Wall Township Public Schools	Board Approval Date: 8/19/2025

Course Title: Geometry Honors

Course Description: This course focuses on developing a strong foundation in the principles and applications of geometry. Students will explore the properties and relationships of points, lines, angles, shapes, and solids through logical reasoning and problem-solving. Key topics include congruence, similarity, parallel and perpendicular lines, right triangles and trigonometry, circles, area and volume, and coordinate geometry. Emphasis is placed on understanding geometric proofs, applying formulas, and enhancing spatial visualization skills. This course prepares students for advanced mathematics and everyday practical use.

New Jersey Student Learning Standards - Mathematics

Vision for Mathematics Education in New Jersey

A New Jersey education in Mathematics builds quantitatively and analytically literate citizens prepared to meet the demands of college and career, and to engage productively in an information-driven society. All students will have access to a high-quality mathematics education that fosters a population that:

- leverages data in decision-making and as a lens for discussing, analyzing, and responding to practical questions.
- persists to make sense of and model problems arising in everyday life, society, and the workplace.
- thinks critically and strategically to assess quantitative relationships and to solutions to complex

problems.

- employs precise reasoning and constructs viable arguments to deduce conclusions, recognize false statements and assess peers' reasoning.
- interprets, evaluates and critiques the mathematics embedded in social, scientific and commercial systems, as well as the claims made in the private and public sectors.
- communicates precisely when conveying, representing, and justifying both qualitative and quantitative perspectives.

Standards for Mathematical Practice*

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

**See end of document for additional information related to the mathematical practices.*

Inclusion of Climate Change Opportunities

( ) notes opportunities to integrate specific examples of climate change education provided by additional age-appropriate resources

The goal of inclusion of climate change education implementation is to foster generations of New Jersey students that can analyze, question, interpret, to think independently, and bring critical deduction to fulfill, and to lead in jobs created by burgeoning industries of the future green economy.

Course Sequence & Pacing	
Unit Title	**Estimated Number of Instructional Periods****
Unit 1: Tools of Geometry	10
Unit 2: Angles and Geometric Figures	13
Unit 3: Logical Arguments and Line Relationships	12
Unit 4: Transformations and Symmetry	11
Unit 5: Triangles and Congruence	11
Unit 6: Relationships in Triangles	13
Unit 7: Quadrilaterals	11
Unit 8: Similarity	10

Unit 9: Right Triangles and Trigonometry	11
Unit 10: Circles	13
Unit 11: Measurement	15
Total Instructional Periods	130

**Instructional periods are scheduled for 56 minutes. Classes meet 3 days every 4 days.

Instructional Notes

The Standards for Mathematical Content

The high school standards specify the mathematics that all students should study in order to be college and career ready. The high school standards are listed in conceptual categories and not course specific. It is important for instructors to pay close attention to the supplemental documents which align standards to courses and include clarifications on multi-course standards.

Students should spend the majority of their time on the major work of the grade (M). Supporting work (S) and, where appropriate, additional work (A) can engage students in the major work of the grade. See linked document for specifics.

Additional resources can be found at the end of this document.

(+) Indicates honors course only which includes Geometry Grade 8.
(++) Indicates math courses beyond geometry but may be taught if time allows in honors and Geometry Grade 8.

Unit 1

Desired Results

Unit 1 Title: Tools of Geometry

Unit Summary: In this unit, students will be introduced to the foundational concepts and instruments essential for exploring and understanding geometry. Students will engage with the basic undefined terms—point, line, and plane—and learn how these building blocks form the basis of all geometric reasoning. Through hands-on use of geometric tools such as rulers, protractors, compasses, and coordinate grids, students develop precision in measuring and constructing figures. The unit emphasizes the importance of clear mathematical language and notation to describe geometric relationships accurately. Additionally, students will explore basic geometric constructions and develop logical reasoning skills needed to justify these constructions. This unit lays the groundwork for more advanced topics in geometry by reinforcing the critical balance between visual intuition and formal mathematical reasoning.

Learning Standards

NJSLS Math:
Geometry
CONGRUENCE G.CO

- **A. Experiment with transformations in the plane**
  - **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.
- **D. Make geometric constructions**

- **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 perpendicular bisector of a line segment, and constructing a line parallel to a given line through a point not on the line.

MODELING WITH GEOMETRY G.MG ★

- **A. Apply geometric concepts in modeling situations**
  - **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).

Expressing Geometric Properties with Equations

- **B. Use coordinates to prove simple geometric theorems algebraically**
  - **G.GPE.B.6 (+):** Find the point of a directed line segment between two points that partition the segment in a given ratio.

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

Computer Science & Design Thinking *(CS & DT)*:
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

Cultural Connections: "Library of Alexandria"

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
• What tools and techniques do we use to measure and construct geometric figures accurately? • How can we use geometric notation and vocabulary to describe and analyze figures and relationships?	• Geometry is built on undefined terms (point, line, and plane) and defined relationships that form the basis for logical reasoning and proof. • Precise use of geometric tools and vocabulary is essential for effective communication and problem solving.

• In what ways do points, lines, and planes form the building blocks of all geometric concepts? • How do we justify geometric constructions and reasoning using logic and definitions? • Why is precision important in geometry, and how do we achieve it in both measurement and communication?	• Measurement and construction in geometry require accuracy, consistency, and attention to detail. • Geometric reasoning involves applying definitions, postulates, and theorems to draw valid conclusions. • Mathematical models and diagrams help represent and analyze real-world and abstract geometric situations.
Vocabulary: Betweenness of Points, Bisect, Collinear, Compass, Congruent, Congruent Segments, Construction, Coplanar, Defined Term, Distance, Equidistant, Intersection, Line, Line Segment, Midpoint, Plane, Point, Postulate, Segment Bisector, Space, Theorem, Undefined Terms	
Students will be able to: • Identify types of Geometry • Identify points, lines and planes • Identify intersections of lines and planes • Make formal geometric constructions using a compass, straight edge, and pencil: Copying a segment and bisecting a segment • Calculate measures of line segments • Apply the definition of congruent line segments to find missing values • Find the length of a line segment on a number line • Find the distance between two points on the coordinate plane • Find the coordinates of a midpoint on a number line • Find the coordinates of the midpoint or endpoint of a line segment on the coordinate plane • Find missing values using the definition of a segment bisector • Find points that partition directed line segments on the coordinate plane (+)	

Learning Activities: *Suggested or Potential Learning Activities*

DeltaMath practice based on each lesson. DeltaMath includes a variety of interactive features and student response types which enable teachers to effectively scaffold and differentiate concepts to meet the needs of all students.

