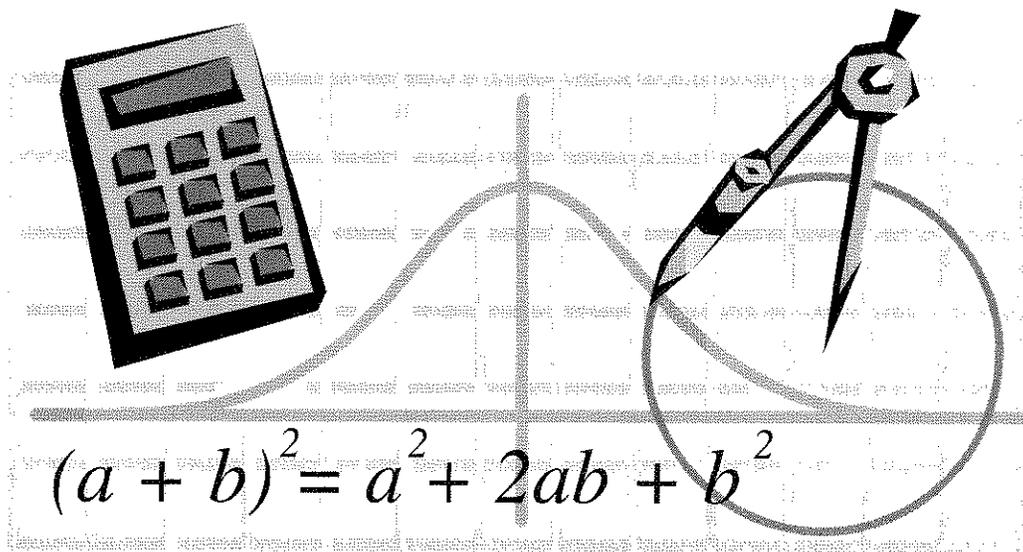


# Atlantic City Public Schools

## AP Statistics

Grades 9 - 12





## **I. OVERVIEW**

AP Statistics is the high school equivalent to one semester of introductory college statistics. In this class, students will develop strategies for collecting, organizing, analyzing, and drawing conclusions from data. The course is aligned with the AP exam that rewards students with college level credits based on the test score. The students will use the TI-84 graphing calculator and some statistical software. Students will be required to do a lot of reading and calculations throughout the year. To develop effective statistical communication skills, students are required to prepare frequent written and oral analyses of real data.

## **II. RATIONALE**

The Advanced Placement Statistics course is offered to secondary school students as an introductory, non-calculus based college course. This type of course is typically required for students considering majoring in the social sciences, health sciences, or business. This course is also excellent preparation for the upper level calculus-based course taken by mathematics and engineering majors. The examination, given in May, is representative of such a course and therefore is considered appropriate for the measurement of skills and knowledge in this field.

## **III. STANDARDS**

The Atlantic City Mathematics Program is aligned too the NJ Core Mathematics Content Standards. The standards are listed below.

- 4.1 All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways
  - A. Number Sense
  - B. Numerical Operations
  - C. Estimation
  
- 4.2 All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.
  - A. Geometric Properties
  - B. Transforming Shapes
  - C. Coordinate Geometry
  - D. Units of Measurement
  - E. Measuring Geometric Objects

- 4.3 All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.
- A. Patterns and Relationships
  - B. Functions
  - C. Modeling
  - D. Procedures
- 4.4 All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.
- A. Data Analysis (Statistics)
  - B. Probability
  - C. Discrete Mathematics-Systematic Listing and Counting
  - D. Discrete Mathematics-Vertex Edge Graphs and Algorithms
- 4.5 All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.
- A. Problem Solving
  - B. Communication
  - C. Connections
  - D. Reasoning
  - E. Representations
  - F. Technology

#### **IV. Student Outcomes**

##### **A. KNOWLEDGE (Information and Concepts)**

1. Exploring Data: Describing patterns and departures from patterns  
[4.3A, 4.3B, 4.5C]
2. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot) including center and spread, clusters and gaps, outliers and other unusual features  
[4.4A, 4.5B, 4.5D]

