TRUMBULL PUBLIC SCHOOLS

Trumbull, Connecticut

Mathematics Curriculum

Advanced Placement Statistics

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Introduction

An understanding of statistics is extremely beneficial in today's world. Numerous careers utilize and are enhanced by statistics such as psychology, education, pharmaceutical companies, business, and sports. Both the State of Connecticut and national organizations have stressed the importance and value of teaching statistics at the high school level. The department feels that statistics is an attractive course for any student regardless of his/her post-high school aspirations.

The Advanced Placement (AP) Program is sponsored by the College Board whose policies are determined by the representation of its member institutions and agencies throughout the United States. Students enrolled in this Advanced Placement course are expected to take the Advanced Placement Statistics Exam in May. The exam contains a free-response section as well as a multiple-choice section. The development, scoring and grading of examinations are provided by the Educational Testing Service (ETS). College credit and/or advanced placement status is then awarded by the college or university of the student's choice.

Philosophy

General:
Mathematics instruction must:

- Blend the concrete with the abstract, the practical with the theoretical, and the routine with the non-routine,
- Teach students to search for, find, and represent patterns,
- Instill in students an appreciation for the intrinsic beauty of mathematics,
- Encourage students to reason, analyze, make connections, and self-assess, and
- Immerse students in the learning process through questioning, technology, manipulatives, and cooperative and individual activities.

Specific to Course:

AP Statistics includes a plethora of activities, projects, and vocational connections that aim to excite, encourage, and motivate students in their pursuit of mathematical empowerment. Statistics will concentrate on teaching how to appropriately gather, display, interpret, analyze, and infer from the data to make and support decisions. The course will rely strongly on the graphing calculator and utilize the math/science lab and an abundance of Internet sites.

Goals

Within the Mathematics curriculum the students will:

- communicate numerical, algebraic, and statistical ideas both orally and in written form with models, pictures, graphs, and mathematical symbols, using paper and pencil, a variety of calculator displays, spreadsheets, graphing packages, word processing and other related computer software.;
- use inductive and deductive reasoning to make, defend and evaluate conjectures and arguments, to justify assertions and verify tentative conclusions, and to solve mathematical problems;
- use mathematical skills and concepts to make and justify decisions and predictions, to identify patterns and trends, to pose questions from data and situations, and to formulate and solve problems;
- identify and use connections within mathematics to identify interrelationships and equivalent representations, to construct mathematical models, and to investigate and appreciate mathematical structure;
- use mathematical skills and concepts to describe and analyze data and measurements from other disciplines;
- select and use appropriate approaches and tools for solving computational, geometric and algebraic problems, including estimation, mental computation, guess and test, paper and pencil, calculators and computers with software for tabulating, charting, graphing, drawing and transforming data and images; and
- use mathematical skills and concepts with proficiency and confidence, and appreciate the power and utility of mathematics as a discipline and as a tool for solving problems.

Connecticut State Department of Education Program Goals, March 1998

Unit 1

Exploring Data

Scope and Sequence: Data analysis is describing data using graphs and numerical summaries. This unit introduces data analysis by presenting statistical ideas and tools for describing the distribution of a single variable.

Objectives:
In this unit, students will:

A) Display distributions with graphs including bar and pie charts, dotplots and histograms, stem plots and time plots,
B) Describe the overall pattern of a distribution including the center, shape, and spread of the data,
C) Describe the deviations from the overall pattern of a distribution including skew and outliers,
D) Describe distributions with numbers including mean and median,
E) Measure and describe the spread using range, quartiles, interquartile range and outliers,
F) Display the above data with boxplots, and
G) Understand and calculate variance, standard deviation, and degrees of freedom.

Project: Matching Graphs to Variables (text: Activity-Based Statistics)

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 1A (Study Habits & Attitude)

Resources: Activity- Based Statistics by R. Scheaffer
Golden Resource Binder – The Practice of Statistics

Time Allocation: 8 days

Unit 2

The Normal Distributions

Scope and Sequence: All normal distributions are the same when measurements are made in units of σ about the mean. These are called standardized observations. Students will use a formula to find this standardized observation. In order to perform certain tests of significance in later chapters, students need to know that the data come from populations that are approximately normally distributed. To assess normality, students can observe the shape of histograms, stemplots, and boxplots and see how well the data fit the 68-95-99.7 rule for normal distributions.