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! “The Last Straw”, Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice, Aleks
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Name Line / Line Segment / Ray
  - Name Angles
  - Name Planes
  - Parallel, Perpendicular, Skew Lines / Planes
  - Copying an Angle with Compass and Straightedge
  - Copy a Segment
  - Constructing a Perpendicular Bisector
  - Segments on a Number Line (MC)
  - Segment Addition / Subtraction (Numbers)
  - Segment Addition / Subtraction (Algebra)
  - Coordinate Distance, Pythagorean (Radical)
  - Coordinate Distance, Pythagorean (Rounding)
  - Coordinate Distance
  - Coordinate Distance (Decimal)
  - Midpoint Graphically
  - The Midpoint Formula
  - Find Endpoint from Midpoint and Endpoint

- **G.MG.A.1 Climate Change Example:** Students may use circles, their measure, and their properties to describe the cross section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.

Assessment Evidence
Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Fractional Distance, Aleks
Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Space Enough!
Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials
Core Instructional Program: Reveal Geometry Online Platform
Materials by Lesson: Protractor, Compass, Straightedge, DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

Accommodations and Modifications: Students with Disabilities, English Language Learners,

Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Specific Strategies and Practices that Support English Language Learners:

English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share - Cooperative learning groups - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Students at Risk of Failure:

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice - Alternate or reduced work within Digital Platforms such as ALEKS,

Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

Students with 504 Plans:

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan. 504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan. -

Specific Strategies and Practices that Support Gifted & Talented Students:

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning

-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 2

Desired Results

Unit 2 Title: Angles and Geometric Figures

Unit Summary: In this unit, students will focus on understanding the fundamental properties and relationships of angles and how they define and interact within various geometric figures. Students explore different types of angles—such as complementary, supplementary, vertical, and adjacent—and learn how these angle relationships arise from intersecting lines and polygonal shapes. The unit also covers classification and properties of polygons, with particular emphasis on triangles and quadrilaterals. Through problem solving and reasoning, students develop skills in identifying, measuring, and applying angle and figure properties to analyze complex shapes. This unit strengthens students' ability to use geometric vocabulary precisely and prepares them for formal proof writing and real-world applications involving geometric figures.

Learning Standards

NJSLS Math:
Geometry
CONGRUENCE G.CO

- **A. Experiment with transformations in the plane**
  - **G.CO.A.1:** Experiment with transformations in the plane. 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.
  - **G.CO.A.2:** Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points

as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

- **D. Make geometric constructions.**
  - **G.CO.D.12:** Make geometric constructions. 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 perpendicular bisector of a line segment, and constructing a line parallel to a given line through a point not on the line.

GEOMETRIC MEASUREMENT AND DIMENSION G.GMD

- **A. Explain volume formulas and use them to solve problems**
  - **G.GMD.A.3:** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G.GPE

- **B. Use coordinates to prove simple geometric theorems algebraically**
  - **G.GPE.B.7:** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★

MODELING WITH GEOMETRY G.MG

- **A. Apply geometric concepts in modeling situations**
  - **G.MG.A.1:** Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically

6. Attend to precision
7. Look for and make use of structure
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Interdisciplinary Connections

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9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

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8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

Cultural Connections: “Zero”

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
• How do angle relationships help us analyze and understand geometric figures? • What role do transformations and symmetry play in identifying and classifying geometric figures? • How can we use properties of angles and polygons to solve real-world problems? • What strategies can we use to prove relationships between angles and sides in geometric figures? • How do congruence and similarity influence the structure and behavior of geometric shapes?	• Angle relationships (such as complementary, supplementary, vertical, and adjacent angles) reveal important properties of intersecting lines and polygons. • Geometric figures can be classified and analyzed based on their angles, sides, and symmetry. • The properties of triangles and other polygons form the foundation for reasoning and problem-solving in geometry. • Transformations preserve or alter certain properties of figures, helping us understand congruence and similarity. • Reasoning and proof are essential tools in verifying geometric relationships and solving problems.
Vocabulary: Accuracy, Adjacent Angles, Angle, Angle Bisector, Angle of Rotation, Area, Base, Center of Rotation, Circumference, Complementary Angles, Concave, Cone, Congruent Angles, Convex, Cylinder, Edge, Equiangular, Equilateral, Exterior, Face, Image, Interior, Line of Reflection, Linear Pair, Net, Opposite Rays, Orthographic Drawing, Perimeter, Perpendicular, Platonic Solid, Polygon, Polyhedron, Preimage, Prism, Pyramid, Ray, Reflection, Regular Polygon, Rigid Motion, Rotation, Sides, Sphere, Straight Angle, Supplementary Angles, Surface Area, Transformation, Translation, Translation Vector, Vertex, Vertical Angles, Volume	
Students will be able to: • Analyze figures using the definitions of angles and parts of angles • Calculate angle measures using the definitions of congruent angles and angle bisectors • Analyze figures using the characteristics of adjacent angles, linear pairs of angles, and vertical angles	

- Calculate angle measures using the characteristics of complementary and supplementary angles
- Calculate angle measures using the characteristics of perpendicular lines
- Demonstrate understanding of what can and cannot be assumed from a diagram
- Make formal geometric constructions using a compass, straight edge, and pencil: bisecting an angle, copying an angle, constructing perpendicular bisector of a segment, construct a perpendicular line through a point not on the line
- Find perimeters, circumferences and areas of two-dimensional geometric shapes
- Calculate the measures of real world objects
- Analyze figures to identify the types of rigid motions represented
- Calculate the coordinates of the vertices of images given the coordinates of the preimages
- Identify and determine characteristics of three-dimensional figures
- Calculate surface areas and volumes
- Identify the orthographic drawings that best model selected three-dimensional figures

Learning Activities: *Suggested or Potential Learning Activities*

DeltaMath practice based on each lesson. DeltaMath includes a variety of interactive features and student response types which enable teachers to effectively scaffold and differentiate concepts to meet the needs of all students.

