

300 HONORS GEOMETRY / ALGEBRA I A/B

GRADE: 9

LEVEL: Honors

CREDITS: 5/5

RECOMMENDED PREREQUISITE: A- or better in 8th grade Algebra

BASIC TEXTS: Geometry, Prentice Hall, 2004
Algebra I, Prentice Hall, 1993

SUPPLEMENTAL READINGS: None

REQUIRED MATERIALS: notebook, writing utensil, scientific calculator

COURSE DESCRIPTION:

This full-year course is designed for the motivated student with a strong mathematics background. The design of the course will lead students through the problem solving process by showing them how to formulate a plan, to select appropriate strategies, and to proceed logically towards a solution. The emphasis in the first part of the course is to solidify algebra topics such as linear equations, polynomials, factoring, systems of equations and radicals. The second part of the course focuses on the definitions and properties of geometric figures including polygons, circles, spheres, rectangular solids and an introduction to rational expressions and equations.

MISSION RELATED GOALS:

This class will provide the student with a variety of opportunities to demonstrate academic excellence and intellectual curiosity by communicating effectively, solving complex problems, and working with others toward a common goal.

STUDENT EXPECTATIONS FOR LEARNING ADDRESSED:

Students will be afforded opportunities to apply mathematical concepts to real-world applications. A variety of teaching methods will be used to foster an environment that promotes self-confidence and respect for others throughout the school and global community.

GENERAL PERFORMANCE OBJECTIVES:

The student will be able to:

1. graph linear equations
2. solve linear equations
3. solve systems of linear equations
4. simplify and perform operations involving radicals
5. apply the rules of exponents using any integral exponents
6. add, subtract, multiply and divide polynomials
7. understand and use factoring procedures to solve polynomial equations
8. add, subtract, multiply and divide rational expressions
9. solve rational equations
10. identify, classify, and measure different types of geometric figures
11. logically reason from a given statement to a desired conclusion in planning and completing a two-column, flow, and indirect proof
12. identify and apply the definitions, theorems, and postulates related to parallel lines, skew lines, parallel planes, transversals and the angles formed by them
13. understand the relationships of angles and sides in triangles and other polygons
14. apply the properties of special triangles, i.e. isosceles, equilateral, and right triangles as well as quadrilaterals
15. apply the properties of similar polygons
16. apply the properties and theorems of arcs, angles, and segments related to circles
17. apply the formulas for perimeter, area, circumference, and volume of geometric figures

MASSACHUSETTS FRAMEWORKS STRANDS:

- Number Sense and Operations
- Patterns, Relations, and Algebra
- Geometry
- Data Analysis, Statistics, and Probability
- Measurement

CURRICULUM FRAMEWORK LEARNING STANDARDS:

- I. Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties. (10.N.1)
- II. Simplify numerical expressions, including those involving positive integer exponents or the absolute value and apply such simplifications in the solution of problems. (10.N.2)
- III. Find the approximate value for solutions to problems involving square roots and cube roots without the use of a calculator. (10.N.3)
- IV. Use estimation to judge the reasonableness of results of computations. (10.N.4)
- V. Describe, complete, extend, and analyze a wide variety of patterns. (10.P.1)

