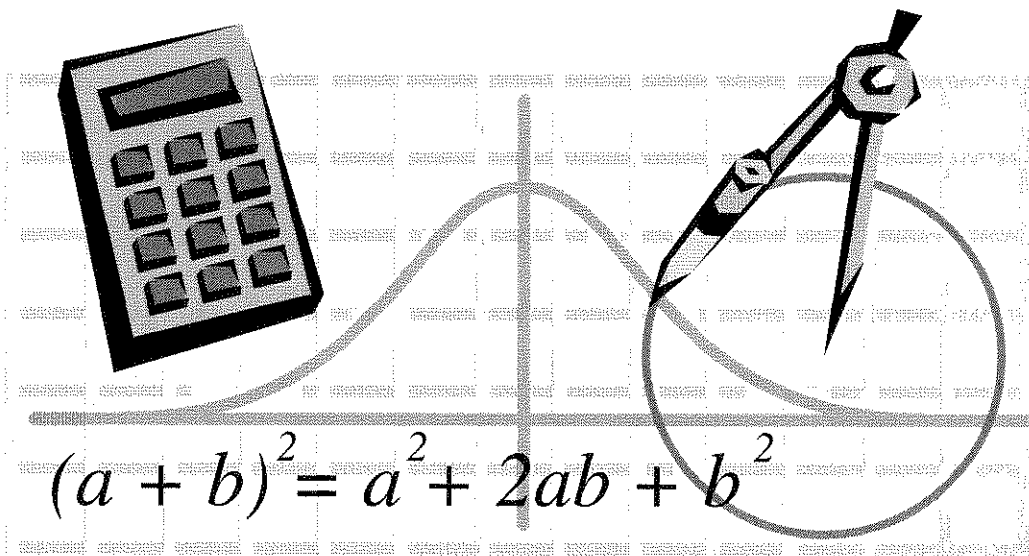


**Atlantic City Public Schools**  
**Honors Probability and Statistics**  
**Grades 9 - 12**



## **I. OVERVIEW**

Probability and Statistics is a fourth year course open to all students in the college prep program who have passed Algebra II. It provides an introduction to mathematical probability and elementary statistics. Topics covered include basic probability, permutations, combinatorics, game theory, statistical graphing, normal distribution, and statistical analysis.

## **II. RATIONALE**

Students may be undecided concerning the role mathematics will play in future academic endeavors. Probability and Statistics exposes them to a wide variety of mathematical problems that they may encounter in college or post high school jobs. The course is particularly relevant since mathematical probability is a major focus of the local casino industry, where many of our future graduates may be employed.

## **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 too 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)**

The student will:

1. demonstrate knowledge of statistical terms.  
[4.4.A, 4.5B]
2. differentiate between the two branches of statistics.  
[4.4A, 4.5D]
3. identify types of data.  
[4.4A, 4.4B; 4.5D]
4. identify the measurement level for each variable.  
[4.4A, 4.5B]
5. identify the four basic sampling techniques.  
[4.4A, 4.5A, 4.5B]
6. explain the difference between an observational and an experimental study.  
[4.4A]
7. explain how statistics can be used and misused.

[4.4A, 4.5C]

8. explain the importance of computers and calculators in statistics.  
[4.4A, 4.5C, 8.1, 8.2]
9. organize data using frequency distributions.  
[4.3A, 4.3B, 4.5C]
10. represent data in frequency distributions graphically using histograms, frequency polygons, and ogives  
[4.3A, 4.4A, 4.5A]
11. represent data using Pareto charts, time series graphs, and pie graphs.  
[4.3A, 4.4A, 4.5A, 4.5C]
12. draw and interpret a stem and leaf plot.  
[4.3A, 4.4A, 4.5A, 4.5B]
13. summarize data using measures of central tendency such as mean, median, and mode.  
[4.1A, 4.4A, 4.5A, 4.5C]
14. describe data using measures of variation, such as range, variance, and standard deviation.  
[4.4A, 4.5A, 4.5B, 4.5C, 4.5D]
15. identify the position of a data value in a data set, using various measures of position, such as percentiles, deciles, and quartiles.  
[4.4A, 4.5A]
16. use the techniques of exploratory data analysis, including boxplots and five-number summaries, to discover various aspects of data.  
[4.4A, 4.5D]
17. determine sample spaces and find the probability of an event, using classical probability or empirical probability.  
[4.5B, 4.5A]
18. find the probability of compound events, using the addition and multiplication rules.  
[4.5B, 4.5A]
19. find the conditional probability of an event.  
[4.5B, 4.5A]

