

Walter Payton College Prep
Honors Geometry Course Outline 2017- 2018
Textbook: CME Geometry

Investigation, justification and proof are themes repeated throughout this course. With Geometer's Sketchpad, students investigate geometric situations and learn to justify their conjectures using a variety of methods. Whenever possible, paper folding and other "hands on" methods are used to introduce concepts.

1st Semester Topics: Habits of Mind, Congruence, Constructions/Dissections, and Area

2nd Semester Topics: Similarity, Coordinates, Vectors, and Optimization

Unit 1: Habits of Mind (Quarter 1)

- Problem-solving strategies: understanding the problem, collecting data, making tables, identifying patterns and invariants, making conjectures, generalizing results
 - Handshake Problem
 - Number of diagonals in a polygon
- Symmetry, Relate 2D and 3D shapes (1a)
- Identify and use properties of circles (central and inscribed angles, arcs) (1b)
- Constructions of shapes using straightedge and compass and using dynamic geometry software. (1d)
 - Writing recipes
 - Perpendicular bisectors, angle bisectors, triangles (given three points, equilateral, isoc.), midlines, midpoints
- Geometric invariants and relationships: diagonals and angle measures in polygons; concurrence; triangle inequality; relationships between lengths of segments of intersecting chords (Power of the Point) (1e)

Unit 2: Proof, Congruence, Quadrilateral Hierarchy, and Intro to Logic (Quarter 1-2)

- Congruency of Shapes: Corresponding parts of congruent shapes, classifying congruence statements as true, false, nonsensical. (2a)
- Congruent Triangles: identifying congruent triangles; proving that triangles are congruent; using congruent triangles to prove facts about other geometric shapes. Properties of isosceles triangles.(2b)
- Angles formed by parallel lines cut by a transversal (2c)
- Introduction to Logic: conditional statements (2d)
- Proof: Turning arguments into formal proofs; structure and content of proofs; axioms and theorems of Geometry; different styles of proof; formal logic of statements, converses, inverses, contrapositives. (2e)
- Families of quadrilaterals: properties of different types of quadrilaterals; the quadrilateral hierarchy. (2f)
- Proofs of the Midline Theorem and the Pythagorean Theorem. (2f)

Chapter 3: Perimeter, Area and Pythagorean Theorem (Quarter 2-3)

- Dissections: using dissection to find the area of a shape or an area formula for a type of shape; describing dissection algorithms clearly and correctly; proving why and in what cases a particular algorithm works. Scale: scale factors; invariant relationships between scaled copies; area and volume relationships between scaled copies; computing scale factors and using scale factors to compute lengths, areas, and volumes. (3a)
- Find areas and perimeters by dissection, developing and appealing to known area formulas. (3b)
- Know and apply the Pythagorean Theorem. (3c)
- Find the surface area of prisms, pyramids, and other polyhedra. (3d)
- Find the volume of prisms, pyramids, and other polyhedra. (3e)
- Area and perimeter formulas for circles.
- Right-triangle trigonometry: definition of basic trigonometric functions; using trigonometric functions and their inverses to find sides and angles of triangles; using trigonometry to answer questions about real-world situations or polygons that can be dissected into quadrilaterals.

Chapter 4: Scaling Objects and Similar Figures (Quarter 3)

- Scale: scale factors; invariant relationships between scaled copies; area and volume relationships between scaled copies; computing scale factors and using scale factors to compute lengths, areas, and volumes. (4a)
- Apply dilation techniques, using either the ratio method or the parallel method, by hand. (4b)
- Definition of similarity; invariant relationships between similar shapes; area and volume relationships between similar shapes; families of similar shapes; proving that triangles are similar; using similarity to solve problems and prove facts about shapes. (4d)

Chapter 6: Using Triangle Similarity (Quarter 4)

- Identify and use special right triangles without a calculator (6a)
- Identify and use trigonometric ratios (6b)
- Calculate the area of a triangle (6c)
 - Heron's formula
 - Use trigonometry to find area and vice versa

Chapter 5: Area and Volume of Shapes (Quarter 4)

- Areas of regular polygons, sectors, and circles (5a)
- Volumes and surface areas of cylinders, cones, and spheres (5b)

Chapter 7: Coordinate Geometry (Quarter 4)

- Coordinate geometry: using coordinates to describe locations in two and three dimensions; describing transformations using coordinates; (7a)
- Midpoint and distance formulas in two and three dimensions; using coordinate algebra to prove geometric theorems. Geometry in the coordinate plane (2D and 3D) (7b)
- Vectors: using vectors to describe translations; arithmetic of vectors and geometric interpretation; basic properties of vector arithmetic; using vectors to describe motion.