

**Dover-Sherborn High School**  
**Mathematics Curriculum**  
**Geometry Honors**

A. DESCRIPTION

This course represents an accelerated, rigorous approach to the topics of the traditional geometry course. Enrichment is gained through student projects and presentations, the study of logic, the study of probability and statistics and the use of technology.

B. OBJECTIVES

The student should be able to:

1. understand the relationships among undefined terms, definitions, postulates and theorems, as they relate to proofs;
2. develop logical thinking skills using proofs as a vehicle;
3. apply the theorems in plane, solid and analytic geometry to the solution of problems;
4. perform constructions and prove related theorems;
5. improve his/her ability to visualize and work with spatial relationships and extend the knowledge of computer applications gained in previous mathematics courses.

C. OUTLINE

1. Introduction to Geometry [G.CO.1]; [G.CO.12]; [G.CO.13]
  - a. introduction to basic geometric terms
  - b. measurement of segments and angles
  - c. collinearity, betweenness, assumptions from diagrams
  - d. beginning proofs
  - e. midpoints, bisectors, the division of segments and angles
  - f. paragraph proofs
  - g. deductive structure
  - h. statements of logic
  - i. implications, converses, inverses and contra positives
  - j. introduction to probability
2. Transformations[G.CO.1]; [G.CO.2]; [G.CO.3]; [G.CO.4]; [G.CO.5]
  - a. represent transformations in the plane; describe transformations as functions that take points in the plane as inputs and give other points as outputs
  - b. given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself
  - c. develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments
  - d. given a geometric figure and a rotation, reflection, or translation, draw the transformed figure; specify a sequence of transformations that will carry a given figure onto another

**Dover-Sherborn High School**  
**Mathematics Curriculum**  
**Geometry Honors**

3. Basic Concepts and Proofs [G.CO.1]; [G.CO.9]; [G.CO.12]
  - e. introduction to perpendicularity
  - f. complementary and supplementary angles
  - g. drawing conclusions
  - h. theorems about complementary and supplementary angles
  - i. addition and subtraction properties
  - j. multiplication and division properties
  - k. transitive and substitution properties
  - l. vertical angles
4. Congruent Triangles [G.CO.6]; [G.CO.7]; [G.CO.8]; [G.CO.10]
  - a. definition and identification of congruent triangles with particular emphasis on how congruence relates to rigid transformations
  - b. SSS, SAS and ASA triangle congruence postulates
  - c. CPCTC and circles
  - d. the use of CPCTC in proofs
  - e. overlapping triangles
  - f. types of triangles
  - g. angle-side theorems
  - h. hypotenuse-leg postulate
5. Perpendicular Lines [G.CO.9]; [G.CO.12]; [G.GPE.5]
  - a. detours in proofs
  - b. creating diagrams to supplement proofs
  - c. right angle theorems
  - d. adjacent angles
  - e. the equidistance theorems
  - f. introduction to parallel lines
  - g. slope
  - h. projections
6. Parallel Lines and Related Figures [G.CO.9]; [G.CO.11]; [G.CO.12]; [G.GPE.1]
  - a. indirect proof
  - b. methods of proving lines parallel
  - c. theorems derived from parallel lines
  - d. four-sided polygons
  - e. properties of quadrilaterals
  - f. proving that a quadrilateral is a parallelogram
  - g. proving that figures are special quadrilaterals
7. Lines and Planes in Space
  - a. introductory ideas relating lines to planes
  - b. perpendicularity between a line and a plane
  - c. basic facts about parallel planes
8. Polygons [G.CO.10]; [G.CO.11]; [G.CO.MA.11.a]; [G.C.MA3a]
  - a. triangle application theorems
  - b. no choice and AAS theorems
  - c. formulas involving polygons

**Dover-Sherborn High School**  
**Mathematics Curriculum**  
**Geometry Honors**

- d. regular polygons
- 9. Similar Polygons [G.SRT.1]; [G.SRT.2]; [G.SRT.3]; [G.SRT.4] ; [G.SRT.5]
  - a. ratio and proportion
  - b. verify the properties of dilations given by a center and a scale factor
  - c. similar figures
  - d. methods for proving triangles similar
  - e. ratios and products from similar triangles
  - f. application theorems involving proportions
- 10. Right Triangle Theorems [G.SRT.4]; [G.SRT.6]; [G.SRT.7]; [G.SRT.8]; [G.GPE.7]
  - a. review of radicals and quadratic equations
  - b. introduction to circles
  - c. altitude and hypotenuse theorems
  - d. the Pythagorean theorem
  - e. the distance formula
  - f. families of right triangles
  - g. special right triangles
  - h. three-dimensional applications of Pythagorean theorem
  - i. introduction to trigonometry
  - j. trigonometric ratios
- 11. Circles [G.C.1]; [G.C.2]; [G.C.3]; [G.C.5]; [G.GPE.1]
  - a. basic properties and definitions related to circles
  - b. congruent chords
  - c. arcs of a circle
  - d. secants and tangents
  - e. angles related to a circle
  - f. angle-arc theorems
  - g. inscribed and circumscribed polygons including constructing inscribed and circumscribed circles for a triangle
  - h. the power theorems
  - i. circumference and arc length
- 12. Areas [G.GMD.1]
  - a. the concept of area
  - b. areas of parallelograms and triangles
  - c. area of a trapezoid
  - d. areas of kites and related figures
  - e. areas of regular polygons
  - f. areas of circles, sectors and segments
  - g. ratios of areas
  - h. special area formulas
- 13. Surface Area and Volume [G.GMD.2]; [G.GMD.3]; [G.GMD.4]; [G.MG.1]
  - a. surface areas of prisms
  - b. surface areas of pyramids
  - c. surface areas of circular solids
  - d. volumes of prisms and cylinders