- VI. Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope. (10.P.2)
- VII. Add, subtract, and multiply polynomials. Divide polynomials by monomials. (10.P.3)
- VIII. Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms; factoring; identifying and canceling common factors in rational expressions; and applying the properties of positive integer exponents. (10.P.4)
- IX. Solve equations and inequalities including those involving absolute value of linear expressions and apply to the solution of problems. (10.P.6)
- X. Solve everyday problems that can be modeled by using linear functions. (10.P.7)
- XI. Solve everyday problems that can be modeled using systems of linear equations. (10.P.8)
- XII. Identify figures using properties of sides, angles and diagonals. Identify the types of symmetry. (10.G.1)
- XIII. Draw congruent and similar figures using compass, straightedge, and protractor. (10.G.2)
- XIV. Recognize and solve problems involving angles formed by transversals of coplanar lines. Identify and determine the measure of central and inscribed angles and their associated minor and major arcs. (10.G.3)
- XV. Apply congruence and similarity correspondences and properties of the figures to find missing parts of geometric figures. (10.G.4)
- XVI. Solve simple triangle problems using the triangle-angle sum theorem and/or the Pythagorean theorem. (10.G.5)
- XVII. Use properties of special triangles to solve problems. (10.G.6)
- XVIII. Using rectangular coordinates, calculate midpoints of segments, slopes of lines and segments, and distances between two points and apply the results to solutions of problems. (10.G.7)
- XIX. Find linear equations that represent lines either perpendicular or parallel to a given line and through a point. (10.G.8)
- XX. Draw the results and interpret transformations of figures in the coordinate plane. (10.G.9)
- XXI. Demonstrate the ability to visualize solid objects and recognize their properties. (10.G.10)
- XXII. Calculate perimeter, circumference and area of common geometric figures. (10.M.1)
- XXIII. Given the formula, find the lateral area, surface area, and volume of prisms, pyramids, spheres, cylinders, and cones. (10.M.2)
- XXIV. Relate changes in measurement of one attribute of an object to changes in other attributes. (10.M.3)
- XXV. Create and interpret an appropriate graphical representation for a set of data and use appropriate statistics to communicate information about the data. (10.D.1)
- XXVI. Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems. (12.G.5)

UNITS AND THEMES:

- I. **Linear Equations** (2 days) 10.P.6
- II. **Polynomials** (12 days) 10.P.1, 10.P.3, 10.P.4

III. Factoring Polynomials (13 days)	10.P.3, 10.P.4
IV. Graphing Linear Equations (6 days)	10.P.2
V. Systems of Linear Equations (3 days)	10.P.8
VI. Radicals (3 days)	10.N.3 10.G.7, 10.P.2, 10.P.6, 10.P.7
VII. Tools of Geometry (10 days)	10.N.1, 10.N.2, 10.P.1, 10.G.7
VIII. Reasoning and Proof (8 days)	10.G.1, 10.G.3, 10.N.1
IX. Parallel and Perpendicular Lines (12 days)	10.G.1, 10.G.3, 10.G.5, 10.G.7, 10.G.8
X. Congruent Triangles (10 days)	10.G.2, 10.G.4
XI. Relationships within Triangles (10 days)	10.G.1, 10.G.3
XII. Quadrilaterals (12 days)	10.P.8, 10.G.1, 10.G.3
XIII. Area (17 days)	10.N.3, 10.N.4, 10.G.1, 10.G.3, 10.G.5, 10.G.6, 10.M.1, 10.M.3, 10.D.1
XIV. Similarity (8 days)	10.N.4, 10.P.7, 10.G.2, 10.G.4.
XV. Surface Area and Volume (16 days)	10.N.4, 10.G.6, 10.G.10, 10.M.1, 10.M.2, 10.M.3
XVI. Circles (12 days)	10.G.3, 12.G.5
XVII. Transformations (8 days)	10.G.1, 10.G.9
XVIII. Rational Expressions and Equations (12 days)	10.P.3, 10.P.4
XIX. Review, Midterm, Finals (5 days)	

COURSE OUTLINE

I. Linear Equations (2 days)	10.P.6
A. Solving multi-step equations	
II. Polynomials (12 days)	10.P.1, 10.P.3, 10.P.4
A. Properties of exponents	
B. Scientific notation	
C. Multiplying & dividing monomials	
D. Negative exponents	
5. Adding & subtracting polynomials	
F. Multiplying binomials & trinomials	
III. Factoring Polynomials (13 days)	10.P.3, 10.P.4
A. Greatest common monomial factors	
B. Factoring trinomials	
C. Factoring by grouping	
D. Factoring completely	
E. Solving equations by factoring	

