Stat 218 – Exam 2 Preparation

Basic information:
The exam will be given on Thursday, February 16 at the usual time in our usual classroom (02-206). The exam covers days 15-24 of class, investigations 7-10, portions of chapters 6 (section 6.6) through 10 (through section 10.3, also sections 10.7 and 10.9) of your text.

Some general advice:
- Prepare well-organized notes
- Arrive on time
- Don’t rely on text, notes too much
- Be cognizant of time constraint
- Read questions carefully
- Make use of partial information, calculations
- Relate conclusions to context
- Explain reasoning when asked

Outline (of most important topics since the first exam):
- Comparing independent samples
  - Confidence interval for \((\mu_1 - \mu_2)\):
    - Degrees of freedom
    - Importance of checking zero
    - Technical conditions
  - Hypothesis test
    - Null and alternative hypotheses
      - Non-directional vs. directional
    - Test statistic:
      \[ t_s = \frac{\bar{y}_1 - \bar{y}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \]
      - Test statistic:
      - \(P\)-value
        - Calculation from table
        - Interpretation
        - Two-sided vs. one-sided
      - Significance level
        - Test decision
      - Technical conditions
        - Transformations
  - More inference considerations
    - Duality of tests and intervals
      - Significance vs. importance
        - Tests concern significance
        - Intervals address importance
- Non-sacredness of conventional $\alpha$ levels
- Types of errors
  - Consequences, trade-offs
- Designing statistical studies
  - Observational studies vs. controlled experiments
    - How to distinguish
    - Explanatory, response variables
    - Scope of conclusions
      - Lurking variables
      - Confounding
      - Causation
  - Designing experiments
    - Comparison
      - Control group
      - Placebo effect
      - Blindness
    - Randomization
- Paired data
  - Advantages of paired design
  - Paired $t$-procedures
    - Hypothesis test
    - Confidence interval
- Categorical data
  - Goodness-of-fit test
    - Expected counts
    - Test statistic
    - Chi-square distribution
    - $P$-value
  - Binary data
    - Goodness of fit test
    - Directional alternative
    - Confidence interval for population proportion $p$
      $$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$
      - Conventional procedure:
      - Technical conditions
      - Sample size determination
    - Alternative procedure:
      $$\widetilde{p} \pm z^* \sqrt{\frac{\widetilde{p}(1-\widetilde{p})}{n+4}}$$
  - Chi-square tests for $2 \times 2$ tables
    - Testing equality of population proportions
    - Directional, nondirectional alternatives
    - Expected counts, test statistic, $P$-value
  - Analyzing $2 \times 2$ tables
    - Chi-square test
• Testing equality of population proportions
• Directional, nondirectional alternatives
• Expected counts, test statistic, $P$-value
  ▪ Difference in proportions
  ▪ Confidence interval
  ▪ Relative risk
  ▪ Odds ratio
    ▪ Confidence interval
    ▪ Importance of containing 1