Objectives:
In this unit, students will:

A) Understand what areas under a density curve represent,
B) Locate the median and the mean on a density curve,
C) Understand where the mean and median lie in symmetric and skewed density curves,
D) Recognize the shape of a normal curve,
E) Use the 68-95-99.7 rule and symmetry to figure what percent fall between two points, when both points lie at the mean, or one, two, or three standard deviations one either side of the mean,
F) Calculate the proportion of values above, below or between stated numbers,
G) Calculate the point having a stated proportion of values above or below it,
H) Determine if a distribution is bell shaped,
I) Determine the proportion of observations within one, two, and three standard deviations of the mean, and compare with the 68-95-99.7 rule for normal distributions, and
J) Construct and interpret normal probability plots.

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 2B – The Shape of Distribution
Cheerios (Mathbox – AP Statistics Activities)

Resources: Golden Resource Binder – The Practice of Statistics
Mathbox: AP Statistics Activities by WKB Publishing Co.

Time Allocation: 7 days

Unit 3

Examining Relationships

Scope and Sequence: In this unit, students will learn how to analyze two-variable data that show a linear pattern. Positive and negative associations will be analyzed and used to measure the strength of association between two variables. Procedures for constructing a model (the least-squares regression line) will be used to capture the trend of the data . This is useful for prediction purposes. Data analysis begins with graphs and then adds numerical summaries of specific aspects of the data.

Objectives:
In this unit, students will:

A) Recognize whether each variable is quantitative or categorical,
B) Identify the exploratory and response variables,
C) Make a scatterplot for two quantitative variables,
D) Add a categorical variable to the scatterplot,
E) Recognize positive or negative association, a linear pattern, and outliers in a scatterplot,
F) Compute the correlation coefficient for small sets of observations,
G) Understand the basic properties of the correlation coefficient,
H) Describe the slope and intercept in the equation of a straight line,
I) Draw the graph of a line given the equation,
J) Calculate the least-squares regression line given data, using a calculator,
K) Find the slope and intercept of the least-squares regression from the means, standard deviations of the data and their correlation,
L) Use the regression line to predict y for a given x and be aware of its dangers, and
M) Recognize potential influences on the regression line by looking at variance, outliers and residuals.

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 3B (What's Your Best Offer?)

Project: Matching Description to Scatter Plots (Activity Based Statistics text)

Resources: http://illuminations.nctm.org/imath/912/LinearRealtionships/index.html
http://standards.nctm.org/document.eexamples/chp7/7.4/index.htm
Text: Activity-Based Statistics by R. Scheaffer
Golden Resource Binder – The Practice of Statistics

Time Allocation: 11 days

Unit 4

Two Variable Data

Scope and Sequence: In this unit students will learn to construct mathematical models for data that fit an exponential function through the origin. Correlation and regression are used as tools for understanding two-variable data when both variables are quantitative. Both correlation and regression have certain limitations. In particular, a strong observed association between two variables may exist without a cause-and-effect link between them.

Objectives:
In this unit, students will:

A) Recognize exponential growth and decay,
B) Recognize a power function,
C) Use a logarithmic transformation on exponential and power functions to obtain points that lie in a linear pattern, then use least-squares regression on the transformed points,
D) Understand that the correlation and the least-squares regression line are strongly influenced by a few extreme observations,
E) Recognize possible lurking variables that may explain the observed association between two variables,
F) Understand that a strong correlation doesn't mean a cause-effect relationship,
G) Understand the importance and application of the residual plot in the analysis of non-linear mathematical modeling.

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 4A (Baseball Salaries)
Special Problem 4B (Cost of a First Class Stamp)
Special Problem 4C (Coffee and Doughnuts)

Resources: Golden Resource Binder – The Practice of Statistics

Time Allocation: 10 days

Unit 5

Producing Data: Samples and Experiments

Scope and Sequence: Designs for producing data are essential parts of statistics in practice. Random sampling and randomized comparative experiments are important statistical inventions of this century. In this unit, students will learn good techniques for producing data and learn why bad techniques often produce worthless data. The use of chance in producing data is a central theme as well as using the laws of probability to analyze data.

Objectives:
In this unit, students will:

A) Identify the population in a sampling situation,
B) Recognize bias due to inferior sampling methods,
C) Select a random sample from a population,
D) Recognize undercoverage and nonresponse as sources of error in a sample survey,
E) Recognize the effect of wording of questions on the responses,
F) Select a stratified sample from a population when strata are identified,
G) Recognize whether a study is observational or an experiment,
H) Recognize bias due to confounding of explanatory variables with lurking variables,
I) Identify the factors, treatments, response variables, and experimental units in an experiment,
J) Recognize the placebo effect and when the double-blind technique should be used,
K) Understand that a randomized comparative experiment can indicate cause-and-effect relationships,
L) Recognize that random phenomena can be investigated through simulation, and
M) Construct and run a simulation using technology.

