Final Exam

- Will cover Chapters 5, 6, 7, 8, 9, sections 1-2 of Ch. 10, and section 1 of Ch. 11
- Open Notes & Open Book; 150 points total
- Problem-solving, as with previous exams
- Bring your own book & your own calculator; no blue book needed

Ch. 5, 6, 7, 8 – please see Brief Review sheets for Exams 2 and 3

Ch. 9: Hypothesis Testing (or “Significance Testing”)

Carefully set up the null and alternative hypotheses:
- \( H_0: \mu \) (or \( p \)) = \( \leq \) or \( \geq \mu_0 \) (or \( p_0 \)) … usually reflects the status quo (current situation)
- \( H_a: \mu \) (or \( p \)) \( \neq \), > or < \( \mu_0 \) (or \( p_0 \)) … usually states what the tester hopes to show

Use sample data to see whether or not \( H_0 \) seems true, e.g., use \( \bar{x} \) to test the value of \( \mu \) in \( H_0 \)
- Calculate the test statistic = \( \frac{\text{sample value} - \text{H}_0 \text{ value}}{\text{SE}} \) … see below for specific cases
- Calculate the \( p \)-value = \( P(\text{test statistic or a more extreme value } | \text{ H}_0 \text{ is true}) \)
- Double the \( p \)-value only if you’re doing a 2-sided test (i.e., only if \( H_a \) contains \( \neq \))
- \( \alpha \) = the significance level for the test; often supplied by the decision maker
- If \( p \)-value < \( \alpha \), then “Reject \( H_0 \) at level \( \alpha \)” or “Data are significant at \( \alpha \) level”

Case 1. Tests about \( \mu \) (\( n \geq 30 \)): Test statistic \( Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}} \). Find \( p \)-value with \( Z \) distribution

Case 2. Tests about \( \mu \) (\( n < 30 \)): Test statistic \( t = \frac{\bar{x} - \mu_0}{s / \sqrt{n}} \). Find \( p \)-value with \( t(\text{df}) \) distribution

Case 3. Tests about \( p \): Test statistic \( Z = \frac{\bar{p} - p_0}{\sqrt{p_0(1-p_0)/n}} \). Find \( p \)-value with \( Z \) distribution

Ch. 10: Comparing Means of Two Populations: \( \mu_1 \) vs. \( \mu_2 \)

Often interested in Confidence Intervals for \( \mu_1 - \mu_2 \) and Hypothesis Tests with \( H_0: \mu_1 - \mu_2 = 0 \)
- Take random samples (of sizes \( n_1 \) and \( n_2 \), respectively) from the two populations
- For each sample, calculate the sample mean & sample standard deviation
- For HTs, test statistic \( Z = \frac{\bar{x}_1 - \bar{x}_2}{ SE } \), where Standard Error SE = \( \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \)
- Assuming sample sizes \( n_1 \geq 30 \) and \( n_2 \geq 30 \), find the \( p \)-value using the \( Z \) distribution
- Can also form a CI for the difference in population means using \( [(\bar{x}_1 - \bar{x}_2) \pm z*SE] \)

Ch. 11: Comparing Proportions of Two Populations: \( p_1 \) vs. \( p_2 \)

- Often interested in Confidence Intervals for \( p_1 - p_2 \) and Hypothesis Tests with \( H_0: p_1 - p_2 = 0 \)
- Take random samples (of sizes \( n_1 \) and \( n_2 \), respectively) from the two populations, respectively
- For each sample, calculate the sample proportion, \( \bar{p}_1 = X_1/n_1 \) and \( \bar{p}_2 = X_2/n_2 \), respectively
- For HTs, test statistic \( Z = (\bar{p}_1 - \bar{p}_2 - 0)/\text{SE} \), where Standard Error SE = \( \sqrt{\frac{\bar{p}(1-\bar{p})(1/n_1 + 1/n_2)}{(n_1 + n_2)}} \)
- In the SE above, note the use of the pooled sample proportion \( \bar{p} = (X_1 + X_2)/(n_1 + n_2) \)
- Assuming \( n_1\bar{p}_1 \geq 5, \ n_1(1-\bar{p}_1) \geq 5, \ n_2\bar{p}_2 \geq 5 \), & \( n_2(1-\bar{p}_2) \geq 5 \), find the \( p \)-value using \( Z \) distribution
- Can also form a CI for the difference in population proportions using \( [(\bar{p}_1 - \bar{p}_2) \pm z*SE], \)
  but here use a slightly different Standard Error SE = \( \sqrt{\frac{\bar{p}_1(1-\bar{p}_1)}{n_1} + \frac{\bar{p}_2(1-\bar{p}_2)}{n_2}} \)