AP Statistics

Syllabus

Course Description:

AP Statistics is a course instructed through discovery and technology to develop a broad understanding and connection among four major fundamental concepts: experimental design, exploration and presentation of data, anticipated patterns, and drawing conclusions through the process of inferential statistics. It is important to note that the course will provide a careful balance between the use of technology and written expression. By the beginning of the month of May, students should be prepared to take and pass the AP Statistics exam.

Primary Textbook:

Peck, Roxy, Chris Olsen, and Jay Devore. *Introduction to Statistics & Data Analysis, 4th edition*, 2010. Belmont, CA: Thomson Brooks/Cole.

Technology:

- All students have a TI-83/TI-83+/TI-84 graphing calculator for use in class, at home, and on the AP Exam. Students will use their graphing calculator extensively throughout the course.
- All students have a copy of Statdisk statistical software for use at home and for demonstrations in class. Students will have occasional assignments that must be completed using Statdisk.
- Various applets on the Internet

Course Outline:

(organized by chapters in primary textbook)

Graphical displays include, but are not limited to using boxplots, dotplots, stemplots, back-to-back stemplots, histograms, frequency plots, parallel boxplots, and bar charts.

Chapter 1: THE ROLE OF STATISTICS AND THE DATA ANALYSIS PROCESS
Total Time: 5 Days
- Why study Statistics
- The Nature and Role of Variability
- Statistics and the Data Analysis Process
- Types of Data and Some Simple Graphical Displays.
    - Activity 1.1: Twitter Words
    - Activity 1.2: Head Sizes: Understanding Variability

Chapter 2: COLLECTING DATA SENSIBLY
Total Time: 10 Days
- Statistical Studies: Observation and Experimentation
- Sampling. Simple Comparative Experiments
- More on Experimental Design
- More on Observational Studies: Designing Surveys (Optional)
- Interpreting and Communicating the Results of Statistical Analyses
    - Activity 2.1: Facebook Friending
    - Activity 2.2: An Experiment to test for the Stroop Effect
    - Activity 2.3: McDonald's and the Next 100 Billion Burgers

Chapter 3: GRAPHICAL METHODS FOR DESCRIBING DATA
Total Time: 5 Days
- Displaying Categorical Data: Comparative Bar Charts and Pie Charts
- Displaying Numerical Data: Stem-and-Leaf Displays
- Displaying Numerical Data: Frequency Distributions and Histograms
- Displaying Bivariate Numerical Data
- Interpreting and Communicating the Results of Statistical Analyses

Chapter 4: NUMERICAL METHODS FOR DESCRIBING DATA
Total Time: 8 Days
- Describing the Center of a Data Set
- Describing Variability in a Data Set
- Summarizing a Data Set: Boxplots
- Interpreting Center and Variability: Chebyshev's Rule, the Empirical Rule, and z Scores,
- Interpreting and Communicating the Results of Statistical Analyses
- Using the Ti-83

Chapter 5: SUMMARIZING BIVARIATE DATA
Total Time: 16 Days
- Correlation
- Linear Regression: Fitting a Line to Bivariate Data
- Assessing the Fit of a Line
- Nonlinear Relationships and Transformations
- Logistic Regression (Optional)
- Interpreting and Communicating the Results of Statistical Analyses
- Using the Ti-83

Midterm: Chapters 1-5
Total Time: 3 Days
- Review Chapters 1-5 using previous AP Questions from

Chapter 6: PROBABILITY
Total Time: 13 Days
- Chance Experiments and Events. Definition of Probability
- Basic Properties of Probability
- Conditional Probability
- Independence
- Some General Probability Rules
- Estimating Probabilities Empirically Using Simulation
- Using the Ti-83 for simulations

Chapter 7: RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS
Total Time: 18 Days
- Random Variables
- Probability Distributions for Discrete Random Variables
- Probability Distributions for Continuous Random Variables
- Mean and Standard Deviation of a Random Variable
- Binomial and Geometric Distributions
- Normal Distributions
- Checking for Normality and Normalizing Transformations
- Using the Normal Distribution to Approximate a Discrete Distribution
- Using the Ti-83 distribution menu