Projects: Free Throws – Page 295
Critical Statistical Analysis #4 (Analyzing Experiments)
Set It Up Right (Mathbox – AP Statistics Activities)
You Can Look It Up (Mathbox – AP Statistics Projects)

Assessments: Tests and quizzes
Alternative Assessments: Special Problem 5A (The spread of an Epidemic)
Special Problem 5C (The Duck Hunter)
Special Problem 5D (Airline Overbooking)

Resources: Golden Resource Binder – The Practice of Statistics
Mathbox: AP Statistics Activities by WKB Publishing Co.

Time Allocation: 12 days

Unit 6

Probability: The Study of Randomness

Scope and Sequence: Probability describes the pattern of chance outcomes and probability calculations provide the basis for inference. When data are produced by random sampling or randomized comparative experiments, the laws of probability answer the question, "what would happen if we did this very many times?" Probability is used to describe the long-term regularity that results from many repetitions of the same random phenomenon. In this unit, a probability model is developed, including rules and tools, which help to describe the behavior of statistics from random samples.

Objectives:
In this unit, students will:

A) Describe the sampling space of a random phenomenon, set up probability models,
B) Use counting techniques, the multiplication principle, Venn diagrams, tree diagrams and geometric areas,
C) Determine probabilities of defined events,
D) Determine, understand and apply rules if two events are joint, disjoint, complementary, independent, or dependent
E) Find the union and intersection of two or more events,
F) Know the general addition rule for disjoint events and the union of two events,
G) Define joint probability,
H) Understand and find the conditional probability of multiple events, and
I) Use the multiplication rule to find joint probability of multiple events.

Projects: What's the Chance? Dependent & Independent Trials (Activity-Based Stat.text)

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 6A (The Birthday Problem)
Special Problem 6C (A Probability Question for Card Sharps)

Resources: Text: Activity-Based Statistics by R. Scheaffer
Golden Resource Binder – The Practice of Statistics

Time Allocation: 13 days

Unit 7

Random Variables

Scope and Sequence: A random variable defines what is counted or measured in a statistics application. Discrete and continuous random variables will be introduced and methods described for finding means and variances. Distributions that can be pictured as histograms or density curves will be revisited, as well as the normal distribution with emphasis on it as a probability distribution. The mean and variance of a random variable will be calculated. Rules for the sum or difference of two random variables will be developed.

Objectives:
In this unit, students will:

A) Recognize and define a discrete random variable,
B) Construct a probability distribution table and a probability histogram,
C) Recognize and define a continuous random variable, and determine probabilities of events and areas under density curves,
D) Find probabilities of events as areas under the standard normal distribution curve,
E) Calculate the mean and variance of a discrete random variable,
F) Find the expected value (payout),
G) Use simulation methods and the law of large numbers to approximate the mean, and
H) Use rules for means and variances to solve problems involving sums and differences of random variables.

Project: Stringing Students Along: Selection Bias (Activity Based Stat. text

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 7A (Games of Chance and Expected Value)
Special Problem 7C (Ask Marilyn Question)

Resources: Text: Activity-Based Statistics by R. Scheaffer
Golden Resource Binder – The Practice of Statistics

Time Allocation: 7 days

Unit 8

The Binomial and Geometric Distributions

Scope and Sequence: This unit focuses on two important classes of discrete random variables, each of which involves two outcomes or events of interest. Both require independent trials and the same probability of success on each trial. The binomial random variable requires a fixed number of trials; the geometric random variable has the property that the number of trials varies.

Objectives:

A) In this unit, students will: Identify a binomial random variable,
B) Determine binomial probabilities,
C) Calculate cumulative distribution functions for binomial random variables,
D) Calculate means and standard deviations of binomial random variables,
E) Identify geometric random variable,
F) Determine geometric probabilities,
G) Calculate cumulative distribution functions for geometric random variables,
H) Calculate expected values of a geometric random variable, and
I) Construct histograms, probability distribution and cumulative distribution tables for both distributions.

Assessments: Tests and quizzes

Alternative Assessment: Births (Mathbox – AP Statistics Activities)
Basketball (Mathbox – AP Statistics Activities)
Free Throw (Mathbox – AP Statistics Activities)
The Last Chance (Mathbox – AP Statistics Activities)
Special Problem 8A (Airline Overbooking Revisited)
Special Problem 8C (The Game of Craps)
Special Problem 8E (The Chevalier's Dilemma)

Resources: Golden Resource Binder – The Practice of Statistics
Mathbox: AP Statistics Activities by WKB Publishing Co.

