Marietta City Schools

2023–2024 District Unit Planner

Geometry: Concepts & Connections

Unit title	Unit 2: Geometric Foundations, Constructions, and Proof	**MYP year**	5	**Unit duration (hrs)**	13 hours

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GA DoE Standards

Standards

8.FGR.7*: Justify and use various strategies to solve systems of linear equations to model and explain realistic phenomena. **(integrate with G.GSR.4.4)**

8.FGR.7.2 Show and explain that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because the points of intersection satisfy both equations simultaneously

8.FGR.7.5 Create and compare the equations of two lines that are either parallel to each other, perpendicular to each other, or neither parallel nor perpendicular.

A.GSR.3*: Solve problems involving distance, midpoint, slope, area, and perimeter to model and explain real-life phenomena. **(integrated with G.GSR.4.1 and G.GSR.4.2)**

A.GSR.3.1 Solve real-life problems involving slope, parallel lines, perpendicular lines, area, and perimeter.

A.GSR.3.2 Apply the distance formula, midpoint formula, and slope of line segments to solve real-world problems.

G.GSR.4: Establish facts between angle relations and generate valid arguments to defend established facts. Prove theorems and solve geometric problems involving lines and angles to model and explain real-life phenomena.

G.GSR.4.1 Use the undefined notions of point, line, line segment, plane, distance along a line segment, and distance around a circular arc to develop and use precise definitions and symbolic notations to prove theorems and solve geometric problems.

Fundamentals

• Students should be provided opportunities to build a conceptual understanding of a point, line, line segment, plane, arc, and angle through modeling and exploration of real-life phenomena.

• Students should attend to precision when using definitions and symbolic notations.

• Students should be able to apply the Segment Addition Postulate and Angle Addition Postulate to solve real-life problems.

• Students should read, write, use, and interpret symbolic notation for point, line, plane, line segment, angle, circle, arc, perpendicular line, and parallel line

G.GSR.4.2 Classify quadrilaterals in the coordinate plane by proving simple geometric theorems algebraically.

Fundamentals

• Students should build on their existing understanding of the slope of a line segment developed in the Algebra: Concepts and Connections course.

• Students should be able to classify quadrilaterals as parallelograms (including rectangles, rhombi, and squares) using sides, angles, and diagonals.

• Students should be able to apply their understanding of slope of a line segment, as well as distance and midpoint formulas to classify quadrilaterals in the coordinate plane.

G.GSR.4.3 Make formal geometric constructions with a variety of tools and methods.

Strategies and Methods

• Students should have opportunities to use a variety of tools, which might include a compass & straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.

Fundamentals

• Students should be able to:

o Copy a segment and angle.

o Bisect a segment and angle.

o Construct perpendicular lines, including the perpendicular bisector of a line segment.

o Construct a line parallel to a given line through a point not on the line.

G.GSR.4.4 Prove and apply theorems about lines and angles to solve problems.

Fundamentals

• Students should be given opportunities to precisely prove vertical angles are congruent.

• Students should be given opportunities to explore using visual tools in order to precisely prove when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent.

• Students should be provided with opportunities to analyze and apply theorems about lines and angles from the context of parallel lines cut by a transversal to make sense of relationships between lines and angles.

• Students should be given opportunities to precisely prove that points on the perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

• Students should be able to show and explain their reasoning used to generate their proof.

Relevance and Application

• Students should be able to apply theorems to solve problems and to prove relationships in geometric figures by applying geometric and algebraic reasoning.

G.GSR.4.5 Use geometric reasoning to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Strategies and Methods

• Use informal (visual) construction with tools (patty paper, protractor, etc.) to discover the angle relationships between angles formed when two lines are cut by a transversal.

• When using more than one transversal, tie into similar triangles and to set up problems using triangle sum relationships (angle sum).

Terminology

• Including identifying alternate exterior angles, alternate interior angles, linear pairs, same side interior angles, same side exterior angles, and corresponding angles.

Example

• For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.

G.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

G.MM.1.1 Explain mathematically applicable problems using a mathematical model.

Fundamentals

• Students should be provided with opportunities to learn mathematics through the exploration of real-life problems.

• Mathematically applicable problems are those presented in context where the context makes sense, realistically and mathematically, and allows for students to make decisions about how to solve the problem (model with mathematics).

G.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.

Fundamentals

• Students should be able to use the content learned in this course to create a mathematical model to explain real-life phenomena.

G.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a mathematically applicable situation.

