Atlantic City Public Schools

Algebra III Trigonometry

Grades 9 - 12

$$(a + b)^2 = a^2 + 2ab + b^2$$
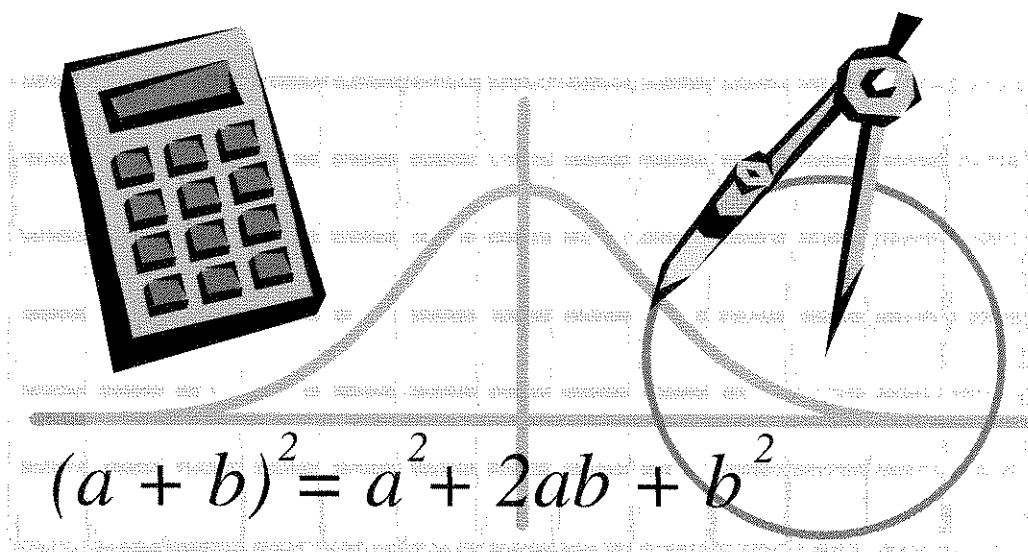
I.   OVERVIEW

Algebra III/Trigonometry is open to all students who have successfully completed Algebra II. The course includes linear functions and systems of linear equations, graphs, polynomial and rational functions, trigonometric functions (including graphs, identities, and equations), conics, and exponential and logarithmic functions.

II.   RATIONALE

Students may be undecided concerning the mathematics will play in future academic endeavors. Algebra III/Trigonometry provides students the opportunity to expand the number of choices by sufficiently developing concepts which prepare students for future courses in mathematics, science, and computer science.

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.   Determine whether a given relation is a function and perform operations with functions.
   [4.3B, C, D, 4.5A, B]

2.   Evaluate and find zeros of linear functions using functional notation.
   [4.3B, C, D, 4.5F]

3.   Graph and write functions and inequalities.
   [4.3B, 4.5D]

4.   Write equations of parallel and perpendicular lines.
   [4.2.12C, 4.5D]

5.   Model data using scatter plots and write prediction equations.
   [4.3D, 4.4A, 4.5C, D]

6. Solve systems of equations and inequalities.

   [4.3B, 4.5D]

7. Define matrices.

   [4.1A, B, 4.5A, D]

8. Add, subtract, and multiply matrices.

   [4.1A, B, 4.5A, D]

9. Use matrices to model transformations.

   [4.1A,B, 4.3B. 4.5A, D]

10. Find determinants and inverses of matrices.

    [4.1A, B, 4.5A, D]

11. Use linear programming to solve problems.

    [4.1A. 4.2B, 4.3B, 4.5D, E, F]

12. Graph functions, relations, inverses, and inequalities.

    [4.1A, 4.2B, 4.3B, 4.5A, D]

13. Analyze families of graphs.

    [4.3B, 4.5A, C, D]

14. Investigate symmetry, continuity, end behavior, and transformations of graphs.

    [4.3B, 4.5D]

15. Find asymptote and extrema of functions.

    [4.3B, C, 4.5A, C, F]

16. Solve problems involving direct, inverse, and joint variation.

    [4.3B, 4.5A, D]

17. Determine roots of polynomial equations.

    [4.3B, 4.5A, C]

18. Solve quadratic, rational, and radical equations and rational and radical inequalities.

    [4.1A, 4.2A, 4.3C, D, 4.5C]

19. Find the factors of polynomials.

    [4.1A, B, 4.3 D, 4.5A, D]

20. Approximate real zeros of polynomial functions.

[4.3B, C, 4.5A, B, C]

21. Write and interpret polynomial functions that model real-world data.

[4.3B, 4.5A, B, C]

22. Convert decimal degree measures to degrees, minutes, and seconds and vice versa.

[4.1A, 4.2A, C, D, 4.5A, D]

23. Identify angles that are co-terminal with a given angle.

[4.2A, B, C, 4.3C, 4.5A, B, E]

24. Solve triangles.

[4.2A, E, 4.3D, 4.5D]

