Public Affairs 818
Professor Wallace
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Midterm #2 Review Sheet

Chapter 7 - Sampling Theory

- Understand the implications and power of the Central Limit Theorem.
- Know the sampling distributions of $\bar{x}$ and $\bar{p}$ when the assumptions of the Central Limit Theorem are met

$$\bar{x} \sim N\left(\mu, \frac{\sigma_x^2}{n}\right)$$

$$\bar{p} \sim N\left(p, \frac{p(1-p)}{n}\right)$$

- At this point you should understand that drawing a random sample of size n to obtain a sample proportion is a binomial experiment with n trials. The outcome of this experiment is the number of success obtained. The number of successes divided by the number of trials is the sample proportion $\bar{p}$.

- Understand why knowing the distributions of $\bar{x}$ and $\bar{p}$ are important. You should be able to reason through the exercises that we did in class were we assumed a specific population mean (proportion) and then determined if the sample mean (proportion) we obtained was likely given the population mean (proportion) that we assumed.

Chapter 8 - Interval Estimation

- Be able to construct 90, 95, and 99 percent confidence intervals in the cases where the Central Limit Theorem is applicable.
- Understand how to construct 90, 95, and 99 percent confidence intervals when the Central Limit Theorem is not applicable
- If the population is normal you can construct confidence intervals using the t-table (if σ is unknown and must be estimated by s) or the standard normal table (if σ is known)).
- Be able to find the sample size needed to insure a specific margin of error for a specified confidence level.
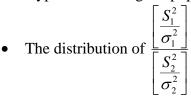
Chapter 9 – Hypothesis Testing

- The sampling distributions of $\bar{x}$ and $\bar{p}$
- The distinction between Type I and Type II errors.
- One and two tailed hypothesis test for population means and proportions.
- Be able to describe and provide intuition for the hypothesis testing procedure in words.
- Understand power and be able to do power calculations.

Chapter 10 – Inference About the Difference of Sample Means and Proportions

- The sampling distributions of $\bar{x}_1 - \bar{x}_2$ and $\bar{p}_1 - \bar{p}_2$
- Estimating confidence intervals for the difference of population means and proportions.
- One and two tailed hypothesis test for the difference of population means and proportions.

Chapter 11 – Inference about population variance[*]

- The distribution of $\dfrac{(n-1)S_x^2}{\sigma^2}$
- Confidence interval estimation of population variances.
- Hypothesis testing for population variances.
- The distribution of $\dfrac{\left[\dfrac{S_1^2}{\sigma_1^2}\right]}{\left[\dfrac{S_2^2}{\sigma_2^2}\right]}$
- Hypothesis testing about the ratio of population variances.
- The relationship between standard normal, Chi-squared, and F-distributed random variables

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[*] Depending on how much we get through Chapter 11 material may or may not be on the exam.