

# Advanced Placement Course Audit

## Aventa Learning

**Course:** Statistics

**Overview:** This course has been used with great success for several years.

### Part I: Course Explanation and Syllabus provide to students

#### Advanced Placement Statistics

Advanced Placement Statistics\* is equivalent to an introductory college level statistics course. Students are introduced to the major concepts of collecting, organizing, and drawing conclusions from data. Students will study four broad areas of introductory statistics:

- Exploring Data: Observing patterns and departures from patterns
- Planning a Study: Deciding what and how to measure
- Anticipating Patterns: Producing models using probability and simulation
- Statistical Inference: Confirming models.

Prospective students should have completed a second year of high school algebra and possess a mathematical maturity that includes quantitative reasoning. Students also should have writing skills that allow them to express answers clearly and succinctly.

AP Statistics data analysis is dependent on the use of technology. Students should have access to computers that include software capable of doing data analysis. Students will be required to interpret output generated by statistical software programs. Students are not expected to learn how to use various statistical programs. In addition one of the following Texas Instruments calculators is required, TI-83, TI-83+, TI-84+, or a TI 89. The TI-83+ is the most popular calculator for AP Statistics. In most cases the calculator is sufficient but the fundamental tool of data analysis is the computer.

Students enrolled in AP Statistics are not expected to memorize tedious formulas but should concentrate their time on understanding the basic concepts on introductory statistics. Formulas will be available throughout the course and the students will have access to formulas and statistical tables on the AP Statistics exam administered by the College Board.

**All students should understand that this is much more difficult than a typical high school course. Students should expect to put in more homework on a daily basis than they normally do.**

### Unit Structure

#### First Semester

#### Part I. Organizing Data: Looking for Patterns and Departures from Patterns

**Unit One:** Exploring Data – Two weeks.

- 1.1 Displaying Distributions with Graphs
- 1.2 Describing Distributions with Numbers

**Unit Two:** The Normal Distribution – Three weeks.

- 2.1 Density Curves and the Normal Distribution
- 2.2 Standard Normal Calculations

**Unit Three:** Examining Relationships – Three weeks

- 3.1 Scatter plots
- 3.2 Correlation
- 3.3 Least-Squares Regression

**Unit Four:** More on Two-Variable Data – Two weeks

- 4.1 Transforming Relationships
- 4.2 Cautions about Correlation and Regression
- 4.3 Relations in Categorical Data

**Part II. Producing Data: Samples, Experiments, and Simulations**

**Unit Five:** Producing Data - Two weeks.

- 5.1 Designing Samples
- 5.2 Designing Experiments
- 5.3 Simulating Experiments

**Part III Probability: Foundations of Inference**

**Unit Six:** Probability: The Study of Randomness – Three weeks

- 6.1 The Idea of Probability
- 6.2 Probability Models
- 6.3 General Probability Rules

**Unit Seven:** Random Variables - Two weeks.

- 7.1 Discrete and Continuous Random Variables
- 7.2 Means and Variances of Random Variables

**Second Semester**

**Unit Eight:** The Binomial and Geometric Distributions – Three weeks

- 8.1 The Binomial Distributions
- 8.2 The Geometric Distributions

**Unit Nine:** Sampling Distributions – Two weeks

- 9.1 Sampling Distributions
- 9.2 Sample Proportions
- 9.3 Sample Means

**Part IV Inference: Conclusions with Confidence**

**Unit Ten:** Introduction to Inference – Three weeks

- 10.1 Estimating with Confidence
- 10.2 Tests of Significance
- 10.3 Making Sense of Statistical Significance
- 10.4 Inference as Decision

**Unit Eleven:** Inference for Distributions – Three weeks

- 11.1 Inference for the Mean of a Population
- 11.2 Comparing Two Means

**Unit Twelve:** Inference for Proportions – Two weeks

- 12.1 Inference for a Population Proportion
- 12.2 Comparing Two Proportions

**Unit Thirteen:** Inference for Tables: Chi-Square Procedures – Two weeks

- 13.1 Test for Goodness of Fit
- 13.2 Inference for Two-Way Tables

**Unit Fourteen:** Inference for Regression – Two weeks

- 14.1 Inference about the Model

## Procedures

Throughout the course students will do assessments. There are different forms of assessment as outlined below.