3. Summarizing distributions of univariate data including: measuring center, median, mean; measuring spread range, interquartile range, standard deviation; measuring position: quartiles, percentiles, standardized scores (z-scores); using boxplots; the effect of changing units on summary measures.  
[4.4A 4.5A]
4. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots) including comparing center and spread: within group, between group variation, clusters and gaps, outliers and other unusual features and shapes.  
[4.4A, 4.5B]
5. Exploring bivariate data including: analyzing patterns in scatterplots; correlation and linearity; least-squares regression line; residual plots, outliers, and influential points; and transformations to achieve linearity: logarithmic and power transformations.  
[4.3B, 4.5B]
6. Exploring categorical data including frequency tables and bar charts, marginal and joint frequencies for two-way tables, conditional relative frequencies and association, and comparing distributions using bar charts.  
[4.4A, 4.5A, 4.5B]
7. Overview of methods of data collection including census, sample survey, experiment and observational study.  
[4.4A, 4.5B]
8. Planning and conducting surveys including: characteristics of a well-designed and well-conducted survey; populations, samples, and random selection; sources of bias in sampling and surveys.  
[4.4A, 4.5A, 4.5B]
9. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling.  
[4.4A, 4.5A, 4.5C]
10. Planning and conducting experiments including: characteristics of a well-designed and well-conducted experiment; treatments, control groups, experimental units, random assignments, and replication; sources of bias and confounding, including placebo effect and blinding; completely randomized design; randomized block design, including matched pairs design.  
[4.4A, 4.5A, 4.5B, 4.5C]
11. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys  
[4.4A, 4.5A, 4.5B]

12. Anticipating Patterns: Exploring random phenomena using probability and simulation.  
[4.4B, 4.5A, 4.5C]
13. Interpreting probability, including long-run relative frequency interpretation  
[4.4B, 4.5A]
14. 'Law of Large Numbers' concept  
[4.4B, 4.5A, 4.5B]
15. Addition rule, multiplication rule, conditional probability, and independence  
[4.4b, 4.5A, 4.4C]
16. Discrete random variables and their probability distributions, including binomial and geometric  
[4.4B, 4.5A, 4.5B, 4.5C]
17. Simulation of random behavior and probability distributions  
[4.4B, 4.5B, 4.5C]
18. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable  
[4.4A, 4.5B]
19. Combining independent random variables including notion of independence versus dependence, and mean and standard deviation for sums and differences of independent random variables.  
[4.4B, 4.5A, 4.5C]
20. The normal distribution including properties of the normal distribution, using tables of the normal distribution, and the normal distribution as a model for measurements.  
[4.4A, 4.5B]
21. Sampling distributions including sample proportion, sample mean, Central Limit Theorem; difference between two independent sample proportions and means; simulation of sampling distributions, t-distribution and Chi-square distribution.  
[4.4A, 4.5A]
22. Statistical Inference: Estimating population parameters and testing hypotheses  
[4.4A, 4.5A]
23. Estimation (point estimators and confidence intervals)  
[4.3A, 4.4A, 4.5A]

24. Estimating population parameters and margins of error  
[4.4A, 4.5A]
25. Properties of point estimators, including unbiasedness and variability  
[4.4A, 4.5A, 4.5B]
26. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals  
[4.3A, 4.4A, 4.5A]
27. Large sample confidence interval for a proportion and a difference between two proportions  
[4.4A, 4.5A]
28. Confidence interval for a mean, a difference between two means (unpaired and paired), and the slope of a least-squares regression line  
[4.3A, 4.4A, 4.5A]

**B. Attitudes**

The student will:

1. develop a desire to pursue the study of mathematics in the future.  
[4.5A, 4.5C]
2. develop an understanding and appreciation for the application of mathematics in real life situations and its relationship to other disciplines.  
[4.5B, 4.5C, 4.2D, 4.3C]
3. develop a desire to persist and solve mathematical problems from beginning to end.  
[4.5A]
4. develop an appreciation for the history of mathematics  
[4.5C]
5. develop an appreciation for mathematics as an integrated whole.  
[4.5C, 4.3D]

### **C. CLASSROOM EXPECTATIONS**

The student will:

1. develop pride in and a feeling of self worth.
2. develop a respect and be active in the learning process.
3. learn to respect those that think, dress, and act differently.
4. encourage and nurture academic achievement through high expectations.
5. promote an appreciation for the strengths of cultural diversity.
6. be prepared to learn on a daily basis.