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! “It’s About Time”, Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice, Aleks
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Name Angles
  - Angle Bisector (Draw Estimate)
  - Angle Bisector
  - Vertical/Adjacent/Complementary Angles L1, L2, Algebraic

- Angle Terminology with Equations
- Copying an Angle with Compass and Straightedge
- Constructing a Perpendicular Bisector
- Perpendicular Line Through Point Off a Line
- Perimeter Given Coordinates
- Translate Figure by Vector (Guided)
- Rotate Figure about Origin (Guided)
- Points Reflected Over an Axis (Graphically)
- Volume of Prisms
- Volume of a Cylinder
- Volume of a Cone
- Volume of a Pyramid
- Volume of a Sphere
- Identify Prism / Pyramid from a Net
- Percent Error

- **G.MG.A.1 Climate Change Example:** Students may use circles, their measure, and their properties to describe the cross section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.

Assessment Evidence
Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Name the Shape, Aleks
Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Designing Video Games
Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks

Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials

Core Instructional Program: Reveal Geometry Online Platform

Materials by Lesson: DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

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Checklists - Immediate feedback - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

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-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning
-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 3

Desired Results

Unit 3 Title: Logical Arguments and Line Relationships

Unit Summary: In this unit, students will develop the ability to reason rigorously and communicate mathematically through the study of logical reasoning and the properties of lines and angles. Students explore the foundations of deductive and inductive reasoning, learning how to construct and analyze valid mathematical arguments, including proofs. The unit covers key line relationships such as parallel and perpendicular lines, transversals, and the angle pairs they create, such as corresponding, alternate interior, and consecutive interior angles. By applying postulates and theorems, students deepen their understanding of how these relationships govern geometric figures and enable precise conclusions. This unit cultivates critical thinking and prepares students for advanced topics that rely on formal proof and geometric reasoning.

Learning Standards

NJSLS Math:
Geometry
CONGRUENCE G.CO

- **A. Experiment with transformations in the plane**
  - **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.
- **C. Prove geometric theorems.**
  - **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.

- **D. Make geometric constructions.**
  - **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 perpendicular bisector of a line segment, and constructing a line parallel to a given line through a point not on the line.

MODELING WITH GEOMETRY G.MG

A. Apply geometric concepts in modeling situations

- **G.MG.A.3:** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G.GPE

B. Use coordinates to prove simple geometric theorems algebraically

- **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).

Math Practices:

1. Make sense of problems and persevere in solving them
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision

Interdisciplinary Connections

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9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
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8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

Cultural Connections: "Sudoku Puzzles"

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
• How can we use logic to construct valid mathematical arguments? • What are the differences between inductive and deductive reasoning, and when should each be used?	• Logical reasoning is the foundation of mathematical proof and essential to justifying conclusions.

• How do we use definitions, postulates, and theorems to prove relationships between lines and angles? • Why is precise reasoning important in geometry and mathematics as a whole? • How do parallel and perpendicular lines help us understand geometric relationships in the coordinate plane?	• Inductive reasoning helps identify patterns, while deductive reasoning is used to prove mathematical statements. • Line relationships—such as parallelism, perpendicularity, and transversals—create predictable angle relationships. • Postulates, definitions, and theorems work together as a logical system for constructing valid arguments. • Precise use of logic and language is necessary for communicating mathematical ideas effectively.
Vocabulary: Alternate Exterior Angles, Alternate Interior Angles, Conclusion, Consecutive Interior Angles, Corresponding Angles, Equidistant, Exterior Angles, Interior Angles, Parallel Lines, Proof, Skew Lines, Slope, Statement, Transversal, Two-Column Proof	
Students will be able to: • Analyze and construct viable arguments in a two-column format • Prove theorems about line segments by using the Segment Addition Postulate • Prove theorems about line segments by using properties of segment congruence • Prove theorems about angles by using the Angle Addition Postulate • Prove theorems about angles by using properties and theorems of angle congruence • Prove theorems about right angles • Identify special angle pairs, parallel and skew lines, and transversals • Classify lines as parallel, perpendicular, or neither using slope criteria • Make formal geometric constructions using a compass, straight edge, and pencil: construct a line parallel to a given line through a given point • Find values by applying theorems about parallel lines and transversals	

- Apply angle relationship theorems to identify parallel lines and find missing values

Learning Activities: *Suggested or Potential Learning Activities*

DeltaMath practice based on each lesson. DeltaMath includes a variety of interactive features and student response types which enable teachers to effectively scaffold and differentiate concepts to meet the needs of all students.

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! "Where's the Gift?", Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice, Aleks
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Finding Angles in Transversal Problems
  - Transversal Problems with Equations
  - Parallel Line Through a Point
  - Parallel and Perpendicular Equations
  - Slopes of Parallel/Perpendicular Lines (and MC)
  - Equation of Perpendicular Bisector
  - Parallel, Perpendicular Skew Lines/Planes
- **G.MG.A.3 Climate Change Example**: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.

Assessment Evidence

Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Conjectures, Aleks

Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Ramp Up!

Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials

Core Instructional Program: Reveal Geometry Online Platform

Materials by Lesson: Protractor, DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:
Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

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Checklists - Immediate feedback - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Specific Strategies and Practices that Support English Language Learners:

English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share - Cooperative learning groups - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Students at Risk of Failure:

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

Students with 504 Plans:

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan. 504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students:

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning

-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 4

Desired Results

Unit 4 Title: Transformations and Symmetry

Unit Summary: In this unit, students will be introduced to the study of geometric transformations, including translations, reflections, rotations, and dilations, and their effects on figures in the plane. Students explore how these transformations preserve or alter properties such as size, shape, orientation, and position, developing a deeper understanding of congruence and similarity. The unit also examines the concept of symmetry, highlighting its presence in both geometric figures and real-world contexts. Through visual, algebraic, and coordinate approaches, students learn to describe and perform transformations precisely, building foundational skills for analyzing geometric patterns and proving geometric relationships. This unit fosters spatial reasoning and connects geometry to practical applications in art, design, and nature.

Learning Standards

NJSLS Math:
Geometry
CONGRUENCE G.CO

- **A. Experiment with transformations in the plane**
  - **G.CO.A.3:** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
  - **G.CO.A.4:** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

- **G.CO.A.5:** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

- **B. Understand congruence in terms of rigid motions.**
  - **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.

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving.

9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

Computer Science & Design Thinking *(CS & DT)*:

8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.

