

**Course Description:**

AP Statistics is a rigorous full-year course divided into two semesters. The full course consists of 12 modules and is equivalent to an introductory college/university statistics course. Semester A of AP Statistics introduces students to the essential building blocks of statistical thinking and prepares them for the rigorous analysis required on the AP Statistics exam. Students begin by exploring categorical and quantitative variables, developing the ability to describe, compare, and interpret data distributions. Students then move into linear regression, where they learn to model relationships between variables and evaluate the model’s strength and limitations. Throughout the semester, focus is placed on asking good questions and collecting data, which includes study and experimental design, sampling methods, and identifying potential sources of bias. In this semester, students also build a strong conceptual and mathematical understanding of probability and probability distributions, laying the groundwork for all inference work in Semester B. Throughout this course students will gain knowledge, skills, and understanding of key statistics principles, as well as gain preparation for taking the AP Statistics Exam.

Module	Lesson Title	Objectives
<b>Module 1: Categorical Variables</b>	1.1 Asking Good Questions	<ul style="list-style-type: none"> <li>Distinguish samples from populations.</li> <li>Determine when it is necessary to sample from a population.</li> <li>Pose appropriate investigative questions given a population of interest.</li> </ul>
	1.2 Defining Variables	<ul style="list-style-type: none"> <li>Identify observational units, variables, parameters, and statistics from a statistical study or data set.</li> <li>Identify categorical and quantitative variables.</li> <li>Identify discrete and continuous quantitative variables.</li> </ul>
	1.3 Categorical Variable Displays	<ul style="list-style-type: none"> <li>Construct and describe categorical one-variable data sets in table form.</li> <li>Construct appropriate one-variable graphical representations.</li> <li>Compare multiple representations of categorical one-variable data.</li> </ul>
	1.4 Two Categorical Variables	<ul style="list-style-type: none"> <li>Construct and compare a variety of representations for the relationship between two categorical variables.</li> <li>Calculate summary statistics for two categorical variables.</li> <li>Compare summary statistics for two categorical variables.</li> </ul>
	1.5 Justify Claims	<ul style="list-style-type: none"> <li>Justify a claim using categorical one-variable graphical representations.</li> <li>Justify a claim using tabular and graphical representations for the distribution of two categorical variables.</li> <li>Justify a claim using summary statistics for two categorical variables.</li> </ul>

Module	Lesson Title	Objectives
<b>Module 2: Quantitative Variables</b>	2.1 One Quantitative Variable	<ul style="list-style-type: none"> <li>Construct a histogram to describe the distribution of a quantitative variable.</li> <li>Construct a stem-and-leaf plot to describe the distribution of a quantitative variable.</li> <li>Construct a dotplot to describe the distribution of a quantitative variable.</li> <li>Choose the most appropriate graphical representation of a quantitative variable.</li> </ul>
	2.2 One-Variable Shapes	<ul style="list-style-type: none"> <li>Describe the shape of distributions of quantitative one-variable graphical representations.</li> <li>Use a graph to determine the modality of quantitative one-variable graphical representations.</li> <li>Identify unusual characteristics of graphical representations of quantitative one-variable data.</li> </ul>
	2.3 Center & Spread Measures	<ul style="list-style-type: none"> <li>Calculate measures of center for quantitative data.</li> <li>Calculate measures of variability for quantitative data.</li> <li>Calculate outliers for quantitative data.</li> <li>Justify the selection of a summary statistic for describing quantitative data.</li> </ul>
	2.4 Summary Statistics	<ul style="list-style-type: none"> <li>Construct quantitative one-variable graphical representations of summary statistics.</li> <li>Describe quantitative one-variable graphical representations of summary statistics.</li> <li>Compare multiple quantitative one-variable distributions using summary statistics.</li> </ul>
	2.5 Comparing Distributions	<ul style="list-style-type: none"> <li>Justify a claim using multiple quantitative one-variable graphical representations.</li> <li>Calculate z-scores as measures of relative position for distributions.</li> <li>Compare z-scores as measures of relative position for distributions.</li> </ul>
<b>Module 3: Linear Regression</b>	3.1 Graphical Representations	<ul style="list-style-type: none"> <li>Construct scatterplots depicting the relationship between two quantitative variables.</li> <li>Describe the key characteristics of a scatterplot.</li> <li>Justify a claim using scatterplots depicting the distribution of two quantitative variables.</li> </ul>
	3.2 Correlation	<ul style="list-style-type: none"> <li>Interpret the correlation for a linear relationship.</li> <li>Identify valid correlation coefficients to describe a linear relationship.</li> <li>Use a scatterplot to estimate the correlation coefficient for a linear relationship.</li> </ul>
	3.3 Linear Regression Models	<ul style="list-style-type: none"> <li>Calculate a predicted response value using a linear regression model.</li> <li>Calculate a predicted explanatory value using a linear regression model.</li> <li>Distinguish between interpolation and extrapolation when interpreting a linear regression model.</li> </ul>

