Unit 01 Basics of Geometry

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

Brief Summary of Unit

In this unit, students will learn precise definitions of line segment and angle, which are based on the undefined notions of point and line. They will make formal geometric constructions and find perimeters and areas of polygons in the coordinate plane. Students will also use geometric shapes, their measures, and their properties to describe objects.

Revision Date: July 2024

Standards

Students will analyze geometric designs which connects 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.

ELA.K-12.1	Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning.
ELA.K-12.2	Adapting Communication: Adapting communication in response to the varying demands of audience, task, purpose, and discipline.
ELA.K-12.3	Valuing Evidence in Argumentation: Constructing viable claims and evaluating, defending, challenging, and qualifying the arguments of others.
ELA.K-12.4	Building Knowledge: Building strong content knowledge and connecting ideas across disciplines using a variety of text resources and media.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.G.GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
MATH.9-12.G.MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
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 can you describe the attributes of a segment or angle?
- How can you represent a three-dimensional figure with a two-dimensional drawing?
- What are the building blocks of geometry?
- What special angle relationships can be formed using parallel, perpendicular, and intersecting lines?

Enduring Understandings

- Algebraic equations will be used in conjunction with the definition of supplementary angles, vertical angles, and complementary angles to find the measures of angles.
- Algebraic equations will be used in conjunction with the segment addition postulate and the angle addition postulate to find the lengths of segments and the measure of angles.
- Geometry is a field of study that analyzes spatial relationships which are developed by reasoning from the known to the unknown. All concluusions must have clear mathematical justification.
- Perimeter and area are two different ways of measuring the size of geometric figures.
- Precise inspection and labeling is crucial to the study of geometry.
- The intersection of two lines is a point and the intersection of two planes is a line.
- 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

- A segment has an infinite number of segment bisectors and an angle has only one angle bisector.
- How to construct segments and angles.
- How to measure segments and angles.
- Key terms: undefined terms (point, line, plane), definitions (segment, midpoint of a segment, bisector of a segment, collinear points, ray, parallel lines, intersecting lines, skew lines, angles, acute angles, obtuse angles, right angles, straight angles, adjacent angles, vertical angles, supplementary angles, complementary angles, bisector of an angle), postulates (Segment Addition Postulate, Angle Addition Postulate), theorems, corresponding angles, alternate interior angles, alternate exterior angles, and same-side interior angles.
- The definitions of supplementary angles, complementary angles, and vertical angles.

Students Will Be Skilled At

- Classifying and describing polygons.
- Constructing a segment bisector.
- Constructing an angle bisector.
- Constructing congruent angles.
- Copying a line segment.
- Defining and naming segments and rays.
- Describing a point, a line, and a plane.
- Explaining and using the Segment Addition Postulate.
- Finding angle measures in pairs of angles.
- Finding angle measures.
- Finding the distance between two points.
- Finding the lengths of segments.
- Finding the midpoint of a segment.
- Finding the perimeters and areas of polygons in the coordinate plane.

- Identifying complementary and supplementary angles.
- Identifying linear pairs and vertical angles.
- Measuring a line segment.
- Measuring and classifying angles.
- Sketching intersections of lines and planes.

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 1: Chapter 1, Basics of Geometry (1-2 days per topic, 12 days instruction, 4 days practice or review, 3 days assessment, 19 days total)

This unit, and many subsequent units in Geometry are rich with new vocabulary for students. Teachers can decide the best way for students to manage and maintain this new vocabulary. It can be overwhelming for many students. During this first unit, students should understand that mastering the new vocabulary with provide a strong foundation for the entire course and that each unit will have new vocabulary that will need to be understood.

Short quizzes throughout the unit culminating in a large unit test.

- Points, Lines, and Planes: 1.1
    - Describe a point, a line, and a plane.
    - Define and name segments and rays.
    - Sketch intersections of lines and planes.
- Measuring and Constructing Segments 1.2
    - Measure a line segment.
    - Copy a line segment**
    - Explain and use the Segment Addition Postulate.
        - Make sure to differentiate between congruent and equal, including the symbols
        - Use supplemental material for algebraic review with Segment Addition.
- Using Midpoint and Distance Formulas 1.3
    - Find lengths of segments
    - Construct a segment bisector **
    - Find the midpoint of a segment using the Midpoint Formula
    - Find the distance between two points using the Distance Formula
        - Students should memorize the formulas
        - Remind students that in Algebra 1, they simplified radicals. In Geometry, we are interested in the approximate distance, so we use the symbol for approximate and a calculator to find the approximate value.
- Perimeter and Area in the Coordinate Plane 1.4
    - Classify and describe polygons
    - Find perimeter and area of polygons in the coordinate plane, incorporating the distance formula and given formulas for Area and Perimeter
- Measuring and Constructing Angles including Perpendicular Bisectors 1.5
    - Classify and name angles
    - Measure angles using a protractor
    - Find angle measures

- Construct congruent angles **
- Construct an angle bisector**

- Describing Pairs of Angles 1.6
  - Identify complementary and supplementary angles
  - Identify linear pairs and vertical angles
  - Find angle measures in pairs of angles.

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
- Khan Academy, Edia, Delta Math, IXL, Geogebra, embedded videos for constructions
- Teacher created activiites
- Teacher created notes

Suggested Strategies for Modifications

Possible accommodations for Geometry CP