AP Statistics Course Syllabus

Raw data, graphs, charts, rates, percentages, probabilities, averages, forecasts, and trend lines are an inescapable part of our every day lives in today's society. Newspapers report almost daily about new studies that make claims about the effect of a diet or food product on people's health. Companies make business decisions based on market research. Politicians rely on data from polls and public opinion. Doctors must know about the effectiveness of medications and treatments. Statistical literacy is needed for any consumer of goods and services in our society to make intelligent choices. AP Statistics gives students the tools to examine the details of a study and make good decisions with data.

The four main topics that we will cover are:

I. Exploring Data: Observing Patterns and Departures form Patterns
II. Planning a Study: Deciding What and How to Measure
III. Anticipating Patterns: Producing Models Using Probability Theory and Simulation
IV. Statistical Inference: Confirming Models

Textbook

Your textbook will be *Stats: Modeling the World.* 2nd ed. by David E. Bock, Paul F. Velleman and Richard D. DeVeaux. You may not have ever read a Math textbook before, but you'll need to read this one. There are note pages that you will complete as you read your book that will highlight the statistics vocabulary and the key concepts.

You will also receive a copy of *Preparing for the Statistics AP* Exam with Stats: Modeling the World, Second Edition, Bock, Velleman, DeVeaux* by Carroll, Carver, Peters, and Ricks. We will use this book to review together for the AP exam in the spring.

Technology

We will be using a graphing calculator regularly. There is a class set of thirty TI-84+ calculators available for use in the classroom. The calculator is an invaluable tool used to create histograms, boxplots, scatterplots, and Normal probability plots to aid in describing patterns in data. It is required for the exam in the spring. We will use them to calculate one-variable statistics, to test hypotheses with z-, *t*- and χ^2 tests, to calculate statistics and to help us analyze data. We will use them to generate random numbers and run simulations. Our textbook provides useful TI Tips that we will practice in the classroom together.

We will use the Math computer lab to access various applets on the internet for explorations and demonstrations. A statistics software program called *Fathom* is available on ten of the computers for small group work. All twenty-five of the computers in the lab are loaded with Excel. Many students choose to use that spreadsheet program to help them create graphs for projects and reports.

Activities

You will work with others in class regularly. Some days, the entire class will participate together in a large group activity and other days, we may break into small groups of two or three students. Activities are designed to provide a "hands-on" experience with data and illustrate the concepts.

Investigative Task

Many chapters will culminate in an Investigative Task. An investigative task is a written task that asks you to apply the major concepts of the chapter or the few previous chapters. These tasks are graded on a rubric scale that is designed to provide you guidance on writing clear, complete and concise answers.

Assignments

Exercises are assigned from the textbook for each chapter. You are encouraged to work together on the chapter exercises. Most students find that the discussions on these problems really help them clarify their own understandings. There are calculations and formulas that you will learn and use, but the emphasis is on interpretation of the results of applying those formulas. We correct and discuss the answers in class together. These assignments are graded for completion.

You will also be assigned Problem Sets to complete. These are sets of two or three multiple choice questions and one free response question from past AP exams. These will be graded using the AP Stats rubric.

Tests and Quizzes

There will be one test at the end of each of the seven main parts of the textbook. Each test consists of ten multiple-choice questions and five or six free response questions. Tests will be graded using the AP Stats grading rubric. You may always use a calculator and formula packet on any test. The formula packet is a copy of the formulas provided on the AP Exam. These are the only notes or formulas that may be used on a test.

There is a short take home check quiz at the end of each chapter. They are designed to sum up the key ideas of the chapter and help you assess your understanding. Additionally, there may be a few other quizzes throughout the chapters. Quizzes will also be graded using the AP Stats grading rubric.

You will be taking a cumulative exam at the end of the first semester. The second semester exam will be waived for those students who take the AP exam in May. All students are encouraged to take the AP exam.

Grading Our goal is to have the student focus on learning, not accumulation of points. Daily work will be assigned as formative practice for assessments and will be monitored for completion. Late work will be accepted up until the time of the summative unit test.

Grade	General Grading Criteria
A	Student has an advanced understanding and/or exceeds course expectations
B	Student has proficient understanding and/or meets course expectations
C	Student has a basic understanding and/or partially meets course expectations
D	Student has a minimal understanding and/or does not meet course expectations
F	Student has failed to demonstrate minimal course expectations

Project

We will end the year after the exam with a final research project. You may work in small groups to complete a project that demonstrates your understanding of the major concepts of AP Statistics. Your project must start with an interesting and meaningful question; use a good design for data collection; summarize the data visually, numerically, and verbally; use the data to make appropriate inferences; and reach sound conclusions about the original questions. You will need to present your research to the class and submit a written report.