Time Allocation: 7 days

Unit 9

Sampling Distributions

Scope and Sequence: Statistical inference uses data to draw conclusions about the population or process from which the data come. What is special about inference is that the conclusions include a statement, in the language of probability, about how reliable they are. In this unit, students will be introduced to sampling distributions of statistics. A sampling distribution describes the values a statistic would take in very many repetitions of a sample of experiment under the same conditions. Students will learn to use what they know about normal distributions to study the sampling distributions of proportions and means.

Objectives:
In this unit, students will:

A) Identify parameters and statistics in a sample,
B) Recognize the fact of sampling variability,
C) Interpret a sampling distribution,
D) Describe the bias and variability of a statistic in terms of the mean, size and spread of its sampling distribution,
E) Recognize when a problem involves a sample proportion,
F) Find the mean and standard deviation of a sample proportion,
G) Use the normal approximation to calculate the probabilities that concern the sample proportion, apply appropriate test prior to normal calculation,
H) Recognize when a problem involves a sample mean,
I) Find the mean and standard deviation of a sample mean, and
J) Understand and apply the Central Limit Theorem and Law of Large Numbers.

Project: Estimating Proportions: How accurate are the Polls?
(Activity Based Stat. text)

Assessments: Tests and quizzes
Alternate Assessment: Special Problem 9B (Exploring Sampling Distributions)

Resources: Golden Resource Binder – The Practice of Statistics
www.ruf.rice.edu/~lane/stat_sim/sampling_dist/

Time Allocation: 9 days

Unit 10

Introduction to Inference

Scope and Sequence: Statistical inference draws conclusions about a population on the basis of sample data and uses probability to indicate how reliable the conclusions are. A confidence interval estimates an unknown parameter. A significance test shows how strong the evidence is for some claim about a parameter. The probabilities in both confidence intervals and tests tell us what would happen if we used the recipe for the interval or test very many times. A confidence level is the probability that the recipe for a confidence interval actually produces an interval that contains the unknown parameter. A 99% confidence interval gives a correct result 99% of the time when we use it repeatedly. A P-value is the probability that the test would produce a result at least as extreme as the observed result if the null hypothesis were true. A P-value tells us how surprising the observed outcome is. Very surprising outcomes (small P=values) are good evidence that the null hypothesis is not true.

Objectives:
In this unit, students will:

A) Define statements of confidence in statistical reports,
B) Calculate the confidence interval of a normal population given μ and σ,
C) Recognize when the confidence interval is influenced by skewed populations,
D) Understand the margin of error changes with sample size and level of confidence,
E) Find the sample size required to obtain a certain confidence interval,
F) State the null and alternative hypotheses in a testing situation,
G) Determine from the given problem whether a one tail or two tail test is to be performed.
H) Calculate the z-statistic and the P-value for one- and two-tailed tests, and
I) State conclusions based on the confidence interval and z-statistic in the context of the given problem
J) Understand and identify the Type I & Type II error involved in each problem.

Project: Nelson TV Ratings (Activity Based Stat. text)
Home Ownership (Mathbox – AP Statistics Activities)

Assessments: Tests and quizzes
Alternative Assessment: Special Problem 10B (The Pineapple Problem)
It's in The Bag (Mathbox – AP Statistics Activities)

Resources: Golden Resource Binder – The Practice of Statistics
Mathbox: AP Statistics Activities by WKB Publishing Co.
Text: Activity-Based Statistics by R. Scheaffer

Time Allocation: 9 days

Unit 11

Inference for Distributions

Scope and Sequence: In this unit, students will be presented with *t* tests and confidence intervals for inference about the mean of a single population and will compare the means of two populations. The one-sample *t* procedures do inference about one mean and the two-sample *t* procedures compare two means. Matched pairs studies use one-sample procedures because you first create a single sample by taking the differences in the responses within each pair. The *t* procedures require that the data be random samples and that the distribution of the population be normal. These t procedures are widely used because they are not very strongly affected by lack of normality.

Objectives:
In this unit, students will:

A) Recognize when σ is not given and that a inference t-test is necessary,
B) Recognize when one-sample, matched pairs, or two sample procedures are necessary,
C) Understand the concept of "degrees of freedom" and how they affect the results obtained,
D) Use the t procedure to obtain a certain level of confidence for the mean,
E) Carry out a t test for the hypotheses that a population mean has a specified value against either a one-tailed or a two-tailed alternative,
F) Recognize when the t procedures are appropriate and what influences might make its use risky,
G) Use and apply the t value to arrive at the p value using t-table and/or graphing calculator.
H) Accurately interpret the confidence interval and p value in the context of the given problem,
I) Give a confidence interval for the difference between two means,
J) Test the hypotheses that two populations have two equal means, and
K) Recognize when the two-sample t procedures are appropriate.