8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

Cultural Connections: "Cornrow Braids"

Learning Targets

Unit Essential Questions:

- How do transformations affect the properties and orientation of geometric figures?
- What does it mean for two figures to be congruent or similar, and how can transformations demonstrate this?
- How does symmetry help us understand structure and balance in geometric figures and the real world?
- In what ways can transformations be used to model real-world motion and design?

Unit Enduring Understandings:

- Transformations (translations, reflections, rotations, and dilations) can be used to explore and establish properties of geometric figures.
- Congruence and similarity can be defined and proven using sequences of transformations.
- Symmetry reveals underlying structure and plays an important role in both natural and human-made designs.
- Transformations can be represented both visually and algebraically using coordinate rules.

• How can we use algebraic representations to describe and perform geometric transformations?	• Understanding how figures move and change builds foundational skills for reasoning in both geometry and real-world applications.
Vocabulary: Center of Symmetry, Composition of Transformations, Glide Reflection, Line of Symmetry, Line Symmetry, Rotational Symmetry, Symmetry, Tessellation	
Students will be able to: • Use rigid motions to reflect figures on the coordinate plane • Use rigid motions to translate figures on the coordinate plane • Use rigid motions to rotate figures about points on the coordinate plane • Use two or more rigid motions to transform figures on the coordinate plane • Identify figures that tessellate the plane and create tessellations by using rigid motions • Use symmetry to describe the transformations that carry a figure onto itself	
Learning Activities: *Suggested or Potential Learning Activities* • **Reveal Aligned Practice:** ○ Launch: Diagnostic Assessment, Video, Ignite! “Let Your Flag Fly High”, Foldables ○ Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice, Aleks ○ Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments • **DeltaMath Aligned Practice:** ○ Translate Figure Graphically ○ Rotate Figure About Origin or Any Point ○ Reflect Figure Over a Line (Level 1, 2, 3) ○ Composition of Transformations: Rigid Motions ○ Lines of Symmetry	

Assessment Evidence
Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Transformations, Aleks
Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Sew Quality!
Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials
Core Instructional Program: Reveal Geometry Online Platform
Materials by Lesson: DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

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Students at Risk of Failure:

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

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Teachers are responsible for implementing designated services and strategies identified on a student’s 504 Plan.

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Specific Strategies and Practices that Support Gifted & Talented Students

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning

-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 5

Desired Results

Unit 5 Title: Triangles and Congruence

Unit Summary: In this unit, students will be introduced to understanding the properties of triangles and the criteria that determine when two triangles are congruent. Students explore key congruence postulates and theorems—such as SSS, SAS, ASA, AAS, and HL—and learn how to apply these to prove triangles congruent in a variety of contexts. Emphasis is placed on logical reasoning and the use of precise geometric language to construct formal proofs and justify conclusions. The unit also highlights the importance of congruence as a foundational concept in geometry, enabling further study of more complex figures and geometric relationships. By mastering these concepts, students build critical problem-solving skills and deepen their ability to analyze geometric structures both theoretically and in real-world situations.

Learning Standards

NJSLS Math:
Geometry
CONGRUENCE G.CO

- **B. Understand congruence in terms of rigid motions**
  - **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.
  - **G.CO.B.8:** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- **C. Prove geometric theorems**

- **G.CO.C.10:** Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY G.SRT

- **B. Prove theorems involving similarity**
  - **G.SRT.B.5:** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G.GPE

- **B. Use coordinates to prove simple geometric theorems algebraically**
  - **G.GPE.B.4:** Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2).

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
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Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

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9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
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Computer Science & Design Thinking *(CS & DT)*:
8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
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8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

Cultural Connections: "Mangbetu Designs"

Learning Targets

Unit Essential Questions:

- What does it mean for two triangles to be congruent, and how can we prove it?
- How do different triangle congruence postulates and theorems help us solve geometric problems?
- Why are triangles considered fundamental building blocks in geometry?

Unit Enduring Understandings:

- Triangles can be proven congruent using specific combinations of sides and angles (SSS, SAS, ASA, AAS, and HL).
- Congruent triangles have corresponding parts that are congruent, allowing us to make further geometric conclusions (CPCTC).

• How can we apply triangle properties and congruence to real-world contexts and constructions? • What logical steps are necessary to prove that two geometric figures are congruent?	• Triangles serve as essential components in understanding more complex geometric figures and structures. • Geometric proofs rely on logical reasoning, definitions, and previously established theorems. • Congruence helps us analyze and model the world, from construction and design to natural forms.
Vocabulary: Base Angle, Congruent Polygons, Coordinate Proofs, Corollary, Corresponding Parts, Exterior Angle of a Triangle, Included Angle, Included Side, Interior Angle of a Triangle, Isosceles Triangle, Legs of an Isosceles Triangle, Vertex Angle of an Isosceles Triangle	
Students will be able to: • Solve problems using the Triangle Angle-Sum and Exterior Angle Theorems • Prove that triangles are congruent and use congruence statements to solve problems • Solve problems using SSS and SAS Congruence Postulate • Solve problems using the ASA Congruence Postulate and the AAS Congruence Theorem • Solve problems using the HL Theorem of Right Triangle Congruence • Solve problems involving isosceles and equilateral triangles using theorems of triangle congruence • Write coordinate proofs using theorems of triangle congruence	
Learning Activities: *Suggested or Potential Learning Activities* • **Reveal Aligned Practice:** ○ Launch: Diagnostic Assessment, Video, Ignite! “Eight is Enough”, Foldables ○ Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice ○ Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments	

- **DeltaMath Aligned Practice:**
  - Solve for Interior Angles - Triangle (Level 1, 2)
  - Exterior Angles (Triangles)
  - Interior and Exterior Triangle Angles
  - Properties of Isosceles Triangles
  - Triangle Congruence, FlowChart Proof (Level 1, 2, 3)
  - Basic Triangle Proof (Congruence Only - No CPCTC)

Assessment Evidence

Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Congruent Triangles, Aleks

Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Flying High!

Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks

Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials

Core Instructional Program: Reveal Geometry Online Platform

Materials by Lesson: DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

Accommodations and Modifications:
Students with Disabilities, English Language Learners,
Students at Risk of Failure, Students with 504s, Gifted & Talented Students

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Unit 6

Desired Results

Unit 6 Title: Relationships in Triangles

Unit Summary: In this unit, students investigate the special segments within triangles—angle bisectors, medians, and altitudes—and explore the geometric relationships and points of concurrency they create. Through hands-on activities, constructions, and problem-solving, students gain a deeper understanding of how these segments define key triangle centers such as the centroid, incenter, orthocenter, and circumcenter. Additionally, students apply properties of inequalities to analyze the relationships between the sides and angles of a triangle. They use the Triangle Inequality Theorem, the Exterior Angle Theorem, and other reasoning strategies to compare side lengths and angle measures, enhancing their ability to justify and prove geometric relationships

Learning Standards

NJSLS Math:
Geometry
CONGRUENCE G.CO

- **C. Prove geometric theorems**
  - **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.C.10:** Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints

of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point

- **D. Make geometric constructions**
  - **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 perpendicular bisector of a line segment, and constructing a line parallel to a given line through a point not on the line.

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
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6. Attend to precision
7. Look for and make use of structure
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Interdisciplinary Connections

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Cultural Connections: "Napoleon Bonaparte"

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
• How do side lengths and angle measures in a triangle relate to one another? • What can we conclude about a triangle based on its special segments (like medians, altitudes, and angle bisectors)? • How do inequalities help us describe relationships within and between triangles? • What strategies can we use to solve problems involving unknown sides and angles in triangles?	• In any triangle, the largest angle is opposite the longest side, and vice versa—this relationship helps us analyze triangle properties. • Special segments (such as medians, altitudes, perpendicular bisectors, and angle bisectors) intersect at notable points (centroid, orthocenter, circumcenter, and incenter) with meaningful geometric properties. • Triangle inequality theorems set constraints on the possible lengths of triangle sides.

• Why are triangle centers important, and how are they used in real-world applications?	• Understanding the internal relationships of triangles helps build skills for solving complex geometric and real-world problems. • Geometric reasoning with triangles is foundational to the study of more advanced topics in mathematics and science.

Vocabulary: altitude of a triangle, centroid, circumcenter, concurrent lines, incenter, indirect proof, indirect reasoning, median, orthocenter, perpendicular bisector, point of concurrency, proof of contradiction

Students will be able to:

- Solve problems using perpendicular bisectors in triangles.
- Solve problems using angle bisectors.
- Solve problems using medians and altitudes in triangles.
- Solve problems using inequalities in the angles and sides of a triangle.
- Prove theorems about triangles using indirect proof.
- Prove and apply the Triangle Inequality Theorem

Learning Activities: *Suggested or Potential Learning Activities*

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! “The Perfect Packaging”, Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Circumcenter/Incenter/Orthocenter/Centroid
  - Angle Side Relationship
  - The Triangle Inequality

Assessment Evidence
Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Relationships in Triangles, Aleks
Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Your Chariot Awaits
Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials
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Students at Risk of Failure:

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

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-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 7

Desired Results

Unit 7 Title: Quadrilaterals

Unit Summary: In this unit, students deepen their understanding of two-dimensional figures by proving theorems and solving problems related to polygons, with a particular focus on quadrilaterals. Students explore the defining properties of parallelograms and extend this knowledge to identify and analyze specific types, including rectangles, rhombi, squares, kites, and trapezoids. Through investigation and deductive reasoning, they determine the conditions under which a quadrilateral is a parallelogram and when a parallelogram qualifies as a rectangle or another special quadrilateral. This unit strengthens students' skills in logical reasoning, geometric proof, and classification based on side lengths, angles, and symmetry.

Learning Standards

NJSLS Math:
Geometry
MODELING WITH GEOMETRY G.MG ★

- **A. Apply geometric concepts in modeling situations**
  - **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).

CONGRUENCE G.CO

- **C. Prove geometric theorems**
  - **G.CO.C.11:** Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G.GPE

- **B. Use coordinates to prove simple geometric theorems algebraically**
  - **G.GPE.B.4:** Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2).

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving.

9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

Computer Science & Design Thinking *(CS & DT)*:

8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

Cultural Connections: "Constructing Rectangles"

Learning Targets

Unit Essential Questions:

- What properties define each type of quadrilateral, and how are they related?
- How can we use angles, sides, and diagonals to classify and prove relationships within quadrilaterals?
- In what ways can coordinate geometry help us analyze and prove properties of quadrilaterals?
- How are quadrilaterals used in real-world applications such as design, architecture, and engineering?
- How can we determine whether a figure is a specific type of quadrilateral based on given information?

Unit Enduring Understandings:

- Quadrilaterals can be classified based on the properties of their sides, angles, and diagonals.
- Parallelograms, rectangles, rhombi, squares, trapezoids, and kites have specific properties that distinguish them from one another.
- Coordinate geometry provides a powerful tool for proving relationships and classifications of quadrilaterals.
- Understanding the hierarchy and relationships among quadrilaterals deepens geometric reasoning.

	• Real-world problem solving often involves recognizing and applying the properties of quadrilaterals.
Vocabulary: base angle of a trapezoid, bases of a trapezoid, diagonals, isosceles trapezoid, kite, legs of a trapezoid, midsegment of a trapezoid, parallelogram, rectangle, rhombus, square trapezoid	
Students will be able to: • Prove theorems about the interior and exterior angles of polygons and use the theorems to solve problems. • Prove theorems about the properties of parallelograms and use the properties of parallelograms to solve problems. • Use the tests for parallelograms to determine whether quadrilaterals are parallelograms • Recognize and apply the properties of rectangles and use them to determine whether a parallelogram is a rectangle. • Recognize and apply the properties of rhombi and squares. • Solve problems using the properties of trapezoids and kites.	
Learning Activities: *Suggested or Potential Learning Activities* • **Reveal Aligned Practice:** ○ Launch: Diagnostic Assessment, Video, Ignite! "Garden Walkway", Foldables ○ Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice ○ Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments • **DeltaMath Aligned Practice:** ○ Identify Polygons ○ Interior Angles of Polygons (Level 1 and 2) ○ Exterior Angles of Polygons ○ Identify Quadrilaterals (Level 1 and 2)	

- Identify Quadrilaterals (Level 1 and 2)
- Parallelogram Properties - Diagonals
- Parallelogram / Rhombus Properties, Sides and Angles
- Parallelogram / Rhombus Properties, Sides and Angles (Algebraic)
- Quadrilateral Properties, Diagonals (Algebraic)
- Quadrilateral Proofs (Level 1 and 2)
- Identify Quadrilaterals from Coordinates (Level 1 and 2)

- **G.MG.A.1 Climate Change Example**: Students may use circles, their measure, and their properties to describe the cross section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.