1. **Discussions** - Students will post a response to a topic and will also be required to respond to another student's posting. Each unit starts and ends with a discussion board.
2. **Self Check quizzes** - The Self Check quizzes are designed to reinforce the basic concepts from the lessons. The student may retake the quizzes multiple times. These Self Checks will count toward the student's overall grade.
3. **Multiple Choice quizzes** - The Multiple Choice quizzes will cover material presented in several lessons. They are timed with an average of 2.5 minutes allowed per question. This closely mimics the AP Exam where a student is given 90 minutes to complete 40 multiple choice questions. The multiple choice quizzes may only be taken one time.
4. **Assignments** - Throughout the course students will be asked to demonstrate their knowledge of concepts by answering free response questions. The assignments are designed to prepare the student for the free response section of the AP exam. All assignments must be hand written and faxed to the instructor.
5. **Exams** - Exams are two part, 48 points of multiple choice questions (12 questions, 4 points each) and 52 points of free response. The free response exams have the same format as the assignments mentioned above. The free response must be completed in the student's handwriting and faxed to the instructor.

The AP Exam is given in May. For precise details, you should visit the [College Board Advanced Placement Web Site](#).

At that site, you will find a wealth of information. Explore it carefully. Download all the information that is available to you, including

- The Course Description
- Sample exam questions
- Sample scoring guides
- Any other information designed to assist you.

You do not need to take all of this in at once. The sample questions will be very difficult for you at this point; that is why you need to take the course! In time, though, you should become very familiar with all of this.

Make sure you know what you have to do at your home school to sign up for the exam. This online program will not sign you up.

## Unit Descriptions, Assignments, and Exams

### Part II: Overview of all content units, assignments, and assessments

#### First Semester

##### Unit 1: Exploring Data (two weeks)

Students begin their study of statistics by learning how to display data and provide numerical summaries of data sets.

**Discussion:** Introductions and “what statistics means to me”

**Quizzes:** 1) Displaying Distributions with Graphs; 2) Describing Distributions with Numbers;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Types of Data and Statistics; 2) Working with Graphs; 3) Measures of Central Tendencies.

##### Unit 2: The Normal Distribution (three weeks)

Students learn how to represent data with density curves and how to match these curves with common distributions (focusing on the normal distribution) and learn how to determine probabilities associated with the normal distribution.

**Discussion:** What does it mean to be normal?

**Quizzes:** 1) Density Curves and the Normal Distribution; 2) Standard Normal Calculations;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Data Distributions; 2) Normal Calculations with Drawings;

##### Unit 3: Examining Relationships (three weeks)

Students look for and examine relationships between two variables, as well as begin to build linear models to represent the relationships between the variables. Students will also learn how to correctly use these models to make predictions.

**Discussion:** Finding examples of strong correlations between variables in our world

**Quizzes:** 1) Scatter plots and Correlation; 2) More Correlation and Least-Squares Regression;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Looking at Data; 2) Olympic Gold Medal Performances;

##### Unit 4: More on Two-Variable Data (two weeks)

Students examine nonlinear relationships between variables and learn how to transform these relationships so that mathematical models can be created and used for predictive purposes. Students will also understand and explore the uses of two way tables.

**Discussion:** Causation – What factors affect the relationship between smoking and lung cancer?

**Quizzes:** 1) Transforming Relationships and Relations in Categorical Data;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Transforming Data; 2) Two-Way Tables;

##### Unit 5: Producing Data (two weeks)

Students learn how to acquire data through nonbiased samples, experiments, and simple simulations.

**Discussion:** Surveys – Do you think the results of surveys (such as political polls) are reliable?

**Quizzes:** 1) Studies, Samples, and Bias;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Working with the Random Number Table; 2) Experimental Design;

**Unit 6:** Probability: The Study of Randomness (three weeks)

Students develop and understanding of the probability rules. Students will also begin to build and use probability models acquired from data sets and use those probability models to make predictions about the population.