Assessments: Tests and quizzes
Alternative Assessment: Haircut (Mathbox – AP Statistics Activities)

Resources: Mathbox: AP Statistics Activities by WKB Publishing Co.

Time Allocation: 8 days

Unit 12

Inference for Proportions

Scope and Sequence: Statistical inference always draws conclusions about one or more parameters of a population. The *t* procedures of the last unit allow us to give confidence intervals and carry out tests about population's means. The *z* procedures of this unit are used for inference about population proportions. Inference about population proportions is based on sample proportions. We rely on the fact that a sample proportion has a distribution that is close to normal unless the sample is quite small. All the z procedures in this unit work well when the samples are large enough. This must be checked before using them.

Objectives:
In this unit, students will:

A) Recognize when a problem requires a proportion z-test for inference or comparing two proportions,
B) Calculate the sample proportion that estimate the parameters of interest,
C) Apply the appropriate test to determine if proportional z-test may be used,
D) Use the z procedure to give a confidence interval for a population proportion,
E) State the appropriate null and alternative hypotheses, determining whether a single tail or two tail test is appropriate,
F) Use the z statistic to carry out a test of significance for the hypothesis against either a one-tailed or a two-tailed alternative,
G) Use the two-sample z procedure to give a confidence interval for the difference between proportions in two populations,
H) Accurately interpret the p-value in the context of the given problem, and
I) Use the z statistic to test the hypothesis that proportions in two distinct populations are equal.

Project: The Eyes Have It (Mathbox – AP Statistics Activities)
Statistical Evidence of Discrimination: The Randomization Test
(Activity Based Stat. text)

Assessments: Tests and quizzes
Alternative Assessment: From Here To There (Mathbox – AP Statistics Activities)
Special Problem 12A (The Airport Problem)
Alternate Activity 12C (Pass The Pig)

Resources: Golden Resource Binder – The Practice of Statistics
Mathbox: AP Statistics Activities by WKB Publishing Co.
Text: Activity-Based Statistics by R. Scheaffer

Time Allocation: 7 days

Unit 13

Inference for Tables: Chi-Square Procedures

Scope and Sequence: This unit develops several settings where a variation of the chi-square test of significance is useful. In a goodness of fit test, the object is to determine if a population has changed. The null hypothesis states that there is no difference between two distributions. The alternative hypothesis states that there is a difference. The chi-square test tells whether there is sufficient reason to reject the null hypothesis, but further analysis is needed to determine how and where the changes have occurred. The chi-square procedure is also useful in testing the equality of proportions of successes in any number of populations. The chi-square test is an overall test that tells whether the data give good reason to reject the hypothesis that all the population proportions are equal.

Objectives:
In this unit, students will:

A) Calculate the expected counts for each category in a distribution, the chi-squared statistic and the P-value,
B) State the null and alternative hypotheses for a difference between two distributions,
C) Use the components of the chi-squared statistic to identify the most important deviations between the observed and expected counts,
D) Arrange data on successes and failures in several groups into a two-way table of counts of successes and failures in all groups,
E) Use percents to describe the relationship between two categorical variables,
F) Locate expected cell counts, the chi-square statistic and its P-value,
G) Use percents, comparison of expected and observed counts, and the components of the chi-square statistic to see what deviations from the null hypothesis are most important,
H) Calculate the expected count for any cell from the observed counts,
I) Calculate the component of the chi-square statistic for any cell,
J) Give the degrees of freedom of the chi-square statistic, and
K) Use the chi-square critical values to approximate the P-value and state a conclusion in the context of the problem based on this value,
L) Realize the strong statistical limitations in the Chi-Square inference test.

Project: Is Your Class Differently Aged? The Chi-Squared Test (Activity Based Stat. text)
Breakfast of Champions (Mathbox – AP Statistics Activities)

Assessments: Tests and quizzes
Alternative Assessment: Count 'Em Up (Mathbox – AP Statistics Activities)

Resources: Golden Resource Binder – The Practice of Statistics
Mathbox: AP Statistics Activities by WKB Publishing Co

Time Allocation: 8 days

Unit 14

Inference for Regression

Scope and Sequence: When a scatterplot shows a straight-line relationship between an explanatory variable x and a response variable y, then we often fit a least-squares regression line to describe the relationship. This line is used to predict y from x. Statistical inference in the regression setting requires more than just an overall linear pattern on a scatterplot. These procedures using regression models and finding standard deviations will be examined and applied. Students will then apply various types of inferences.

