

\$MORENO VALLEY HIGH SCHOOL GEOMETRY CURRICULUM

Course Title: Geometry Course Number: 2034

Department: Mathematics ADS Number: 2034

Prerequisites: None

Length of Course: Year long Credit/PRI Area: .5 credit per semester Grade Level(s): 9-12

COURSE DESCRIPTION

This course is designed to cover the geometric topics of inductive reasoning, geometric terms and symbols, compass and straightedge constructions, line and angle relationships, properties of triangles (SSS, SAS, ASA, SAA), properties of circles, formulas for finding the areas of rectangles, parallelograms, triangles, kites, trapezoids, regular polygons, and circles, conjectures related to the Pythagorean Theorem, formulas for finding the volumes of prisms, pyramids, cylinders, cones, and spheres, and the basic properties of similarity.

SYLLABUS

Topics Covered:

1. Inductive reasoning
2. Geometric terms and symbols
3. Compass and straightedge constructions
4. Line and angle relationships
5. Properties of triangles (SSS, SAS, ASA, SAA)
6. Properties of circles
7. Formulas for finding the areas of rectangles, parallelograms, triangles, kites, trapezoids, regular polygons, and circles
8. Conjectures related to the Pythagorean Theorem
9. Formulas for finding the volumes of prisms, pyramids, cylinders, cones, and spheres
10. Basic properties of similarity.

Skills Emphasized:

1. Problem Solving
2. Critical Thinking
3. Reading Comprehension
4. Understanding Logical Process
5. Seminar
6. Group Work

STRATEGIES: Paideia method

Didaactic: Guided discussion, lecture, research, newspapers, and textbook.

Intellectual Coaching: Students will create their own geometric definitions, proofs, axioms, postulates, and starting points.

Seminar: Critical reading, conflicting viewpoints in writings, coaching, seminar behaviors.

ASSESSMENTS

- **Quizzes and Tests**
- **Essay Questions**
- **Performance Tasks** – I.e. homework, proofs, axioms, postulates
- **Socratic Seminar Rubric** – The framework of the rubric is listed below:
 1. **ACADEMIC SKILLS** – Textual understanding; speaking; listening; knowing how to learn; critical thinking
 2. **SOCIAL SKILLS** – Teamwork; Sensitivity/Good manners
 3. **PERSONAL SKILLS** – Honesty and integrity; Willingness to accept criticism; Responsibility and initiative
- **Teacher Observation** – Group participation and leadership
- **Student Self-Assessment** – Students reflect on what they learned, strengths and weaknesses, and goal setting.

SUGGESTED TEXTBOOKS AND INSTRUCTIONAL MATERIALS

Discovering Geometry An Inductive Approach 2nd Edition by Michael Serra

Taxicab Geometry: An Adventure in Non-Euclidean Geometry by Eugene F. Krause

SUGGESTED TITLES/AUTHORS WEB SITES:

The Thirteen Books of Euclid's Elements Vol. 1 (Books I and II) 2nd Edition -- Translated from the texts of Heiberg

www.earthmeasure.com/index_earth.html (Native American Geometry)

<http://www.montanamath.org/TMME/v2n1/TMMEv2n1a5.pdf> (Taxicab geometry)

SEMINAR PIECES OR USE:

The Thirteen Books of Euclid's Elements Vol. 1 (Books I and II) 2nd Edition -- Translated from the texts of Heiberg

STRAND III: GEOMETRY & TRIGONOMETRY**CONTENT STANDARD 3: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.**

A. BENCHMARK: *Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Interpret and draw two-dimensional objects and find the area and perimeter of basic figures (e.g., rectangles, circles, triangles, other polygons [e.g., rhombi, parallelograms, trapezoids]). 2. Find the area and perimeter of a geometric figure composed of a combination of two or more rectangles, triangles, and/or semicircles with just edges in common. 3. Find and use measures of sides and interior and exterior angles of triangles and polygons to classify figures (e.g., scalene, isosceles, and equilateral triangles; rectangles [square and non-square]; other convex polygons). 4. Interpret and draw three-dimensional objects and find the surface area and volume of basic figures (e.g., spheres, rectangular solids, prisms, polygonal cones), and calculate the surface areas and volumes of these figures as well as figures constructed from unions of rectangular solids and prisms with faces in common, given the formulas for these figures. 5. Demonstrate an understanding of simple aspects of a logical argument: <ul style="list-style-type: none"> • identify the hypothesis and conclusion in logical deduction • use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion 6. Demonstrate an understanding of inductive and deductive reasoning, explain the difference between inductive and deductive reasoning, and identify and provide examples of each: <ul style="list-style-type: none"> • for inductive reasoning, demonstrate understanding that showing a statement is true for a finite number of examples does not show it is true for all cases • unless the cases verified are all cases • for deductive reasoning, prove simple theorems 7. Write geometric proofs (including proofs by contradiction), including: <ul style="list-style-type: none"> • theorems involving the properties of parallel lines cut by a transversal line and the properties of quadrilaterals • theorems involving complementary, supplementary, and congruent angles • theorems involving congruence and similarity • the Pythagorean theorem (tangram proof) 	<p>Sample geometry projects include:</p> <ul style="list-style-type: none"> • Students will recreate Euclid’s books in a yearlong project by creating their own definitions, axioms, proofs and postulates. They will begin with a single point and move through the books. • Students will build a settlement using points, lines, squares, circles, and triangles only. Chaco Canyon will be discussed as a geometric form. • Students will deduce the geometry of the Anasazi roads. • Students will design a town using taxicab geometry. <p>Textbook references include:</p> <ul style="list-style-type: none"> • Chapter 9.1-9.5 Area • Chapter 3.1 Duplicating Segments and Angles • Chapter 9.7 Surface Area • Chapter 11 Volume • Chapter 11.1 Polyhedrons, Prisms, and Pyramids • Chapter 14 Deductive Reasoning • Chapter 14.1 “That’s Logical” <p>Chapter 1 Inductive Reasoning Ch 1.1 – 1.7 Chapter 14.1 – 14.10</p> <p><i>The Thirteen Books of Euclid’s Elements Vol. 1 (Books I and II)</i></p> <p>Chapter 15 Geometric Proof <i>The Thirteen Books of Euclid’s Elements Vol. 1 (Books I and II)</i> Chapter 3.5 Constructing Parallel Lines Chapter 4.1 Discovering Angle Relationships Chapter 4.2 Discovering Properties of Parallel Lines Chapter 5 Triangle Properties Chapter 10 Pythagorean Theorem</p>

