# The Advanced Placement Statistics Course
# Syllabus

Portsmouth High School *** Clipper Nation

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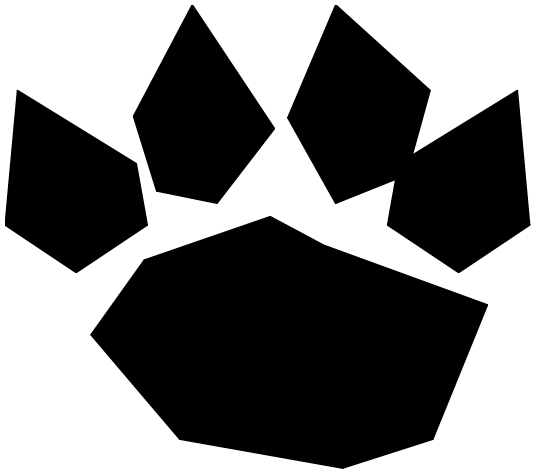
If you're not the Alpha Dog,
the view doesn't change!!!



## Overview

Portsmouth High School serves approximately 1100 students from Portsmouth (two-thirds of the student body) and the surrounding communities of Rye, Greenland, New Castle, and Newington. The school schedule follows a modified 4x4 block system and most classes meet every day for ninety minutes. The majority of mathematics classes last one semester (approximately ninety school days). The Advanced Placement Statistics class is offered as a three quarter class beginning in quarter one, typically the last week of August, and ending the first week in April. One obvious drawback of Portsmouth's 4x4 block schedule is that Advanced Placement classes end approximately one month before the AP exams.

## Course Design

*Stats: Modeling the World* by Bock, Velleman, and De Veaux (BVD) sets the general blueprint of the course and acts as the primary source of homework problems. Students are required to read for understanding chapters in the text in advance of formal class discussions. Students are encouraged although not required to take notes on their readings. Students will also be provided with Instructor Notes from the instructor. Instructor Notes are a compilation of material to support and expand on chapter readings. Instructor Notes are composed of instructor commentary, passages from other statistical texts and the BVD teacher guide, and passages and examples copied from the AP Statistics Electronic Discussion Group. Our discussions of statistical concepts begin once students have read the appropriate chapter(s) and supporting Instructor Notes and engaged in activities and explorations. Students are expected to devote one hour, on average, to homework/reading/project work on a daily basis.

The Advanced Placement Statistics course is activity-driven and fun. The method of instruction emphasizes an inquiry-based, discovery approach to learning statistics. We will plan, collect data, and conduct analysis in small groups. The instructional intent for the course is to have students actively engaged in exploring, discovering, and constructing an understanding and mastery of the course curriculum. These activities, explorations, and investigations come from a variety of sources such as: math conferences (Phillips Exeter Academy's Anja S. Greer Math, Science & Technology Conferences and Bristol-Myers Squibb Statistics workshops), Fifty Fathoms, the AP Statistics Electronic Discussion Group, the vast resources of the Internet, and the instructor. These activities and interesting data sets are chosen and designed so that students will learn how to draw connections between all aspects of the statistical process, including design, analysis, and conclusions.

In fact, on the initial day of school the first activity we engage in – "Can the students of Portsmouth High School tell the difference between Coke and Pepsi by taste?" - is designed to set the foundation for how we will draw connections between all aspects of the statistical process: design/collection of data, methods of analysis, and communicating conclusions. Examples of some of the many interesting historical data sets we will analyze include the 1970 Vietnam draft lottery and the comparison of the polling results and the actual votes cast in the key battleground states of the 2004 Presidential election. The results of the 1970 Vietnam draft lottery, one of our early projects, will again build our habit of mind for how students must be able to make connections between between all aspects of the statistical process. In the example of the 1970 Vietnam draft lottery, we will look at how the lottery was designed and the data was collected, the different methods for analysis and interpretation, and how to best

communicate our conclusions regarding whether the draft lottery was biased. We will make a simulation of the draft lottery using Winstat software as part of our analysis.

Students discover that the AP Statistics course may be dissimilar to the typical mathematics courses they have taken. Aside from the reading requirements discussed above, students are required to communicate effectively in writing and orally about the statistical process as well as the results. In many algebra courses, students' work on a problem is finished once the search for the ever-elusive 'x' is complete. And certainly in our study of statistics, we are interested in computational accuracy. But the study of statistics is much more than making computations. Data analysis is a voyage of discovery. Students will learn how to communicate effectively about all aspects of the statistical process. They will be able to discuss, compare, contrast, and interpret statistical design, analysis, and conclusions. Student use of the vocabulary of statistics to communicate about methods, results, and interpretations of those results is required on all assignments.