Assessment Evidence

Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Is It a Parallelogram?, Aleks

Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Inside a Hexagon

Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks

Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials

Core Instructional Program: Reveal Geometry Online Platform

Materials by Lesson: DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

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English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share -

Cooperative learning groups - Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Students at Risk of Failure:

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice - Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

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-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 8

Desired Results

Unit 8 Title: Similarity

Unit Summary: In this unit, students explore the concept of similarity in two-dimensional figures, with a focus on identifying similar polygons and applying ratios and proportions to solve geometric problems. Through investigation and reasoning, students learn to establish similarity using the AA (Angle-Angle) Similarity Postulate and the SSS (Side-Side-Side) and SAS (Side-Angle-Side) Similarity Theorems. They apply these criteria to analyze and solve problems involving scale, indirect measurement, and geometric constructions. By connecting similarity to proportional reasoning, students strengthen their understanding of geometric relationships and develop strategies for solving real-world and mathematical problems.

Learning Standards

NJSLS Math:
Geometry
SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY G.SRT

- **A. Understand similarity in terms of similarity transformations**
  - **G.SRT.A.1:** Verify experimentally the properties of dilations given by a center and a scale factor:
    - **a.** A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
    - **b.** The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
  - **G.SRT.A.2**: Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for

triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
    - **G.SRT.A.3:** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
- **B. Prove theorems involving similarity**
    - **G.SRT.B.5:** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

CONGRUENCE G.CO

- **A. Experiment with transformations in the plane**
    - **G.CO.A.2:** Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
- **C. Prove geometric theorems**
    - **G.CO.C.10:** Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
- **D. Make geometric constructions**
- **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 perpendicular bisector of a line segment, and constructing a line parallel to a given line through a point not on the line.

Math Practices:
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4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Interdisciplinary Connections

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Cultural Connections: “The Sea Island Mathematical Manual”

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
• What does it mean for two figures to be similar, and how can we prove similarity? • How are proportions and scale factors used to describe and solve problems involving similar figures? • How can transformations be used to establish similarity between geometric figures? • In what ways is similarity used to model and solve real-world problems? • How do properties of similar triangles help us find missing measurements and justify conclusions?	• Similar figures have the same shape but not necessarily the same size; corresponding angles are congruent, and corresponding sides are proportional. • Triangle similarity can be proven using AA, SSS, and SAS criteria. • Dilations and combinations of rigid motions can be used to demonstrate similarity through transformations. • Understanding similarity allows us to solve problems involving indirect measurement, scale drawings, and real-world modeling. • Ratios and proportions are essential tools for comparing figures and solving for unknown values in similar figures.
Vocabulary: center of dilation, dilation, enlargement, midsegment of a triangle, nonrigid motion, reduction, scale factor of a dilation, similar polygons, similarity ratio, similarity transformation, similar triangles	
Students will be able to:	

- Draw and analyze dilated figures using tools or functions
- Solve problems using the definition of similar polygons
- Use the AA similarity criterion to solve problems and prove triangles similar
- Use the SSS and SAS Similarity criteria to solve problems and prove triangles similar.
- Use triangle proportionality to solve problems and prove theorems.
- Solve problems and prove theorems about parts of similar triangles by using triangle similarity

Learning Activities: *Suggested or Potential Learning Activities*

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! “Holy Guacamole”, Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Similar Figures / Direct Scale (Level 1 and 2)
  - Similar Figures / Proportion (Level 1, 2, and 3)
  - Proving Triangles Similar
  - Triangle Midsegment (Numeric and Algebraic)
  - Solve for Side or Perimeter, Similar Triangles
  - Side Splitter Theorem
  - Angle Bisector Theorem (vs. Median)
  - Word Problems, Similar Triangles (Level 1 and 2)

Assessment Evidence

Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Similar Triangles, Aleks

Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: T-Shirt Sales
Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

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Unit 9

Desired Results

Unit 9 Title: Right Triangles and Trigonometry

Unit Summary: In this unit, students develop a deeper understanding of right triangle geometry by applying trigonometric ratios—sine, cosine, and tangent—and the Pythagorean Theorem to solve real-world and mathematical problems involving right triangles. Emphasis is placed on solving for missing side lengths and angle measures in practical contexts. Students also explore and explain the relationship between the sine and cosine of complementary angles, recognizing how these functions are interconnected. Through hands-on activities, problem-solving, and reasoning, students build fluency in using trigonometric tools and gain insight into their applications across various disciplines.

Learning Standards

NJSLS Math:
Geometry
SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY G.SRT

- **B. Prove theorems involving similarity**
  - **G.SRT.B.4:** Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
  - **G.SRT.B.5:** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- **C. Define trigonometric ratios and solve problems involving right triangles**

- **G.SRT.C.6:** Define trigonometric ratios and solve problems involving right triangles. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- **G.SRT.C.7:** Explain and use the relationship between the sine and cosine of complementary angles.
- **G.SRT.C.8:** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. ★

- **D. Apply trigonometry to general triangles**
  - **G.SRT.D.9:** Derive the formula $A = \frac{1}{2}ab\ sin\ (C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. (++)
  - **G.SRT.D.10:** Prove the Laws of Sines and Cosines and use them to solve problems. (++)
  - **G.SRT.D.11:** Understand and apply the Law of Sines and and the Law of Cosines to find unknown measurements in right and non-right triangles. (++)

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Cultural Connections: "The Pythagorean Theorem"

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
• How can trigonometric ratios be used to find unknown side lengths and angle measures in right triangles?	• The Pythagorean Theorem establishes a fundamental relationship between the legs and hypotenuse of a right triangle.

