Exam 3 Preparation

- Logistical details
  - Thur Nov 19
  - 50 minutes
  - Open-book, open-notes
  - Calculator needed

- Coverage
  - Handouts 15–20
  - Sections 5.5 – 5.6, 7.1 – 7.5, 8.1 – 8.3

- Resources available online
  - This preparation sheet
  - Handouts
  - Quizzes and solutions
  - Investigation assignments and solutions
  - Optional exercises

- Types of questions to expect
  - Short answer
  - Calculations
  - Interpretations and explanations
  - Similar to handout examples, quizzes, investigations, optional exercises, previous exams

- Advice for preparing
  - Prepare and organize your notes carefully
  - Don’t study less because it’s open-notes/book
  - Plan not to rely on your notes/book too much
  - Re-read, work through handouts
  - Re-read sections from text
  - Focus on understanding, not memorization
  - Review and make sure that you can answer quiz, investigation, optional exercise questions
  - Ask questions during class, office hours

- Advice during the exam
  - Show up on time!
  - Be cognizant of time constraint
  - Read carefully
  - Relate conclusions to context
  - Write and explain clearly
  - Show details of calculations
  - Do not elaborate excessively
Outline (of most important topics)

- Sampling distributions
  - Parameter, statistic
  - Sampling variability
  - Effect of sample size
    - Central Limit Theorem for sample proportion
      - Shape: approximately normal
      - Center: mean $\pi$
      - Variability: SD $\sqrt{\frac{\pi(1-\pi)}{n}}$
    - Technical conditions
  - Central Limit Theorem for sample mean
    - Shape: normal if pop’n normal, approx. normal for large $n$ otherwise
    - Center: mean $\mu$
    - Variability: SD $\sigma/\sqrt{n}$
    - Technical conditions

- Confidence intervals
  - Basic ideas
    - Form: point estimate $\pm$ (critical value) $\times$ (standard error)
    - Interpretations: of confidence interval, of confidence level
    - Effects of sample size, confidence level

- Hypothesis tests
  - Structure, reasoning, interpretation
    - Null hypothesis
      - Claim about parameter value
    - Alternative hypothesis
      - One-sided vs. two-sided
    - Test statistic: (statistic – hypothesized value) / standard error of statistic
      - Measure of how far sample statistic falls from hypothesized value of population parameter
    - p-value
      - Interpretation: probability of obtaining such an extreme sample if null hypothesis were true
      - Smaller p-values provide stronger evidence against null hypothesis
    - Significance level $\alpha$
    - Test decision
      - Reject $H_0$ when p-value $\leq \alpha$
      - Fail to reject $H_0$ when p-value $> \alpha$
    - Technical conditions

- Inference for population proportion $\pi$
  - Confidence interval for population proportion $\pi$
    $$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$
  - Technical conditions
  - Interpretation
- Sample size determination
  - Hypothesis test for population proportion $\pi$
    - Test statistic $z = \frac{\hat{p} - \pi_0}{\sqrt{\frac{\pi_0(1-\pi_0)}{n}}}$
    - p-value from $z$-distribution
    - Technical conditions
    - Conclusion

- Inference for population mean $\mu$
  - Confidence interval for population mean $\mu$
    - $\bar{x} \pm t^* \frac{s}{\sqrt{n}}$
    - Technical conditions
    - Interpretation
    - Not prediction interval
  - Hypothesis test for population mean $\mu$
    - Test statistic $t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$
    - p-value from $t$-distribution
    - Technical conditions
    - Conclusion

- Comparing two groups
  - Two-sample $z$-procedure for comparing proportions
    - Hypothesis test
    - Confidence interval, interpretation
    - Technical conditions
  - Two-sample $t$-procedure for comparing means
    - Hypothesis test
    - Confidence interval, interpretation
    - Technical conditions

- More inference considerations
  - Relationship between tests and intervals
  - Statistical significance vs. practical importance
    - Tests/p-values concern significance
    - Confidence intervals address importance
  - Importance of random sampling