In addition to the activities, explorations, projects, and textbooks assignments, we will use historical AP exam Free Response (APFR) questions as vehicles for learning and discussing effective statistical analysis and communication. Not only will students work all past free response questions over the length of the course, we will also analyze examples of student responses, and scoring rubrics provided by the College Board. Furthermore, we will review and use scoring commentary from past AP exams also provided by the College Board. We will also work and discuss all of the past Investigative Tasks (Question 6) to further our ability to communicate statistically and to prepare for the AP exam.

Technology is a powerful tool in the statistical process. Students will master several different forms of technology for producing graphical displays, summary statistics, and performing actual calculations. Texas Instrument graphing calculators will play an integral role in our inquiry and discovery approach to learning statistics and are used throughout the course. The authors of our textbook do an excellent job of showing us how to use the calculator's statistical functions. Easy-to-read instructions titled, “TI Tips” provide straight-forward instructions and examples geared for use with the TI-83 and TI-84 family of calculators. Appendix B of our text provides helpful hints for students who own a TI-89 calculator. Students who do not own a TI-83 Plus calculator (or better) will be assigned one until the AP exam is completed.

Our primary computer lab (Room 328) and mobile computer lab have JMP-IN software. For future reference, none of the other labs/mobile labs have JMP-IN. Students are expected to master the use of JMP-IN and be able to independently use JMP-IN to produce and interpret graphical displays, statistical summaries, and test statistics and corresponding p-values. Students should save all JMP-IN files to their Personal (P) Drives.

We will also make use of free software on the Internet like Rick Paris’s Peanut software at math.exeter.edu/r**parris**/ and applets such as the Rice University Virtual Lab in Statistics at www.ruf.rice.edu/~lane/rvls.html.

**Assessment** The grade scale used in the Advanced Placement Statistics Course is in compliance with the Portsmouth High School Faculty Handbook and Student Handbook. Tests, quizzes, and APFRs compose 50% of students' grades with homework, activities, and projects accounting for the other fifty percent of students' grades.

## Course Materials

**Primary Text:**

Bock, David; Velleman, Paul; De Veaux, Richard. *Stats: Modeling the World, First Edition.* Boston: Pearson Addison Wesley, 2004. ISBN 0-201-73735-3.

**Supporting Texts and Resources:**

Bohan, James. *AP Statistics: Preparing for the Advanced Placement Examination.* New York: Amsco School Publications, 2001. ISBN 1-56765-527-0.

Erickson, Tim. *Fifty Fathoms: Statistics Demonstrations for Deeper Understanding*. Oakland, CA: EEPS Media, 2002. ISBN0-9648496-2-3.

Rossman, Alan and Chance, Beth. *Workshop Statistics: Discovery with Data and the Graphing Calculator.* Emeryville, CA: Key College Publishing, 2001. ISBN 1-930190-05-0.

## Syllabus Key:

ACT Activity

AMS AMSCO Review book

APFR AP Free Response Question (problem number-year)

APL Applet

BVD Bock, Velleman, and De Veaux

EXP Exploration

JMP JMP-IN software

OTH Other

PROJ Project

RFU Read for understanding (Unless otherwise specified, all RFU assignments are from BVD)

SIM Simulation

TI Calculator Skills

WIN Winstat software

WST Workshop Statistics

**Unit 1 – Exploring and Understanding Data** "Describing patterns and departures from patterns (20% –30% of the AP Statistics course). *Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summarie*s. In examining distributions of data, students should be able to detect important characteristics, such as shape, location, variability, and unusual values. From careful observations of patterns in data, students can generate conjectures about relationships among variables. The notion of how one variable may be associated with another permeates almost all of statistics, from simple comparisons of proportions through linear regression. The difference between association and causation must accompany this conceptual development throughout." ("AP Statistics Course Description", The College Board, pp.5-6.)