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CONTENT STANDARD 3: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.

B. BENCHMARK: *Specify locations and describe spatial relationships using coordinate geometry and other representational systems.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Demonstrate understanding of the construction of the coordinate plane, know the names of the origin, coordinate axes and four quadrants, draw and label them correctly, find the coordinates of an indicated point, and plot a point with given coordinates. 2. Determine the midpoint and distance between two points within a coordinate system and relate these ideas to geometric figures in the plane (e.g., find the center of a circle given two endpoints of a diameter of the circle). 3. Given two linear equations, determine whether the lines are parallel, perpendicular, or coincide. 4. Use basic geometric ideas (e.g., the Pythagorean theorem, area, and perimeter of objects) in the context of the Euclidean Plane, calculate the perimeter of a rectangle with integer coordinates and sides parallel to the coordinate axes and with sides not parallel. 	<p>See sample projects listed above.</p> <p>Textbook references include:</p> <ul style="list-style-type: none"> • Chapter 4.3 Midpoint and Slope Conjectures • Chapter 4.3 Midpoint and Slope Conjectures • Chapter 7.3 Discovering Tangent Properties • Chapter 4.4 Slopes of Parallel and Perpendicular Lines • Chapter 4.4 Slopes of Parallel and Perpendicular Lines <p><i>The Thirteen Books of Euclid's Elements Vol. 1 (Books I and II)</i></p>

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CONTENT STANDARD 3: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.

C. BENCHMARK: *Apply transformations and use symmetry to analyze mathematical situations.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ul style="list-style-type: none"> • Describe the effect of rigid motions on figures in the coordinate plane and space that include rotations, translations, and reflections: determine whether a given pair of figures on a coordinate plane represents the effect of a translation, reflection, rotation, and/or dilation sketch the planar figure that is the result of a given transformation of this type <ol style="list-style-type: none"> 2. Deduce properties of figures using transformations that include translations, rotations, reflections, and dilations in a coordinate system: <ul style="list-style-type: none"> • identify congruency and similarity in terms of transformations 	<p>See sample projects listed above.</p> <p>Textbook references include:</p> <ul style="list-style-type: none"> • Chapter 8.2 Properties of Isometries • Chapter 8.6 Tessellations using only Translations • Chapter 8.7 Tessellations That use Rotations • Chapter 8.8 Tessellations That use Glide Reflections • Chapter 8.1 Transformations • Chapter 8.2 Properties of Isometries

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ul style="list-style-type: none"> determine the effects of the above transformations on linear and area measurements of the original planar figure 	<ul style="list-style-type: none"> Chapter 8.6 Tessellations using only Translations Chapter 8.7 Tessellations That use Rotations Chapter 8.8 Tessellations That use Glide Reflections

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D. BENCHMARK: Use visualization, spatial reasoning, and geometric modeling to solve problems.

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> Solve real-world problems using congruence and similarity relationships of triangles (e.g., find the height of a pole given the length of its shadow). Solve problems involving complementary, supplementary, and congruent angles. Solve problems involving the perimeter, circumference, area, volume, and surface area of common geometric figures (e.g., 'Determine the surface area of a can of height h and radius r. How does the surface area change when the height is changed to $3h$? How does the surface area change when the radius is changed to $3r$? How does the surface area change when both h and r are doubled?'). Solve problems using the Pythagorean theorem (e.g., 'Given the length of a ladder and the distance of the base of the ladder from a wall, determine the distance up the wall to the top of the ladder'). Understand and use elementary relationships of basic trigonometric functions defined by the angles of a right triangle (e.g., 'What is the radius of a circle with an inscribed regular octagon with the length of each side being exactly 2 feet?'). Use trigonometric functions to solve for the length of the second leg of a right triangle given the angles and the length of the first leg. (e.g., 'A surveyor determines that the angle subtended by a two-foot stick at right angles to his transit is exactly one degree. What is the distance from the transit to the base of the measuring stick?'). Know and use angle and side relationships in problems with special right triangles (e.g., 30-, 45-, 60-, and 90-degree triangles). 	<p>See sample projects listed above.</p> <p>Textbook references include:</p> <ul style="list-style-type: none"> Chapter 5.6 Flow-Chart Thinking Chapter 15.4 Proving Angle Conjectures Chapter 9 Area (Chapter 9.1-9.7) Chapter 11 Volume Chapter 10 Pythagorean Theorem Chapter 10.3 Word Problems Chapter 10.6 Return of the Word Problems Chapter 13 Trigonometry Chapter 13.5 Problem Solving with Trigonometry Chapter 13.3 Law of Sines Chapter 13.4 Law of Cosines