# Hoover High School 4250 E. 1st St. Bakerville, CA 93702 402 253 5200

Advanced Placement Statistics

2011-2012

# Instructor Information

Name

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# Course Design

 The Advanced Placement Statistics standards are divided into four major categories: Exploring Data, Sampling and Experimentations, Anticipating Patterns and Statistical Inference. Students will demonstrate a working understanding of these topics by designing and analyzing the effectiveness of experiments in addition to working in an environment where assessment is a significant part of the learning process. A variety of assessments will be used to both gauge student understanding of critical concepts and prepare them to succeed on the Advanced Placement Statistics Exam. Assessment will include but is not be limited to: homework assignments, classroom discussions and activities, projects involving the gathering, analysis and communication of real-life data, quizzes and tests. Through regular classroom discussions, students will become proficient articulating the feasibility of statistical experiments, including common errors made during the gathering and presentation of data.

 Students will complete a variety of minor projects throughout the year which will prepare them for a final project that integrates Data Exploration, Sampling and Experimentation, Anticipating Patterns and Statistical Inference. Students will work in small groups to design, implement and analyze an experiment to answer a question of each group’s choice. Students will then communicate their findings to the class in a concise manner at an academically appropriate level. The overall goal of the final project, all projects leading up to it and the course as a whole is to develop students into competent interpreters and investigators of data and information. This course is equivalent to a one-semester, introductory, non-calculus-based college course in statistics.

# Pedagogy

 Statistics is the most immediately applicable mathematics course offered at the high school level. It is therefore, important that the opportunity to make connections between what is discussed in class and its application to everyday life is not missed. Instructional emphasis is placed on applicable and instructive activities, classroom discussion centered on both the interpretation and implications of statistical outcomes and current events most frequently presented in the media.

 Each student will have access to a TI-84 Plus SE graphing calculator. Students are encouraged to purchase their own calculators but a class set is available. In addition to the use of graphing calculators, demonstrations using Fathom, Mini-Tab and Microsoft Excel will be used to enhance the development of statistical concepts.

# Text/Supplements

Bock, Velleman and De Veaux. *Stats: Modeling the World*. 3rd ed. Boston: Addison-Wesley, 2010.

Carroll, Carver, Peters and Ricks. *AP Statistics*. Boston: Addison-Wesley, 2010.

Statistical Software, including Microsoft Excel, TI-84+ SE, Fathom and MiniTab.

# Assignments

**Classroom Participation:** Each student will start each week with 15 out of 20 participation points. Throughout the week students will either earn additional points or lose points based on their participation. Participation can take several different forms. Many students do not like raising their hands and speaking in front of the class; this is not the only way to earn participation points. Students can earn additional participation points by going above and beyond the minimum requirements on homework, class work and tests. In addition, students who seek help outside of class are likely to earn additional participation points.

**Attendance:** As well as students may perform when present, attending class regularly is important. Students will earn 1 point for attending during a traditional schedule (Monday) and 2 points for each even/odd day. During a full week, students can earn a maximum attendance score of 5 out of 5. Each week students will earn an attendance score.

**Tests/Exams:** Students will take a number of exams throughout the course of the year. Typically, these tests will coincide with the conclusion of chapters in the textbook. The final exam for each semester will count the same as chapter tests. At the teacher’s discretion, students will have the opportunity to rework specific sections of or entire chapter tests. This re-take is never done during class and students should not assume this opportunity will always be available.

**Homework/Quiz** A majority of the work done during class time is completed in small groups or pairs; therefore, homework is essential because it allows students to independently practice the skills introduced during class. A student’s homework grade is determined by the completion of the assignment and the score earned on a brief quiz at the beginning of class. The questions on the quiz are typically identical or similar to those from the homework and students may use their homework to complete the quiz. Completed homework is worth 3 points and the quiz is worth 6 points.

**Grading**

Classroom Participation: 20% A 90% - 100%

Attendance: 20% B 80% - 89%

Test/Exams: 30% C 70% - 79%

Homework/Quiz: 30% D 60% - 69%

 F 0% - 59%

# Classroom Policies

**Classroom Rules**

* 1. Follow Directions.
	2. Keep your hands and feet to yourself.
	3. No shouting or other disruptive noises.
	4. Be in your assigned seat when class begins.