### **D. SKILLS AND BEHAVIORS**

The student will:

1. develop and apply various strategies to solve problems from everyday and mathematics situations as well as career-based problems.  
[4.5A, 4.5B, 4.5C, 4.5E, 4.5F, 4.2D, 3.2D, 4.3C, 4.4D]
2. develop the ability to communicate mathematically through a variety of forms of expression including oral, written, and visual.  
[4.5A, 4.5B, 4.5C, 4.5D, 4.5E]
3. use physical models and manipulatives to model and investigate problem situations and mathematics concepts.  
[4.5A, 4.5E, 4.5F]
4. use calculators and other appropriate forms of technology to gather, analyze, and display mathematical data, and to facilitate and enhance their mathematical thinking, understanding, and power.  
[4.5A, 4.5B, 4.5C, 4.5E, 4.5F, 4.1C, 4.1B, 4.2B, 4.4A]
5. demonstrate organization by keeping a complete and detailed notebook.
6. work independently and in cooperative groups to enhance mathematical thinking.  
[4.5A, 4.5A, 4.5B, 4.5D]

7. recognize that there may be multiple ways to solve a problem, weigh their relative merits, and select and use appropriate problem solving strategies.  
[4.5A, 4.5B, 4.5E, 4.5F, 4.1C, 4.2D, 4.3D]
8. reflect on and clarify their thinking so as to present convincing arguments for their conclusions.  
[4.5A, 4.5B, 4.5D, 4.5E]

## **E. TECHNOLOGICAL LITERACY**

The student will:

1. demonstrate the ability to enter data, use mathematical or logical functions to manipulate data, to generate charts and graphs, and to interpret the results [8.12.1.A.3]
2. exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse [8.12.1.B.2]
3. understand the nature and impact of technology as well as its costs and trade-offs in terms of productivity [8.12.2.A.1, 8.12.2.A.2, 8.12.2.A.3]

## **F. CAREER EDUCATION AND CONSUMER, FAMILY, AND LIFE SKILLS**

The student will:

1. understand the necessary pathways for entering the world of work as well as continuing education, such as college, post-secondary vocational-technical education, specialized certification and/or registered apprenticeships [9.1.A.1, 9.1.A.2, 9.1.A.3, 9.1.A.4]
2. understand the importance of mathematics and how to use mathematics in order to be functional members of society.  
[9.2.12.A.1, 9.2.12.A.2, 9.2.12.A.4, 9.2.12.C.1, 9.2.12.E]

## V. STRATEGIES

Analyzing and interpreting data as well as understanding probabilities are the central focus of the *Advanced Placement Statistics* course. As a result, opportunities will be provided throughout the course for students to see statistics as a tool for problem solving and a way to understand and explain the world around them. Emphasis will be made on real-life applications allowing students to connect statistical techniques with other math topics and disciplines.

Since problem-solving skills are strengthened through communication, appropriate classroom time will be devoted to activities that allow for a variety of student interactions:

- Interactive lecture
- Brainstorming
- Hands-on activities
- Scientific and graphing calculators

To further facilitate the interpretation, translation, and solution of problems, the following strategies may be used:

- Make models for use in simulations
- Look for patterns
- Exploration on a graphing calculator
- Data collection and analysis

The focus of all strategies and methods will be to foster the development of the student's ability to think logically and communicate clearly. Appropriate classroom time will be given to allow students to:

- Work independently, work in pairs and work in cooperative groups;
- Use the language and symbols of mathematics to communicate and discuss solutions verbally and in writing;
- Present original work to other students and receive critiques of their work; to critique the work of other students.

## VI. EVALUATION

Students will be evaluated by multiple criteria which may include:

- Chapter/Unit Test & Quizzes; these will consist of recall questions, short constructed response questions and open-ended questions requiring students to explain their thinking in arriving at their solution/conclusion.
- Notebooks; specific criteria will be determined by the teacher and will include note taking and homework
- Out-of-class graded assignments such as enrichment projects

- Oral presentations
  - informal- participation in class discussions
  - formal- presentation of special assignments/projects
- Class participation as determined by the teacher
- Open-Ended Questions based upon the High School Proficiency Assessment.