**Dover-Sherborn High School**  
**Mathematics Curriculum**  
**Geometry Honors**

- e. volumes of pyramids and cones
- f. volumes of spheres
- 14. Coordinate Geometry Extended [G.GPE.5]
  - a. graphing equations
  - b. equations of lines
  - c. systems of equations
  - d. graphing inequalities
  - e. three-dimensional graphing
  - f. circles
- 15. Locus and Constructions
  - a. locus problems
  - b. compound locus
  - c. concurrence theorems and related constructions
  - d. linear constructions
  - e. angle constructions
  - f. partitioning constructions
  - g. circle constructions
  - h. triangle constructions
- 16. Inequalities
  - a. number properties
  - b. inequalities in a triangle
  - c. the hinge theorems

D. TEXT

Geometry for Enjoyment and Challenge - Road, Milauskas and Whipple.  
(McDougal, Littell & Company, 1991.)  
ISBN-08660996545

E. SUPPLEMENTARY MATERIAL

1. Teacher web site
2. Geometer's Sketchpad (both teacher-generated sketches and student-generated ones)

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Introduction to Geometry

Month Presented: September

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What are the “building blocks of geometry?”
- What are geometric definitions, theorems, and postulates?
- What is a structured proof and how do we use them to make logical arguments?

**Learning Objectives:**

- Determine unions and intersections of geometric figures
- Finding restrictions on angles
- Converting angles measured in degrees, minutes, and seconds to fractional degrees and vice versa
- Adding and subtracting angles in degrees, minutes, and seconds form
- Knowing what can and cannot be assumed from diagrams
- Constructing segment and angle bisectors and equilateral triangles.
- Solving simultaneous equation problems
- Solving probability problems
- Determining converse, inverse and contrapositives of conditional statements
- Solving chain of reasoning problems

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Transformations

Month Presented: September

Unit Length (in weeks): 1-2

**Essential Question(s):**

- What is a transformation?
- How do we represent transformations formulaically and graphically?

**Learning Objectives:**

- Understand different types of transformations (rotation, reflection, translation)
- Perform designated transformations on polygons
- Determine appropriate rules given a graphical representation of a transformation on a coordinate plane

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Basic Concepts and Proofs

Month Presented: September/October

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What are perpendicular lines?
- How do I construct perpendicular lines?
- What are complementary and supplementary angles?
- Do properties of numbers apply to geometric figures (e.g., addition, subtraction, multiplication, division, etc.)
- How do I prove geometric theorems?

**Learning Objectives:**

- Learn definitions of perpendicular lines, complementary & supplementary angles, opposite rays, and vertical angles
- Constructing perpendiculars to a line (from a point on the line and from a point not on the line)
- Solving simultaneous equations
- Proving geometric theorems related to properties of real numbers (e.g., addition property, subtraction property, multiplication property, division property, transitive properties)

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Congruent Triangles

Month Presented: October/November

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What are congruent polygons?
- How do I prove that triangles are congruent?
- What are ways of classifying triangles?

**Learning Objectives:**

- Learn definitions of congruent polygons, CPCTC, circles, median of a triangle, altitude of a triangle, Scalene, isosceles, equilateral, acute, right, obtuse
- Constructing medians and altitudes of triangles
- Solving simultaneous equations
- Proving triangles are congruent using ASA, SAS, SSS, and HL
- Use the Isosceles Triangle Theorem and its converse to show parts of triangles congruent.
- Learn how to solve inequality problems using the Triangle Inequality Theorem.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes



**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Lines in the Plane

Month Presented: November/December

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What is the Equidistance Theorem?
- How do I find the midpoint of a segment in the coordinate plane?
- What is a transversal and what are parallel lines?
- What is slope?

**Learning Objectives:**

- Learn definitions of a transversal (and the angles related to a transversal), parallel lines, and the slope of a line.
- Solving problems involving midpoints of segments on the coordinate plane.
- Proving a perpendicular bisector using the Equidistance Theorem.
- Proving segments congruent using the Converse of the Equidistance Theorem.
- Learning how to calculate the slope of a line as well as lines parallel and perpendicular to a given line.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Parallel Lines and Related Figures

Month Presented: December/January

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What is the indirect proof and why would I use it?
- How do prove that lines are parallel?
- How do I use parallel lines in proofs?
- What are quadrilaterals and how can I use their properties in proofs?