25. Find the values of trigonometric functions.

[4.2A, B, C, E, 4.3C, 4.5A, B, C]

26. Find the areas of triangles.

[4.2D, E, 4.5A, D]

27. Change from radian measure to degree measure, and vice versa.

[4.1A, B, 4.2A, B, C, E, 4.5A, D]

28. Find linear and angular velocity.

[4.2A, B, C, E, 4.3B, C, 4.5A, C, D, F]

29. Use and draw graphs of trigonometric functions and their inverses.

[4.2A, C, E, 4.3A, 4.5A, B]

30. Find the amplitude, the period, the phase shift, and the vertical shift for trigonometric functions.

[4.1C, 4.2A, C, D, 4.3B, C, D, 4.5, E, F]

31. Write trigonometric equations to model a given situation.

[4.2A, B, E, 4.5E, F]

32. Use reciprocal, quotient, Pythagorean, symmetry, and opposite-angle identities.

[4.2E, 4.3B, 4.5E]

33. Verify trigonometric identities.

[4.2A, 4.3C, 4.5D, E]

34. Use sum, difference, double-angle, and half-angle identities.
[4.2A, D, 4.3B, 4.5E]

35. Solve trigonometric equations and inequalities.
[4.2B, C, E, 4.3C, 4.5E]

36. Write a linear equation in normal form.
[4.1A, 4.2C, D]

37. Find the distance from a point to a line.
[4.2C, D, 4.5A, D]

38. Use and graph exponential functions and inequalities.
[4.2C, D, 4.5A, D]

39. Evaluate expressions and graph and solve equations involving logarithms.
[4.1B, 4.3A-D, 4.5E, F]

40. Model real-world situations and solve problems using common and natural logarithms.
[4.1B, C, 4.3A-C, 4.5E, F]

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, 9.2.12.A.4, 9.2.12.C.1, 9.2.12.E]

V. STRATEGIES

This course will place emphasis on interpretation and analysis of algebraic properties and concepts introduced in Algebra II.
To foster the students' ability to interpret algebraic properties and concepts, strategies will be used that emphasize student participation in:

- interactive lecture
- brainstorming
- manipulatives/hands-on activities
- using graphing calculators/computers.

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

- guess and check
- work backwards to an answer
- paper-and-pencil calculations
- graphing calculator explorations.

The goal of Algebra III/Trigonometry is to make students aware of the concepts that are necessary to be mastered in order to be successful in Calculus. The students will be prepared to take Calculus when the course is complete.

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/Benchmarks)   70%
- Homework, notebook, project, class   30%
  participation, special graded assignments,
  and alternative assessments (as determined
  by teacher)

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

The final grade for Geometry 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:

      Advanced Mathematical Concepts, Glencoe/McGraw-Hill, New York, NY, 2006. ISBN: 0-618-50304-8

2.   Other primary resources:

      Teacher Classroom Resources Package, Advanced Mathematical Concepts Glencoe/McGraw-Hill.

      NJ Mathematics Curriculum Framework, NJ Department of Education, 1996.

3.   Other resources:

      Principles and Standards for School Mathematics. National Council of Teachers of Mathematics. New York. 2000.

      Preparing for the New Jersey HSPA. AMSCO School Publications Inc. New York. 2001.

      New Jersey Core Curriculum Content Standards and Success for the HSPA. People Publishing Group. Saddle Brook, NJ. 2005

      Montgomery Township Public School District

District Laptop Carts

4.   Calculators

TI-83 Plus Graphing Calculator

5.   Benchmark Assessments
        Monthly Assessments
        S-Tests

VIII. SCOPE AND SEQUENCE

Unit	Textbook Section	Time
1.	**Linear Relations and Functions**	**15 days**
1.1	Relations and Functions	
1.2	Composition of Functions	
1.3	Graphing Linear Equations	
1.4	Writing Linear Equations	
1.5	Writing Equations of Parallel and Perpendicular Lines	
1.6	Real World Data with Linear Functions	
1.7	Piecewise Functions	
1.8	Graphing Linear Inequalities	
2.	**Systems of Linear Equations and Inequalities**	**20 days**
2.1	Solving Systems of Equations in Two Variables	
2.2	Solving Systems of Equations in Three Variables	
2.3	Real World Data with Matrices	
2.4	Motion with Matrices	
2.5	Determinants and Multiplicative Inverses of Matrices	
2.6	Solving Systems of Linear Inequalities	
2.7	Linear Programming	
3.	**The Nature of Graphs**	**16 days**
3.1	Symmetry and Coordinate Graphs	
3.2	Families of Graphs	
3.3	Graphs of Nonlinear Inequalities	
3.4	Inverse Functions and Relations	
3.5	Continuity and End Behavior	
3.6	Critical Points and Extrema	
3.7	Graphs of Rational Functions	
3.8	Direct, Inverse, and Joint Variation	
4.	**Polynomial and Rational Functions**	**17 days**
4.1	Polynomial Functions	