• What is the relationship between the sides of a right triangle and its angles? • How do we apply the Pythagorean Theorem in various problem-solving contexts? • In what ways can right triangle trigonometry be used to model and solve real-world problems? • How can technology support understanding and solving right triangle problems?	• Trigonometric ratios (sine, cosine, tangent) relate the angles of a right triangle to the ratios of its sides. • Right triangle trigonometry provides a systematic approach to finding missing measurements when some side lengths or angles are known. • Real-world situations can often be modeled and solved using right triangle trigonometry. • Technology, such as graphing calculators and apps, can enhance exploration and application of trigonometric concepts.
Vocabulary: ambiguous case, angle of depression, angle of elevation, cosine, geometric mean, indirect measurement, inverse cosine, inverse sine, inverse tangent, octant, ordered triple, Pythagorean triple, sine, solving a triangle, tangent, trigonometric ratio, trigonometry	
Students will be able to: • Solve problems involving relationships between parts of a right triangle and the altitude to its hypotenuse using the geometric mean. • Solve problems using the Pythagorean Theorem and its converse. • Graph points and find distances using the distance formula for three dimensions. • Solve problems using the trigonometric ratios and inverse trigonometric ratios for acute angles. • Solve real-world problems using the trigonometric ratios and their inverses. • Derive and use a formula for the area of a triangle bu using trigonometry (+).	

- Solve problems by using rhe Law of Sines (+).
- Solve problems by using the Law of Cosines (+).
- Understand and apply the Law of Sines and and the Law of Cosines to find unknown measurements in right and npn-right triangles

Learning Activities: *Suggested or Potential Learning Activities*

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! “Get to the Other Side”, Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Similar Right Triangles, Altitude to Hypotenuse
  - Geometric Mean (Altitude to Hypotenuse)
  - Pythagorean Theorem (Rounding and Radical)
  - Converse of the Pythagorean Theorem (Level 1 and 2)
  - Special Right Triangles (Radical Answers)
  - Identifying Trig Ratios (Diagram), Level 1, 2, and 3
  - Using Trig to Find a Side
  - Using Trig to Find Angles
  - Trig Word Problems (Level 1, 2 and solve for angle)

Assessment Evidence

Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Solving Trigometric Equations, Aleks

Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: The Great Pyramid of Giza

Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
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Unit 10

Desired Results

Unit 10 Title: Circles

Unit Summary: In this unit, students explore the properties and relationships within circles by measuring and analyzing arcs, chords, and inscribed angles. They extend their understanding by solving problems involving tangents, secants, and circumscribed angles. Building on these foundational concepts, students study conic sections, learning to determine and apply their equations to solve a variety of mathematical problems, thereby deepening their comprehension of both geometric and algebraic representations.

Learning Standards

NJSLS Math:
Geometry
CIRCLES G.C

- **A. Understand and apply theorems about circles**
  - **G.C.A.2:** Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
  - **G.C.A.3:** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
  - **G.C.A.4:** Construct a tangent line from a point outside a given circle to the circle. (++)
- **B. Find arc lengths and areas of sectors of circles**
  - **G.C.B.5:** Find arc lengths and areas of sectors of circles. Derive using similarity the fact that the

length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

GEOMETRIC MEASUREMENT AND DIMENSION G.GMD

- **A. Explain volume formulas and use them to solve problems**
  - **G.GMD.A.1**. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.

CONGRUENCE G.CO

- **D. Make geometric constructions**
  - **G.CO.D.13:** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G.GPE

- **A. Translate between the geometric description and the equation for a conic section**
  - **G.GPE.A.1:** Derive the equation of a circle of a given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. (+)
  - **G.GPE. A.2:** Derive the equation of a parabola given a focus and a directrix. (++)
- **B. Use coordinates to prove simple geometric theorems algebraically**
  - **G.GPE.B.4:** Use coordinates to prove simple geometric theorems algebraically.

Math Practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Interdisciplinary Connections
Career Readiness, Life Literacies, & Key Skills *(CLKS)*: **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas. **9.4.12.CT.1:** Identify problem-solving strategies used in the development of an innovative product or practice. **9.4.12.CT.2:** Explain the potential benefits of collaborating to enhance critical thinking and problem solving. **9.4.12.TL.1:** Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task. **9.4.12.TL.3:** Analyze the effectiveness of the process and quality of collaborative environments.
Computer Science & Design Thinking *(CS & DT)*: **8.1.12.CS.4:** Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. **8.1.12.DA.1:** Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. **8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.2.12.NT.1:** Explain how different groups can contribute to the overall design of a product.
Cultural Connections: “Moroccan Art”

Learning Targets	
Unit Essential Questions:	**Unit Enduring Understandings:** • A circle is defined by all points equidistant from a fixed center point, leading to unique properties

• What properties define a circle and distinguish it from other geometric figures? • How do arcs, chords, tangents, and secants relate to each other within a circle? • How can we use circle theorems to find unknown angles, lengths, and segments? • In what ways do circles appear and apply in real-world contexts and other areas of mathematics? • How do the concepts of radius, diameter, circumference, and area connect to each other and to circle properties?	and relationships. • Relationships among chords, arcs, tangents, and secants allow us to solve problems involving angles and lengths in circles. • Circle theorems provide tools for reasoning about central angles, inscribed angles, and segment lengths. • Circles serve as models in various real-world and mathematical situations, including engineering, astronomy, and design. • Formulas for circumference and area connect geometric measurement with algebraic representation.
Vocabulary: adjacent arcs, arc, arc length, center of a circle, chord, circle, circumscribed angle and polygon, common tangent, congruent arcs, degree, diameter of a circle, inscribed angle and polygon, intercepted arc, major arc, minor arc, parabola, pi, point of tangency, radian, radius, secant, semicircle, tangent	
Students will be able to: • Use the formula for circumference of a circle • Prove all circles are similar • Find measures of angles and arcs using the properties of circles • Solve problem using the relationships between arcs, chords and diameters • Solve problems using inscribed angles	

- Solve problems using inscribed polygons
- Solve problems using relationships between circles, tangents, and secants
- Construct inscribed and circumscribed circles
- Construct a tangent line from a point outside a given circle to the circle (+)
- Derive the standard equation of a circle with a given center and radius using the Pythagorean Theorem, and rewrite a general form equation of a circle in standard form by completing the square to identify its center and radius. (+)
- Derive the equation of a parabola given a focus and a directrix (+)

Learning Activities: *Suggested or Potential Learning Activities*

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! "Out of the Lion's Mouth", Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Circumference (in terms of pi, rounding, and Level 2)
  - Parts of Circles
  - Naming Arcs
  - Central / Inscribed Angles Level 1, 2, and Algebraic
  - Angles Formed by Chords, Tangents, Secants (Level 1 and 2)
  - Intersection of Chords
  - Intersection of Secants/Tangents (L1 and L2)