**Discussion:** The Lottery – A tax on those who did not do so well in math in school.

**Quizzes:** 1) Probability

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Rules of Probability

**Unit 7:** Random Variables (Two weeks)

Students learn to identify discrete and continuous random variables and learn to use their associated probability distributions to make predictions. Students also learn how to determine the population means and variances from the probability distribution. Students will also learn the laws that means and variances obey.

**Discussion:** Choices – Exploring the Game – “Let’s Make a Deal”

**Quizzes:** 1) Discrete and Continuous Random Variables; 2) Means and Variances of Random Variables;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Means and Variances of Random Variables; 2) Project: Students do a semester summary project that requires that they draw connections between all aspects of the statistical process, including design, analysis, and conclusions.

## Second Semester

**Unit 8:** The Binomial and Geometric Distribution (three weeks)

Students will explore the binomial and geometric distributions and learn some of their properties. Students will also learn how to use the normal distribution to approximate binomial probabilities.

**Discussion:** Multiple Choice Exams and Guessing

**Quizzes:** 1) Binomial Distribution; 2) Normal Approximation of the Binomial; 3) Geometric Distribution;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Working with the Binomial Distribution

**Unit 9:** Sampling Distributions (two weeks)

Students begin to prepare for the study of statistical inference by looking at the probability distributions of sample proportions and sample means.

**Discussion:** Do you trust the results from polls taken on national issues?

**Quizzes:** 1) Sample Distributions, Means, and Proportions

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Working with Sampling Distributions of Proportions; 2) Working with Sampling Distributions of Means;

**Unit 10:** Introduction to Inference (three weeks)

Students begin exploring the methods of statistical inference to express the strength of the conclusions that they are drawing from the data, including hypothesis tests and confidence intervals. Students will also learn about Type 1 and Type II errors.

**Discussion:** “To guess is cheap, to guess incorrectly is expensive.”

**Quizzes:** 1) Statistical Inference and Estimating with Confidence

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Hypothesis Testing (Mean with Known Standard Deviation) Part 1; 2) Hypothesis Testing (Mean with Known Standard Deviation) Part 2; 3) Type I and Type II Errors;

#### **Unit 11:** Inference for Distributions (three weeks)

Students will use confidence intervals and significance tests to draw conclusions about the mean of a single population and for comparing the mean of two populations.

**Discussion:** Supermarket security cameras and useable data

**Quizzes:** 1) Inference for the Mean of a Population; 2) Comparing Two Means;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Student’s  $t$  and Population Mean; 2) Confidence Interval and t-Test: One Sample Mean; 3) Comparing Independent Sample Means;

#### **Unit 12:** Inference for Proportions (two weeks)

Students will use confidence intervals and significance tests to draw conclusions about population proportions.

**Discussion:** Bureau of Labor and Statistics; CNN polls; and Exit Polls;

**Quizzes:** 1) Inference for Population Proportions;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Working with a Single Proportion; 2) Working with Two Proportions;

#### **Unit 13:** Inference for Tables: Chi-Square Procedures (two weeks)

Students will learn how to use the Chi-squared test for goodness of fit to determine whether a specified population distribution seems valid. Students will also learn how to compare two or more population proportions using a chi-square test for homogeneity. Students learn how to use the information found in a two-way table to determine whether the distribution of one variable has been influenced by another variable using the chi-square test of association/independence.

**Discussion:** Does ballot order effect a voter’s choice of candidate?

**Quizzes:** 1) Chi-Square Tests;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Goodness of Fit; 2) Inference for Two-Way Tables;

#### **Unit 14:** Inference for Regression (two weeks)

Students will learn to perform hypothesis tests and find confidence intervals about their linear regression models.

**Discussion:** Presidential Vote Equation

**Quizzes:** 1) Inference about the Model;

**Exams:** 1) Unit Free Response exam; 2) Unit Multiple Choice exam;

**Assignments:** 1) Inference about the Model;

#### **Unit:** Exam Review (One Week)

Students are given instruction for dealing with the different types of assessments found on the AP exam and practice.

**Assignments:** 1) practice with multiple choice and free response questions

**Unit:** Final Exam

**Part III: Required Texts**

The required textbook for this course is **The Practice of Statistics, Ti-83/89 Graphing Calculator Enhanced**. Dan S. Yates, David S. Moore, and Daren S. Starnes; W. H. Freeman and Company, ISBN 0716747731, Second Edition, 2003.