| Number of Days | Chapter * Activities * Topics * Assignments | AP Statistics Course Topic Outline |
|---|---|---|
| **2** | RFU Chapter 1 Stats Starts Here<br><br>Topics:<br>• Introduction to Statistics, Data, and Variation<br>• Think-Show-Tell strategy for statistics<br><br>ACT Coke® versus Pepsi®: Can anyone tell the difference between Coke and Pepsi by taste?<br><br>EXP "An Unusual Incident" | I.Exploring Data<br><br>A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)<br><br>1. Center and spread<br>2. Clusters and gaps<br>3. Outliers and other unusual features<br>4. Shape<br><br>II. Sampling and Experimentation<br><br>C. Planning and conducting experiments<br><br>1. Characteristics of a well-designed and well-conducted experiment<br>2. Treatments, control groups, experimental units, random assignments, and replication<br>3. Sources of bias and confounding, including placebo effect and blinding<br>4. Completely randomized design<br>5. Randomized block design, including matched pairs design<br><br>D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys |
| **2** | RFU Chapter 2 Data<br><br>Topics:<br>• Analyzing Data – Who, What, When, Where, Why, How - Context<br>• Categorical vs. Quantitative Variables | I.Exploring Data<br><br>E. Exploring categorical data<br>1.Frequency tables and bar charts<br>2.Marginal and joint frequencies for two-way tables<br>3.Conditional relative frequencies and association |

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| | TI Enter and edit data in lists; random number generators | 4.Comparing distributions using bar charts |
| **1** | RFU Chapter 3 Displaying and Describing Categorical Data<br>Topics:<br>• Relative frequency table<br>• Area principle<br>• Graphical displays – make a picture<br>• Bar and pie charts<br>• Contingency tables<br>• Informal concept of independence | I.Exploring Data<br><br>E. Exploring categorical data<br>1. Frequency tables and bar charts<br>2. Marginal and joint frequencies for two-way tables<br>3. Conditional relative frequencies and association<br>4. Comparing distributions using bar charts |
| **5** | RFU Chapter 4 Displaying Quantitative Data<br><br>Topics:<br>• Stem-and-leaf displays<br>• Dotplots<br>• Distribution<br>• Relative frequency histograms<br>• Shape, center, spread, outliers, and unusual features of distributions<br>• Comparing distributions<br>• Timeplots<br><br>TI Make modified box plots and histograms<br><br>JMP Make modified boxplots and histograms<br><br>ACT Sorting Distributions into Shapes<br><br>ACT Paper Helicopters: comparing distributions<br><br>OTH "Calculations Aren't Enough!"<br><br>APL Comparing distributions: how quickly can students use their mouse to click on a small rectangle compared to a large rectan http://onlinestatbook.com/stat_sim/compare_dist/index.html<br><br>APFR 1-2004; 5-2002; 1-2005B; 1-2005 | I. Exploring Data<br><br>A. Constructing and interpreting graphical displays of distributions of univariate data (boxplot, stemplot, histogram, cumulative frequency plot)<br>1.Center and spread<br>2.Clusters and gaps<br>3.Outliers and other unusual features<br>4.Shape<br><br>C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)<br>1.Comparing center and spread within group, between group variation<br>2.Comparing clusters and gaps<br>3.Comparing outliers and other unusual features<br>4.Comparing shapes |
| **5** | RFU Chapter 5 Describing Distributions Numerically | I.Exploring Data |

