

Dover-Sherborn High School
Mathematics Curriculum
AP Statistics

A. DESCRIPTION

This course prepares students for the AP Statistics exam. The syllabus adheres to the AP Statistics curriculum. Students taking this class are expected to sit for the AP exam. The outline below is intended to indicate the scope of the course, but it is not necessarily the order in which the topics will be taught.

B. OBJECTIVES

Upon completion of this class, students should be able to:

1. Make sense of problems and persevere in solving them. [MP.1]
2. Reason abstractly and quantitatively. [MP.2]
3. Construct viable arguments and critique the reasoning of others. [MP.3]
4. Model with mathematics. [MP.4]
5. Use appropriate tools strategically. [MP.5]
6. Attend to precision. [MP.6]
7. Look for and make use of structure. [MP.7]
8. Look for and express regularity in repeated reasoning. [MP.8]

Specific to this curriculum, the student should be able to:

1. Observe patterns in data, interpret these patterns and make conclusions from them using dotplots, stemplots, histograms, boxplots, scatterplots, etc.
2. Plan a statistical study including methods of data collection, conducting surveys, and experiments.
3. Produce statistical models based on probability as relative frequency and normal distributions.
4. Confirm statistical models using a variety of tools (confidence intervals, tests of significance, etc.).

C. OUTLINE

1. Exploring Data: Observing patterns and departures from patterns
 - a. Interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram) [S.ID.1]
 - i. Center and spread
 - ii. Clusters and gaps
 - iii. Outliers and other unusual features
 - iv. Shape
 - b. Summarizing distributions of univariate data [S.ID.2]
 - i. Measuring center: median, mean
 - ii. Measuring spread: range, interquartile range, standard deviation
 - iii. Measuring position: quartiles, percentiles, standardized scores (z-scores)

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- 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) [S.ID.3]
 - vi. Comparing center and spread: within group, between group variation
 - vii. Comparing clusters and gaps
 - viii. Comparing outliers and other unusual features
 - ix. Comparing Shapes
 - d. Exploring bivariate data [S.ID.5]; [S.ID.6]; [S.ID.6a]; [S.ID.6b]; [S.ID.6c]; [S.ID.7]; [S.ID.8]; [S.ID.9]; [F.BF.1]; [F.BF.1a]; [F.BF.1b]; [F.BF.5]; [F.LE.1]; [F.LE.1a]; [F.LE.1b]; [F.LE.2]; [F.LE.3]; [F.LE.4]; [F.LE.5]
 - x. Analyzing patterns in scatterplots
 - xi. Correlation and linearity
 - xii. Least squares regression line
 - xiii. Residual plots, outliers, and influential points
 - xiv. Transformations to achieve linearity: logarithmic and power transformations
 - e. Exploring categorical data: frequency tables [S.ID.5]
 - xv. Marginal and joint frequencies for two-way tables
 - xvi. Conditional relative frequencies and association
2. Planning a Study: Deciding what and how to measure
- a. Overview of methods of data collection [S.IC.1]
 - i. Census
 - ii. Sample survey
 - iii. Experiment
 - iv. Observational study
 - b. Planning and conducting surveys [S.IC.2]; [S.IC.3]; [S.IC.4]; [S.IC.5]; [S.IC.6]
 - i. Simple random sampling
 - ii. Characteristics of a well-designed and conducted survey
 - iii. Sampling error: the variation inherent in a survey
 - iv. Sources of bias in surveys
 - v. Stratifying to reduce variation
 - c. Planning and conducting experiments [S.IC.2]; [S.IC.3]; [S.IC.4]; [S.IC.5]; [S.IC.6]
 - i. Experiments versus observational studies versus surveys
 - ii. Confounding, control groups, placebo effects, blinding
 - iii. Treatments, experimental units, and randomization
 - iv. Completely randomized design for two treatments
 - v. Randomized paired comparison design
 - vi. Replication, blocking, and generalizability of results

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3. Anticipation Patterns: Producing models using probability and simulation
 - a. Probability as relative frequency [S.CP.1]; [S.CP.2]; [S.MD.5(+)]; [S.MD.5a(+)]; [S.MD.5b(+)]
 - i. “Law of large numbers” concept
 - ii. Addition rule, multiplication rule, conditional probabilities, and independence
 - iii. Discrete random variables and their probability distributions
 - iv. Simulation of probability distributions, including binomial and geometric
 - v. Mean (expected value) and standard deviation of a random variable, including binomial
 - b. Combining independent random variables [S.CP.2]; [S.CP.3]; [S.CP.4]; [S.CP.5]; [S.CP.6]; [S.CP.7]; [S.CP.8(+)]; [S.CP.9(+)]
 - vi. Notion of independence versus dependence
 - vii. Mean and standard deviation for sums and differences of independent random variables
 - c. The normal distribution [S.ID.4]
 - viii. Properties of the normal distribution
 - ix. Using tables of the normal distribution
 - x. The normal distribution as a model for measurements
 - d. Simulating sampling distributions [S.ID.4]; [S.MD.1(+)]; [S.MD.2(+)]; [S.MD.3(+)]; [S.MD.4(+)]; [S.MD.5(+)]; [S.MD.6(+)]; [S.MD.7(+)]
 - xi. Sampling distribution of a sampling proportion
 - xii. Sampling distribution of a sample mean
 - xiii. Central Limit Theorem
 - xiv. Sampling distribution of a difference between two independent sample proportions
 - xv. Sampling distribution of a difference between two independent sample means
4. Statistical Inference: Confirming models
 - a. Confidence intervals [S.ID.4]; [S.MD.1(+)]; [S.MD.2(+)]; [S.MD.3(+)]; [S.MD.4(+)]; [S.MD.5(+)]; [S.MD.6(+)]; [S.MD.7(+)]
 - i. The meaning of a confidence interval
 - ii. Large sample confidence interval for a proportion
 - iii. Large sample confidence interval for a mean
 - iv. Large sample confidence interval for a difference between two proportions
 - v. Large sample confidence interval for a difference between two means (paired and unpaired)
 - b. Tests of significance
 - i. Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests
 - ii. Large sample test for a proportion

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- 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, homogeneity of proportions, and independence
- c. Special case of normally distributed data
 - i. t-distribution
 - ii. Single sample t procedures
 - iii. Two sample (independent and matched pairs) t procedures
 - iv. Inference for slope of least squares line

D. TEXT

The Practice of Statistics, Yates, Moore, McCabe (W.H. Freeman and Company)
ISBN 0-7167-3370-6

E. RESOURCE MATERIALS

1. Active Statistics, (CD Rom), Paul Velleman
2. Elementary Statistics, Triola (Addison Wesley) ISBN 0-201-33593-X
3. Films and videos
4. TI-83 Plus or TI-84 graphical calculator
5. Web Sites
6. Related computer activities
7. MiniTab