20. find the total number of outcomes in a sequence of events, using the fundamental counting rule.  
[4.4C, 4.5B]
21. find the number of ways that  $r$  objects can be selected from  $n$  objects, using the permutation rule and without regard to order, using the combination rule.  
[4.4C, 4.5B]
22. find the probability of an event, using the counting rules.  
[4.4C, 4.5A]
23. construct a probability distribution for a random variable.  
[4.4A, 4.5B]
24. find the mean, variance, and expected value for a discrete random variable.  
[4.4B, 4.5A]
25. identify distributions as symmetrical or skewed.  
[4.4A, 4.5C]
26. identify the properties of the normal distribution.  
[4.4A, 4.5A, 4.5C]
27. find the area under the standard normal distribution, given various  $z$  values.  
[4.4B, 4.5A]
28. find probabilities for a normally distributed variable by transforming it into a standard normal variable.  
[4.4B, 4.5A]
29. find specific data values for given percentages, using standard normal distribution.  
[4.4A, 4.4B, 4.5A]
30. use the central limit theorem to solve problems involving sample means for large samples.  
[4.4A, 4.5A]
31. research a casino game and learn the probabilities and game strategies.  
[4.4B, 4.5A, 4.5B, 4.5C, 4.5D]
32. research lottery games and learn the probabilities and game strategies.  
[4.4B, 4.5A, 4.5B, 4.5C, 4.5D]
33. demonstrate the Stock Market and how it relates to statistical analysis.  
[4.4A, 4.4B, 4.5A, 4.5B, 4.5C, 4.5D]

34. demonstrate a casino game and teach the probabilities and game strategies.  
[4.4B, 4.5A, 4.5B, 4.5C, 4.5D]
35. demonstrate lottery games and teach the probabilities and game strategies.  
[4.4B, 4.5A, 4.5B, 4.5C, 4.5D]

## **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.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 Probability and Statistics course. As a result, opportunities will be provided throughout the course for students to see probability and statistics as assistance 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 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
- Looks 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)  | 75% |
| • Homework, notebook, project, class participation, special graded assignments, and alternative assessments (as determined by teacher) | 25% |

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

The final grade for Probability and 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 text for this course is:  
Elementary Statistics: A Step by Step Approach  
ISBN: 13-978-0-07-327160-6
2. Other primary sources:  
Instructor Resources Package including solutions manual.  
Online :<http://highered.mcgraw-hill.com/classware/infoCenter.do?isbn=0072549076>  
NJ Mathematics Curriculum Framework, NJ Department of Education, 1996.
3. Other resources:  
Principles and Standards for the School Mathematics. National Council of Teachers of Mathematics. New York. 2000.
4. Calculators  
TI-34 Scientific Calculators  
TI-83 Plus Graphing Calculator  
District Laptop Carts
5. Benchmark Assessments  
Monthly Assessments  
S-Tests

## **VIII. SCOPE AND SEQUENCE**

### **Chapter 1**

**(15 days)**

- 1.1 Introduction
- 1.2 Descriptive and Inferential Statistics
- 1.3 Variables and Types of Data
- 1.4 Data Collection and Sampling Techniques
- 1.5 Observational and Experimental Studies
- 1.6 Uses and Misuses of Statistics
- 1.7 Computers and Calculators
- 1.8 Summary
- Chapter 1 Assessment

### **Chapter 2**

**(23 days)**

- 2.1 Introduction
- 2.2 Organizing Data
- 2.3 Histograms, Frequency Polygons, and Ogives
- 2.4 Other Types of Graphs
- 2.5 Summary
- Chapter 2 Assessment

### **Chapter 3**

**(23 days)**

- 3.1 Introduction
- 3.2 Measures of Central Tendency
- 3.3 Measures of Variation
- 3.4 Measures of Position
- 3.5 Exploratory Data Analysis
- 3.6 Summary
- Chapter 3 Assessment

### **Chapter 4**

**(40 days)**

- 4.1 Introduction
- 4.2 Sample Spaces and Probability
- 4.3 The Addition Rules for Probability
- 4.4 The Multiplication Rules and Conditional Probability
- 4.5 Counting Rules
- 4.6 Probability and Counting Rules
- 4.7 Summary
- Chapter 4 Assessment

**Chapter 5****(15 days)**

5.1 Introduction

5.2 Probability Distributions

5.3 Mean, Variance, and Expectation

**Chapter 6****(21 days)**

6.1 Introduction

6.2 Properties of the Normal Distribution

6.3 The Standard Normal Distribution

6.4 Applications of the Normal Distribution

6.5 The Central Limit Theorem

Chapter 6 Assessment

**Enrichment Activities (28 days)**

Probabilities of Casino Games

Strategies of Casino Games

Probabilities of Lottery Games

Strategies of Lottery Games

Stock Market Theorems

Final Project Assessment

Testing Days, Final Exam, and Special Schedules (15 days)