MATHEMATICS
AP Statistics
Standard: Number, Number Sense and Operations

Organizing Topic	Benchmark	Indicator
Number and Number Systems	A. Apply factorials and exponents, including fractional exponents, to solve practical problems.	1. Use factorial notation and computations to represent and solve problem situations involving arrangements. 2. Apply combinations as a method to create coefficients for the Binomial Theorem, and make connections to everyday and workplace problem situations.

MATHEMATICS
AP Statistics
Standard: Measurement

Organizing Topic	Benchmark	Indicator
Use Measurement Techniques and Tools	A. Explain differences among accuracy, precision and error, and describe how each of those can affect solutions in measurement situations.	1. Explain how a small error in measurement may lead to a large error in calculated results. 2. Calculate relative error. 3. Explain the difference between absolute error and relative error in measurement. 4. Give examples of how the same absolute error can be problematic in one situation but not in another (e.g., compare "accurate to the nearest foot" when measuring the height of a person versus when measuring the height of a mountain).

MATHEMATICS
AP Statistics
Standard: Geometry and Spatial Sense

Organizing Topic	Benchmark	Indicator
Geometry/Spatial Sense	A. Use formal mathematical language and notation to represent ideas, to demonstrate relationships within and among representation systems, and to formulate generalizations.	1. Relate graphical and algebraic representations of lines, simple curves and conic sections.

MATHEMATICS
AP Statistics
Standard: Data Analysis and Probability

Organizing Topic	Benchmark	Indicator
Statistical Methods	A. Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.	1. Create a scatterplot of bivariate data, identify trends, and find a function to model the data. 2. Use technology to find the Least Squares Regression Line, the regression coefficient, and the correlation coefficient for bivariate data with a linear trend, and interpret each of these statistics in the context of the problem situation. 3. Describe the standard normal curve and its general properties, and answer questions dealing with data assumed to be normal. 4. Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions. 5. Understand and use the concept of random variable, and compute and interpret the expected value for a random variable in simple cases. 6. Transform bivariate data so it can be modeled by a function; e.g., use logarithms to allow nonlinear relationship to be modeled by linear function. 7. Apply the concept of a random variable to generate and interpret probability distributions, including binomial, normal and uniform.

MATHEMATICS
AP Statistics
Standard: Data Analysis and Probability

Organizing Topic	Benchmark	Indicator
	B. Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.	1. Describe how a linear transformation of univariate data affects range, mean, mode, and median. 2. Use technology to find the Least Squares Regression Line, the regression coefficient, and the correlation coefficient for bivariate data with a linear trend, and interpret each of these statistics in the context of the problem situation. 3. Use technology to compute the standard deviation for a set of data, and interpret standard deviation in relation to the context or problem situation. 4. Analyze and interpret univariate and bivariate data to identify patterns, note trends. 5. Describe the shape and find all summary statistics for a set of univariate data, and describe how a linear transformation affects shape, center and spread.
Statistical Methods	C. Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions. (Continued)	1. Design a statistical experiment, survey or study for a problem; collect data for the problem; and interpret the data with appropriate graphical displays, descriptive statistics, concepts of variability, causation, correlation and standard deviation. 2. Describe the role of randomization in a well designed study, especially as compared to a convenience sample, and the generalization of results from each. 3. Evaluate validity of results of a study based on characteristics of the study design, including sampling method, summary statistics and data analysis techniques.

MATHEMATICS
AP Statistics
Standard: Data Analysis and Probability

Organizing Topic	Benchmark	Indicator
Statistical Methods	C. Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions.	4. Identify and use various sampling methods (voluntary response, convenience sample, random sample, stratified random sample, census) in a study. 5. Use sampling distributions as the basis for informal inference.
Statistical Methods	D. Connect statistical techniques to applications in workplace and consumer situations.	1. Design a statistical experiment, survey or study for a problem; collect data for the problem; and interpret the data with appropriate graphical displays, descriptive statistics, concepts of variability, causation, correlation and standard deviation. 2. Describe the role of randomization in a well designed study, especially as compared to a convenience sample, and the generalization of results from each. 3. Evaluate validity of results of a study based on characteristics of the study design, including sampling method, summary statistics and data analysis techniques. 4. Examine statements and decisions involving risk; e.g., insurance rates and medical decisions. 5. Use theoretical or experimental probability, including simulations, to determine probabilities in real-world problem situations involving uncertainty, such as mutually exclusive events, complementary events and conditional probability.

Advanced Placement Statistics Curriculum Outline

Following is an outline of the major topics covered by the AP Statistics Exam. The ordering here is intended to define the scope of the course but not necessarily the sequence. The percentages in parentheses for each content area indicate the coverage for that content area in the exam.

I. Exploring Data: Describing patterns and departures from patterns (20%–30%)
Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)
    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: within group, between group variation
    2. Comparing clusters and gaps
    3. Comparing outliers and other unusual features
    4. Comparing shapes

D. Exploring bivariate data
    1. Analyzing patterns in scatterplots
    2. Correlation and linearity
    3. Least-squares regression line
    4. Residual plots, outliers, and influential points
    5. Transformations to achieve linearity: logarithmic and power transformations

E. Exploring categorical 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 charts

II. Sampling and Experimentation: Planning and conducting a study (10%–15%)
Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

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 (20%–30%)
Probability is the tool used for anticipating what the distribution of data should look like under a given model.

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

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C. The normal distribution
   1. Properties of the normal distribution
   2. Using tables 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 parameters and testing hypotheses (30%–40%)
Statistical inference guides the selection of appropriate models.

A. Estimation (point estimators and confidence intervals)
   1. Estimating population parameters and margins of error
   2. Properties of point estimators, 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 confidence 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 the slope of a least-squares regression line

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