Additional Resources

Students have access to power point summaries for the textbook chapters on my school homework page. You may also check out the video series, Statistics: Decisions Through Data, for viewing at home. We may view some of these in the classroom together if time permits.

AP Stats Course Outline

Part I: Exploring and Understanding Data

Chapter	Time	Topics	Activities
1: Stats Starts Here	1 day	• Introduction to Statistics	• Read pp. 2-6 • Complete Chapter 1 Notes: 1-3 • Class data survey
2: Data	1 day	• Identify the five W's of data • Categorical vs. Quantitative	• Read pp. 7-15 • Complete Chapter 2 Notes: 4-6 • Chapter 2 Exercises: pp. 16-18 • Chapter 2 Check Quiz
3: Displaying and Describing Categorical Data	4 days	• Choosing appropriate displays for data • Constructing and interpreting bar charts, segmented bar charts and pie charts • Frequency and relative frequency tables • Marginal and conditional distributions • Contingency tables • Identify independent variables in a contingency table • Simpson's paradox examples	• Read pp. 20-35 • Complete Chapter 3 Notes • Chapter 3 Exercises: pp.36-44 • Classwork: Smoking and Education • Investigative Task: Death Penalty • Chapter 3 Check Quiz • Quiz: Marginal and Conditional Distributions
4: Displaying Quantitative Data	4 days	• Constructing and interpreting histograms, stem-and-leaf displays, dotplots and timeplots • Describe shape, center and spread, unusual features of distributions-gaps, clusters, outliers	• Read pp. 45-61 • Complete Chapter 4 Notes • Chapter 4 Exercises: pp. 64-72 • Graphing Calculator: Creating Stats Plots • Chapter 4 Check Quiz
5: Describing Distributions Numerically	5 days	• 5-number summaries: Minimum-Quartile 1-Median-Quartile 3 -Maximum • Measures of center – mean and median • Measures of spread – range, IQR and standard deviation • Boxplot displays • Identifying outliers • Comparing distributions • Interpreting an ogive	• Read pp. 73-90 • Complete Chapter 5 Notes • Chapter 5 Exercises: pp. 90-100 • Activity: Matching Statistics to Plots • Classwork: Chapter 5 • Chapter 5 Check Quiz
6: The Standard Deviation as a Ruler and the Normal Model	5 days	• Shifting and rescaling data • Calculating and using z-scores • Normal models • Using tables and the graphing calculator for normal distributions • 68-95-99.7 Empirical Rule	• Read pp. 102-122 • Complete Chapter 6 Notes • Chapter 6 Exercises: pp. pp. 123-128 • Graphing calculator: normalcdf and invNorm • Investigative Task: The Normal Model • Chapter 6 Check Quiz
	3 days	Part I Test and Review	Review Exercises pp. 130-140

Part II: Exploring Relationships Between Variables

Chapter	Time	Topics	Activities
7: Scatterpolts, Association, and Correlation	3 days	• Scatterplots-direction, form and strength • Explanatory vs response variables • Find and interpret a correlation coefficient • Correlation Conditions -Quantitative Variables Condition -Straight Enough Condition -Outlier Condition • Association is not cause-and-effect • Beware of lurking variables!	• Read pp. 132-160 • Complete Chapter 7 Notes • Chapter 7Exercises: pp. 160-167 • Graphing calculator: Creating a scatterplot • Chapter 7 Check Quiz
8: Linear Regression	7 days	• Meaning of a line of best fit and regression to the mean • Calculating a regression equation • Recalculating regression equation to predict x from values of y • Finding the slope of the regression line and interpreting slope in context • Finding the y-intercept of the y-intercept and interpreting in context • Residuals and residual plots • Using R^2 in context • Reading computer table of results for regression	• Read pp. 168-188 • Complete Chapter 8 Notes • Chapter 8 Exercises: pp. 189-197 • Computer Activity: NCTM Illuminations-Line of Best Fit • Classwork: Distance and Ticket Price • Chapter 7 & 8 Prediction Worksheet • Graphing calculator: Linear Regression • Investigative Task: Smoking • Quiz: Linear Regression • Chapter 8 Check Quiz
9: Regression Wisdom	3 days	• Cautions for regression -Subsets in data -More on the Straight Enough Conditon -Influential points-outliers and high leverage points -Extrapolation -Lurking variables	• Read pp. 198-212 • Complete Chapter 9 Notes • Chapter 9 Exercises: pp.213-219 • Class Activity: Graduating Classes • Class Activity: The Wandering Point • Computer Activity: NCTM Illuminations-The Effects of Outliers • Activity: Matching Descriptions to Scatterplots • Graphing calculator: Residual plots • Chapter 9 Check Quiz
10: Re-expressing Data: Get It Straight!	3 days	• Using the Ladder of Powers to re-express data • Rewriting equations from logarithmic form to exponential form	• Read pp. 220-238 • Complete Chapter 10 Notes • Chapter 10 Exercises: pp. 238-243 • Graphing Calculator: Re-expression • Classwork: Models • Log Worksheet • Chapter 10 Check Quiz
	3 days	Part II Test and Review	Review Exercises pp. 244-254