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| | Topics:<br>• Median and interquartile range (IQR)<br>• Five number summary<br>• Percentile<br>• Mean, variance, and standard deviation<br>• Introduction to degrees of freedom<br><br>TI Comparing modified boxplots; viewing a distribution's modified boxplot and histogram simultaneously; calculate statistical summaries for univariate data<br><br>ACT Hershey's ® Kisses ® Activity<br><br>ACT How many drops of water can fit on a penny?<br><br>EXP Is Babe Ruth an Outlier?<br><br>OTH "The Median Isn't the Message."<br><br>OTH "…And Black Swans."<br><br>APL Mean and Median<br>http://onlinestatbook.com/stat_sim/descriptive/index.html<br><br>APL Histograms<br>http://onlinestatbook.com/stat_sim/histogram/index.html<br><br>APFR 3-2000; 1-2001; 1-2006; 1-2006B | A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)<br><br>1. Center and spread<br>2. Clusters and gaps<br>3. Outliers and other unusual features<br>4. Shape<br><br>B. Summarizing distributions of univariate data<br><br>1. Measuring center: median, mean<br>2. Measuring spread: range, interquartile range, standard deviation<br>3. Measuring position: quartiles, percentiles, standardized scores (z-scores)<br>4. Using boxplots<br>5. The effect of changing units on summary measures<br><br>C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)<br>1. Comparing center and spread: within group, between group variation<br>2. Comparing clusters and gaps<br>3. Comparing outliers and other unusual features<br>4. Comparing shapes |
| **7** | RFU Chapter 6 The Standard Deviation as a Ruler and the Normal Model<br><br>Topics:<br>• Standard deviation<br>• Standardized values and z-scores<br>• Rescaling data<br>• Normal models<br>• The Standard Normal distribution<br>• 68-95-99.7 Rule for Normal distributions<br>• Finding percentiles by hand<br>• Normal probability plot<br><br>TI finding percentiles using normalcdf; finding z-scores using invNorm; normal probability plot; generating random numbers from | III. Anticipating Patterns<br><br>B. Summarizing distributions of univariate data<br>1. Measuring center: median, mean<br>2. Measuring spread: range, interquartile range, standard deviation<br>3. Measuring position: quartiles, percentiles, standardized scores (z-scores)<br>5. The effect of changing units on summary measures<br><br>C. The normal distribution<br>1. Properties of the normal distribution<br>2. Using tables of the normal distribution<br>3. The normal distribution as a model for measurements |

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| | a Normal model using randNorm<br><br>EXP "Ms. Brooks, We Have A Problem…"<br><br>OTH "Is it Normal?"<br><br>PROJ An Analysis of the 1970 Draft Lottery<br><br>RFU "The Writing on the Wall"<br>RFU "Nonrandom Risk: The 1970 Draft Lottery"<br>RFU "Randomization and Social Affairs: The 1970 Draft Lottery"<br><br>WIN > Simulations > Deal Cards<br><br>ACT/PROJ Simulation 1970 Vietnam draft lottery | |

## Unit II – Exploring Relationships Between Variables

| Number of Days | Chapter * Activities * Topics * Assignments | AP Statistics Course Topic Outline |
|---|---|---|
| **4** | RFU Chapter 7 Scatterplots, Association, and Correlation<br><br>Topics:<br>• Making and describing scatterplots: association, form, direction, strength, outlier<br>• Explanatory/predictor variable and response variable<br>• Correlation<br>• Straightening scatterplots<br><br>TI Working with lists; making scatterplots; calculating the least-squares regression line; correlation<br><br>JMP Create scatterplots<br><br>ACT/PROJ "Is there an association between ramp height and the length of marble rolls?"<br><br>APL Regression by eye<br>http://onlinestatbook.com/stat_sim/reg_by_eye/index.html | I.Exploring Data<br><br>D. Exploring bivariate data<br><br>1. Analyzing patterns in scatterplots<br>2. Correlation and linearity<br>3. Least-squares regression line<br>4. Residual plots, outliers, and influential points |

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| | APFR 2-1998; 1-2000 | |
| **5** | RFU Chapter 8 Linear Regression<br><br>Topics:<br>• Linear model<br>• Predicted values<br>• Slope<br>• Intercept<br>• Residuals<br>• Least squares<br>• R-squared<br><br>TI Create a residual plot<br><br>JMP Create least squares regression equations; create residual plots; read computer output for linear regression<br><br>ACT/PROJ Toy Story Paratrooper Activity<br><br>APL Regression to the mean<br>http://onlinestatbook.com/stat_sim/reg_to_mean/index.html<br><br>APL least squares regression<br>http://www.dynamicgeometry.com/javasketchpad/gallery/pages/least_squares.php<br><br>APFR 4-2002; 1-2002B; 2-2006 | I.Exploring Data<br><br>D. Exploring bivariate data<br><br>1. Analyzing patterns in scatterplots<br>2. Correlation and linearity<br>3. Least-squares regression line<br>4. Residual plots, outliers, and influential points |
| **4** | RFU Chapter 9 Regression Wisdom<br><br>Topics:<br>• Extrapolation<br>• Influential points<br>• Lurking variable<br>• Outlier<br>• Leverage<br><br>APFR 4-1998;1-1999;1-2003B; 1-2004B; 3-2005B | I.Exploring Data<br><br>D. Exploring bivariate data<br><br>1. Analyzing patterns in scatterplots<br>2. Correlation and linearity<br>3. Least-squares regression line<br>4. Residual plots, outliers, and influential points |
| **3** | RFU Chapter 10 Re-expressing Data<br><br>Topics:<br>• The ladder of powers<br>• Models: exponential; logarithmic; power | D. Exploring bivariate data<br><br>1. Analyzing patterns in scatterplots<br>2. Correlation and linearity<br>3. Least-squares regression line<br>4. Residual plots, outliers, and influential |