**Consequences (The Good)**

Students can earn a variety of privileges as a result of following directions and working hard during class. These privileges include but are not limited to:

* Gaining Participation Points
* Homework Skips (including the quiz)
* Question skips on a test
* Ability to redo test questions
* Ability to retake homework quizzes
* Preferential seating

**Consequences (The Bad)**

The entire disciplinary process, including consequences, can be found at the Roosevelt High School website or can be picked up at the main office. The shortened version goes like this. Minor classroom infractions such as tardiness, lack of materials, lack of effort, failure to complete homework and cell phone use during class will result in a “step.” Each step a student receives for minor infractions results in an increasingly severe consequence. These consequences will be discussed with students the first day of school and any students who receive a step.

Major infractions, such as direct defiance “I’m not doing what you say,” fighting, theft and profanity/threats directed toward students or staff will result in direct referrals to the vice-principal. These referrals will result in a parent/guardian being contacted.

# Final Project

 The final project consists of two parts: a formal written report and a presentation of methods and results. Students will work in pairs to complete the project. The first focus of the project is experimental design. Students must clearly submit a plan for their project that includes the question being investigated, the method for collecting data and any criteria for drawing conclusions. Once the plan has been approved and the data is collected, students will compose a final report/presentation. Students will present their methods, results and conclusions to the class. An outline of each component is given below.

 *Before collecting any data…*

* Describe the question you wish to investigate.
* Explain in detail the design of your study; state whether you will use an observational study, survey or experiment.
* Describe what steps have been taken to minimize confounding and bias.
* Explain the criteria you will use for making conclusions, including confidence intervals and assumptions.

*Your final report/presentation will include…*

* Graphical representations that are appropriate for your study.
* A description of any changes you made from your original plan and why you made them.
* An analysis of any bias that may be present.
* A description of any inference procedures used to answer the initial question.
* A detailed interpretation of your results including conclusions.

*Your final report/presentation will have the following attributes:*

* The final report must be typed. Equations cannot be hand-written; Microsoft Word comes with an equation editor that should be used. Necessary graphs can be produced using statistical software or graphing calculators.
* All symbols must be defined. All formulas must be shown before used.
* Any descriptions of procedures must use accurate statistical vocabulary, not calculator commands.

# Pacing

 The following pacing chart represents an estimation of both pace and focuses. A column of notes has been included to shed light on numerous uses of technology, test dates and activities. In no way are the indicated dates final nor should any guarantees be inferred from their inclusion.

 In addition, the list of topics included is not comprehensive. While topics are not written in objective format, they indicate focuses for student mastery in each chapter.

|  |  |  |  |
| --- | --- | --- | --- |
| Chapters | Date | Topics | Notes |
| PART 1 – Exploring and Understanding Data – 16 Hours (5 weeks) |
| 1 and 2 | * Stats Starts Here
* Data
	+ Determining the 6 W’s
	+ Categorical vs. Quantitative
 |  |
| 3 | * Displaying & Describing Quantitative Data
	+ Marginal and Conditional Distributions
	+ Bar and Pie Charts
	+ Independence
 |  |
| 4 | * Displaying and Summarizing Quantitative Data
	+ Measures of Center and Spread
	+ Shape of Data and the IQR
 | Using a calculator to measure center and spread. |
| 5 | * Understanding and Comparing Distributions
	+ Shape, Center, Spread and Outliers
	+ Boxplots and 5-Number Summaries
 | Creating boxplots with calculators. |
| 6 | * The Standard Deviation as Ruler and the Normal Model
	+ Standardizing using Z-Scores
	+ Normality and the 68-95-99.7 Rule