The marking period grades for the course will be determined as follows:

- Formal Assessment (Tests/Quizzes) 80%
- Homework, notebook, project, class participation, special graded assignments, and alternative assessments (as determined by teacher) 20%

The number of/and frequency of tests/quizzes and other assessments will be determined by the teacher.

The final grade for AP Statistics will be determined by the following:

- Four quarter grades each worth 22.5% 90%
- One final exam 10%

Final exams are departmental tests and will consist of multiple choice and open-ended questions.

## **VII. REQUIRED RESOURCES**

1. The required text for this course is:

The Practice of Statistics, Third Edition. W.H. Freeman and Company. New York, 2008. ISBN-13: 978-0-7167-7309-2

2. Advanced Placement exams as released by The College Board  
Teacher created resource binder.
3. Principles and Standards for School Mathematics. The National Council of Teachers of Mathematics. New York, 2000
4. Calculator : TI 83 Plus, TI-84, TI 89, Texas Instruments Incorporated.
5. Monthly Assessments  
AP Test

## VIII. SCOPE AND SEQUENCE

<b>Chapter Preview</b>	<b>(5 days)</b>
P.1 What is statistics	
P.2 Overview of the course and basic definitions	
<b>Chapter 1</b>	<b>(10 days)</b>
1.1 Displaying Distributions with Graphs	
1.2 Describing Distributions with Numbers	
<b>Chapter 2</b>	<b>(9 days)</b>
2.1 Measures of Relative Standing and Density Curves	
2.2 Normal Distributions	
<b>Chapter 3</b>	<b>(12 days)</b>
3.1 Scatterplots and Correlation	
3.2 Least-Squares Regression	
3.3 Correlation and Regression Wisdom	
<b>Chapter 4</b>	<b>(10 days)</b>
4.1 Transforming to Achieve Linearity	
4.2 Relationships between Categorical Variables	
4.3 Establishing Causation	
<b>Chapter 5</b>	<b>(11 days)</b>
5.1 Designing Samples	
5.2 Designing Experiments	
<b>Chapter 6</b>	<b>(13 days)</b>
6.1 Simulation	
6.2 Probability Models	
6.3 General Probability Rules	
<b>Chapter 7</b>	<b>(9 days)</b>
7.1 Discrete and Continuous Random Variables	
7.2 Means and Variances of Random Variables	

<b>Chapter 8</b>	<b>(9 days)</b>
8.1 The Binomial Distribution	
8.2 The Geometric Distribution	
<b>Chapter 9</b>	<b>(10 days)</b>
9.1 Sampling Distributions	
9.2 Sample Proportions	
9.3 Sample Means	
<b>Chapter 10</b>	<b>(11 days)</b>
10.1 Confidence Intervals: The Basics	
10.2 Estimating a Population Mean	
10.3 Estimating a Population Proportion	
<b>Chapter 11</b>	<b>(12 days)</b>
11.1 Significance Tests: The Basics	
11.2 Carrying Out Significance Tests	
11.3 Use and Abuse of Tests	
11.4 Using Inference to Make Decisions	
<b>Chapter 12</b>	<b>(7 days)</b>
12.1 Tests about a Population Mean	
12.2 Tests about a Population Proportion	
<b>Chapter 13</b>	<b>(8 days)</b>
13.1 Comparing Two Means	
13.2 Comparing Two Proportions	
<b>Chapter 14</b>	<b>(8 days)</b>
14.1 Test for Goodness of Fit	
14.2 Inference for Two-Way Tables	
<b>Chapter 15</b>	<b>(5 days)</b>
15.1 Inference for Regression	
<b>Chapter 16</b>	<b>(7 days)</b>
16.1 Complete practice exams from previous years AP Exam	

**Post AP Exam**

**(30 days)**

- PO.1 Applications of Statistics project completed by students.
- PO.2 Proposal
- PO.3 Conduct Experiment
- PO.4 Written Report
- PO.5 Poster
- PO.6 Oral Presentation