Exam Formal Sheet

QUA 207 (1439 1440 2)

Population Mean

$$\mu = \frac{\sum_{i=1}^{N} X_i}{N} \quad (7.1)$$

Population Standard Deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^{N} (X_i - \mu)^2}{N}} \quad (7.2)$$

Standard Error of the Mean

$$\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} \quad (7.3)$$

Finding Z for the Sampling Distribution of the Mean

$$Z = \frac{\bar{X} - \mu_{\bar{X}}}{\sigma_{\bar{X}}} = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} \quad (7.4)$$

Finding $\bar{X}$ for the Sampling Distribution of the Mean

$$\bar{X} = \mu + Z\frac{\sigma}{\sqrt{n}} \quad (7.5)$$

Sample Proportion

$$p = \frac{X}{n} \quad (7.6)$$

Standard Error of the Proportion

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

Finding Z for the Sampling Distribution of the Proportion

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

Confidence Interval for the Mean (σ Known)

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

or

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

Confidence Interval for the Mean (σ Unknown)

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

or

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

Confidence Interval Estimate for the Proportion

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

or

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

Sample Size Determination for the Mean

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

Sample Size Determination for the Proportion

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

Z Test for the Mean (σ Known)

$$Z_{STAT} = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} \quad (9.1)$$

***t* Test for the Mean (σ Unknown)**

$$t_{STAT} = \frac{\bar{X} - \mu}{\frac{S}{\sqrt{n}}} \quad (9.2)$$

Z Test for the Proportion

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

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

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

If the one – tailed test (Right) : $P - value = P(Z > z_{stat})$

If the one – tailed test (left) : $P - value = P(Z < -z_{stat})$

If the two – tailed test : $P - value = P(Z > z_{stat}) + P(Z < -z_{stat})$

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

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

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

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

or

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

Paired *t* Test for the Mean Difference

$$t_{STAT} = \frac{\bar{D} - \mu_D}{\frac{S_D}{\sqrt{n}}} \quad (10.3)$$

$$S_P^2 = \frac{(n_1-1)\ S_1^2 + (n_2-1)\ S_2^2}{(n_1-1) + (n_2-1)} \qquad S_D^2 = \frac{\sum(D_i - \bar{D})^2}{(n-1)} \qquad \bar{D} = \frac{\sum D_i}{n}$$

Confidence Interval Estimate for the Mean Difference

$$\overline{D} \pm t_{\alpha/2}\frac{S_D}{\sqrt{n}} \quad (10.4)$$

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

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

Confidence Interval Estimate for the Difference Between Two Proportions

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

or

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

Total Variation in One-Way ANOVA

$$SST = \sum_{j=1}^{c}\sum_{i=1}^{n_j}(X_{ij} - \overline{\overline{X}})^2 \quad (10.8)$$

Among-Group Variation in One-Way ANOVA

$$SSA = \sum_{j=1}^{c} n_j(\overline{X}_j - \overline{\overline{X}})^2 \quad (10.9)$$

Within-Group Variation in One-Way ANOVA

$$SSW = \sum_{j=1}^{c}\sum_{i=1}^{n_j}(X_{ij} - \overline{X}_j)^2 \quad (10.10)$$

Mean Squares in One-Way ANOVA

$$MSA = \frac{SSA}{c-1} \quad (10.11a)$$

$$MSW = \frac{SSW}{n-c} \quad (10.11b)$$

$$MST = \frac{SST}{n-1} \quad (10.11c)$$

One-Way ANOVA F_{STAT} Test Statistic

$$F_{STAT} = \frac{MSA}{MSW} \quad (10.12)$$

χ^2 Test for the Difference Between Two Proportions

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

Computing the Estimated Overall Proportion for Two Groups

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

Computing the Estimated Overall Proportion for c Groups

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

Computing the Expected Frequency

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

Computational Formula for the Slope, b_1

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

Computational Formula for the Y Intercept, b_0

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

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

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