

South Hadley High School
"A Tradition of Excellence"

We pledge to create a challenging and supportive academic community in which each member strives to develop his/her potential, to become a life-long learner, and to act as a responsible citizen in a diverse and global society.

AP Statistics Syllabus

Course Description / Prerequisites

3030 AP Statistics (6 credits Full Year) (Open to Grades 11,12 Only)

Prerequisite: Minimum of A in Algebra 2 or B in AST

This is a College Board sponsored advanced placement option that can be taken in conjunction with (or in lieu of) Calculus. Developed with the assistance of an Advanced placement grant, the purpose of this course is to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Work is organized around four themes: a) Exploring data b) Planning a study c) Anticipating patterns in advance and producing models using probability and simulation d) Statistical inference. Minitab statistical software is used. Student MUST have their own TI - 83 graphing for this course. The students will be required to take the Statistics Advanced Placement Exam in May.

Course Objectives / Outcomes / Expectations/ Topics

I. Exploring Data : Describing patterns and departure from patterns
(Content A-D ->3-4 weeks; Content E and F -> 5 weeks)

Student will learn:

- A. Constructing and interpreting graphical displays of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)
 - Center and spread.
 - Cluster and gaps.
 - Outliers and other unusual features.
 - Shape
- B. Summarizing distribution of univariate data
 - Measuring center: mean, median
 - Measuring spread: range, interquartile, range, and standard deviation.
 - Measuring position: quartiles, percentiles, standardized scores (z- scores)
 - Using box plots
 - The effect of changing the units on summary measures
- C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, and parallel boxplots)
 - Comparing center and spread
 - Comparing cluster and gaps
 - Comparing outliers and other unusual features
 - Comparing shapes
- D. Normal distribution
 - Properties of normal distribution
 - Using tables for normal distribution
 - The normal distribution as a model for measurements
- E. Exploring bivariate data
 - Analyzing patterns in scatter plots
 - Correlation
 - Least square regression line
 - Residual plots, outliers, and influential points.
 - Logarithmic and power transformation to achieve linearity.
- F. Exploring categorical data
 - Frequency tables and bar charts
 - Two-way tables
 - Comparing distribution using bar charts.

II. Sampling and Experimentation: Planning and conducting a study
(Content A to D -> 3-4 weeks)

Student will learn:

- A. Methods of data collection
 - Census
 - Experiment
 - Sample survey
 - Observational study
- B. Planning and conducting surveys
 - Characteristics of a well designed well conducted survey
 - Populations, samples, and random selection
 - Sources of bias.
 - Sampling methods: SRS, stratified, cluster, and systematic
- C. Planning and conducting experiments
 - Characteristics of a well designed well conducted experiment
 - Treatments, control groups, experimental units, random assignments, and replication
 - Sources of bias and confounding, placebo effect and blinding.

<ul style="list-style-type: none"> • Completely randomized design • Randomized block design and matched pairs design <p>D. Generalizability of results and types of conclusions that can be drawn from observational studies, experimental, and surveys.</p> <p>III. Anticipating Patterns: Exploring random phenomena using probability and simulation (Content A ->5-6 weeks; Content B -> 1-2 weeks; Content C-> 2 weeks)</p> <p>Students will learn:</p> <p>A. Probability</p> <ul style="list-style-type: none"> • Interpreting the probability and the "Law of Large Numbers" • Addition and multiplication rule. Conditional probability and independence. • Probability distribution of discrete random variable, and simulation of random behavior. • Binomial and geometric distribution. • Expected value and standard deviation of the random variable, and linear transformation of random variable. <p>B. Combining independent random variables</p> <ul style="list-style-type: none"> • Identifying the independent variables and dependent variables • Mean and standard deviation of for sums and differences of independent random variables <p>C. Sampling distributions</p> <ul style="list-style-type: none"> • Sampling distributions of a sample proportion • Sampling distributions of a sample mean • Central limit theorem discussion; AAO Video for related topics of the unit. <p>IV. Statistical Inference: Estimating population parameters and testing hypotheses. (Content A ->2-3 weeks; Content B -> 2-3 weeks; Content C ->3 -4 weeks;)</p> <p>The students will learn:</p> <p>A. Point estimators and confidence intervals for populations proportions.</p> <ul style="list-style-type: none"> • Properties of point estimators including unbiasedness and variability for proportions. • Meaning and properties of confidence intervals and confidence levels. • Confidence interval for a proportion • Testing hypotheses about proportions. The meaning of significance testing, null and alternative hypotheses, p-values; one and two sided tests; Type I and type II Error, concept of power. • Comparing two proportions. <p>B. Inference about means.</p> <ul style="list-style-type: none"> • Properties of point estimators including unbiasedness and variability for the means. • Confidence interval for a mean • Testing hypotheses about a mean. • Comparing means. Confidence interval and test for a difference between two means (matched and unmatched design) <p>C. Inferences for regression.</p> <ul style="list-style-type: none"> • Confidence interval for the slope of a least-square regression line. • Chi-square test for the goodness of fit, homogeneity of proportions, and independence one and two way tables. • Test for the slope of the least square regression line. <p>Final Project will demonstrates students understanding of the four major concept of AP Statistics and formal research strategies. (3 weeks)</p> <p>The students will:</p> <ul style="list-style-type: none"> • Choose a question of interest to investigate • Design an appropriate study or experiment • Collect good data • Describe the data using appropriate terminology, graphical displays, and summary statistics • Use the sample to make inference about the population • Justify methods and state conclusions • Present the research to the class and submit a complete written report
<ul style="list-style-type: none"> ❖ E2: Define, analyze, and solve complex problems and communicate results. ❖ E4: Demonstrate personal, social and civic responsibility. ❖ E5: Acquire, apply, integrate, analyze, and synthesize knowledge.
<p>Text and Resources Required</p> <p>Text: Stats Modeling the world; Bock,Velleman, and De Veaux, 2-nd edition, 2007 TI-83 Graphing Calculator, notebook, pencil</p>
<p>Course Assessments</p> <p>Grade based on: Tests, Quizzes, and Homework Final Project – 1/9th of final grade AP Statistics exam (required to earn A.P. credit, but does not impact grade)</p>