

## GEOMETRY HONORS

Prerequisite: A grade of B or better in Algebra I (as a rule Algebra I grade eight) is strongly recommended

Meeting time: 5 days a week, full-year, one credit

Placement: Grade 9, 10, Level II

## GEOMETRY

Prerequisite: A grade of C or better in Algebra I is strongly recommended

Meeting time: 5 days a week, full-year, one credit

Placement: Grades 9, 10, 11, 12, Level III

By using advanced topics, Geometry extends and utilizes the concepts and terminology of elementary algebra while clarifying, simplifying, and broadening the basic ideas of mathematics. Algebraic concepts are reinforced through multiple applications. Hands-on activities allow students to discover geometric concepts. A variety of supplementary materials incorporating the use of technology will be utilized to investigate current trends in mathematics.

Geometry Honors extends the topics presented in Geometry and introduces additional concepts necessary for the study of Algebra II. Those concepts which are unique to Geometry Honors are identified by an asterisk (\*).

### COURSE GOALS AND OBJECTIVES

1. To develop knowledge and fundamental ideas of the central concepts of geometry.
2. To acquire the basic properties, postulates, theorems, definitions, and structure of geometry.
3. To investigate the nature of deductive and inductive reasoning.
4. To give the student an understanding of the congruence of polygons, angles, and lines.
5. To enable the student to have an understanding of parallelism, the parallel postulate, and perpendicular lines.
6. To introduce to the student the concepts of symmetry, transformations, and reflections.
7. To develop the concepts of geometric constructions and design.
8. To present the ideas of the postulates and theorems of equality and inequalities.
9. To make the geometry student aware of the relationship between proportionality, similarity, and ratios.
10. To acquire an understanding of polygons and circles.
11. To develop an awareness of trigonometry of the right triangle.

# GEOMETRY

(Agawam High School Academic Expectations: 1, 2, 3, 4, 5, \*6, 8)

## **Strand 1: Number Sense and Operations**

*NCTM Standards (State Standards)*

- Collect and organize data using charts, tables, graphs, and models. (A1.D1)
- Interpret, analyze graphs, models, and geometric figures. (G.G.1, G.G.11, G.G.12, and G.G.13)
- \* Analyze figures beyond Euclidian geometry. (12.G.4)
- Numerical evaluation of geometric structures. (G.M.1)
- \* Expound three-dimensional structures (i.e.: Platonic solids, Archimedian solids, etc.) (G.G.16)
- Visualize the movement of geometric figures. (G.G.15 and G.G.18)
- Apply technology to discrete mathematics.(G.G.4)
- Identify geometric figures and forms. (G.G.1)
- \* Discuss the history of geometry. (i.e.: Egyptians, Babylonians, and Greeks).
- Compare and contrast inductive and deductive reasoning. (G.G.2)
- Apply the properties of real numbers. (A1.N.1)
- Perform the four arithmetic operations with rational numbers. (A1.N.1 and A1.N2)
- Interpret real-world scenarios involving rational numbers. (A1.N.1, A1.N.2 and A1.P.8)
- Evaluate expressions using order of operations. (A1.N.1 and A1.N.2)
- Investigate arithmetic and geometric sequences and series. (G.G.2)
- Analyze, evaluate, and develop explicit definitions. (G.G.2)
- Utilization of formulas in geometric structures. (G.G.1, G.G.2, G.G.3, G.M.1, and G.M.2)
- Apply technology to mathematical structure. (G.G.4)
- Estimate solutions. (A1.N.3)
- Apply estimation in real-world scenarios. (A1.N.4)
- Investigate angles of elevation and depression. (G.G.9)

## **Strand 2: Patterns, Relations, and Algebra**

*NCTM Standards (State Standards)*

- Comprehend the concepts of variable, expression, and equation. (G.G.2, G.G.11, G.G.12, and G.G.13)
- Identify and perform operations in solving one variable equations and inequalities. (G.G.12)
- Develop and write equations or inequalities based on word problems. (A1.P.10)
- \* Perform complex word problems involving supplementary and complementary angles. (G.G.6)
- Use equations to solve real-world problems and interpret the results. (A1.P.12)
- Utilize ratios and proportions in roof-pitch problems. (G.G.5 and G.G.8)
- Use theorems, corollaries, postulates, and properties to transform formulas, equations, and inequalities. (G.G.2)
- Graph coordinate points and linear equations. (G.G.12 and G.G.15)
- Identify and solve quadratic equations. (A1.P.9)
- Interpret and justify the reasonableness of a solution. (A1.N.4 and G.M.5)
- Utilize technology for the purpose of analyzing patterns. (G.G.2 and G.G.4)
- Investigate patterning, tessellations, and tiling. (G.G.15)
- Apply technology to situations involving algebra. (G.G.4)
- Analyze and interpret the graphs of linear functions. (G.G.11 and G.G.13)
- Write rules for trigonometric functions in real-world scenarios. (G.G.9)

