

PRIMARY TEXTBOOK

Yates, Daniel, David Moore, and George McCabe. *The Practice of Statistics*. New York, NY: W. H. Freeman, 2008.

TECHNOLOGY

All students have a TI-84Plus graphing calculator for use in class, at home and on the AP Exam.

All students will use excel to analyze data and create graphs.

Various applets from the internet will be used.

OVERVIEW

During the advanced placement statistics course, the themes in the course outline will be covered. Graphing calculators and statistical software will be used on a regular basis to understand and make connections with the five stated themes. Simulations will be incorporated throughout the course in order for students to develop the necessary knowledge applicable to various concepts. Before the end of the course, the students will perform a statistical project to communicate designs, analyze data, and state conclusions in order to connect all the aspects of the course.

TEACHING STRATEGIES

1. This course is organized as an activity-based experience for students. Students are regularly engaged in the discovery and exploration of statistical realities and relationships.
2. Students regularly interpret and investigate statistical data and information. Therefore, teaching students how to make appropriate decisions by validating/justifying statistical hypotheses is of great importance. For this reason, students are required to demonstrate critical connections between the analysis and conclusions of all statistical design experiments.
3. Students are required to justify their responses both orally and in carefully written sentences that validate their process and conclusions.
4. Students are encouraged to work cooperatively on classwork and homework assignments.
5. One week before the AP exam, students are given a “mock” exam under conditions similar to ones they will experience on test day. This exam is scored, immediately returned to the students and discussed. A substantial part of the fourth quarter grade is determined using the scores on the “mock” exam.

ASSESSMENT

1. Beginning in the middle of October, students are given one free-response problem from released AP exams once a week. Questions are scored according to the rubric supplied by the College Board. Calculator use is dictated by its original form when presented on the AP exam.
2. Students are given practice with multiple choice questions from released AP exams during weekly quizzes.

3. Each test includes teacher-generated problems as well as selected problems from AP released exams. Students are encouraged to work efficiently, making use of the calculator only when necessary.

COURSE OUTLINE

The major topics covered in the AP Statistics course are as follows. The number of days is based on a seven period school day.

Unit I – Exploring Data: Observing patterns and departures from patterns (35 days)

Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis is placed on interpreting information from graphical and numerical displays and summaries.

- A. Interpreting graphical displays of distributions of univariate data (dot plots, stem plots, histograms, cumulative frequency plots)
 1. Center and spread
 2. Clusters and gaps
 3. Outliers and other unusual features
 4. Shape
- B. Summarizing distributions of univariate data
 1. Measuring center: median and mean
 2. Measuring spread: range, interquartile range, standard deviation
 3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
- C. Comparing distributions of univariate data (dot plots, back-to-back stem plots, parallel box plots)
 1. Comparing center and spread: within group, between group variation
 2. Comparing clusters and gaps
 3. Comparing outliers and other unusual features
 4. Comparing shapes
- D. Exploring bivariate data
 1. Analyzing patterns in scatter plots
 2. Correlation and linearity
 3. Least-squares regression line
 4. Residual plots, outliers and influential points
 5. Transformations to achieve linearity: logarithmic and power transformations
- E. Exploring categorical data: frequency tables
 1. Marginal and joint frequencies for two-way tables
 2. Conditional relative frequencies and association

Unit II – Planning a Study: Deciding what and how to measure (30 days)

Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

- A. Overview of methods of data collection

1. Census
 2. Sample survey
 3. Experiment
 4. Observational study
- B. Planning and conducting surveys
1. Characteristics of a well-designed and well-conducted survey
 2. Populations, samples and random selection
 3. Sources of bias in surveys
 4. Simple random sampling
 5. Stratified random sampling
- C. Planning and conducting experiments
1. Characteristics of a well-designed and well-conducted experiment
 2. Treatments, control groups, experimental units, random assignments, and replication
 3. Sources of bias and confounding, including placebo effect and blinding
 4. Completely randomized design
 5. Randomized block design, including matched pairs design
- D. Generalizability of results from observational studies, experimental studies, and surveys

Unit III – Anticipating Patterns: Producing models using probability theory and simulation (35 days)

Probability is the tool used for anticipating what the distribution of data should look like under a given model.

- A. Probability as a relative frequency
1. “Law of Large Numbers”
 2. Addition rule, multiplication rule, conditional probability, and independence
 3. Discrete random variables and their probability distributions, including binomial
 4. Simulation of probability distributions, including binomial and geometric
 5. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable
- B. Combining independent random variables
1. Notion of independence versus dependence
 2. Mean and standard deviation for sums and differences of independent random variables
- C. The Normal distribution
1. Properties of the Normal distribution
 2. Using tables of the Normal distribution
 3. The Normal distribution as a model for measurements
- D. Sampling distributions
1. Sampling distribution of a sample proportion

2. Sampling distribution of a sample mean
3. Central Limit Theorem
4. Sampling distribution of a difference between two independent sample proportions
5. Sampling distribution of a difference between two independent sample means
6. Simulation of sampling distributions

Unit IV – Statistical Inference: Confirming models (55 days)

Statistical inference guides the selection of appropriate models.

- A. Confidence intervals
 1. The meaning of a confidence interval
 2. Large sample confidence interval for a proportion
 3. Large sample confidence interval for a mean
 4. Large sample confidence interval for a difference between two proportions
 5. Large sample confidence interval for a difference between two means (unpaired and paired)
- B. Tests of significance
 1. Logic of significance testing, null and alternative hypotheses; p -values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power
 2. Large sample test for a proportion
 3. Large sample test for a mean
 4. Large sample test for a difference between two proportions
 5. Large sample test for a difference between two means (unpaired and paired)
 6. Chi-squared test for goodness to fit, homogeneity of proportions, and independence (one- and two-way tables)
- C. Special case of normally distributed data
 1. t -distribution
 2. Single sample t procedures
 3. Two sample (independent and matched pairs) t procedures
 4. Inference for the slope of least-squares regression line

Advanced Placement Review (10 days)

Unit V – Statistics Project and Other Topics (15 days)

Software

Microsoft Excel. Microsoft Corporation.

