AP Statistics Syllabus
Fall 2009 – Spring 2009

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Welcome to Advanced Placement Statistics. I am very pleased that you have enrolled in this course. Statistics affects all aspects of our lives. More than 80% of all college students take Statistics as a requirement towards their major field of study. By passing the AP test next May, you may be able to waive that requirement and obtain up to 5 math credits. This information will be discussed during the year. A statistics course is typically required for majors such as social sciences, health sciences, and business. Every semester about 236,000 college and university students enroll in an introductory statistics course offered by a mathematics or statistics department. In addition, a large number of students enroll in an introductory statistics course offered by other departments. Science, engineering, and mathematics majors usually take an upper-level calculus-based course in statistics, for which the AP Statistics course is effective preparation.

The AP Statistics classroom is nothing if not active. You will analyze data with calculators and computers, conduct classroom experiments, carry out individual and group projects, and perform simulations involving probabilistic concepts. AP Statistics students are active, engaged learners. There will be many opportunities for us to collect data by conducting surveys, performing our own experiments in the classroom and throughout the school. We will then analyze and interpret that data using graphing calculators or statistical software such as Microsoft Excel, Statdisk 8.4 and Fathom. Each of your textbooks includes a CD-ROM with over 100 data sets for us to explore. These also include interactive tutorial exercises and quizzes for each chapter section. We will also use our graphing calculators (TI-83/TI-84) to simulate our own data and analyze our results. In doing so, you will learn more about how statistics affects our lives and how wonderful technology can be in interpreting our results.

Course Description:

The textbook that will be used in this course is Brase, Charles Henry and Brase, Corrinne Pellillo. *Understandable Statistics, Concepts and Methods*, New York, NY: Houghton Mifflin Company, 2006, Eighth Edition.

An additional resource is *Barron's AP Statistics* written by Martin Sternstein,Ph.D., Professor of Mathematics Ithaca, New York, 2008, 4th Edition. This resource has practice problems and reviews for each of the topics covered on the AP Exam.

This course will be comprised of four basic concepts.

1. <u>Exploring Data</u>: Describing patterns and departures from patterns
   a. Chapters 2, 3
2. <u>Sampling and Experimentation</u>: Planning and conducting a study
   a. Chapter 1 and Semester Project
3. <u>Anticipating Patterns</u>: Exploring random phenomena using probability and simulation
   a. Chapters 4, 5, 6, 7, 10
4. <u>Statistical Inference</u>: Estimating population parameters and testing hypotheses
   a. Chapters 8, 9, 11 and Second Semester Project

Important components of this course will include the use of technology, projects and cooperative group problem solving, and writing, as a part of concept-oriented instruction and assessment. Emphasis will be placed on writing complete responses using appropriate justifications throughout the course on homework assignments, class activities, projects and tests. In addition, students will practice this skill by working released AP Statistics free response questions and using a scoring guide to evaluate their response.

Dates	Topic and Activities

Aug 20 – Aug 30	Chapter 1 – Getting Started
	  Simulations, Simple Random Samples and other Sampling Techniques
	  Experimental Design and Observational Studies
	  Activity: Stanley Milgram Experiment
	  Lurking Variables, Placebo Effect, Control Group
	  Replication and Randomization

	Surveys, Likert scale, Voluntary Response, and Hidden Bias
	Chapter 1 Project – Students find an article and answer the following questions giving an explanation for each response:
	Is the research an observation or an experiment? Is the variable qualitative or quantitative? What is the implied population? What method was used to collect the data? At what level is the data? What could have been done to improve the research and reduce bias?
Sept 4 – Sept 14	Chapter 2 – Organizing Data
	Bar Graphs, Circle Graphs, and Time-Series Graphs
	Frequency Tables and Histograms
	Cumulative and Relative Frequency
	Ogives and Dotplots
	Distribution Shapes
	Stem Plots and back-to-back stem plots\
	Activity – Number of cell phone contacts – Students explore data by creating a frequency table, histogram, circle graph and stem-and-leaf plot for the number of cell phone contacts for everyone in the class.
Sept 17 – Sept 28	Chapter 3 – Averages and Variation
	Measures of Center
	Measures of Spread
	Coefficient of Variation and Chebyshev's theorem
	Percentiles and Box-Plots
	Outliers and Interquartile Range
	Activity - Exploring Univariate Data – students collect data from teachers and then find the measures of center, measures of spread, create a histogram and boxplot. Students also apply linear transformations to the data and explore its effect on the measures of center and spread.
Oct 1 – Oct 12	Chapter 4 – Elementary Probability Theory
	Law of large numbers, Sample Space, Complementary Events
	Addition Rule and Multiplication Rule
	Independent events
	Mutually exclusive events
	Counting Techniques
	Permutations and Combinations
	Activity – Pepsi v. Coke Students will plan and conduct an experiment to see who can guess which of three cups holds a different cola than the other two cups. They will then simulate the same experiment 40 times on their graphing calculators and compare their results to the true probability of blinding guessing which cup holds a different cola.

