}}} \quad \textbf{(12.19a)}$$

$$r = \frac{\text{cov}(X, Y)}{S_X S_Y} \quad \textbf{(12.19b)}$$