Unit 03 Parallel and Perpendicular Lines

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 1**
Length: **3 weeks**
Status: **Published**

Brief Summary of Unit

Students will learn the precise definition of parallel lines. They will prove theorems about lines and angles and make formal geometric constructions. Students will also partition directed line segments and use the slope criteria for parallel and perpendicular lines.

Revision Date: July 2024

Standards

Students will analyze geometric designs which connect to various cultures. Embracing the diversity within society incorporates the following:

Amistad Commission

This unit also reflects the goals of the Department of Education and the Amistad Commission including the infusion of the history of Africans and African-Americans into the curriculum in order to provide an accurate, complete, and inclusive history regarding the importance of of African-Americans to the growth and development of American society in a global context.

Asian American and Pacific Islander History Law

This unit includes instructional materials that highlight the history and contributions of Asian Americans and Pacific Islanders in accordance with the New Jersey Student Learning Standards in Social Studies.

New Jersey Diversity and Inclusion Law

In accordance with New Jersey's Chapter 32 Diversity and Inclusion Law, this unit includes instructional materials that highlight and promote diversity, including:

economic diversity, equity, inclusion, tolerance, and belonging in connection with gender

and sexual orientation, race and ethnicity, disabilities, and religious tolerance.

1	Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning.
3	Valuing Evidence in Argumentation: Constructing viable claims and evaluating, defending, challenging, and qualifying the arguments of others.
4	Building Knowledge: Building strong content knowledge and connecting ideas across disciplines using a variety of text resources and media.
3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
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.
3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
G.CO.C.9	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
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.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
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).
TEC.K-12.8.1	All students will use computer applications to gather and organize information and to solve problems.
TEC.K-12.8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual society, and the environment.
WORK.K-12.9.1	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.
WORK.K-12.9.2	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.

Essential Questions

- How do you prove that two lines are parallel or perpendicular?
- How do you write the equation of a line in the coordinate plane?
- What special angle relationships can be formed using parallel, perpendicular, and intersecting lines?

Enduring Understandings

- Corresponding angles, alternate interior angles, and alternate exterior angles are congruent and same-side interior angles are supplementary only if the lines being cut by the transversal are parallel. These are the parallel line postulates and theorems.
- The definition of perpendicular lines can be extended to prove three theorems relating to perpendicular lines: if two lines are perpendicular, then they form congruent adjacent angles; if two lines meet to form congruent adjacent angles, then the lines are perpendicular; and if the exterior sides of two adjacent acute angles are perpendicular, then the angles are complementary.
- Two lines can either be parallel, intersecting, or skew.
- Two points determine a unique line and three non-collinear points determine a unique plane.

Students Will Know

- Definitions, algebraic properties, geometric postulates, and previously proven theorems are used as reasons in a formal statement/reason geometric proof.
- How to describe relationships formed by parallel lines and a transversal.
- How to identify perpendicular lines.
- How to write equations of parallel and perpendicular lines.
- Prove theorems involving parallel and perpendicular lines.
- The definitions of supplementary angles, complementary angles, and vertical angles.

Students Will Be Skilled At

- Constructing parallel lines.
- Constructing perpendicular lines and perpendicular bisectors.
- Identifying lines and planes.
- Identifying pairs of angles formed by transversals.
- Identifying parallel and perpendicular lines.
- Proving theorems about identifying parallel lines.
- Proving theorems about parallel lines.
- Proving theorems about perpendicular lines.
- Using properties of parallel lines to find angle measures.
- Using slopes to identify parallel and perpendicular lines.
- Using theorems to identify parallel lines.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform

problems, Albert/AP Classroom and/or Big Ideas Math unit assessments

- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

Unit 3: Chapter 3, Parallel and Perpendicular Lines (2 days per topic, 1 day construction, 2 days practice, 2 days review, 2 days assessment for 16 days)

- Pairs of Lines and Angles
    - Identifying Lines and Plans, vocabulary (skew)
    - Identifying Parallel and Perpendicular lines
    - Identifying pairs of angles formed by transversals
- Parallel Lines and Transversals
    - Use Properties of Parallel Lines
    - Algebra review with pairs of angles, solving equations
- Proofs with Parallel Lines
    - Use Converse Theorems to prove Parallel Lines
    - Construct Parallel Lines
    - Proofs with Parallel Lines
- Proofs with Perpendicular Lines
    - Find Distance from a Point to a Line
    - Construct Perpendicular Lines

    - Proofs with Perpendicular Lines

- Equations of Parallel and Perpendicular Lines
    - Identifying Parallel and Perpendicular Lines
    - Writing Equations of Parallel and Perpendicular Lines

Materials

Core instructional materials: Core Book List including Big Ideas Math Common Core Geometry

Supplemental materials: Khan Academy, Edia, DeltaMath

- District approved textbook and ancillary materials.
- Online resources: Khan Academy, Delta Math, Edia, Geogebra
- Teacher created activiites
- Teacher created notes

Suggested Strategies for Modifications

Possible accommodations/modification for Geometry CP