  |  |
| Part 1  | * Review and Assessment
 | Test |
| PART 2 - Exploring Relationships Between Variables – 19 Hours (5 weeks) |
| 7 | * Scatterplots, Association and Correlation
	+ Correlation Coefficient
 |  |
| 8 | * Linear Regression
	+ Residuals
	+ Interpreting $R^{2}$
 | Creating residual plots with calculators. |
| 9 | * Regression Wisdom
	+ Interpreting Outliers, Leverage and Influential Points
 | Analyzing outliers using MiniTab and Fathom. |
| 10 | * Re-Expressing Data
	+ Ladder of Powers
 | Re-expressions will be done with TI-84 and MiniTab software.  |
| Part 2 | * Review and Assessment
 | Test |
| PART 3 – Gathering Data – 13 Hours (3 Weeks) |
| 11 | * Understanding Randomness
	+ Designing Simulations
 | Using the random number generator on the calculator. |
| 12 | * Sample Surveys
	+ Simple Random, Stratified, Cluster, Multistage and Systematic Sampling
	+ Bias and What Can Go Wrong
 | Students will discuss the appropriateness of different sampling methods depending on context. |
| 13 | * Experiments and Observational Studies
	+ Experimental Design
	+ Drawing Conclusions from Experiments
	+ Blocking
 |  |
| Part 3 | * Review and Assessment
 | Test |
| PART 4 – From Randomness to Probability – 16 Hours (5 weeks) |
| 14 | * From Randomness to Probability
	+ The Law of Large Numbers
 |  |
| 15 | * Probability Rules!
	+ Conditional Probability
	+ Addition/Multiplication and Independence
 |  |
| 16 | * Random Variables
	+ Discrete vs. Continuous Random Variables
 |  |
| 17 | * Probability Models
	+ Geometric Probability Model
	+ Binomial Probability Model
 | Using the PDF and CDF commands on the calculator. |
|  | * Review and Assessment
 | Test |
| PART 5 – From Data at Hand to the World at Large – 17 Hours (5 Weeks) |
| 18 | * Sampling Distribution Models
	+ Central Limit Theorem
 | Using Penny activity to demonstrate normality of a sampling distribution from a non-normal population. |
| 19 | * Confidence Intervals for Proportions
	+ One-Proportion Z-Interval
	+ Standard Error as an Estimate for $σ$
 | Using Calculator for 1-prop-z-int |
| 20 | * Testing Hypotheses about Proportions
	+ Defining a Null and Alternate Hypothesis
	+ P-values and One Proportion Z-Tests
 | Using Calculator for1-prop-z-test |
| 21 | * More About Tests and Intervals
	+ Statistical Significance
	+ Type 1, 2 and Power Error
 |  |
| 22 | * Comparing Two Proportions
	+ Determining Confidence Intervals for the difference between proportions
	+ Interpreting the Results of a Significance Test
 | Using calculator for 2-prop-z-int/test |
|  | * Review and Assessment
 | Test |
| PART 6 – Learning About the World – 13 Hours (4 Weeks) |
| 23 | * Inference About Means
	+ Compute and Interpret t-tests
	+ Interpreting Confidence Intervals
 | Use calculators to perform t-tests |
| 24 | * Comparing Means
	+ Determining Situations when Inference Between two Means is Appropriate
	+ Perform a 2-Sample T-Test
 |  |
| 25 | * Paired Samples and Blocks
	+ Performing and Interpreting the Results of a Paired T-Test
 | Students will consider the W’s of an experiment to determine the appropriateness of a paired T-Test. |
|  | * Review and Assessment
 | Test |
| PART 7 – Inference When Variables Are Related – 10 Hours (2 Weeks) |
| 26 | * Comparing Counts
	+ The Three Chi-Square Tests: Goodness of Fit, Homogeneity and Independence
	+ Using Chi-Square Tables and Calculators to Perform Chi-Square Tests
	+ Interpret Chi-Square Test Results Obtained from Computer Output
 | M&M color distribution activity for Goodness of Fit. |
| 27 | * Inferences for Regression
	+ Setting up and Testing Hypothesis Concerning Linear Regression
 | Focus will be on use of calculator to perform regression inference. |
|  | * Review and Assessment
 | Test |
| Review for the AP Exam – Remaining Time (2-3 Weeks) |
| FINAL PROJECT |