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| | • Re-expressing data<br><br>TI Transforming data using logarithms; other regression models: logarithmic, power, exponential – LinReg(a + bx), LnReg, ExpReg, PwrReg<br><br>ACT Pulse Rate: What is the association between stairs climbed and pulse rate?<br><br>ACT The Decay of M&Ms<br><br>APL Transformations<br><br>http://onlinestatbook.com/stat_sim/transformations/index.html | points<br>5. Transformations to achieve linearity: logarithmic and power transformations |

## Unit III – Gathering Data

*"Sampling and Experimentation: Planning and conducting a study (10% –15%) 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. Data must be collected according to a well-developed plan if valid information is to be obtained.* If data are to be collected to provide an answer to a question of interest, a careful plan must be developed. Both the type of analysis that is appropriate and the nature of conclusions that can be drawn from that analysis depend in a critical way on how the data was collected. Collecting data in a reasonable way, through either sampling or experimentation, is an essential step in the data analysis process. ("AP Statistics Course Description", The College Board, p. 6.)

| Number of Days | Chapter * Activities * Topics * Assignments | AP Statistics Course Topic Outline |
|---|---|---|
| **3** | RFU Chapter 11 Understanding Randomness<br><br>Topics:<br>• Random numbers<br>• Simulation<br><br>ACT Simulation: "Is the American justice system working?"<br><br>PROJ "Driving While Black: A Statistician Proves That Prejudice Still Rules the Road."<br><br>TI random number generators – rand, randInt, randNorm, randbin | II. Sampling and Experimentation<br><br>A. Overview of methods of data collection<br><br>1. Census<br>2. Sample survey<br>3. Experiment<br>4. Observational study |
| **5** | RFU Chapter 12 Sample Surveys | II. Sampling and Experimentation |

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| | Topics:<br>• Populations and samples<br>• Bias<br>• Census<br>• Sampling<br>• Simple Random Sample (SRS)<br>• Sampling variability<br>• Stratified random sampling; strata<br>• Cluster sampling; cluster<br>• Multistage sampling<br>• Systematic sampling<br>• Convenience sampling<br>• Voluntary response sampling; voluntary response bias<br>• Undercoverage<br>• Response bias<br><br>EXP "An Exercise in Sampling: Rolling Down The River"<br><br>APFR 3-1998; 2-2004B | B. Planning and conducting surveys<br><br>1. Characteristics of a well-designed and well-conducted survey<br>2. Populations, samples, and random selection<br>3. Sources of bias in sampling and surveys<br>4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling<br><br>D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys |
| **9** | RFU Chapter 13 Experiments<br><br>Topics:<br>• Principles of experimental design:<br>+ Control<br>+ Randomization<br>+ Replication<br>+ Blocking<br>• Studies: observational; retrospective; prospective<br>• Statistically significant<br>• Blinding<br>• Placebo<br>• Factors<br>• Treatments<br>• Confounding<br><br>ACT "How many water drops can fit on the head of a penny: Redux?"<br><br>ACT Helicopter drops<br><br>ACT More Than Your Heart Desires…An Exploration | II. Sampling and Experimentation<br><br>C. Planning and conducting experiments<br><br>1. Characteristics of a well-designed and well-conducted experiment<br>2. Treatments, control groups, experimental units, random assignments, and replication<br>3. Sources of bias and confounding, including placebo effect and blinding<br>4. Completely randomized design<br>5. Randomized block design, including matched pairs design<br><br>D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys |

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| | of Blocking<br><br>ACT "Blocking Activity: Can you see the trees for the forest?"<br><br>PROJ Student-designed experiment<br><br>APFR 3-1998; 5-2000; 4-2001; 2-2002; 4-2003; 4-2003B; 2-2004; 3-2005B; 5-2006B; 5-2006 | |