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	3.4 Residuals	<ul style="list-style-type: none"> <li>Calculate the differences between the observed and predicted values.</li> <li>Interpret the differences between the observed and predicted values.</li> <li>Describe the form of association of bivariate data using residual plots.</li> </ul>
	3.5 Least Squares Regression	<ul style="list-style-type: none"> <li>Calculate the coefficients for the least-squares regression line model.</li> <li>Interpret coefficients for the least-squares regression line model.</li> <li>Interpret the value of R-squared in the least-squares regression line model.</li> </ul>
<b>Module 4: Collecting Data</b>	4.1 The Investigative Question	<ul style="list-style-type: none"> <li>Determine the components of an investigative question within a statistical study.</li> <li>Distinguish between an experiment and an observational study.</li> <li>Justify the appropriateness of generalizations for a statistical study.</li> </ul>
	4.2 Sampling Techniques	<ul style="list-style-type: none"> <li>Identify a sampling method given a description of a study.</li> <li>Justify the appropriateness of a sampling method.</li> <li>Identify the advantages of one sampling method over another in context.</li> </ul>
	4.3 Problems with Sampling	<ul style="list-style-type: none"> <li>Identify potential sources of bias in sampling methods.</li> <li>Identify potential sources of response bias.</li> <li>Identify improvements in sampling methods to reduce or eliminate bias.</li> </ul>
	4.4 Experimental Design 1	<ul style="list-style-type: none"> <li>Identify elements of a well-designed experiment.</li> <li>Identify advantages of single- and double-blind experiments.</li> <li>Design an experiment to address the placebo effect.</li> </ul>
	4.5 Experimental Design 2	<ul style="list-style-type: none"> <li>Identify key components of experimental design.</li> <li>Justify the appropriateness of a particular experimental design.</li> <li>Justify the appropriateness of the conclusions based on a well-designed experiment.</li> </ul>
<b>Module 5: Probability</b>	5.1 Estimating Probability	<ul style="list-style-type: none"> <li>Estimate probabilities using simulations.</li> <li>Define probability in terms of desired outcomes over a large number of trials.</li> <li>Apply the Law of Large Numbers to random processes.</li> </ul>
	5.2 Probability	<ul style="list-style-type: none"> <li>Determine the sample space for random processes.</li> <li>Calculate theoretical probabilities.</li> <li>Calculate the probability of complementary events.</li> </ul>

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	5.3 Special Cases	<ul style="list-style-type: none"> <li>Justify why two events are mutually exclusive (or disjoint) using joint probability.</li> <li>Calculate the probability of the union of two events.</li> <li>Determine whether two events are independent using the rules of probability.</li> </ul>
	5.4 Conditional Probability	<ul style="list-style-type: none"> <li>Calculate conditional probability.</li> <li>Apply the general multiplication rule to determine whether events are independent.</li> <li>Construct visual depictions of conditional probabilities.</li> </ul>
	5.5 Applications	<ul style="list-style-type: none"> <li>Calculate and interpret probabilities from real-world situations.</li> <li>Apply the Law of Large Numbers to interpret and predict long-term behavior of random processes.</li> <li>Justify a claim based on the results of probability calculations.</li> </ul>
<b>Module 6: Probability Distributions</b>	6.1 Random Variables	<ul style="list-style-type: none"> <li>Construct a probability distribution for a discrete random variable.</li> <li>Calculate probabilities of a discrete random variable distribution using rules of probability or a simulation.</li> <li>Construct graphical representations of a discrete probability distribution.</li> </ul>
	6.2 Parameters	<ul style="list-style-type: none"> <li>Calculate the mean of a discrete random variable.</li> <li>Calculate the standard deviation of a discrete random variable.</li> <li>Interpret the parameter, mean, and standard deviation in context for a discrete random variable.</li> </ul>
	6.3 The Binomial Distribution	<ul style="list-style-type: none"> <li>Justify why a random variable is or is not a binomial random variable.</li> <li>Calculate and interpret the mean and standard deviation for a binomial distribution.</li> <li>Calculate probabilities for a binomial distribution.</li> </ul>
	6.4 The Normal Distribution	<ul style="list-style-type: none"> <li>Describe the standard Normal distribution.</li> <li>Calculate the mean and standard deviation for a Normal distribution.</li> <li>Calculate percentages from a Normal distribution using the empirical rule.</li> </ul>
	6.5 Calculating Probabilities	<ul style="list-style-type: none"> <li>Calculate the probability that a particular value lies within a given interval of a Normal distribution.</li> <li>Calculate the associated intervals and areas of a Normal distribution.</li> <li>Calculate measures of relative position (percentiles) for Normal distributions.</li> </ul>