

AP Statistics

Primary textbook:

Stats: Modeling the World

Bock, Velleman, De Veaux

Pearson Education

2007

Supplementary textbooks:

The Practice of Statistics (3rd edition)

Yates, Moore and Starnes

Freeman and Company

2007

Introduction to Statistics and Data Analysis

Peck, Olsen, Devore

Thomson Learning

2007

We have a classroom set of TI 89 Titanium calculators which we use extensively. We also have a site license for MINITAB 14, which is on all the classroom computers. Topics are explored in as many ways as possible. First we begin by developing an understanding of the new topic and we work the problems using formulas and by showing each step of the procedure. Next we investigate how to use the TI 89 calculators to obtain the same result. Finally we use MINITAB to obtain a print out of the desired results. Students are required to verbally interpret and explain their analysis of the data. They also must write short paragraphs explaining their analysis of the data. Ideally students could produce a report which included a MINITAB printout, appropriate charts and graphs, and a summary of the problem and an analysis of the data presented in the problem. The report should also include conclusions reached from the analyzed. The appropriate vocabulary of statistics should appear throughout the report.

We plan to cover all the objectives listed in the College Board topic outline. We will make extensive use of technology to analyze data. Students will defend their conclusions either verbally or with written paragraphs using statistics obtained from computer software.

Students are expected to become proficient at communicating statistical concepts throughout the course. They must explain effectively how methods, results and conclusions reached are valid. Students should be able to write complete responses with correct justifications when they analyze a study or an experiment.

Projects are assigned throughout the year to help students draw connections between all aspects of the statistical process including design, analysis and conclusions. These also teach students how to communicate methods, results, and interpretations using the vocabulary of statistics. Two examples of past projects follow.

Project 1. The high school principal asked the statistics class to conduct a survey of the student body in order to get the students' opinions on dress code proposals. Students had to design the survey in a manner that would reflect the opinions of all four grade levels at the high school. Sampling method, wording of the questions and interviewing techniques were all carefully considered. Then they had to actually conduct the survey and compile results. Finally, they had to prepare a report with appropriate tables and graphs summarizing the results. The high school principal presented the report at the next school board meeting. This report required students to clearly explain the design, analysis and conclusions of the survey using the vocabulary of statistics.

Project 2. The physics class worked together with the statistics class to conduct an experiment which investigated the relationship between the length of a pendulum and its period. Students had to design an experiment that controlled lurking variables and included replication. Different lab groups used different pendulum bobs and performed many trials of varying pendulum lengths. The data was plotted and appeared to show a relationship that could be modeled by a power regression. MINITAB was used to produce a graph of the original data, a graph of the transformed data and a regression equation to fit the transformed data. Students then transformed this equation into a "physics formula" that closely fit the original data. This equation was then compared to the known formula for the period of a pendulum. The differences between the coefficients and exponents were noted. The differences were very small. A lab report containing the experimental design, all appropriate graphs, the regression equation and the predicted physics formula was submitted to the physics instructor. The report required students to clearly explain the design, analysis and conclusions of the experiment using the vocabulary of statistics.

It should be noted that the statistics class is an excellent complement to the AP science classes as students are often able to produce improved lab reports.

The first seven units and unit nine will use the Bock, Velleman, De Veaux text. The eighth unit will use the Yates, Moore, Starnes text and the Peck, Olsen, Devore text as well as released College Board tests.

Unit 1

Exploring and Understanding Data (5 weeks)

Construct and interpret graphical displays of distributions of univariate data (dotplots, stemplots, histograms, cumulative frequency plots).

Describe center and spread. Describe clusters and gaps. Note outliers and other unusual features. Describe the shape of a distribution.

Summarize distributions of univariate data.

Measure center and spread using the mean and median. Measure the spread using the range, interquartile range, and standard deviation.

Measure position using quartiles, percentiles, and z-scores. Use boxplots to describe a distribution. Note the effect of changing units of measure.

Compare distributions of univariate data (dotplots, back to back stemplots, parallel boxplots).

Compare center and spread. Compare clusters and gaps. Compare outliers and other unusual features. Compare shapes.

Explore categorical data

Create frequency tables and bar charts. Calculate marginal and joint frequencies for two-way tables. Calculate relative frequencies. Compare distributions using bar charts.

Investigate the normal distribution.

Understand the properties of the normal distribution. Use tables of the normal distribution. Use the normal distribution as a model for measurements.

Chapter 1	Introduction
Chapter 2	Data
Chapter 3	Display and Describe Categorical Data
Chapter 4	Display and Describe Quantitative Data
Chapter 5	Describe Distributions Numerically
Chapter 6	The Normal Model and the Standard Deviation

Unit 2

Exploring Relationships Between Variables (4 weeks)

Explore bivariate data

Analyze patterns in scatterplots. Calculate correlation and explain its relationship to linearity. Find the least squares regression line. Sketch residual plots; identify outliers and influential points. Use transformations to achieve linearity; find logarithmic and power transformations.