## Unit IV – Randomness and Probability

*"Anticipating Patterns: Exploring random phenomena using probability and simulation (20% –30%) Probability is the tool used for anticipating what the distribution of data should look like under a given model.* Random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution. The mathematical description of variation is central to statistics. The probability required for statistical inference is not primarily axiomatic or combinatorial, but is oriented toward using probability distributions to describe data." *("AP Statistics Course Description", The College Board, p. 6.)*

| Number of Days | Chapter * Activities * Topics * Assignments | AP Statistics Course Topic Outline |
|---|---|---|
| **5** | RFU Chapter 14 From Randomness to Probability<br><br>Topics:<br>• Probability<br>• Trial and outcome<br>• Independent trials and Independence (informal)<br>• The Law of Large Numbers<br>• Probability of an event<br>• Complement rule<br>• Addition rule<br>• Multiplication rule<br>• Disjoint<br><br>ACT Simulation of the 2003 Red Sox v. NYY seventh game of the AL Championship Series: Should Pedro Martinez have been pulled after the seventh inning?<br><br>APFR 5-1999; 3-2001; 5-2003B | III. Anticipating Patterns<br><br>A. Probability<br><br>1. Interpreting probability, including long-run relative frequency interpretation<br>2. "Law of Large Numbers" concept<br>3. Addition rule, multiplication rule, conditional probability, and independence<br>4. Discrete random variables and their probability distributions, including binomial and geometric<br>5. Simulation of random behavior and probability distributions<br>6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable<br><br>B. Combining independent random variables<br><br>1. Notion of independence versus dependence |
| **4** | RFU Chapter 15 Probability Rules! | III. Anticipating Patterns |

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| | Topics:<br>• General Addition rule<br>• General Multiplication rule<br>• Independence (formal)<br>• Tree diagrams<br>• Conditional probability<br><br>ACT Drug testing<br><br>APFR 4-1999; 4-2004 | A.Probability<br><br>1. Interpreting probability, including long-run relative frequency interpretation<br>2. "Law of Large Numbers" concept<br>3. Addition rule, multiplication rule, conditional probability, and independence<br>5. Simulation of random behavior and probability distributions |
| **3** | RFU Chapter 16 Random Variables<br><br>Topics:<br>• Continuous random variables<br>• Probability models<br>• Expected value: mean and standard deviation<br>• The algebra involved in combining random variables<br><br>TI activate prior knowledge --- calculating summary Statistics – 1 – Var Stats<br><br>OTH "Why Variances Add -- And Why It Matters."<br><br>APFR 2-2001; 2-2002B; 2-2005; 2-2005B | III. Anticipating Patterns<br><br>B. Combining independent random variables<br>1. Notion of independence versus dependence<br>2. Mean and standard deviation for sums and differences of independent random variables |
| **4** | RFU Chapter 17 Probability Models<br><br>Topics:<br>• The Geometric Model<br>• The Binomial Model<br>• Approximating the binomial model with a Normal model<br><br>TI the geometric and binomial models – binompdf, binomcdf, geometpdf, geometcdf; approximating a binomial model with a Normal model; what is the difference between cdf and pdf?<br><br>APFR 2-2003B; 3-2004; 3-2006; 3-2006B | III. Anticipating Patterns<br><br>C. The normal distribution<br>1. Properties of the normal distribution<br>2. Using tables of the normal distribution<br>3. The normal distribution as a model for measurements |

## Unit V – Sampling Distributions and Statistical Inference

"*Statistical Inference: Estimating population parameters and testing hypotheses (30% –40%).* Statistical inference guides the selection of appropriate models. Models and data interact in statistical work: models are used to draw conclusions from data, while the data are allowed to criticize and even falsify the model through inferential and diagnostic methods. Inference from data can be thought of as the process of selecting a reasonable model, including a statement in probability language, of how confident one can be about the selection. ("AP Statistics Course Description", The College Board, p. 6.)