Part III: Gathering Data

Chapter	Time	Topics	Activities
11: Understanding Randomness	3 days	• Power of randomness • Simulation strategies • Using random numbers-tables and calculator	• Read pp. 257-265 • Complete Chapter 11 Notes • Chapter 11 Exercises: pp. 266-269 • Graphing calculator: Random numbers • Investigative Task: ESP • Chapter 11 Check Quiz
12: Sample Surveys	4 days	• Census vs sample • Sampling methods -SRS -Stratified random -Cluster -Systematic -Convenience -Multistage • Types of Bias -Undercoverage -Voluntary response -Nonresponse -Response • Parameter vs Statistic	• Read pp. 270-288 • Complete Chapter 12 Notes • Chapter 12 Exercises: pp. 289-292 • Activity: Random M&M's • Activity: Rolling Down the River • Chapter 12 Check Quiz
13: Experiments and Observational Studies	6 days	• Recognize sample surveys, observational studies and randomized comparative experiments • Retrospective vs prospective observational studies • Cause-and-effect conclusions from experiments only • Four principals of experimental design • Value of control group, blinding, placebo • Confounding vs lurking variables	• Read pp. 293-313 • Complete Chapter 13 Notes • Chapter 13 Exercises: pp.313-317 • Activity: Gummy Bears in Space • Chapter 13 Check Quiz • Group Project: Students gather data, analyze data for patterns, and present findings to class
	3 days	Part III Test and Review	Review Exercises pp.319-324

Part IV: Randomness and Probability

Chapter	Time	Topics	Activities
14: From Randomness to Probability	2 days	• Interpreting probability • Law of Large Numbers • Complement Rule • Addition Rule for disjoint events • Multiplication Rule for independent events	• Read pp. 326-339 • Complete Chapter 14 Notes • Chapter 14 Exercises: pp. 339-343 • Chapter 14 Check Quiz
15: Probability Rules!	4 days	• Conditional probability • General Addition Rule • General Multiplication Rule • Creating and using Venn diagrams • Creating and using tree diagrams • Disjoint vs independent • Using conditional probability to determine if events are independent	• Read pp. 344-362 • Complete Chapter 15 Notes • Chapter 15 Exercises: pp. 362-366 • Chapter 15 Check Quiz
16: Random Variables	5 days	• Finding expected value, variance and standard deviation of random variables • Pythagorean Theorem of Statistics: variances add • Mean and standard deviation of the sums and differences of random variables • Using Normal models for sums and differences of continuous random variables	• Read pp. 368-381 • Complete Chapter 16 Notes • Chapter 16 Exercises: pp.381-385 • Activity: Play "Greedy Pig" • Activity: Play dice rolling game • Chapter 16 Check Quiz
17: Probability Models	5 days	• Bernoulli trials • Geometric models -Conditions -Expected value -Probability • Binomial models -Conditions -Mean and standard deviation -Probability • Normal model approximation for binomial	• Read pp. 386-397 • Complete Chapter 17 Notes • Chapter 17 Exercises: pp. 238-243 • Activity: Waiting for a Red Skittle • Graphing calculator: Calculating binomial probabilities • Chapter 17 Check Quiz
	3 days	Part IV Test and Review	Review Exercises pp. 402-407