- IV. Graphing Linear Equations** (6 days) 10.P.2
- A. Slope
 - B. Methods of graphing
 - C. Writing equations of the line
- V. Systems of Linear Equations** (3 days) 10.P.8
- A. Graphing, elimination, substitution
- VI. Radicals** (3 days) 10.N.3
- A. Simplifying and performing operations on radicals
- VII. Tools of Geometry** (10 days) 10.N.1, 10.N.2, 10.P.1, 10.G.7
- A. Initial terms and properties
 - B. Angle and segment measurement
 - C. Definitions
 - D. Inductive reasoning
 - E. Distance and midpoint formula
 - F. Introduction to Perimeter and Area
- VIII. Reasoning and Proof** (8 days) 10.G.1, 10.G.3, 10.N.1
- A. Logic and Deductive Reasoning
 - B. Algebraic Properties
 - C. Angle Pairs
- IX. Parallel and Perpendicular Lines** (12 days) 10.G.1, 10.G.3, 10.G.5, 10.G.7, 10.G.8
- A. Properties of parallel lines
 - B. Proving lines parallel
 - C. Triangles
 - D. Polygons
 - E. Parallel and Perpendicular Lines in the Coordinate Plane
- X. Congruent Triangles** (10 days) 10.G.2, 10.G.4
- A. Isosceles Triangles
 - B. SSS, SAS
 - C. ASA, AAS
 - D. HL
 - E. CPCTC

XI. Relationships within Triangles (10 days)

10.G.1, 10.G.3

- A. Mid segments
- B. Inequalities
- C. Bisectors
- D. Concurrent lines
- E. Contrapositives and inverses

XII. Quadrilaterals (12 days)

10.P.8, 10.G.1, 10.G.3

- A. Classifying Quadrilaterals
- B. Parallelograms
- C. Special parallelograms
- D. Trapezoids
- E. Kites
- F. Coordinate proofs

XIII. Area(17 days)

10.N.3, 10.N.4, 10.G.1, 10.G.3,
10.G.5, 10.G.6, 10.M.1, 10.M.3,
10.D.1

- A. Areas of parallelograms and triangles
- B. Review of Radicals
- C. Pythagorean Theorem
- D. Special right triangles
- E. Area of trapezoids, rhombuses, and kites
- F. Area of regular polygons
- G. Circles - circumference and area, arc length, area of sector

XIV. Similarity (8 days)

10.N.4, 10.P.7, 10.G.2, 10.G.4

- A. Ratio and proportion
- B. Similar polygons
- C. Proving triangles similar
- D. Right triangle applications of similarity
- E. Proportion in triangles
- F. Perimeter and area of similar figures

XV. Surface Area and Volume (16 days)

10.N.4, 10.G.6, 10.G.10, 10.M.1,
10.M.2, 10.M.3

- A. Nets
- B. Isometric and orthographic drawings
- C. Surface area of prisms, cylinders, pyramids, and cones
- D. Volume of prisms, cylinders, pyramids, and cones
- E. Surface and volume of spheres
- F. Area and volume of similar solids

XVI. Circles (12 days)

10.G.3, 12.G.5

- A. Tangent lines
- B. Chords and arcs
- C. Inscribed angles
- D. Angle measures and segment lengths
- E. Circles in the coordinate plane
- G. Locus

XVII. Transformations (8 days)

10.G.1, 10.G.9

- B. Reflections
- C. Translations
- D. Rotations
- E. Composition of reflections
- F. Symmetry
- G. Dilations

XVIII. Rational Expressions and Equations (12 days)

10.P.3, 10.P.4

- A. Simplifying rational expressions
- B. Multiplication & division
- C. Least common denominator
- D. Addition & subtraction
- E. Solving rational equations

XIX. Review, Midterm, Finals (6 days)

SUGGESTED INSTRUCTIONAL STRATEGIES:

1. Lecture
2. Oral classroom practice
3. Written exercises
4. Group Work
5. Projects
6. Use of a variety of questioning techniques
7. Board Work
8. Scientific Calculator Activities
9. Model rocket project

SUGGESTED INTEGRATED ACTIVITIES:

1. Create a flag project (model UN week)
2. Golden Rectangle Project

3. Pantograph Project
4. Holiday ornament icosahedron project
5. Fractal lilacs
6. Making kites
7. Create a Pythagoras board game
8. Pointillism Project

USE OF TOOLS/TECHNOLOGY:

1. Use a classroom computer and an integrated software package
2. Use a graphics calculator
3. Use an overhead projector with transparencies
4. View video selections
5. Use computer laboratory

ASSESSMENT TECHNIQUES:

1. Students will take free-response performance tests
2. Students will answer questions orally
3. Students will do written presentations at the board
4. Students will participate in classroom discussions
5. Students will work in cooperative groups and report their results.
6. Students will create integration projects.
7. Homework evaluation