| **Number of Days** | **Chapter * Activities * Topics * Assignments** | **AP Statistics Course Topic** Outline |
|---|---|---|
| **6** | RFU Chapter 18 Sampling Distribution Models<br><br>Topics:<br>• The sampling distribution model for a proportion<br>• The sampling distribution model for a mean<br>• The Central Limit Theorem<br>• Assumptions and Conditions<br>• Standard Error<br><br>ACT "The JellyBlubber Colony"<br><br>APL Sampling Distributions and the Central Limit Theorem<br>http://onlinestatbook.com/stat_sim/sampling_dist/index.html<br><br>APFR 1-1998; 3-2001; 3-2003; 3-2004B | IV. Statistical Inference<br>D. Sampling distributions<br><br>1. Sampling distribution of a sample proportion<br>2. Sampling distribution of a sample mean<br>3. Central Limit Theorem |
| **6** | RFU Chapter 19 Confidence Intervals for Proportions<br><br>Topics:<br>• Confidence interval for a proportion<br>• Margin of error<br>• Critical values<br>• Interpretation of a confidence interval and a confidence level<br>• Assumptions for use of the model and the conditions that verify that those assumptions are reasonable<br><br>APL confidence intervals for a proportion<br>http://onlinestatbook.com/stat_sim/normal_approx_conf/index.html<br><br>PROJ Sampling for a one proportion confidence interval<br><br>TI one proportion z-interval: 1-PropZInt | IV.Statistical Inference<br>A. Estimation (point estimators and confidence intervals)<br><br>1. Estimating population parameters and margins of error<br>2. Properties of point estimators, including unbiasedness and variability<br>3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals<br>4. Large sample confidence interval for a proportion<br><br>B. Tests of significance<br><br>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 |

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| | APFR 2-2002B; 2-2006B | |
| **6** | RFU Chapter 20 Testing Hypotheses about Proportions<br><br>Topics:<br>• Null and alternative hypotheses<br>• The reasoning of hypothesis testing<br>• Decision-making and p-values<br>• Assumptions and conditions for using the one-proportion z-test<br>• One-sided alternative and two-sided alternatives<br>• Comparison of one-proportion z-test and a one sample confidence interval for a proportion<br><br>TI one proportion z-test – 1-PropZTest<br><br>APFR 5-1998; 4-2005; 5-2005 | IV. Statistical Inference<br><br>A. Estimation (point estimators and confidence intervals)<br>1. Estimating population parameters and margins of error<br>2. Properties of point estimators, including unbiasedness and variability<br>3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals<br>4. Large sample confidence interval for a proportion<br>5. Large sample confidence interval for a difference between two proportions |
| **4** | RFU Chapter 21 More About Tests<br><br>Topics:<br>• Alpha levels and significance level<br>• Statistical significance<br>• Type I and Type II errors<br>• The power of a test<br>• Reducing both Type I and Type II errors<br>• Effect size<br><br>OTH "On Power"<br><br>OTH Interpreting computer output<br><br>APL Robustness<br>http://onlinestatbook.com/stat_sim/robustness/index.html<br><br>APL effect size<br>http://onlinestatbook.com/stat_sim/index.html<br><br>APFR 2-2003 | IV. Statistical Inference<br><br>B. Tests of significance<br>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 |
| **5** | RFU Chapter 22 Comparing Proportions<br><br>Topics:<br>• The standard deviation of the difference between two proportions | IV. Statistical Inference<br><br>A. Estimation (point estimators and confidence intervals)<br>1. Estimating population parameters and margins of error |

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| | • Assumptions for use of the model and the conditions that verify that those assumptions are reasonable<br>• The sampling distribution model for a difference between two independent proportions<br>• Constructing and interpreting a two-proportion confidence interval<br>• The standard error of the difference in proportions and pooling<br>• Significance testing to compare two population proportions<br><br>TI two-proportion z-interval – 2-PropZInt<br><br>OTH "Why do we pool for the two proportion z-test?" | 2. Properties of point estimators, including unbiasedness and variability<br>3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals<br>4. Large sample confidence interval for a proportion<br>5. Large sample confidence interval for a difference between two proportions<br>6. Confidence interval for a mean<br>7. Confidence interval for a difference between two means (unpaired and paired)<br>8. Confidence interval for the slope of a least-squares regression line |
| **5** | RFU Chapter 23 Inferences about Means<br><br>Topics:<br>• Student's t-model family of distributions<br>• Sampling distribution for sample means<br>* Degrees of freedom<br>* Assumptions for use of the model and the conditions that verify that those assumptions are reasonable<br>• Constructing and interpreting a One-sample t-interval<br>• One-sample t-test for the mean<br>• Standard error of y-bar<br><br>ACT Church building and colored blocks time trials<br><br>APL confidence intervals<br>http://onlinestatbook.com/stat_sim/conf_interval/index.html<br><br>TI T-Test – Input: Data and Stats; TInterval; Normal probability plot<br><br>APFR 2-2000; 1-2002; 1-2003 | IV. Statistical Inference<br><br>A. Estimation (point estimators and confidence intervals)<br>1. Estimating population parameters and margins of error<br>2. Properties of point estimators, including unbiasedness and variability<br>3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals<br>6. Confidence interval for a mean |
| **5** | RFU Chapter 24 Comparing Means<br><br>Topics:<br>• Activate prior knowledge: independent random variables<br>• The sampling distribution for the difference between two means | IV. Statistical Inference<br><br>A. Estimation (point estimators and confidence intervals)<br>1. Estimating population parameters and margins of error<br>2. Properties of point estimators, including unbiasedness and variability |

