Unit 3: Parallel Lines and Planes

Content Area: **Mathematics**
Course(s): **Geometry, Honors Geometry**
Time Period: **October**
Length: **3 weeks**
Status: **Published**

Unit Overview

- Apply the properties of parallel lines to solve real life problems.
- Construct parallel lines using a straightedge and a compass.
- Describe the different relationships between lines. Identify and describe the angles formed by parallel and intersecting lines.
- Find the slope of lines on a coordinate plane.
- Solve problems with and construct proofs using the properties of parallel lines.
- Use algebra and properties of parallel/perpendicular lines to prove lines are parallel or perpendicular.
- Write equations of parallel and perpendicular lines.

Enduring Understandings

- Mathematics can be learned through problem solving, inquiry, and discovery.
- Spatial relationships can be clearly described with geometric properties.
- Valid argument and presentation of clearly conclusive evidence is essential to writing a proof.

Essential Questions

- How are geometric properties used in proofs?
- How can inquiry and discovery infuse the power and usefulness of mathematics?
- What are the benefits of finding different methods for solving problems?
- What are valid justifications in proofs and why are they necessary?

Student Learning Objectives

- To classify triangles according to sides and to angles
- To distinguish between intersecting lines, parallel lines, and skew lines
- To find the measure of interior angles and exterior angles of convex polygons
- To identify the angles formed when two lines are but by a transversal
- To recognize and name convex polygons and regular polygons
- To state and apply the postulates and theorems about parallel lines
- To state and apply the theorem about the intersection of two parallel lines by a third plane
- To state and apply the theorem about the measure of an exterior angle of a triangle

- To state and apply the theorems about a parallel and a perpendicular to a given line through a point outside a line
- To state and apply the thorem and the corollaries about the sum of the measures of the angles of a triangle
- To understand and use inductive reasoning

Standards

	Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MA.G-CO.B	Understand congruence in terms of rigid motions
MA.G-CO.C	Prove geometric theorems
	Geometry

Indicators

MA.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MA.G-CO.B.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

MA.G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
MA.G-CO.C.9	Prove theorems about lines and angles. An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material. Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.) During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.

Lesson Titles

- Angles formed by parallel and intersecting lines
- Constructing paralllel lines
- Equations of parallel and perpendicular lines
- Properties of parallel lines
- Prove lines are parallel or perpendicular
- Slope of lines

Career Readiness, Life Literacies & Key Skills

WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RL.9-10.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word

	choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
LA.RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) and make relevant connections, to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RI.9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.WHST.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Instructional Strategies. Learning Activities. and Levels of Blooms/DOK:

- Intro. applying theorems of special angles of parallel lines cut by a transversal
- Intro. convex and concave polygons
- Intro. corollaries associated to the sum of the angles of a triangle
- Intro. find the sum of the angles of any convex polygon
- Intro. finding angle measures of convex polygons
- Intro. finding missing angle measures of a triangle
- Intro. finding the measure of the exterior angle of a triangle
- Intro. finding the sum of the measures of the exterior angles of a convex polygon
- Intro. how to classify a triangle by its angles
- Intro. how to classify a triangle by its sides
- Intro. how to prove lines are parallel
- Intro. inductive reasoning and when to use it to solve proofs.
- Intro. parallel lines cut by a plane
- Intro. parallel lines, intersecting lines,and skew lines
- Intro. parallel planes
- Intro. properties of parallel lines
- Intro. regular and non-regular polygons
- Intro. special angles formed by parallel lines cut by a transversal
- Intro. special angles formed by two lines cut by a transversal
- Intro. the sum of the angles of a triangle theorem

- Review anticipatory Set
- Review Homework
- Review Quiz
- Review standardized-test practice questions for warmup
- students will take a quiz on parallel llines and their applicaitons

Modifications:

ELLs Modifications

- 1:1 testing
- Offer alternate/or modify assessments
- Tap prior knowledge
- Tutoring during Delsea One
- Utilize explicit learning strategies that are well planned in advance (intentional planning)

IEP & 504 Modifications

- direct teaching and/or assistance for organization, social skills/peer interactions
- math tests could have formula's available on the test and/or sample problems
- modeling and showing lots of examples
- Tutoring during Delsea One

G&T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- Encourage students to explore concepts in depth and encourage independent or investigations
- Modeling
- Tutoring during Delsea One

At Risk Modifications

- Additional help during tutoring/Delsea One/Academic Enrichment
- Retesting
- Speaking to students privately when redirecting behaviors
- Study Guides

- Tutoring during Delsea One

Alternative Assessment

Performance tasks
Project-based assignments
Problem-based assignments
Presentations

Benchmark Assessment

Skills-based assessment- math practice

Formative Assessment

- closure state which lines are parallel and why
- closure using angle relationships to find measures
- journal write
- pass out of class
- think-pair-share
- warm up parallel angle relationships
- warm up why lines are parallel

Summative Assessment

- Alternate Assessment
- Marking Period Assessment
- Test proving lines parallel using angles and slope
- Test using parallel lines to solve for angle measures

Resources & Technology

Resources and Materials

- Geometry Text Book- McDougal – Littell
- Manipulatives
- Protractors
- Ruler
- Study Guide and Practice Sheet – Glencoe/McGraw Hill
- Teacher Created worksheets
- Teacher Generated worksheets

Technology

- Geometer sketchpad
- Mathxl
- Smart Board
- Ti-84 calculator
- Videos

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.