- Identify and analyze real-world scenarios involving geometric functions. (G.G.2 and G.G.3)
- Solve problems involving angles of depression and angles of elevation. (G.G.9)
- Use trigonometric ratios to explore the parts of a right triangle. (G.G.9)
- Apply trigonometric ratios and the Pythagorean Theorem to real-world scenarios. (G.G.7)
- \* Analyze experimental outcome of navigational problems. (G.G.9 and G.G.18)
- \* Recognize usage of common right triangles in construction and design. (G.G.9)
- Interpret and evaluate circular and trigonometric equations. (G.G.9 and G.G.14)

### **Strand 3: Geometry**

#### *NCTM Standards (State Standards)*

- Draw or construct using a compass, straightedge, protractor, or computer software geometric models to aid in problem solving. (G.G.4 and G.G.15)
- Solve problem situations with geometric properties. (G.G.1, G.G.6, G.G.7, G.G.8, and G.G.10)
- Analyze and connect properties of geometric shapes to real-world scenarios. (G.G.1, G.G.6, G.G.7, G.G.8, G.G.10, G.M.1, and G.M.2)
- Identify and analyze two and three-dimensional figures. (G.G.16, G.M.1, and G.M.2)
- Compare and contrast inductive and deductive reasoning in relation to real-world scenarios. (G.G.2)
- Identify and investigate parallel lines and planes. (G.G.6)
- \* Compare the effect on parallel lines, polygons, etc. in non-Euclidean Geometry. (12.G.4)
- Explore three space including skew lines. (G.G.16)
- Prove congruency and similarity of triangles. (G.G.2 and G.G.5)
- Demonstrate proofs involving complex overlapping triangles. (G.G.2)
- Investigate the properties of the special segments in a triangle. (G.G.7 and G.G.8)
- Identify and explore types of quadrilaterals. (G.G.1)
- Analyze and identify types of polygons. (G.G.1)
- Recognize a variety of transformations. (G.G.15)
- Experiment with translations, rotations, and reflections. (G.G.15)
- Make conjectures about right triangles. (G.G.7, G.G.8, and G.G.9)
- Analyze the relationship of lines/planes. (G.G.16)
- Identify and solve problems involving symmetry. (G.G.15)
- Coordinate geometry. (G.G.3, G.G.11, G.G.12, G.G.13, G.G.14, and G.G.15)
- Investigate geometry and spatial sense through the application of technology. (G.G.4)
- Formulate and apply geometric analysis of slope in real-world applications and modeling. (G.G.2, G.G.6, G.G.11, G.G.12, and G.G.13)
- Use linear equations and formulas to solve realistic situations. (A.I.P.2, A.I.P.6, A.I.P.11, and A.I.P.12)
- Identify, analyze, and justify the use of the Pythagorean Theorem. (G.G.7 and G.G.8)
- Apply technology to geometry from an algebraic perspective. (G.G.4)

### **Strand 4: Measurement**

#### *NCTM Standards (State Standards)*

- Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles. (G.M.1 and G.M.4)
- \* Derive formulas for area (e.g.: parallelogram, trapezoid, etc.). (G.M.1)
- Calculate the lateral area, surface area, and volume of prisms, pyramids, spheres, cylinders, and cones. (G.M.2 and G.M.4)
- \* Derive formulas for volume (e.g.: cylinder, prism, etc.). (G.M.2)

- \* Conduct an experiment to test lack of conservation of volume. (G.M.3)
- Relate changes in the measurement of one attribute of an object to changes in other attributes (e.g.: how changing the radius or height of a cylinder affects the surface area or volume). (G.M.3)
- \* Use similar triangles to measure distance on Earth from photos taken in space. (G.G.5)
- \* Find distance and measurement in non-Euclidean space. (12.M.1)

### **Strand 5: Data Analysis, Statistics and Probability**

*NCTM Standards (State Standards)*

- Draw inferences, summarize, and communicate from both data collected and data representations. (A.I.D.2)
- Determine ratios and percents of outcome. (A.I.D.1)
- Calculate the mean, median, range, and mode of a given data set. (A.I.D.1)
- Utilize technology in the evaluation of statistical data. (A.I.D.2)
- Use and apply theoretical probabilities to determine outcomes. (A.I.D.3)
- Conduct experimental probabilities. (A.I.D.3)
- Use equations to solve problems involving percents to solve real-world problems. (A.I.P.11)
- Apply technology to the study of probability. (A.I.D.2)
- Select, create, and interpret an appropriate graphical representation for a set of data and use appropriate statistics to communicate information about the data. (A.I.D.1)

## RESOURCES

Larson, Ronald. et al. Geometry. Evanston, Illinois; McDougal Littell Inc., 2007.

Teacher generated materials such as NCTM journals, note taking outlines, etc.

Technology Resources: Classroom sets of scientific and graphing calculators, and *The Geometer's Sketchpad* software.

Hands-On Geometry: Supplemental Hands-on Computer and Computer Activities *For Geometry Students*. Agawam High School Mathematics Department, August 2003.

*An Introduction to Probability and Statistics*. Agawam High School Mathematics Department, March 2004

## ASSESSMENT STRATEGIES

- Class participation, written and oral communication
- Class work
- Homework
- Class projects and presentations
- Notebooks/Portfolios
- Quizzes
- Tests
- Departmental Semester Exams
- School Wide and Department Rubrics