Objectives:
In this unit, students will:

A) Recognize the regression setting.
B) Recognize which type of inference you need in particular regression setting,
C) Recognize situations in which inference is not safe,
D) Use and understand the calculation for standard error about the line,
E) Explain the meaning of slope in a specific regression setting,
F) Understand technological outputs for regression,
G) State the null and alternative hypotheses in the context of the given problem and determine if a one-tail or two-tail test is appropriate,
H) Use that information to calculate and test confidence intervals for slope,
L) Accurately interpret the confidence interval and p value in the context of the given problem,
I) Explain the distinction between a confidence interval for the mean response and a prediction interval for an individual response, and
J) Use technological outputs for predictions.

Assessments: Tests and quizzes
Time Allocation: 7 days

Post-AP Examination Topic:
(Optional)

Analysis of Variance (ANOVA)

This topic is not included in the AP Exam, but is often part of a college statistics course.

Objectives:
In this unit students will:

A) Recognize when testing the equality of several means is helpful in understanding data.
B) Recognize that the statistical significance of differences among sample means depends on the sizes of the samples and on how much variation there is within the samples.
C) Recognize when you can safely use ANOVA to compare means.
D) Explain what null hypothesis F tests in a specific setting.
E) Locate the F statistic and its P-value on the output of a computer analysis of variance program.
F) Find the degrees of freedom for the F statistic from the number and sizes of the samples.
G) After a significant test, use graphs and descriptive statistics to analyze the results.

Time Allocation: The time period between the completion of the AP Exam, and the start of Senior Exam week, approximately two to three weeks.

POST EXAM
FINAL PROJECT

FINAL STATISTICS PROJECT GUIDELINES

To the Student: There are some basic steps to consider in order to produce a successful statistics project. A simple guideline of what you should include in the project is listed below.

I. You need a question or problem. Statistics is a tool to help you answer a question.

II. Define the problem or question in clear, specific terms.

III. Develop the hypotheses.

IV. Find out as much as you can about the question.
   A. Has someone already done work on this question?
   B. Is the question one for which there is an answer?
   C. Collect research about your topic. (Be sure to include this information in your works cited.)

V. Design the study. Develop techniques and measuring instruments which will provide objective data pertinent to the hypotheses. (Remember that any survey used as a source of your data must be field-tested before use.)

VI. Collect data using good sampling techniques.

VII. Analyze the data.

VIII. Interpret the results and draw conclusions relative to the hypotheses based upon the data and analysis of the data.
   A. Use charts, tables, histograms, box plots, stem and leaf plots, correlation lines, statistical tests, proportions, etc. (not all of them) to display and analyze the data.
   B. Remember to identify the sample size, distribution, and confidence level so that you use appropriate test statistics and have checked all requirements.

IX. Write the results - write and rewrite - PROOFREAD!

PROJECT TIMELINE AND DUE DATES

All work must be turned in on or before due date. Absence is not an excuse for late work Any portion of the project not turned in on time (or early) will receive a zero for that part of the project grade.

I. Project proposal due - Friday, May 14th
II. Summary of data collection - Tuesday, May 25th
III. Final written paper - Monday, June 7th
IV. Presentation - Week of June 7th

FORMAT AND STRUCTURE FOR STATISTICS PROJECT

I. All portions of the project listed above must be typed using a standard font and double-spaced.

II. All charts, data sheets and graphs should be done on the computer. If not, they must be **neatly** constructed and written in ink on unlined paper. Graphs should have a title and labeled axes. You need graphs in both the written paper and on your power point presentation.

III. All mathematical formulas must be given when computing test statistics. The substitution step should be shown before numerical answer is given. When using variables, be sure to state what each represents.

IV. All pages should be numbered.

V. Order of pages (Final Paper):
   A. COVER SHEET – The first page of the project must be a cover sheet that includes your name(s), date, teacher's name, class period and title of the project.
   B. TABLE OF CONTENTS
   C. INTRODUCTION, PROBLEM, PURPOSE – This section should include the statement of the question, a statement as to why your project is important or relevant, and your null and alternative hypotheses.
   D. RESEARCH – A summary of your background research and information on related studies goes here.
   E. METHODS AND PROCEDURES – This should include how the data were collected (randomness, etc) or the research was done to collect the data. Be specific. Remember to document all items that need to be cited.