**Part IV: Other details required for audit**

Each student is required to have individual access to the required text both at school and at home as well as a graphing calculator with statistical capabilities. This particular course and textbook are geared towards the TI-83/84+ and the TI-89. Students also gain experience reading and interpreting output from computer statistical packages throughout the course.

<b>Course Requirements</b>	<b>Location in Course</b>
<p>The course provides instruction in each of the following four broad conceptual themes outlined in the Course Description with appropriate emphasis on each:</p> <ul style="list-style-type: none"><li>• Exploring Data</li><li>• Sampling and Experimentation</li><li>• Anticipating Patterns</li><li>• Statistical Inferences</li></ul>	<p style="text-align: center;"><b>EXPLORING DATA</b></p> <p><b>Unit One:</b> Exploring Data</p> <ul style="list-style-type: none"><li>1.1 Displaying Distributions with Graphs</li><li>1.2 Describing Distributions with Numbers</li></ul> <p style="text-align: center;"><b>ANTICIPATING PATTERNS</b></p> <p><b>Unit Three:</b> Examining Relationships</p> <ul style="list-style-type: none"><li>3.1 Scatter plots</li><li>3.2 Correlation</li><li>3.3 Least-Squares Regression</li></ul> <p><b>Unit Four:</b> More on Two-Variable Data</p> <ul style="list-style-type: none"><li>4.1 Transforming Relationships</li><li>4.2 Cautions about Correlation and Regression</li><li>4.3 Relations in Categorical Data</li></ul> <p style="text-align: center;"><b>SAMPLING AND EXPERIMENTATION</b></p> <p><b>Unit Five:</b> Producing Data</p> <ul style="list-style-type: none"><li>5.1 Designing Samples</li><li>5.2 Designing Experiments</li><li>5.3 Simulating Experiments</li></ul> <p><b>Unit Six:</b> Probability: The Study of Randomness</p> <ul style="list-style-type: none"><li>6.1 The Idea of Probability</li><li>6.2 Probability Models</li><li>6.3 General Probability Rules</li></ul> <p><b>Unit Eight:</b> The Binomial and Geometric Distributions</p> <ul style="list-style-type: none"><li>8.1 The Binomial Distributions</li><li>8.2 The Geometric Distributions</li></ul> <p><b>Unit Nine:</b> Sampling Distributions</p> <ul style="list-style-type: none"><li>9.1 Sampling Distributions</li><li>9.2 Sample Proportions</li><li>9.3 Sample Means</li></ul>

	<p style="text-align: center;"><b>STATISTICAL INFERENCE</b></p> <p><b>Unit Ten:</b> Introduction to Inference  10.1 Estimating with Confidence  10.2 Tests of Significance  10.3 Making Sense of Statistical Significance  10.4 Inference as Decision</p> <p><b>Unit Eleven:</b> Inference for Distributions  11.1 Inference for the Mean of a Population  11.2 Comparing Two Means</p> <p><b>Unit Twelve:</b> Inference for Proportions  12.1 Inference for a Population Proportion  12.2 Comparing Two Proportions</p> <p><b>Unit Thirteen:</b> Inference for Tables: Chi-Square Procedures  13.1 Test for Goodness of Fit  13.2 Inference for Two-Way Tables</p> <p><b>Unit Fourteen:</b> Inference for Regression  14.1 Inference about the Model</p>
<p>The course draws connections between all aspects of the statistical process, including design, analysis, and conclusions.</p>	<p><b>PROJECT:</b>  Students will propose, design, and conduct an experiment that requires use of statistical design and sampling procedures to collect data. Students will then present the data in graphical format and analyze the data using the methods learned in the course. The students will then conclude the project by giving a written descriptive report of their results.</p>
<p>The course teaches students how to communicate methods, results, and interpretations using the vocabulary of statistics.</p>	<p>Throughout the course students are required to write detailed descriptions and interpretations of what their results mean. A simple numerical answer is never enough. Students are also asked to detail or describe the steps they would follow to go about solving a particular hypothetical problem without actually solving the problem. These skills are most evident in the following units.</p> <p><b>Unit Two:</b> The Normal Distribution  2.1 Density Curves and the Normal Distribution  2.2 Standard Normal Calculations</p> <p><b>Unit Three:</b> Examining Relationships  3.1 Scatter plots  3.2 Correlation  3.3 Least-Squares Regression</p> <p><b>Unit Four:</b> More on Two-Variable Data  4.1 Transforming Relationships  4.2 Cautions about Correlation and Regression  4.3 Relations in Categorical Data</p> <p><b>Unit Five:</b> Producing Data</p>