First Semester Final Exam

Total Time: 4 days
- Review Using Previous AP Questions

Chapter 8: SAMPLING VARIABILITY AND SAMPLING DISTRIBUTION

Total Time: 9 Days
- Statistics and Sampling Variability
- The Sampling Distribution of a Sample Mean
- The Sampling Distribution of a Sample Proportion

Chapter 9: ESTIMATION USING A SINGLE SAMPLE

Total Time: 10 Days
- Point Estimation
- Large-Sample Confidence Interval for a Population Proportion
- Confidence Interval for a Population Mean
- The t-distribution
- Checking Conditions
- Interpreting and Communicating the Results of Statistical Analyses

Chapter 10: HYPOTHESIS TESTING USING A SINGLE SAMPLE

Total Time: 11 Days
- Hypotheses and Test Procedures
- Errors in Hypotheses Testing
- Large-Sample Hypothesis Tests for a Population Proportion
- Hypotheses Tests for a Population Mean
- Power and Probability of Type II Error
- Interpreting and Communicating the Results of Statistical Analyses

Chapter 11: COMPARING TWO POPULATIONS OR TREATMENTS

Total Time: 11 Days
- Inferences Concerning the Difference Between Two Population or Treatment Means Using Independent Samples
- Inferences Concerning the Difference Between Two Population or Treatment Means Using Paired Samples
- Large Sample Inferences Concerning a Difference Between Two Population or Treatment Proportions
- Interpreting and Communicating the Results of Statistical Analyses

Midterm (Chapters 8-11)

Total Time: 3 Days
- Review using previous AP Questions

Chapter 12: THE ANALYSIS OF CATEGORICAL DATA AND GOODNESS-OF-FIT TESTS.

Total Time: 8 Days
- Chi-Square Tests for Univariate Data
- Tests for Homogeneity and Independence in a Two-way Table
- Interpreting and Communicating the Results of Statistical Analyses
- Using Ti-83

Chapter 13: SIMPLE LINEAR REGRESSION AND CORRELATION: INFERENTIAL METHODS.
<u>Total Time: 5 Days</u>
- Simple Linear Regression Model
- Inferences About the Slope of the Population Regression Line
- Checking Model Adequacy
- Inferences Based on the Estimated Regression Line (Optional)
- Inferences about the Population Correlation Coefficient (Optional)
- Interpreting and Communicating the Results of Statistical Analyses
- Using TI-83

Review for AP Exam and Final Exam
<u>Total Time: 7 days</u>
- Complete AP Exam
- Remaining AP questions
- Final Exam
- AP Exam

Post AP Exam
<u>Total Time: 25 Days</u>

- End of year project

- Chapter 14: MULTIPLE REGRESSION ANALYSIS
  - Multiple Regression Models
  - Fitting a Model and Assessing Its Utility
  - Inferences Based on an Estimated Model (online)
  - Other Issues in Multiple Regression (online)
  - Interpreting and Communicating the Results of Statistical Analyses (online)

- Chapter 15: ANALYSIS OF VARIANCE
  - Single-Factor ANOVA and the F Test. Multiple Comparisons.
  - The F Test for a Randomized Block Experiment
  - Two-Factor ANOVA
  - Interpreting and Communicating the Results of Statistical Analyses (online)

AP Statistics Example Project:

The Project: Students will design and conduct an experiment to investigate the effects of response bias in surveys. They may choose to the topic for the surveys, but they must design their experiment so that it reflects the content from the course. The project will be done in groups (2 students). Students will turn in one project per group.

Proposal: The proposal should:
  ➢ Describe the topic
  ➢ Describe how to obtain subjects (minimum sample size 50)
  ➢ Describe questions to be answered and how to incorporate concepts from class

Written Report: The written report should include:
  • Title
  • Introduction: What was investigated? Why was the topic chosen for the survey?
  • Methodology: Describe how the experiment was conducted and justify why the design was effective
  • Results: Present the data in both tables and graphs in such a way that conclusions can be easily made.
  • Conclusions: What conclusions can be drawn from the experiment?
  • The original proposal

Presentation: The presentation should summarize the project. Students should include some pictures of the data collection in progress.

Oral Presentation: Groups will present their project and should be prepared for questions.