Fundamentals

• Students should be able to connect learning of geometric shapes and their properties to describe objects.

• Students should be able to apply geometric methods and data to make decisions about structures and solve real-world problems.

G.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.

Fundamentals

• Students should be able to construct a model by selecting and creating algebraic and geometric representations that describe relationships between variables in context.

Concepts/Skills to support mastery of standards

- parallel /perpendicular
- Slope
- Writing of expressions
- congruent

Vocabulary

Angle Bisector	Alternate Exterior Angles	Alternate Interior Angles	Compass	Construction	Corresponding Angles
Distance Formula	Line	Line Segment	Linear Pairs	Midpoint	Perpendicular Bisector
Parallelogram	plane	Planar Region	Point	Proof	Protractor
Ray	Same Side / Consecutive Interior Angles	Same Side / Consecutive Exterior Angles	Rectangle	Theorem	Vertical Angles

Vocabulary Point Alternate Exterior Angles, Alternate interior angles, Angle, angle bisector, Arc, Bisect, classify, Compass, Congruent, Construction, Corresponding Angles, Line, Distance Formula, Line segment, Linear Pair, Midpoint, Notation,Parallel, Parallelogram, Perpendicular, Plane, Point, Postulate, Proof, Protractor, Prove, Quadrilateral, Ray, Rectangle , Rhombus, Same-side interior angles/consecutive angles, Slope, Square, Slope, Supplementary, Theorem, Transversal, Vertical angles

Notation

$\overline{AB}$, $\measuredangle$ABC,

Key concept	Related concept(s)	Global context
Relationship	Models, Generalization	Scientific and Technical Innovation, Systems, models, methods; products, processes and solutions

Statement of inquiry

Students will explore relationships and generalizations in order to represent geometric constructions.

Inquiry questions
Factual— ● What are the angle relationships in parallel lines? ● What are the characteristics of a specific quadrilateral? ● How can the segment addition postulate be used to find length? **Conceptual—** ● What are the similarities and differences of parallel and perpendicular lines? ● What is the most appropriate formula to find the length of a segment? **Debatable-** ● Which process is more appropriate when finding interior and exterior angles of a triangle or a quadrilateral? ● How do you use the properties of geometric constructions to create them?

MYP Objectives	**Assessment Tasks**	
*What specific MYP **objectives** will be addressed during this unit?*	***Relationship** between summative assessment task(s) and statement of inquiry:*	*List of common formative and summative assessments.*
MYP B: Investigating patterns (i, ii) MYP A: Knowing and understanding (i, ii)	Students will explore the angles created by parallel lines and apply this knowledge to unfamiliar situations to create models for all angle relationships.	**Formative Assessment(s):** MYP B: Angles formed by parallel lines TOTD - Triangle Sums CFA - Quadrilaterals **Summative Assessment(s):** MYP A

Approaches to learning (ATL)
Category: Thinking Skills **Cluster:** Transfer **Skill Indicator:** Combine knowledge, understanding and skills to create products or solutions

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
• **G.GSR.4.3** Make formal geometric constructions with a variety of tools and methods. • **G.GSR.4.4** Prove and apply theorems about lines and angles to solve problems. • **G.GSR.4.5** Use geometric reasoning to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	**Lines and Angles - Explore (Lines, Transversals, and Angles, Desmos)** **Description:** In this learning plan, students explore the relationship among angles formed by a transversal and a system of two lines to prove the Triangle Sum Theorem: the sum of all angle measures in any triangle is `180` degrees. In particular, they consider what happens when the two lines are parallel vs. when they are not. Students solve angle puzzles to apply what they've learned about angle relationship **Learning Goals** • I can use the relationship between angles formed by parallel lines cut by a transversal. • I can prove why the sum of the interior angles of a triangle is 180 degrees. • I can use algebraic properties to find angle measures by applying the properties of parallel lines angle relationships.	• Scaffolding Notes outline for the Desmos Activities • Preview Vocabulary, Graphic Organizer

Content Resources

Textbook Correlation: enVision A|G|A - Geometry

G.GSR.4.1 - Lesson 1-1, 10-1, Topic 1 - Mathematical Modeling in 3 Acts
G.GSR.4.2 - Lesson 9-1, 9-2
G.GSR.4.3 - Lesson 1-2
G.GSR.4.4 - Lesson 1-7, 2-1, 2-3, 5-1
G.GSR.4.5 - Lesson 2-1, 2-3, 7-3, 7-5