**Learning Objectives:**

- Learn definitions of quadrilateral, parallelogram, rectangle, rhombus, kite, trapezoid, isosceles trapezoid and associated components.
- Learn how to prove something indirectly.
- Constructing a line parallel to a given line through a given point.
- Using the exterior angle theorem to solve angle problems.
- Solving for angle measures given parallel line diagrams.
- Proving that a quadrilateral is a parallelogram, rectangle, rhombus, kite, trapezoid or isosceles trapezoid.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Lines & Planes in Space

Month Presented: January

Unit Length (in weeks): 1

**Essential Question(s):**

- What do geometric figures look like in space?
- Are the properties of geometric figures the same when thinking about 3D space?

**Learning Objectives:**

- Learn what determines a plane.
- Learn what are the intersections of lines and planes.
- Learning what it means for a line to be perpendicular to a plane
- Learning the difference between parallel lines and skew lines.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Polygons

Month Presented: January

Unit Length (in weeks): 1-2

**Essential Question(s):**

- What is the sum of the measures of the interior angles of a polygon with  $n$  sides?
- What is the sum of the measures of the exterior angles of a polygon with  $n$  sides?
- What is a regular polygon and what special properties do they have?

**Learning Objectives:**

- Learn how to prove triangles congruent using AAS.
- Learn the names of various polygons as classified by the number of sides they possess.
- Learn how to calculate the sum of the measures of the interior and exterior angles of various polygons.
- Learn how to determine how many diagonals a polygon has based on its number of sides.
- Learn the Exterior Angle Theorem and the Midline Theorem.
- Learn how to find the measure of one angle in a regular polygon.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Similar Polygons

Month Presented: February

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What does it mean for geometric figures to be similar as compared to congruent?
- How do I prove that triangles are similar?
- How is similarity useful?

**Learning Objectives:**

- Learn definitions of ratio, proportion, and similar polygons.
- Learn how to solve various problems using proportions.
- Learn how to prove that triangles are similar using AA~, SAS~ and SSS~.
- Learn the Side-Splitter Theorem and how to use it to solve for the lengths of the sides of triangles and various parallel segments.
- Learn the Angle Bisector Theorem and how to use it to solve for side lengths.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: The Pythagorean Theorem

Month Presented: February/March

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What is the Pythagorean Theorem?
- What are Special Right Triangles (30-60-90 & 45-45-90) and how are they used?
- What is Trigonometry and how is it useful?

**Learning Objectives:**

- Learn how to manipulate radicals and quadratic equations in a variety of situations (including factoring).
- Learn the Altitude-On-Hypotenuse Theorem and its applications
- Learn the Pythagorean Theorem, how to prove it, and how to apply it to a variety of situations.
- Memorize the side relationships for Special Right Triangles, and how to apply these in a variety of situations.
- Learn the basic Trigonometric Ratios (Sine, Cosine, and Tangent) and how to apply them to “real-world” problems.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Circles

Month Presented: March/April

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What is a circle and what are its related components?
- What are angles related to circles?
- What is an arc and how does it relate to angles in a circle?

**Learning Objectives:**

- Learn definitions of a circle and related objects (center, radius, concentric circles, chord, diameter, secant, secant segment, tangent to a circle, common tangent, arc, semicircle, major arc, minor arc, inscribed angle, tangent-tangent angle, secant-secant angle, etc.).
- Finding the measures of arcs and angles related to circles
- Finding lengths of chords
- Common internal and external tangent problems
- Finding the measure of angles and arcs related to polygons inscribed in and circumscribed about circles (including "walk-around" problems)
- Power Theorem problems
- Finding arc length

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Area

Month Presented: May

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What is area and how do I find the area of various geometric shapes?

**Learning Objectives:**

- Learn how to find the area of rectangles, parallelograms, triangles, trapezoids, kites, regular polygons, circles, sectors, and segments.
- Learn how to calculate ratios of areas.
- Learn how to calculate areas of triangles using Hero's Formula.
- Learn how to calculate areas of cyclic quadrilaterals using Brahmagupta's Formula

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes



**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Geometry Honors**

Course Title: Geometry – Honors

Grade: 9

Unit: Surface Area and Volume

Month Presented: May/June

Unit Length (in weeks): 2-3

**Essential Question(s):**

- What is surface area and how do I find the surface area of various three dimensional shapes?
- What is volume and how do I find it for various three dimensional shapes?

**Learning Objectives:**

- Learn definitions of prisms, pyramids, circular solids (cones, cylinders, spheres).
- Learn how to find the surface area for prisms, pyramids, and circular solids.
- Learn how to find the volume of prisms, pyramids, and circular solids.

**Instructional Strategies & Activities:**

- Note taking
- Cooperative learning/group work
- Competitive review games

**Materials Utilized:**

- Teacher generated homework worksheets and review packets
- Web based notes

**Assessment Strategies:**

- Daily homework
- Class participation
- Tests and quizzes