	<p>5.1 Designing Samples 5.2 Designing Experiments 5.3 Simulating Experiments</p> <p><b>Unit Six:</b> Probability: The Study of Randomness 6.1 The Idea of Probability 6.2 Probability Models 6.3 General Probability Rules</p> <p><b>Unit Seven:</b> Random Variables 7.1 Discrete and Continuous Random Variables 7.2 Means and Variances of Random Variables</p> <p><b>Unit Eight:</b> The Binomial and Geometric Distributions 8.1 The Binomial Distributions 8.2 The Geometric Distributions</p> <p><b>Unit Nine:</b> Sampling Distributions 9.1 Sampling Distributions 9.2 Sample Proportions 9.3 Sample Means</p> <p><b>Unit Ten:</b> Introduction to Inference 10.1 Estimating with Confidence 10.2 Tests of Significance 10.3 Making Sense of Statistical Significance 10.4 Inference as Decision</p> <p><b>Unit Eleven:</b> Inference for Distributions 11.1 Inference for the Mean of a Population 11.2 Comparing Two Means</p> <p><b>Unit Twelve:</b> Inference for Proportions 12.1 Inference for a Population Proportion 12.2 Comparing Two Proportions</p> <p><b>Unit Thirteen:</b> Inference for Tables: Chi-Square Procedures 13.1 Test for Goodness of Fit 13.2 Inference for Two-Way Tables</p>
<p>The course teaches students how to use graphing calculators and demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploring and analyzing data, assessing models, and performing simulations.</p>	<p>All students must have access to a graphing calculator with statistical capabilities at home, in class, and on the AP exam. The preferred calculators in this course are the Ti-83/84+ and the TI-89. Graphing calculators are used extensively in the units below.</p> <p>In these units, students are also given computer generated statistical output from programs like Minitab and SAS and asked to point out and use the relative information to the problem at hand.</p> <p><b>Unit One:</b> Exploring Data 1.1 Displaying Distributions with Graphs 1.2 Describing Distributions with Numbers</p> <p><b>Unit Two:</b> The Normal Distribution</p>

- 2.1 Density Curves and the Normal Distribution
- 2.2 Standard Normal Calculations

**Unit Three: Examining Relationships**

- 3.1 Scatter plots
- 3.2 Correlation
- 3.3 Least-Squares Regression

**Unit Four: More on Two-Variable Data**

- 4.1 Transforming Relationships
- 4.2 Cautions about Correlation and Regression
- 4.3 Relations in Categorical Data

**Unit Eight: The Binomial and Geometric Distributions**

- 8.1 The Binomial Distributions
- 8.2 The Geometric Distributions

**Unit Nine: Sampling Distributions**

- 9.1 Sampling Distributions
- 9.2 Sample Proportions
- 9.3 Sample Means

**Unit Ten: Introduction to Inference**

- 10.1 Estimating with Confidence
- 10.2 Tests of Significance
- 10.3 Making Sense of Statistical Significance
- 10.4 Inference as Decision

**Unit Eleven: Inference for Distributions**

- 11.1 Inference for the Mean of a Population
- 11.2 Comparing Two Means

**Unit Twelve: Inference for Proportions**

- 12.1 Inference for a Population Proportion
- 12.2 Comparing Two Proportions

**Unit Thirteen: Inference for Tables: Chi-Square Procedures**

- 13.1 Test for Goodness of Fit
- 13.2 Inference for Two-Way Tables

**Unit Fourteen: Inference for Regression**

- 14.1 Inference about the Model