Internet Web Sites

| Web Site | Description |
|--|---|
| www.collegeboard.org/ap | Provides complete, current information on |

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|--|---|
| | the AP Statistics exam and posts released problems. |
| www.cate.org/sms99/writ/thouap.htm | Provides thoughts relating to the AP exam. |
| www.savcds.org/us/math/Courses/MA592/ma592test.htm | Provides self-scoring questions based on textbook (IPS). |
| www.math.sfu.ca/stats/Courses/MultipleChoice/ | Exhibits multiple choice questions organized by small topics. |
| www.gsu.edu/~dscbms/ibs/qcontent.html | Exhibits multiple choice questions organized by small topics. |
| business.clayton.edu/arjomand/business/ma_inkey2.html | Provides four “quizzes” that are self-scoring. You can ask for hints. |
| www.dickinson.edu/~rossman/ws/wssampleexams.html | Displays sample exams that model free response format. |
| member.aol.com/johnp71/javasta4.html#Demos | Shares list of interactive web sites covering a broad range of topics. |
| www.ruf.rice.edu/~lane/stat_sim/index.html | Shows an assortment of applets developed by Rice University’s Virtual Lab for Probability and Statistics. |
| exploringdata.cqu.edu.au/sctrplot.htm | Provides an assortment of data exploration activities. |
| home.clara.net/sisa/ | Allows the user to do statistical analysis directly on the internet using SISA: Simple Interactive Statistical Analysis. Includes 2 X 2 tables, <i>t</i> -tests, random number generators, significance testing and more. |
| www.keypress.com/sketchpad/java_gsp/squares.html | Demonstrates least squares line; user tries to find the best fit by minimizing the squared distances from the sample points to the line. |
| www.stat.uiuc.edu/~stat100/java/GCApplet/GCAppletFrame.html | Shares an applet used to guess the correlation of a linear equation. |
| www.magiccarpet.com/~rnorman/statistic.html | Generates a normal distribution and more on an interactive site. |
| www.stat.uiuc.edu/~stat100/cuwu/ | Exhibits CUWU Statistics Program, several games and simulations. |
| web.a-znet.com/marianos/assumptions.htm | Provides a summary of Justifications and Assumptions for significance tests. |
| www.peddie.org/princip/mathematics/assump3.htm | Provides a summary of Justifications and Assumptions for significance tests. |
| www.tiac.net/users/tiberio/assumptions.htm | Provides a summary of assumptions and Rules of Thumb. |
| www.projects.cgu.edu/wise/appletsf.shtml | Shares applets that develop relationships between Type I and Type II errors, power, and <i>p</i> -values. |

Parental/Guardian Signature Form

I have read and understand Mrs. Doverspike's rules, policies, and procedures.

Parent/Guardian Signature _____ Date _____

Parent/Guardian Name _____

Phone number(s) (best location to be reached at) _____

Email(if available) _____

Student Signature _____

Student Name _____

CALCULATOR RELEASE FORM

I, _____ (print name) accept full responsibility for
calculator _____ (number). I agree that if this calculator is lost, stolen or broken, I
will replace it with the same calculator or will refund the money.

Student Signature _____

Date _____

Parent/Guardian Signature _____

Date _____

Research Project AP Statistics

Purpose: The purpose of this project is for you to actually do statistics. You are to form a hypothesis, design a study, conduct the study, collect the data, describe the data, analyze the data and make conclusions using the data. You are going to do all of it!

Topics: You may do your study on any topic, but you must be able to do all 6 steps listed below. I expect that this can most easily be accomplished with an experiment or observational study. No survey projects will be allowed. You must get approval before you begin!

Group Size: You may do this project individually or with a partner. However, if you do the project with a partner, I will expect more than with an individual project. Also, you must include an acknowledgement section where you must detail who did what.

Proposal: You must have an approved project by (date). To get approval, you must be able to demonstrate how your proposal will meet the requirements of the project. In other words, you need to clearly and completely describe your hypotheses, how you will collect the data, and what it will look like. You must also make sure that your experiment will be safe and ethical for the subjects. This should be one page and typed. It will be worth 15 points.

Data Collection: You must have your data collections completed by (date). You will turn a copy of your data in. It must be in table form. It will be worth 10 points. It must be typed.

Data Analysis: This portion of the project will be completed after we have studied hypothesis testing. (see below)

Final Report: The final report will be due (date). It should be typed and follow the format below. Some symbols ($\mu, \sigma, \bar{X}, etc$) may be inserted by hand, although most word processors have this capability. This is to be an unbiased report, therefore personal opinions should be left out of the report. To obtain maximum credit on your project you should include in your report information on your topic from other sources, i.e. internet websites, government reports, almanacs, etc. The more in depth projects will receive higher scores. The design of the study, a complete statistical process must be clearly stated in the report, as well as statistical conclusion. Embed all data including, graphs and tables, do not place them at the end of the report. Reports should be grammatically correct. I will deduct points for offensive errors. The final report will be worth 100 points.

The project must have each of the below sections defined and labeled:

1. Title
2. Abstract: a brief summary of your report.
3. Intro/statement of the problem: what are you trying to learn? Why?