Unit 06: Parallel Lines and Related Figures

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 14**
Length: **3 Weeks**
Status: **Published**

Unit Overview

In this unit, students will study parallel lines and special quadrilaterals. First, they will identify and define parallel lines and the angle pairs that are formed by a transversal that intersects two parallel lines. They will be able to find missing measurements and use the properties of the angle pairs when writing proofs. Students will also use these angle relationships to prove that lines are parallel. They will identify and use the properties of special quadrilaterals including squares, rectangles, parallelograms, rhombi, trapezoids, and kites. Students will be able to find missing measurements, prove properties regarding special quadrilaterals, and prove that a figure is one of the special quadrilaterals.

Standards

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.C.9	Prove theorems about lines and angles.
MA.G-CO.C.11	Prove theorems about parallelograms.
MA.G-CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).
MA.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically.
MA.G-GPE.B.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Essential Questions

1) Why is proof necessary?

2) How can lines be proven to be parallel?

3) How can the parallel lines that are contained within squares, rectangles, parallelograms, and trapezoids be used to prove properties of these polygons?

Application of Knowledge and Skills...

Students will know that...

- 1) parallel lines are coplanar lines that do not intersect and cannot be assumed from a diagram.
- 2) lines can be proven parallel by either proving that corresponding, alternate interior, or alternate exterior angles are congruent or that same side interior or same side exterior angles are supplementary.
- 3) if two parallel lines are cut by a transversal, then any pair of the angles formed are either congruent or supplementary.
- 4) the special quadrilaterals, squares, rectangles, parallelograms, rhombi, trapezoids, and kites, contain parallel lines and/or perpendicular bisectors.
- 5) to prove that a figure is one of the special quadrilaterals, one must be sure to prove sufficient properties to establish the quadrilateral's identity.

Students will be skilled at...

Students will be able to:

- a) identify and solve problems pertaining to parallel lines and the angle pairs that are formed by parallel lines and transversals.
- b) prove that lines are parallel.
- c) use the Parallel Postulate and theorems regarding angle pairs that are formed by parallel lines and transversals when writing proofs.
- d) use properties of special quadrilaterals to find missing measurements and write proofs.
- e) prove that figures are special quadrilaterals.

Assessments

- Daily Formative Assessments Formative: Other written assessments Formative assessments, such as Do-Now assignments, homework assignments, Tickets-to-Leave, and SmartPal response board practice problems, will provide daily data for teachers.
- Pre-Assessment Diagnostic: Other written assessments Students will be assessed on their prior knowledge of parallel lines, angle pairs of parallel lines, classification of quadrilaterals, and the properties of quadrilaterals.
- Unit Quiz Formative: Written Test Students will be assessed on defining parallel lines, finding missing measurements in figures containing parallel lines, and proving lines are parallel.
- Unit Test Summative: Written Test Students will be assessed on defining parallel lines, finding missing measurements in figures containing parallel lines, proving lines are parallel, using properties to find missing measurements and write proofs, and proving figures are special quadrilaterals.

Activities

Communicator Practice

Students will complete differentiated practice problems on SmartPal response boards.

Cooperative Problem-Solving

Students will work cooperatively on challenge problems. This work may be presented by students, discussed as a class, or submitted for grading and comments.

Definition of Parallel Lines Investigation

Students will draw a figure of a rectangular prism and use it to visualize the definitions of parallel, intersecting, and skew lines.

Proving Lines are Parallel Investigation

Students will diagonally cut an index card and use it to draw two lines that intersect a third line. They will use their knowledge of corresponding angles to discover that if corresponding angles are congruent, then two lines are parallel.

Proving that Quadrilaterals are Parallelograms Investigation

Students will use measured straws in their investigation to discover two methods that can be used to prove that a quadrilateral is a parallelogram. (If both pairs of opposite sides of a quadrilateral are congruent, then it is a parallelogram, and if one pair of opposite sides of a quadrilateral is parallel and congruent, then it is a parallelogram.)

Activities to Differentiate Instruction

Interactive Smartboard Activities will be utilized.

Students will work in mixed-level groups.

Students will be assigned optional and mandatory challenge problems on homework assignments.

Enrichment worksheets will be available for classwork and/or homework.

Guided notes and study guides will be provided accordingly.

Appropriately-leveled problems for students to complete. Proofs can range from having few steps to requiring multiple steps using multiple geometric figures.

Integrated/Cross-Disciplinary Instruction

- Students will understand that writing geometry proofs is similar to writing persuasive essays. They must take given information, build supporting details, and draw a conclusion.
- Students will build connections between geometry and engineering by discovering techniques in which one can prove that two segments are parallel. These methods can be used in order to prove that two objects are parallel to each other.

Resources

McDougal Littell *Geometry for Enjoyment and Challenge* textbook and resources

Smartboard

Smart Exchange

McDougal Littell *Activity Generator* CD-ROM (Geometry 3.1, 3.3, and 8.3 investigations)

Rulers

Straws and string (for investigations)

Smart Exchange

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.