F. RESULTS (ANALYSIS OF DATA) – Your graphs and charts go here, interspersed with your narrative. This is also where you include all statistical tests (including calculations). Graphs and charts should be inserted into the appropriate location of your paper and referred to by page number if not in the body of the paper.
G. PROBLEMS IN THE PROJECT - Statements regarding any difficulties that occurred when collecting and analyzing the data, as well as any changes you would make in a follow-up project. Limitations of your inferences should also be discussed.
H. CONCLUSION - Interpret your findings (what can you conclude from your research).
I. DISCUSSION - Suggestions for further work in the area of your topic as well as recommendations are mentioned here.
J. WORKS CITED - Use the M.L.A. or A.P.A. format for your paper.
K. APPENDICES - Include your log, raw data, a copy of your survey and cover letter (if applicable), any other handouts or information you used in your project, and hard copies of any information obtained from the internet.

VI. Final Presentation – The written portion of your project (worth 200 points) will be due Monday, June 7th. ***Absolutely no late papers will be accepted!*** The oral power point presentations are to be 10 to 15 minutes in length and should summarize your project from start to finish. All members of your group must be active participants in the written and oral portion of the project. The oral presentations will be schedules for the week of June 7th. (worth 50 points)

VII. Your final project will be kept by the instructor. If you want a copy, make one before you turn it in.

EVALUATION

I. Correctness of statistical techniques and procedures (most important aspect).
II. Creativity and originality
III. Organization and neatness. (Does the project adhere to format guidelines?) Clarity – correct use of vocabulary and grammar; well-presented data and charts. Write in paragraph not bullet form.
IV. Date of completion – All work must be submitted on or before the stated due dates. If you are absent, the project must still be at school on the due date – NO EXCEPTIONS!
V. Validity of conclusions. (Was your objective accomplished?)
VI. Active participation of all members of the group. (Your log will show this).

All PROJECTS COMPLETED, TYPED AND MEETING ALL DEADLINES WILL RECEIVE A GRADE OF AT LEAST "C".

PROPOSAL

50 POINTS – DUE 5/14

Your proposal needs to be typed and should include:

I. Your research question
II. Your background research.
III. Your experimental design.
IV. Your group task assignment.
V. Your timeline.
VI. All questions on the separate proposal handout.

SUMMARY OF DATA COLLECTION

100 POINTS – DUE 5/25

Your summary needs to be typed and should include:

I. Summary of how your experiment went was conducted.
II. Copy of the data collected.
III. Any problems that came up during the experiment.
IV. Preliminary analysis of data.

LOG

Your log is the first typed portion of the appendix of your written paper. The following needs to be included in the log:

I. When – date and time when work was completed.
II. Who - names of those present at each working session.
III. Where - where did you meet to do the work?
IV. What – the specific tasks that were addressed at that session.
V. Why – the purpose of the task, how does it fit into the project.

FINAL PROJECT PROPOSAL WORK SHEET

Group members:

1. What question do you hope to answer with your study? Why did you choose this topic?

2. Define your problem or question in clear, specific terms.

3. What is your hypothesis? (What do you expect to find when you get your data?)

4. Background research:
   A. Is the question one for which there is an answer?
   B. What work has already been done on this question?
   C. What sources have you used so far? What additional sources do you plan to use to research your topic?

5. What is the design of your study? How do you plan to collect your data? Be specific about sample selection and your planned testing/surveying techniques.

6. How do you plan to analyze your data?

7. Who is going to do what (your group tasks assignments)?

8. When you are going to do these tasks (your timeline)?

STATISTICS FINAL PROJECT RUBRIC

Proposal (50 points)

Summary of Data Collection (100 points)

Written Project (200 points)
Statistical content
Originality
Organization – overall flow
Format:
- Cover sheet
- Table of contents (pages numbered)
- Introduction, problem, purpose
- Research
- Methods and procedures
- Results (analysis of data)
  - Statistical tests
  - Graphs
- Problems
- Conclusion
- Discussion - further work?
- Works cited
- Appendices
  - Log
  - Raw data
  - Sample survey/letter/etc.
  - Internet research
  - Other
- Group participation (as evidenced by log)
- Neatness – overall appearance
- Spelling
- Grammar

Oral Presentation (50 points)
- Voice projection/ eye contact (5)
- Power point - clarity, readability, Appearance, relevance (25)
- Class interest (5)
- Creativity (5)
- Group participation (5)
- Time - 10 to 15 minutes (5)

Appendix
Methods of Assessment

A student's grade will include the teacher's evaluation in the following areas:

Assignments (both in and out of class) assessed on:

- completeness
- effort
- critical thinking
- organization
- neatness
- accuracy
- resourcefulness
- group interaction & participation

Tests & Quizzes (mainly criterion-referenced) assessed on:

- understanding of concepts, techniques, and skills
- applying concepts
- connecting concepts,
- writing with correct notation & symbols
- organization

Projects: assessed on:

- mathematical accuracy
- sophistication of response
- clarity of writing/explanation
- use of mathematical support in decision or recommendation
- adherence to other criteria detailed in assessment list

Department Midyear and Final exam (mainly norm-referenced) with the following question formats:

- standard multiple choice (AP Test)
- free response (AP Test)

Other possible grade determinants are:

- participation
- homework
- extra credit
- notebook
- projects
- computer lab work

Prerequisites

A student enrolled in this course should have earned:

- a grade of "B" or higher in an Algebra II course or its equivalent

Course Credit

Advanced Placement Statistics is full year course earning 1 credit.