Chapter 7	Scatterplots, Association, and Correlation
Chapter 8	Linear Regression
Chapter 9	Regression Wisdom
Chapter 10	Re-expressing Data: Get it Straight

Unit 3

Gathering Data (4 weeks)

Understand the methods of data collection.

Recognize the difference between a census, sample survey, experiment, and observational study.

Plan and conduct a survey.

Understand the characteristics of a well designed survey. Understand the difference between populations, samples, and random selection. Identify sources of bias. Understand how to conduct a simple random sample and a stratified random sample. Understand cluster sampling.

Plan and conduct an experiment.

Understand the characteristics of a well designed experiment. Identify treatments, control groups, experimental units, random assignment, and replication. Identify sources of bias and confounding. Understand the placebo effect and blinding. Implement completely randomized design. Understand how to use block design, including matched pairs design.

Generalize results and draw conclusions.

Chapter 11

Understanding Randomness.

Chapter 12

Sample Surveys

Chapter 13

Experiments and Observational Studies

Unit 4

Randomness and Probability (4 weeks)

Explore random phenomena using probability and simulation.

Interpret probability, including long-run relative frequency interpretation. Understand the law of large numbers. Apply the addition rule and the multiplication rule. Understand conditional probability and independence. Investigate discrete random variables and their probability distributions including binomial and geometric distributions. Conduct simulations of random behavior. Find the mean and standard deviation of a random variable.

Combine independent random variables.

Understand the difference between independence and dependence. Find the means and standard deviations for sums and differences of independent random variables.

Chapter 14

From Randomness to Probability

Chapter 15

Probability Rules

Chapter 16

Random Variables

Chapter 17

Probability Rules

Unit 5

From the Data at Hand to the World at Large (5 weeks)

Investigate sampling distributions.

Examine the sampling distribution of a sample proportion. Understand the central limit theorem. Examine the sampling distributions of a difference between two independent sample proportions.

Estimate population parameters and apply statistical inference.

Estimate margins of error. Calculate large sample confidence interval for a proportion. Calculate a large sample confidence interval for a difference between two proportions. Understand confidence intervals and draw conclusions.

Apply tests of significance.

Understand the logic of significance testing, the null and alternative hypothesis, p-values, one and two sided tests, Type I and Type II errors, and power. Apply a large sample test for a proportion. Apply a large sample test for a difference in proportions.

Chapter 18	Sampling Distribution Models
Chapter 19	Confidence Intervals for Proportions
Chapter 20	Testing Hypotheses About Proportions
Chapter 21	More About Tests
Chapter 22	Comparing Two Proportions

Unit 6

Learning About the World (4 weeks)

Estimate population parameters and apply statistical inference.

Estimate margins of error. Calculate a confidence interval for a mean. Calculate a confidence interval for a difference between two means.

Apply tests of significance.

Understand the logic of significance testing, the null and alternative hypothesis, p-values, one and two sided tests, Type I and Type II errors, and power. Investigate the t-distribution. Apply a test for a mean. Apply a test for a difference between two means.

Plan and conduct an experiment.

Plant and analyze the results of an experiment that uses block design, including matched pairs design

Chapter 23	Inferences About Means
Chapter 24	Comparing Means
Chapter 25	Paired Samples and Blocks

Unit 7 **Inference When Variables are Related (2 weeks)**

Estimate population parameters and apply statistical inference.

Estimate margins of error and calculate confidence intervals.

Estimate population parameters.

Calculate a confidence interval for the slope of a least squares regression line.

Apply tests of logic.

Understand the logic of significance testing, the null and alternative hypothesis, p-values, one and two sided tests, Type I and Type II errors, and power. Investigate the chi-square distribution. Apply a chi square test for goodness of fit, homogeneity of proportions, and independence (one and two way tables). Apply a test for the slope of a least squares regression line.

Chapter 26	Comparing Counts
Chapter 27	Inference for Regression

Unit 8 **Course Review (6 weeks) YMS Textbook**

Explore data. Plan and conduct an experiment. Explore random phenomena using probability and simulation. Estimate population parameters and apply tests of significance.

Chapter 1	Exploring Data
Chapter 2	The Normal Distributions
Chapter 3	Examining Relationships
Chapter 4	More on Two Variable Data
Chapter 5	Producing Data
Chapter 6	Probability
Chapter 7	Random Variables
Chapter 8	The Binomial and Geometric Distributions
Chapter 9	Sampling Distributions
Chapter 10	Introduction to Inference
Chapter 11	Inference for Distributions
Chapter 12	Inference for Proportions
Chapter 13	Inference for Tables: Chi Square Procedures
Chapter 14	Inference for Regression
Released AP Exams	

Unit 9 **Post Exam Topics BVD Textbook**

Chapter 28	Analysis of Variance
Chapter 29	Multiple Regression