STAT 150 – Exam Preparation – Fall 2009

Format:
The exam will cover material from class presentations and discussions, handouts, assigned readings (including SuperCrunchers and SAGTU essays) and discussions, assignments (including Minitab assignments), and project assignments. You will be asked to draw conclusions, interpret results, and explain findings. Be prepared to justify your answers fully and communicate your conclusions clearly.

You may be asked to use Minitab to carry out analyses; you can ask one of the instructors if you know what you want Minitab to do but forget how to do it. You will not have access to your book or notes during the exam. You will have 50 minutes to complete the exam.

As you prepare for the exam, you can consult the course webpage to review what we have studied during each class session (under “schedule”) and can also find handouts, assignments, readings, and other information.

Study Advice:
• Review handouts and make sure you understand key ideas and that you could carry out similar analyses and answer comparable questions on your own.
• Review the course readings, focusing on the big picture issues. (For example, we wouldn’t ask how many people enrolled at the Butterball website, but we could ask what questions the researchers wanted to investigate in that advertising study. We wouldn’t ask what country the HIV study was conducted in, but we could ask about the role of random assignment in that study.)
• Review the course readings for important statistical ideas (e.g., sampling bias, random assignment, statistical significance). Practice explaining these ideas in both technical and nontechnical terms (e.g., how would you explain it to your roommate vs. your statistics instructor).
• Review the projects and other assignments, along with feedback provided on your work.
• Note the course learning goals given in the syllabus and reproduced below.
• Show up on time, read questions carefully, do not spend too long on any one question.

Course Learning Goals:
• Appreciate the role of statistics in the scientific enterprise and in everyday life
• Understand the process of statistical investigations, from the posing of questions and the collection of data through the analysis of data and presentation of results
• Comprehend fundamental concepts of statistics, such as variability, randomness and randomization, experiment, significance, sampling, bias, confidence
• Recognize the importance of sound data collection strategies
• Plan an effective data collection strategy to address a particular question
• Conduct preliminary analyses of data involving graphical and numerical techniques
• Use Minitab statistical software to perform basic analyses of data
• Critically read, summarize, and evaluate articles from popular media involving statistics
• Present clear arguments concerning statistical issues both orally and in writing
Specific Statistical Concepts, Skills:

- Variability, variable, observational units (day3 handout, Cell Phone essay)
  - Quantitative, categorical variables
  - Explanatory, response variables (day7 handout, day15 handout, day26 handout)
- Principles of good graphs (day4 handout)
  - Common characteristics of poor graphs (Wainer article)
- Choosing, producing and interpreting appropriate graphs and numerical summaries
  - Categorical variables: bar graph, segmented bar graph, proportions
  - Quantitative variables: dotplot, histogram, boxplot, five-number summary, mean, median, std dev, IQR (day6 handout)
- Comparing groups, statistical tendency (day6 handout, ice cream assg, comparison project)
  - Shape, center, spread, outliers
- Scatterplot, association (day7 handout, Gesell assg, gapminder project, utilities assg)
  - Form, direction, strength, smoother, transformation
- Research questions (day8 handout, gapminder project, Rosling TED lecture)
- Types of studies, scope of conclusions (day15 handout, HIV essay, school choice essay, cursive writing and all-nighter assg)
  - Population, sample, parameter, statistic
  - Biased sampling, random sampling (pre-election polling essay)
  - Non-sampling errors (day18 handout)
  - Observational study, confounding variable
  - Experiment, treatment, random assignment (advertising essay)
  - Blindness, placebo (HIV essay)
  - Generalizability of results
  - Causation, causal conclusions
- Statistical significance, P-value (murder trial essay, memory study, comparison project)
  - Logic of hypothesis testing
  - Simulating randomization tests (day20 handout)
- Least squares regression, prediction (day26 handout, utilities assg)
  - Residuals, slope and intercept interpretations, influential observations, $R^2$
- Multiple regression (day27-28 handouts, wine essay, finger article, regression project)
  - Indicator variables for categorical variables, labeled scatterplots
  - Interpreting coefficients
  - Comparing different models, $R^2$, parsimony
- Statistical significance in regression (day29 handout)
  - P-values for regression coefficients (simple and multiple regression; overall and individual coefficients)