

AP Statistics

Course Design

Our AP Statistics course is designed as an activity-based mathematics course. Our school offers open enrollment into AP courses and the only pre-requisite for AP Statistics is completion of Algebra II. We offer AP Statistics as an alternative to the traditional pre-calculus/AP Calculus mathematics track. Some of our students choose to take both AP Statistics and AP Calculus. Our school is on an A/B block schedule. Each class meets every other day for 90 minutes. The school year is divided into 4 nine-week grading periods, 2 per semester.

Course Projects

A project is assigned each nine-week grading period. The students work in small groups and must design an experiment, collect data, write up the results with supporting graphs and present the material to the class. Example project:

For each person in group (maximum of 4 students), a minimum of 30 subjects per group member must be surveyed. Project must be typed, graphical displays must be calculator or computer generated, and includes the following:

Why: Purpose/objective of project. Describe population of interest

What: What did you ask/measure

Who: Who did you sample

Where: Where did the sampling occur at

When: When did the sampling occur

How: How did you sample---stratified, convenience, etc.

Theoretically, describe how a SRS would have occurred

Table: Make a summary table of the data

Graphs: Graphically display the data in 2 different graphs. Describe each graph

Interpretation: Write a conclusion to your statistical project. Answer the why to your project.

Technology

All students have a TI-83/TI-84 graphing calculator for use in class, at home, and on the AP exam. The instructor uses a graphing calculator with an overhead display as well as a LCD projector for PowerPoint presentations and a TI Smart View for calculator demonstrations. Various applets on the Internet are also used by the students either as an at home assignment or in a computer lab. Some assignments are completed using Excel or JMP-Intro.

Assessments

Each nine-week grade is calculated from daily homework assignments, short quizzes, class activities, projects, and major test scores. 2-3 major tests are given each nine-week grading period. A day of review before each test is devoted to working content appropriate AP exam free response questions. Each major test consists of a multiple-choice section and a free response section.

Course Materials

Primary Text

Peck, Olsen, and Devore. *Introduction to Statistics and Data Analysis, Second Edition*. Belmont, Calif.:Brooks/Cole, 2005. ISBN 0-534-46710-5.

References and Resource Materials

- ABS Scheaffer, Watkins, Witmer, and Gnanadesikan. *Activity-Based Statistics: Instructor Resources, Second Edition*. Emeryville, Calif.: Key College, 2004. ISBN 1-930190-73-5.
- V Annenberg/CPB. *Against All Odds: Inside Statistics*. 26 30-min. Washington, D.C.:The Annenberg/CPB Collection, 1989. Videocassettes.(800)LEARNER. www.learner.org.
- WK Rossman, Allan J., and Beth L. Chance. *Workshop Statistics: Discovery with Data and Minitab, 2nd ed.* New York: Key College, 2000.

- TEC Barton, Ray, Diehl, John. *TI-83 Enhanced Statistics. 2nd Edition*. Venture Publishing, Andover, MA 01910.
- REV Sternstein, Martin. *Barron's How to Prepare for the AP Statistics Advanced Placement Test in Statistics, 2nd edition*. Barron's Educational Series, Inc. Hauppauge, NY ISBN 0-7641-1091-8.
- OT Other resource materials used in the classroom from various College Board workshops.

Course Outline

(organized by chapters in primary text)

Fall Semester

Chapter 1: The Role of Statistics

(total time: 2 classes)

- Course Overview
- Policies and Expectations
- Types of Data
- Bar Chart
- Dotplot
- Activity: Head Sizes

Chapter 2: The Data Analysis Process and Collecting Data Sensibly

(total time: 5 classes)

- Data Analysis
- Observational Study
- Simple Random Sample
- Stratified Sampling
- Cluster Sampling
- Bias in Sampling
- Random Rectangles Activity (ABS)
- Designing Experiments
- Treatments
- Blocking
- Randomization
- Replication
- Control Groups
- Designing Surveys
- Helicopter Activity (OT)
- Gummy Bears in Space Activity(OT)
- Review Chapter 1 and 2
- Test Chapter 1 and 2

Chapter 3: Graphical Methods for Describing Data

(total time: 3 classes)

- Bar Charts and Pie Charts
- Stem-and-Leaf Displays
- Frequency Distribution and Histograms
- Describing the Shape of a Distribution
- Cumulative Frequency Graphs
- Displaying Bivariate Numerical Data
- Communicating and Interpreting the Results of Statistical Analyses

Chapter 4: Numerical Models for Describing Data

(total time: 5 classes)

