

AP STATISTICS

Prerequisite: A grade of B or better in Algebra II or Algebra II Honors

Meeting time: 5 days per week, full year, one credit

Placement: Grade 11, 12, Level I

This course is a college-level course in statistics meant to introduce students to the major tools for collecting, analyzing, and drawing conclusions from data. It is designed to prepare students for the Advanced Placement Examination given by the College Board. Students in this course will be exposed to four broad conceptual themes. They will explore data, observing patterns and departures from patterns. They will learn to plan a study, deciding what data to collect and how to measure the data. They will anticipate patterns, producing models using probability and simulations. Students will also learn to use statistical inference to confirm their models. In addition, students are required to complete summer assignments, which will review basic concepts in probability and statistics prior to taking the course.

COURSE GOALS AND OBJECTIVES

1. For this course, students will prepare to take the Advanced Placement Statistics Examination administered by the College Board in May
2. To provide the students with a challenging and stimulating college level mathematics course among peers who are both interested and talented in mathematics
3. To provide a solid statistical background for students who intend to matriculate into a two or four year college. The course is particularly beneficial for students planning to major in business or the social sciences.
4. To make students sufficiently proficient in statistics so that they may successfully matriculate in an advanced statistics course in college
5. To develop the student's ability to apply statistical concepts to practical situations
6. To generate in the student a recognition of, and an appreciation for, the beauty inherent in the a well-planned and executed statistical study
7. To provide the student opportunities for imaginative and critical thinking in mathematics

AP STATISTICS

(Agawam High School Academic Expectations: 1, 3, 4, 5, 6, 10)

Exploring Data

- Observe patterns and departures from patterns.
- Construct and interpret graphical displays of distributions of univariate data (dotplot, stemplot, histogram, box plot, cumulative frequency plot).
- Determine center and spread of data.
- Recognize shape, clusters, gaps, outliers and other unusual features.
- Summarize distributions of univariate data using measures of central tendency.
- Calculate range, interquartile range, and standard deviation.
- Determine quartiles, percentiles, and standardized scores (z-scores).
- Determine the effect of changing units on summary measures.
- Compare distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots).

- Compare center and spread within and between groups.
- Compare shape, clusters, gaps, outliers and other unusual features.
- Explore bivariate data.
- Analyze patterns in scatterplots, including correlation and linearity.
- Calculate least-squares regression line
- Create residual plots and calculate outliers, and influential points.
- Perform transformations to achieve linearity: logarithmic and power.
- Explore categorical data.
- Analyze marginal and joint frequencies for two-way tables.

Sampling and Experimentation

- Explore methods of data collection (census, survey, experiment, and observation).
- Plan and conduct a study or experiment.
- Recognize characteristics of a well-designed and well-conducted survey.
- Define population, sample, and random selection.
- Explore and determine sources of bias in sampling and surveys.
- Present sampling methods, including simple random sampling, stratified random sampling, and cluster sampling
- Recognize characteristics of a well-designed and well-conducted experiment.
- Define treatments, control groups, experimental units, random assignments, and replication.
- Explore sources of bias and confounding including placebo effect and blinding.
- Create a completely randomized design and randomized block design, including matched pairs design.
- Generalize results and types of conclusions that can be drawn from observational studies, experiments, and surveys.

Anticipating Patterns

- Explore random phenomenon using probability and simulation.
- Define and interpret probability, including ‘Law of Large Numbers.’
- Present addition and multiplication rule for probabilities.
- Define conditional probability and independence.
- Explore discrete random variables and their probability distributions, including binomial and geometric distributions.
- Create simulations of random behavior and probability distributions.
- Calculate mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable.
- Combine independent random variables, noting independence versus dependence.
- Calculate mean and standard deviation for sums and differences of independent random variables.
- Recognize properties of the normal distribution and use as a model for measurements.
- Define and simulate sampling distributions, including a sample proportion, sample mean, difference between two sample proportions, and difference between two sample means.
- Define the Central Limit Theorem.
- Present t -distribution and chi-square distribution.

Statistical Inference

- Estimate population parameters and margins of error.
- Present properties of point estimators, including unbiasedness and variability.
- Explore the logic of confidence intervals, measuring confidence level and confidence intervals, and properties of confidence intervals.
- Calculate confidence intervals for a proportion, a difference between proportions, a mean, and the difference between two means.
- Create a confidence interval for the slope of a least-squares regression line.
- Introduce hypothesis testing.
- Examine the 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.
- Perform hypothesis tests for proportions, a difference between two proportions, a mean, a difference between two means.
- Perform the chi-square test for goodness of fit, homogeneity of proportions, and independence (one-way and two-way tables).
- Complete a test for the slope of a least-squares regression line.

RESOURCES

Bock, David et al. Stats: Modeling the World. Boston: Pearson-Prentice Hall, 2007.

Schneider, R. & Best, G. Introduction to Statistics with the TI-83 Graphing Calculator. Andover, Massachusetts: Venture Publishing, 1999.

Teacher generated materials such as NCTM journals, note taking outlines, etc.

Technology Resources: Classroom sets of scientific and graphing calculators.

ASSESSMENT STRATEGIES

- Class participation, written and oral communication
- Class work
- Homework
- Class projects and presentations
- Notebooks/Portfolios
- AP Practice Exams
- Quizzes
- Tests
- Departmental Semester Exams
- School Wide and Department Rubrics