

Lake Zurich High School

Mathematics Department

AP Statistics

Course Description

Prerequisites: Advanced Math or Pre-Calculus
Open To: 11, 12
Credit: 1 unit
Level: Advanced Placement

The purpose of the A.P. course in statistics is to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students will explore the course themes using a variety of technologies- graphing calculator, spreadsheets and other software designed for statistical applications. Students are exposed to four broad conceptual themes: 1. Exploring Data: Describing patterns and departures from patterns. 2. Sampling and Experimentation: Planning and conducting a study. 3. Anticipating Patterns: Exploring random phenomena using probability and simulation. 4. Statistical Inference: Estimating population parameters and testing hypotheses. Students who successfully complete the course and the A.P. Examination may receive university credit, advanced placement, or both for a one-semester introductory college statistics course. Students are required to bring a TI-83 or TI-84 graphing calculator to class on a daily basis.

Textbook

Title:	The Practice of Statistics 2 nd edition
Publisher:	W.H. Freeman and Company
Author(s)	Yates, Moore, Starnes
Copyright date:	2003
ISBN number:	

Course Objectives

The purpose of the AP course in statistics is to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students are exposed to four broad conceptual themes:

1. Exploring Data – Observing patterns and departures from patterns
2. Planning a Study – Deciding what and how to measure
3. Anticipating Patterns – Producing models using probability theory and simulations
4. Statistical Inference – Confirming models

Course Syllabus

1st Semester

Chapter	Topic
1	Exploring Data
2	The Normal Distributions
3	Examining Relationships
4	More on Two-Variable Data
5	Producing Data
6	The Study of Randomness
7	Random Variables
8	The Binomial and Geometric Distributions
9	Sampling Distributions

2nd Semester

Chapter	Topic
10	Introduction to Inference
11	Inference for Distributions
12	Inference for Proportions
13	Inference for Tables: Chi-Square Procedure
14	Inference for Regression
15	Analysis of Variance

Concepts Covered in the AP Statistics curriculum, as defined by the College Board
(% indicates percentage of Advanced Placement Exam covered by topic)

- I. Exploring Data: Describing Patterns and departures from patterns (20%-30%)
 - A. Constructing and Interpreting graphical displays of distributions of univariate data
 - i. Center and spread
 - ii. Clusters and gaps
 - iii. Outliers and other unusual features
 - iv. Shape
 - B. Summarizing distributions of univariate data
 - i. Measuring center: median, mean
 - ii. Measuring spread: range, interquartile range, standard deviation
 - iii. Measuring position: quartiles, percentiles, standardized scores (z-scores)
 - iv. Using boxplots
 - v. The effect of changing units on summary measures
 - C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)
 - i. Comparing center and spread: within group, between group variation
 - ii. Comparing clusters and gaps
 - iii. Comparing outliers and other unusual features
 - iv. Comparing shapes
 - D. Exploring bivariate data
 - i. Analyzing patterns in scatterplots
 - ii. Correlation and linearity
 - iii. Least square regression line
 - iv. Residual plots, outliers, and influential points
 - v. Transformations to achieve linearity: logarithmic and power transformations
 - E. Exploring categorical data: frequency tables
 - i. Frequency tables and bar charts
 - ii. Marginal and joint frequencies for two-way tables
 - iii. Conditional relative frequencies and association
 - iv. Comparing distributions using bar charts
- II. Sampling and Experimentation: Planning and Conducting a Study (10%-15%)
 - A. Overview of methods of data collection
 - i. Census
 - ii. Sample survey
 - iii. Experiment
 - iv. Observational study
 - B. Planning and conducting surveys
 - i. Characteristics of a well-designed and well-conducted survey
 - ii. Populations, samples, and random selection
 - iii. Sources of bias in sampling and surveys
 - iv. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling
 - C. Planning and conducting experiments
 - i. Characteristics of a well-designed and well-conducted experiment
 - ii. Treatments, control groups, experimental units, random assignments, and replication
 - iii. Sources of bias and confounding, including placebo effect and blinding
 - iv. Completely randomized design

- v. 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: Producing models using probability theory and simulation (20%-30%)
- A. Probability as relative frequency
 - i. Interpreting probability, including long-run relative frequency interpretation
 - ii. "Law of large numbers" concept
 - iii. Additional rule, multiplication rule, conditional probability, and independence
 - iv. Discrete random variables and their probability distributions, including binomial and geometric
 - v. Simulation of random behavior and probability distributions
 - vi. Mean (expected value) and standard deviation of a random variable
 - B. Comparing independent random variables
 - i. Notion of independence versus dependence
 - ii. Mean and standard deviation for sum and differences of independent random variables
 - C. The normal distribution
 - i. Properties of the normal distribution
 - ii. Using tables of the normal distribution
 - iii. The normal distribution as a model for measurements
 - D. Sampling distributions
 - i. Sampling distribution of a sample proportion
 - ii. Sampling distribution of a sample mean
 - iii. Central limit theorem
 - iv. Sampling distribution of a difference between two independent sample proportions
 - v. Sampling distribution of a difference between two independent sample means
 - vi. Simulation of sampling distributions
 - vii. t-distribution
 - viii. Chi-square distribution
- IV. Statistical Inference: Estimating population parameters and testing hypotheses (30%-40%)
- A. Estimation (point estimators and confidence intervals)
 - i. Estimating population parameters and margins of error
 - ii. Properties of point estimators, including unbiasedness and variability
 - iii. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
 - iv. Large sample confidence intervals for a proportion
 - v. Large sample confidence intervals for a mean
 - vi. Large sample confidence interval for a difference between two proportions
 - vii. Large sample confidence interval for a difference between two means (unpaired and paired)
 - viii. Confidence interval for the slope of a least-squares regression line
 - B. Tests of significance
 - i. Logic of significance testing, null and alternative hypothesis; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power
 - ii. Large sample test for a proportion
 - iii. Large sample test for a mean
 - iv. Large sample test for a difference between two proportions
 - v. Large sample test for a difference between two means (unpaired and paired)
 - vi. Chi-square test for goodness of fit, and independence (one- and two-way tables)
 - vii. Test for the slope of a least-squares regression line