- Describing Center: Mean and Median
- Describing Spread: Range, Interquartile Range, and Standard Deviation
- Summarizing a Data Set: Boxplots
- Outliers
- Using the TI-83
- Matching Distributions Activity (ABS)
- The Empirical Rule
- Standardized Scores
- Percentiles and Quartiles
- Communicating and Interpreting the Results of Statistical Analyses
- Review Chapter 3 and 4
- Test Chapter 3 and 4

Chapter 5: Summarizing Bivariate Data

(total time: 5 classes)

- Making and Describing Scatterplots
- Correlation
- Properties of the Correlation Coefficient
- Correlation Game Applet
- Least Squares Regression Line
- Using the TI-83
- Regression to the Mean
- Residual Plots
- Standard Deviation
- Coefficient of Determination
- Unusual and Influential Points
- Modeling Nonlinear Data: Exponential and Power Transformations
- Communicating and Interpreting the Results of Statistical Analyses
- Review Chapter 5
- Test Chapter 5

Chapter 6: Probability

(total time: 6 classes)

- Definition of Probability, Outcomes, and Events
- Law of Large Numbers
- Basic Properties of Probability
- Conditional Probability
- Independence
- General Probability Rules
- Estimating Probabilities Empirically using Simulation
- Using the TI-83 for simulation
- Review Chapter 6
- Test Chapter 6

Chapter 7: Random Variables and Probability Distributions

(total time: 8 classes)

- Properties of Discrete Random Variables
- Properties of Continuous Random Variables
- Mean and Standard Deviation of a Random Variable
- Linear Functions and Linear Combinations of Random Variables
- Binomial and Geometric Distributions
- Normal Distributions
- Using the Normal Tables

- Checking for Normality and Normalizing Transformations
- Using the Normal Distribution to Approximate a Discrete Distribution
- M & M Candy Activity (OT)
- Review Chapter 7
- Test Chapter 7

Chapter 8: Sampling Variability and Sampling Distributions

(total time: 4 classes)

- Sampling Distributions
- The Sampling Distribution of a Sample Mean
- The Sampling Distribution of a Sample Proportion
- Review Chapter 8
- Test Chapter 8

Semester Exam

(total time: 3-5 classes)

- Review Chapters 1-8
- Semester Exam

Spring Semester

Chapter 9: Estimation Using a Single Sample

(total time: 4 classes)

- Point Estimation: Bias and Variability
- Large-Sample Confidence Interval for a Population Proportion
- Confidence Interval for a Population Mean
- Finding Sample Size
- Finite Population Correction Factor
- Communicating and Interpreting the Results of a Statistical Analyses
- Hill of Beans Activity (OT)
- ESP Activity (OT)
- Review Chapter 9
- Test Chapter 9

Chapter 10: Hypothesis Testing Using a Single Sample

(total time: 6 classes)

- Hypotheses and Test Procedures
- Errors in Hypothesis Testing
- Large-Sample Hypothesis Tests for a Population Proportion
- Hypothesis Tests for a Population Mean
- Test Statistics and p-values
- Checking Conditions
- Power and Probability of Type II Error
- Communicating and Interpreting the Results of Statistical Analyses
- Review Chapter 10
- Test Chapter 10

Chapter 11: Comparing Two Populations or Treatments

(total time: 5 classes)

- Inferences Concerning the Difference Between Means Using Independent Samples
- Inferences Concerning the Difference Between Means Using Paired Samples
- Large-Sample Inferences Concerning a Difference Between Two Proportions

- Matched Pairs Hypothesis Test
- Distribution Free Procedures for Inferences Using Independent Samples
- Using TI-83
- Review Chapter 11
- Test Chapter 11

Chapter 12: The Analysis of Categorical Data and Goodness-of-Fit Tests

(total time: 5 classes)

- Chi-Square Tests for Univariate Categorical Data
- Tests for Homogeneity and Independence in a Two-Way Table
- Communicating and Interpreting the Results of Statistical Analyses
- Using the TI-83
- Fruit Loop Cereal Activity (OT)
- Review Chapter 12
- Test Chapter 12

Chapter 13: Simple Linear Regression and Correlation: Inferential Methods

(total time: 5 classes)

- Simple Linear Regression Model
- Inferences About the Slope of the Population Regression Line
- Checking Model Adequacy
- Using the TI-83
- Understanding Computer Output
- Review Chapter 13
- Test Chapter 13

Preparing for the AP Exam

(total time: as needed)

- Review of AP outline
- Practice Exams
- Scoring of exam discussed

After the AP Exam

Chapter 14: Multiple Regression Analysis