Part V: From the Data at Hand to the World at Large

Chapter	Time	Topics	Activities
18: Sampling Distribution Models	5 days	• Sampling error • Assumptions and Conditions for sampling distributions • Sampling distribution of proportions • Central Limit Theorem • Sampling distribution of means	• Read pp. 410-428 • Complete Chapter 18 Notes • Chapter 18 Exercises: pp. 428-431 • Activity: Cents and the Central Limit Theorem • Investigative Task: Simulated Coins • Chapter 18 Check Quiz
19: Confidence Intervals for Proportions	5 days	• Meaning of a confidence interval • Calculating standard error • Margin of error • Critical value z^* • Assumptions and Conditions • Create a one-proportion z-interval • Interpret meaning of n% confidence interval in context • Interpret meaning of n% confidence	• Read pp. 432-445 • Complete Chapter 19 Notes • Chapter 19 Exercises: pp. 446-449 • Activity: What is a Confidence Interval Anyway? • Graphing calculator: 1-PropZInt • Chapter 19 Check Quiz
20: Testing Hypotheses About Proportions	4 days	• Four step process for testing hypotheses • Write a null and alternative hypothesis • Assumptions and conditions • One-sided vs two-sided • Finding the P-value • Interpreting the P-value in context	• Read pp. 451-469 • Complete Chapter 20 Notes • Chapter 20 Exercises: pp. 469-472 • Activity: Introduction to Hypothesis Testing • Graphing calculator: 1-PropZTest • Chapter 20 Check Quiz
21: More About Tests	5 days	• Alpha levels • Connection between hypothesis test and confidence level • Type I and Type II error • Power of a test • Reading computer output report for hypothesis tests	• Read pp. 473-490 • Complete Chapter 21 Notes • Chapter 21 Exercises: pp. 491-494 • Activity: Coins on Edge • Investigative Task: Life after High School? • Chapter 21 Check Quiz
22: Comparing Two Proportions	4 days	• Difference between two proportions • Assumptions and conditions • Two-proportion z-interval • Two-proportion z-test • Pooling data	• Read pp. 495-507 • Complete Chapter 22 Notes • Chapter 22 Exercises: pp. 507-511 • Activity: Statistical Evidence of Discrimination • Graphing calculator: 2-PropZTest • Chapter 22 Check Quiz
	3 days	Part V Test and Review	Review Exercises pp. 512-517

Part VI: Learning About the World

Chapter	Time	Topics	Activities
23: Inferences About Means	4 days	• Student's *t* • Degrees of freedom • Assumptions and conditions • Creating a one-sample *t*-interval • One-sample *t*-test for the mean • Reading typical computer output record	• Read pp. 520-541 • Complete Chapter 23 Notes • Chapter 23 Exercises: pp. 541-546 • Activity: M&M confidence Intervals • Graphing calculator: tcdf, invT, and T-Test • Investigative Task: SAT Performance • Chapter 23 Check Quiz
24: Comparing Means	5 days	• Comparing two means • Assumptions and conditions • Creating a two-sample *t*-interval • Two-sample *t*-test • Pooled *t*-test and corresponding confidence interval	• Read pp. 547-566 • Complete Chapter 24 Notes • Chapter 24 Exercises: pp. 566-573 • Activity: Goldfish • Graphing calculator: 2-SampTInt, 2-SampTTest • Chapter 24 Check Quiz
25: Paired Samples and Blocks	5 days	• Paired data • Assumptions and conditions • Paired *t*-test • Creating a paired *t*-interval • Blocking • Reading computer output for paired-*t* analyses	• Read pp. 574-586 • Complete Chapter 25 Notes • Chapter 25 Exercises: pp. 586-593 • Graphing calculator: T-Test and TInterval • Chapter 25 Check Quiz
	3 days	Part VI Test and Review	Group Inference Review Project Review Exercises pp. 595-603

Part VII: Inference When Variables Are Related

Chapter	Time	Topics	Activities
26: Comparing Counts	5 days	• Goodness-of-fit • Assumptions and conditions • Calculating a χ^2 statistic • Chi-square test for goodness-of-fit • Chi-square test of homogeneity • Examining the residuals • Chi-square test for independence • Chi-square and causation	• Read pp. 606-627 • Complete Chapter 26 Notes • Chapter 26 Exercises: pp. 628-633 • Activity: Goodness of Fit M&M's • Activity: How Typical Are Our Household Ages? • Investigative Task: AP Stat Scores • Graphing calculator: χ^2GOF-Test, χ^2-Test • Chapter 26Check Quiz
27: Inferences for Regression	5 days	• Assumptions and conditions for regression • Regression inference • Standard error for the slope • Regression slope *t*-test • (Standard error for predicted values) • (Confidence intervals for predicted values) • Reading regression analysis on the computer output record	• Read pp. 634-657 • Complete Chapter 27 Notes • Chapter 27 Exercises: pp. 658-669 • Worksheet: Correlation & Regression Review • Worksheet: Regression Inference-Electricity • Graphing calculator: LinRegTTest and LinRegTInt • Chapter 27Check Quiz
	3 days	Part VII Test and Review	Review Exercises pp. 670-680