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| | • Assumptions for use of the model and the conditions that verify that those assumptions are reasonable<br>• Two-sample t-interval<br>• Degrees of freedom<br>• Two-sample t-test for means<br>• Pooling (compare to two proportion z-test)<br><br>ACT Scooter rides for distance<br><br>TI 2-SampTInt; 2-SampTTest<br><br>APFR 4-2000; 5-2002; 4-2004B; 5-2004B; 4-2005B; 4-2006 | 3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals<br>6. Confidence interval for a mean<br>7. Confidence interval for a difference between two means (unpaired and paired) |
| **6** | RFU Chapter 25 Paired Samples and Blocks<br><br>Topics:<br>• Paired data<br>• Matched pairs t-test<br>• Assumptions for use of the model and the conditions that verify that those assumptions are reasonable<br>• Confidence intervals for matched pairs<br><br>ACT Razor Scooters: Do students scoot further using their left foot or their right foot for pushing?<br><br>PROJ Oreo® Project<br>PROJ M&Ms® Project<br><br>APFR 5-2001; 4-2006B | IV. Statistical Inference<br><br>A. Estimation (point estimators and confidence intervals)<br>1. Estimating population parameters and margins of error<br>2. Properties of point estimators, including unbiasedness and variability<br>3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals<br>6. Confidence interval for a mean<br>7. Confidence interval for a difference between two means (unpaired and paired) |

## Unit VI – Inference When Variables are Related

| Number of Days | Chapter * Activities * Topics * Assignments | AP Statistics Course Topic Outline |
|---|---|---|
| **6** | RFU Chapter 26 Comparing Counts<br><br>Topics:<br>• The chi-square test statistic<br>• Goodness-of-fit test<br>• Test for homogeneity<br>• Chi-square test for independence | IV. Statistical Inference: Estimating population parameters and testing hypotheses<br>B. Tests of significance<br>1. Logic of significance testing, null and alternative hypotheses; p-values<br>6. Chi-square test for goodness of fit, homogeneity of proportions, and |

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| | • Assumptions for use of the models and the conditions that verify that those assumptions are reasonable<br><br>ACT Weighing bookbags: Is there an association between bookbag weight and gender?<br><br>PROJ Barnum's Animal Crackers<br><br>APL chi-square applet<br>http://onlinestatbook.com/stat_sim/chisq_theor/index.html<br><br>TI __-Test for homogeneity or independence<br><br>APFR 2-1998; 3-2003B; 5-2003; 5-2004 | independence (one- and two-way tables) |
| **5** | RFU Chapter 27 Inference for Regression<br><br>Topics:<br>• T-test for the regression slope<br>• Confidence interval for the regression slope<br>• Residual standard deviation<br>• Assumptions for use of the model and the conditions that verify those assumptions are reasonable<br><br>TI LinRegTTest<br><br>APFR 5-2005B | IV. Statistical Inference: Estimating population parameters and testing Hypotheses<br><br>B. Tests of significance<br>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<br>7. Test for the slope of a least-squares regression line |

## Unit VII – AP Exam Review

| Number of Days | Chapter * Activities * Topics * Assignments | AP Statistics Course Topic Outline |
|---|---|---|
| **10-15** | OTH "The Trials of Scipio: An Investigative Task."<br><br>EXP "Inference: Connecting the Question and the Solution."<br><br>EXP "Can Mice Learn and Transfer the Concept of Middle? A Statistical Exploration"<br><br>PROJ Helicopter Activities<br><br>APFR Investigative Tasks | |

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| | APL Classifying Statistical Inference Problems<br>http://www.ltcconline.net/greenl/java/Statistics/StatsMatch/StatsMatch.htm | |

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