

AP STATISTICS (AB)

CURRICULUM

GUIDE

Board approval: June 18, 2015

Advanced Placement Statistics Course Overview

Advanced Placement (AP) Statistics is offered to any student who has successfully completed a second-year course in algebra and who possesses sufficient mathematical maturity and quantitative reasoning ability. Students with the appropriate mathematical background are encouraged to take both AP Statistics and AP Calculus in high school. There are four themes in the AP Statistics course: exploring data, sampling and experimentation, anticipating patterns, and statistical inference. Upon completion of this course, students should be prepared to pass the AP Statistics exam as a as possess the skills necessary to be successful in subsequent mathematics courses.

Goals

- Describe patterns and departures from patterns
- Plan and conduct a study
- Explore random phenomena using probability and simulation
- Estimate population parameters and test hypothesis

Advanced Placement Statistics Scope and Sequence

- I. Exploring Data: Describing patterns and departures from patterns
 - A. Constructing and interpreting graphical displays of distributions of univariate data
 1. Center and spread
 2. Clusters and gaps
 3. Outliers and other unusual features
 4. Shape
 - B. Summarizing distributions of univariate data
 1. Measuring center: median, mean
 2. Measuring spread: range, interquartile range, standard deviation
 3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
 4. Using boxplots
 5. The effect of changing units on summary measures
 - C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)
 1. Comparing center and spread
 2. Comparing clusters and gaps
 3. Comparing outliers and unusual features
 4. Comparing shape
 - D. Exploring bivariate data
 1. Frequency tables and bar charts
 2. Marginal and joint frequencies for two-way tables
 3. Conditional relative frequencies and association
 4. Comparing distributions using bar chart
- II. Sampling and experimentation: planning and conducting a study
 - A. Overview of methods of data collection
 1. Census
 2. Sample survey
 3. Experiment
 4. Observational study
 - B. Planning and conducting surveys
 1. Characteristics of a well-designed and well-conducted survey
 2. Populations, samples, and random selection
 3. Sources of bias in sampling and surveys
 4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling

- C. Planning and conducting experiments
 - 1. Characteristics of a well-designed and well-conducted experiment
 - 2. Treatments, control groups, experimental units, random assignments and replication
 - 3. Sources of bias and confounding, including placebo effect and blinding
 - 4. Completely randomized design
 - 5. Randomized block design, including matched pairs design
 - D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys
- III. Anticipating Patterns: Exploring random phenomena using probability and simulation
- A. Probability
 - 1. Interpreting probability, including long-run relative frequency interpretation
 - 2. "Law of Large Numbers" concept
 - 3. Addition rule, multiplication rule, conditional probability and independence
 - 4. Discrete random variables and their probability distributions, including binomial and geometric
 - 5. Simulation of random behavior and probability distributions
 - 6. Mean (Expected value) and standard deviation of a random variable, and linear transformation of a random variable
 - B. Combining independent random variables
 - 1. Notion of independence versus dependence
 - 2. Mean and standard deviation for sums and differences of independent random variables
 - C. The normal distribution
 - 1. Properties of the normal distribution
 - 2. Using table of the normal distribution
 - 3. The normal distribution as a model for measurements
 - D. Sampling distributions
 - 1. Sampling distribution of a sample proportion
 - 2. Sampling distribution of a sample mean
 - 3. Central Limit Theorem
 - 4. Sampling distribution of a difference between two independent sample proportions
 - 5. Sampling distribution of a difference between two independent sample means
 - 6. Simulation of sampling distributions
 - 7. T-distribution

8. Chi-square distribution

IV. Statistical Inference: Estimating population parameter and testing hypotheses

A. Estimation (point estimator and confidence intervals)

1. Estimating population parameters and margins of error
2. Properties of point estimator, including unbiasedness and variability
3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
4. Large sample confidence interval for a proportion
5. Large sample confident interval for a difference between two proportions
6. Confidence interval for a mean
7. Confidence interval for a difference between two means (unpaired and paired)
8. Confidence interval for the slope of a least-squares regression line

B. Tests of significance

1. 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
2. Large sample test for a proportion
3. Large sample test for a difference between two proportions
4. Test for a mean
5. Test for a difference between two means(unpaired and paired)
6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)
7. Test for slope of a least-squares regression line