Oct 16 – Oct 29	Chapter 5 – The Binomial Probability Distribution and Related Topics Random Variables and Probability Distributions Continuous and Discrete Data Linear Combinations of Independent Random Variables Binomial Distribution Geometric and Poisson Distributions Poisson Approximation to the Binomial Distribution
Oct 30 – Nov 12	Chapter 6 – Normal Distributions Empirical Rule z-scores Normal Approximation to the Binomial Distribution
Nov 14 – Nov20	Chapter 7 – Introduction to Sampling Distributions The Central Limit Theorem Activity – Students will calculate the mean mint date of pennies of various sample sizes and construct histograms to look at the distributions. Sampling Distributions for Proportions
Nov 26 – Dec 5	Chapter 8 – Estimation Confidence Intervals t distribution Choosing Sample Size n
Dec 6 – Dec 13	First Semester Project**
Dec 17 – Dec 19	First Semester Final
Jan 3 – Jan 18	Chapter 9 – Hypothesis Testing Null Hypothesis and Alternate Hypothesis p-value Type I and Type II Errors Activity – Does Mars candy accurately claim their color distributions for M & Ms?
Jan 22 – Feb 5	Chapter 10 – Correlation and Regression Scatter diagrams and linear correlation Correlation coefficient r Coefficient of Determination Residual Multiple regression Coefficient of Multiple Determination Activity – Barbie Bungee Drop
Feb 7 – Feb 29	Chapter 11 – Chi-Square and F Distributions Tests of Independence

	Goodness of Fit\
	Confidence interval for variance
Mar 3 – Mar 14	Chapter 12 – Nonparametric Statistics
	The Sign Test for Matched Pairs
	Spearman Rank Correlation
Mar 17 – Mar 21	Spring Break
April	Second Semester Project**/AP Statistics Exam Review
May 8, 2008	AP Statistics Exam

**Semesters Project:

Students will decide upon a research topic that involves the collection of data by wording two questions so that the data will be at the ratio level**.** They will collect at least 50 data items for each question. A written report should include why that topic was chosen, how they collected their data and what measures they take to reduce bias. They need to justify why the design of their experiment was effective. The data needs to be presented in both tables and graphs using a stem plot, histogram, boxplot and circle graph that are clearly and consistently labeled. Students will summarize the results and give the 95% confidence interval for the population mean. Students will also present their research to the class using Power point. Interpretation of those results should be in the written report and oral presentation and should answer the following questions: What conclusions can be drawn from the experiment? What could be done differently if the experiment were repeated? What was learned about the implied population? Were any problems encountered during the project?

Second semester, students will perform their own hypothesis testing. The subject may or may not relate to their previous research. They will collect two sets of data about one topic and make a scatter diagram to estimate the degree of correlation.   They will compute the correlation coefficient, find the equation of the least-squares line and determine if the sample correlation coefficient is statistically significant. A written essay should include the main points of their findings. Emphasis will be placed on writing complete responses using appropriate justifications.

Instructional Approach:

Although this course tends to be lecture based, I believe that it is imperative to incorporate as much group learning into this class as possible. Therefore, students should expect to do a great deal of active learning in this course. Many of the things that we do

in this course will be done together; in other words, each student will share a responsibility in teaching as well as learning. You should not plan on performing 50-minute lectures, but you should be prepared to play the role of "expert" in certain situations through presentation of projects to the class. For example if the data you collect does not show expected results, we will want to analyze why and be able to back up our interpretations using reasoning and statistics. I am convinced that this approach will ensure the greatest level of success for all of the individuals involved in this class.

Required Supplies:

1. **Textbook**. Brase, Charles Henry and Brase, Corrinne Pellillo. *Understandable Statistics, Concepts and Methods*, New York, NY: Houghton Mifflin Company, 2006, Eighth Edition.

2. **Writing Utensils**. All of your homework, quizzes, and tests should be completed in pencil unless I tell you otherwise.

3. **Paper**. I recommend that you take notes in a spiral or on loose-leaf paper kept in a sturdy three-ring binder. You must complete all homework on loose-leaf paper. Do not throw notes or handouts away.

4. **Graphing Calculator**. A TI-83Plus/TI-84Plus graphing calculator will be beneficial in this course and may prove helpful in future math courses. I have a class set of 30 TI-83 Plus to use in class.

Grading Policy:

- Your final grade will be based upon the following:
  Tests and Projects: 65%
  Homework and Class Activities: 25%
  Final: 10%

- Parts of each test will be formatted similarly to the AP Statistics examination. This means that you will see multiple choice and free response questions on every test. No partial credit will be given on multiple-choice questions, but it will be given on free response questions. Tests will contain material covered during previous chapters (in other words, the tests will have a "cumulative" aspect to

them). Most chapter tests will be worth 100 points but shorter tests will be worth fewer points.

- Successful mastery of statistics involves, in part, the ability to use the language of statistics. We must be sure to correctly interpret the numbers that represent standard deviation, confidence intervals and hypothesis testing. With this in mind, we will prepare a list of vocabulary words related to the language of statistics, along with their meanings. These vocabulary words will be assessed on tests. This will hopefully provide motivation for you to focus on the language of statistics. The vocabulary assessments will also be cumulative.

- Homework will be assessed in a variety of ways. I may elect to perform a homework check where I ask you to record selected homework problems from an assignment or give a homework quiz using homework problems from a particular section in the book. We may grade an assignment together or I may grade it.

- I do not appreciate late submission of work. If an assignment is less than one block late, I will automatically deduct 20% of the total points available on that assignment. If an assignment is submitted more than one block late, the maximum score you will receive on that assignment is 50% of its original point value.

Academic Integrity:

It is expected that all the materials submitted for this course are the actual work of the individual whose name appears on the materials. Violations of this policy include but are not limited to cheating, plagiarism, copying answers and passing off as your own work, giving another student answers, storing notes on a calculator, any communication with another person other than the teacher during an individual test or quiz. Students in violation of this policy are subject to failure for that activity or the course.