Textbook & Other Resources

Textbooks:

The Practice of Statistics, Freeman, 2000.
The Practice of Statistics: Golden Resource Binder 2nd ed., Freeman, 2003
Statistics: A First Course, McGraw Hill, 2000
Activity Based Statistics, Springer-Verlag New York, Inc. 1996.
A Hands-on Approach to Statistics, AP Statistics Activites, Mathbox, W.K.Bradford Publishing Co., 1999

Websites:

Teachers Resources:

http://apcentral.collegeboards.com
-invaluable source of resources directed at preparing for the AP Statistics exam
http://a-s.clayton.edu/apstatfaq/
-contains teacher's guide to frequently asked questions in AP Statistics as well as resources and links to other sites
http://mathforum.org/
-useful links to other websites
http://bcs.whfreeman.com/yates2e/
- textbook publishers' website
http://www.woodward.edu/faculty/us/math/apstat
-contains sample tests/quizzes and links to other sites
http://www.starlibrary.net/
-activities for the classroom

http://www.fuf.rice.edu/~lane/stat_sim/index.html
-java applets that illustrate key concepts
www.worldwatch.org
-source of articles, datasets and graphs on the state of world
www.usatoday.com
-source of articles containing data, charts and graphs

Data Resources:

http://exploringdata.cqu.edu.au/
-datasets, some with suggested activities and worksheets
http://it.stlawu.edu/~rlock/
-link to data sources
http://statweb.calpoly.edu/chance/
-contains data from various studies
www.stat.ucla.edu
-case studies from various fields
http://lib.stat.cmu.edu/DASL/DataArchive.html
-source of data sets, problems, and case studies
www.census.gov/
-sources of census data
http://www.mindspring.com/~hlthdata/lifeline.html
-contains health and population trends
www.amstat.org
-source of data
http://www.amstat.org/chapters/connecticut
-source of information for statistics poster contest (submission date March)
www.gallop.com
-source of polling data
www.fedstat.gov
-source of government collected data
www.cdc.gov
-source of Center for Disease Control collected data

http://stats.bls.gov
-source of Bureau of Labor Statistics data
www.saferoads.org
-source of National Highway Traffic Safety Administration data

THS MISSION STATEMENT

Trumbull High School educates students in a safe, inviting, student-centered community. We encourage academic achievement, extracurricular participation, enthusiasm and self-confidence to foster independence and personal and social growth. We teach skills necessary for lifelong learning. We hold our school community to the ethical conduct and social awareness necessary to live and participate in a democratic diverse and global society.	**E** ducation **A** chievement **G** rowth **L** ife-long learning **E** thical conduct **S** ocial awareness

Syllabus/Course Description

Course Name: Advanced Placement Statistics **Course Level:** 400 **Catalog Number:** 684

Prerequisites:
A student enrolled in this course should have earned a grade of "B" or higher in an Algebra II course or its equivalent.

General Description of Course Content:
This course is designed to teach students how to appropriately gather, display, interpret, analyze, and use data to make and support decisions. The misuse and dangers of statistics will be stressed and explored. Numerous projects will be sprinkled throughout the course connecting the class to current, "real-world" applications of statistics. Topics include: displaying data, normal distribution, regression (both linear and non-linear), sampling and survey techniques, experimental design, identification of bias, probability and conditional probability, random variables, binomial distribution, geometric distribution, sampling distributions, confidence levels, and inference tests. The course will utilize the graphing calculator and the Internet with great frequency.

Students are expected to take the AP Statistics Exam in May. Depending on the score obtained, students may earn college credit at the college or university of their choice.

Assessment:
Students are evaluated by their performance on tests, quizzes, departmental midyear and final exams, assignments, and anchor tasks. There will be a comprehensive final project which will test students ability to apply the knowledge they have gained throughout the course to a real-world problem.

Text and Supplementary Materials:
1). The Practice of Statistics, Freeman, 2000.
2). TI-83 plus Calculators.
3). Internet