

HONORS GEOMETRY

Course Number: 310-H

Grade: 9/10

Credits: 5

Recommended Prerequisite: A grade of “B” or better in Algebra 1

Required Materials:

1. Writing utensil
2. Textbook or online textbook access
3. Notebook
4. Scientific or graphing calculator

Course Description:

This full year course is an honors level course. The design of the course will lead students through the problem solving process by showing them how make sense of problems, reason abstractly and quantitatively, construct viable arguments model with mathematics, use appropriate tools strategically and pay attention to precision. The course focuses on the definitions and properties of geometric figures including polygons, circles, transformations, similarity and congruence, solid figures and an introduction to right triangle trigonometry.

General Performance Objectives:

1. Reason quantitatively and use units to solve problems.
2. Experiment with transformations in the plane.
3. Understand congruence in terms of rigid motions.
4. Prove geometric theorems.
5. Make geometric constructions.
6. Understand similarity in terms of similarity in terms of similarity transformations.
7. Prove theorems involving similarity.
8. Define trigonometric ratios and solve problems involving right triangles.
9. Apply trigonometry to general triangles.
10. Understand and apply theorems about circles.
11. Find arc lengths and area of sectors of circles.
12. Translate between the geometric description and the equation for a conic section.
13. Use coordinates to prove simple geometric theorems algebraically.
14. Explain volume formulas and use them to solve problems.
15. Visualize relationships between two-dimensional and three-dimensional objects.
16. Apply geometric concepts in modeling situations.
17. Understand independence and conditional probability and use them to interpret data.
18. Use the rules of probability to compute probabilities of compound events in a uniform probability model.
19. Use probability to evaluate outcomes of decisions.

Massachusetts Curriculum Frameworks for Mathematics:

<http://goo.gl/tv2ya>

Units and Themes:

| | Unit Title | Standard |
|--------------|----------------------------------|---|
| I. | Tools of Geometry | G-CO; G-GPE; G-MG |
| II. | Reasoning and Proof | G-CO |
| III. | Parallel and Perpendicular Lines | G-CO; MA.3; MA.11 |
| IV. | Congruent Triangles | G-CO; G-SRT |
| V. | Transformations | G-CO |
| VI. | Relationships Within Triangles | G-CO |
| VII. | Exploring Quadrilaterals | G-CO, G-GPE |
| VIII. | Area | N-Q, G-GPE, G-MG, MA.4, G-SRT, G-GMD, G-C |
| IX. | Similarity | G-SRT, G-C |
| X. | Right Triangle Trigonometry | N-Q, MA.3, G-SRT |
| XI. | Surface Area and Volume | G-GMD, G-MG |
| XII. | Circles | G-C, G-GPE |
| XIII. | Probability | S-CP, S-MD |
| XIV. | Review, Midterm Exam, Final Exam | |

Course Outline: (number of days are an approximation and may be adjusted by course demands)

I. Tools of Geometry (8 days)

- A. Points lines and planes
- B. Segments, rays, parallel lines and planes
- C. Measuring segments and angles
- D. Basic constructions
- E. Distance and midpoint formula

II. Reasoning and Proof (7 days)

- A. Conditional statements
- B. Biconditionals and definitions
- C. Reasoning in Algebra
- D. Proving angles congruent

III. Parallel and Perpendicular Lines (8 days)

- A. Properties of parallel lines

- B. Proving lines parallel
- C. Parallel lines and the triangle angle sum theorem
- D. Polygon angle sum theorems
- E. Lines in the coordinate plane
- F. Slopes of parallel and perpendicular lines (quick refresher)

IV. Congruent Triangles (9 days)

- A. Congruent figures
- B. SSS, SAS
- C. ASA, AAS
- D. Using congruent triangles: CPCTC
- E. Isosceles and equilateral triangles
- F. Hypotenuse-leg

V. Transformations (7 days)

- A. Reflections
- B. Translations
- C. Rotations
- D. Compositions of reflections
- E. Symmetry
- F. Dilations

VI. Relationships Within Triangles (8 days)

- A. Mid segments
- B. Bisectors
- C. Concurrent lines – medians and altitudes
- D. Contrapositives and inverses
- E. Inequalities in triangles

VII. Exploring Quadrilaterals (10 days)

- A. Classifying quadrilaterals
- B. Properties of parallelograms
- C. Proving a quadrilateral is a parallelogram
- D. Special parallelograms
- E. Trapezoids and kites
- F. Placing figures in the coordinate plane
- G. Proofs using coordinate geometry

VIII. Area (15 days)

- A. Areas of parallelograms and triangles
- B. Review of radicals
- C. Pythagorean theorem and its converse
- D. Special right triangles
- E. Areas of trapezoids, rhombuses, and kites
- F. Area of regular polygons
- G. Circles and arcs
- H. Areas of circles, sectors, and segments

IX. Similarity (7 days)

- A. Ratio and proportions
- B. Similar polygons
- C. Proving triangles similar
- D. Similarity in right triangles
- E. Proportions in triangles
- F. Perimeter and area of similar figures
- X. Right Triangle Trigonometry (8 days)**
 - A. Tangent ratio
 - B. Sine and cosine ratios
 - C. Angles of elevation and depression
 - D. Trigonometry and area
- XI. Surface Area and Volume (10 days)**
 - A. Cross sections and nets
 - B. Surface area of prisms and cylinders
 - C. Surface area of pyramids and cones
 - D. Volumes of prisms and cylinders
 - E. Volumes of pyramids and cones
 - F. Surface areas and volumes of spheres
 - G. Areas and volumes of similar solids
- XII. Circles (12 days)**
 - A. Tangent lines
 - B. Chords and arcs
 - C. Inscribed angles
 - D. Angle measures and segment lengths
 - E. Arc length and areas of sectors and segments
 - F. Circles in the coordinate plane
- XIII. Probability (7 days)**
 - A. Experimental and theoretical probability
 - B. Probability distributions and frequency tables
 - C. Permutations and combinations
 - D. Compound probability
 - E. Probability models
 - F. Conditional probability formulas
 - G. Modeling randomness
- XIV. Review, Midterm, Final Exam (5 days)**

Suggested Instructional Strategies:

1. Lecture
2. Written Exercises
3. Group Work
4. Projects
5. Use of Manipulatives
6. Use of a Variety of Questioning Techniques

7. Board work
8. Calculator Activities
9. Games (Math Jeopardy, Kahoot, etc..)
10. Student Presentations
11. A variety of assessment tools

Suggested Integrated Activities:

1. Create a flag project (model UN week)
2. Golden Rectangle Project
3. Ornament icosahedron project
4. Fractal lilacs
5. Making kites
6. Create a board game
7. Polygon Poster
8. Paper airplane contest

Use of Tools/Technology:

1. Use of scientific or graphing calculator
2. Use of iPads and/or computer carts
3. Use of Smart Board
4. Use of classroom responders or students' own devices as responders
5. View online video selections (YouTube, Khan Academy, etc)
6. Use of Geometer's Sketchpad to model and investigate geometric theorems
7. Use of Google apps for education

Assessment Techniques:

1. Students will take free-response performance tests and quizzes
2. Students will participate in classroom discussions and demonstrate problem solving on the Smart Board, whiteboard, and individual response formative assessment tools.
3. Students will work in cooperative situations and report their results
4. Students will prepare integrated projects
5. Students will respond to writing prompts incorporated in various assessment instruments.
6. Students will answer essential questions and be evaluated on District Determined Measures