Assessment Evidence

Formative Assessments: Module Pretest, Checks, Exit Ticket, Math Probe: Angles in Circles, Aleks

Summative Assessments: Module Test, Module Vocabulary Test, Performance Task: Profits at the Amusement Park
Common Benchmark Assessments: Common Unit Assessments, LinkIt! Benchmarks
Alternative Assessments: Modified Unit Assessments, Modified Projects, Other Modified Assessments

Core Instructional & Supplemental Materials

Core Instructional Program: Reveal Geometry Online Platform
Materials by Lesson: DeltaMath, Khan Academy, Desmos, Graphing Calculators, LinkIt! Benchmarks, LinkIt! Test Bank

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

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Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

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Students at Risk of Failure:

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice

Alternate or reduced work within Digital Platforms such as ALEKS, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

Students with 504 Plans:

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan. 504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan. -

Specific Strategies and Practices that Support Gifted & Talented Students:

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

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-Enrichment/Extension Activities within Digital Platforms such as ALEKS, Delta Math, and Link It assignments

Unit 11

Desired Results

Unit 11 Title: Measurement

Unit Summary: In this unit, students develop a conceptual understanding of key geometric formulas by providing informal arguments for the circumference and area of a circle, as well as the volume of cylinders, pyramids, and cones. They explore the relationships between two- and three-dimensional shapes by identifying the shapes of various two-dimensional cross sections of three-dimensional objects. Building on this foundation, students apply formulas for cylinders, pyramids, cones, and spheres to solve practical problems, strengthening their ability to connect geometric reasoning with real-world contexts.

Learning Standards

NJSLS Math:

Geometry

CIRCLES G.C

- **B. Find arc lengths and areas of sectors of circles.**
  - **G.C.B.5:** Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

GEOMETRIC MEASUREMENT AND DIMENSION G.GMD

- **A. Explain volume formulas and use them to solve problems**

- **G.GMD.A.1:** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
- **G.GMD.A.2:** Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. (++)
- **G.GMD.A.3:** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★

- **B. Visualize relationships between two-dimensional and three-dimensional objects**
  - **G.GMD.B.4:** Visualize relationships between two-dimensional and three-dimensional objects. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify the three-dimensional objects generated by rotations of two-dimensional objects.

MODELING WITH GEOMETRY G.MG

- **A. Apply geometric concepts in modeling situations**
  - **G.MG.A.2:** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
  - **G.MG.A.3:** Apply geometric methods to solve problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

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Cultural Connections: “African Hexastrip Weaves”

Learning Targets	
Unit Essential Questions:	**Unit Enduring Understandings:**

• How do we select and apply appropriate units and tools for measuring geometric figures? • What are the relationships between linear, area, and volume measurements? • How do formulas for perimeter, area, surface area, and volume relate to geometric properties of figures? • In what ways can measurement be used to solve real-world problems accurately and efficiently? • How does precision and accuracy affect measurement and its applications?	• Measurement connects abstract geometric concepts to real-world quantities through standardized units. • Different dimensions (length, area, volume) require different measurement strategies and formulas. • Formulas for perimeter, area, surface area, and volume are derived from the properties of geometric figures. • Accurate measurement and appropriate unit selection are essential for problem solving in various contexts. • Understanding the limitations of measurement tools and techniques is crucial for interpreting results.
Vocabulary: Altitude of a parallelogram, prism, cylinder, pyramid and cone. Apothem, axis of cone and cylinder, base edge, base of parallelogram, center of a regular polygon, central angle of a regular polygon, chord of a sphere, composite figure, composite solid, density, diameter of a sphere, height of a parallelogram, height of a trapezoid, lateral area, lateral edges, plane symmetry, radius of a regular polygon, radius of a sphere, regular pyramid, sector, similar solids, tangent to a sphere	
Students will be able to: • Find areas of quadrilaterals by using the formulas they derive.	

- Find areas of regular polygons by using the formulas they derive.
- Find areas of circles and sectors by using the formulas they derive.
- Find surface areas of prisms, cylinders, pyramids, cones and spheres and composites of these shapes by using the formulas they derive.
- Identify the shapes of cross sections formed by cuts to a solid.
- Find volumes of prisms by using the formulas they derive.
- Find volumes of cylinders, cones and spheres by using the formulas they derive.
- Find measures of similar figures and solids by using scale factors.
- Solve real-world problems involving density by using area and volume.
- Students will be able to apply Cavalieri's Principle to compare the volumes of three-dimensional solids with equal heights and cross-sectional areas, and use it to justify volume formulas for prisms, cylinders, pyramids, and cones. (+)

Learning Activities: *Suggested or Potential Learning Activities*

- **Reveal Aligned Practice:**
  - Launch: Diagnostic Assessment, Video, Ignite! "Aquarium Design", Foldables
  - Lessons: Launch, Explore, Learn and Examples, Check, Exit Ticket, Practice
  - Close: Reflect, Test Practice (Module Review, Dynamic Module Practice, Module Vocabulary Activity), Module Assessments
- **DeltaMath Aligned Practice:**
  - Area of Quadrilaterals
  - Perimeter / Area of Regular Polygons
  - Sector Area Level 1 and Level 2
  - Surface Area from a Net (Level 1 and 2)
  - Identify Cross Sections of Solids
  - Volume of Rectangular Prisms/Cylinders
  - Volume of a Cone Level 1 and Level 2
  - Volume of a Pyramid Level 1 and Level 2

- Volume of a Sphere (Level 1 and Level 2)
- Volume Word Problems (Level 1 and Level 2)
- Scaled Figures Perimeter and Area (L1 and L2)

- **G.MG.A.2 Climate Change Example:** Students may apply the concept of population density of different urban areas, including calculations of population density, and discuss different environmental factors (e.g., air and water quality, waste disposal, energy consumption) that might be exacerbated by increased population density.
- **G.MG.A.3 Climate Change Example**: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.

Assessment Evidence

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Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them 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.
2. Reason abstractly and quantitatively Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics

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.

5. Use appropriate tools strategically

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered$7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression

$x^2 + 9x + 14$ older students can see the 14 as $2 \times 7$and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $\frac{(y-2)}{(x-1)} = 3$.

Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)\left(x^2 + x + 1\right)$ and $(x - 1)\left(x^3 + x^2 + x + 1\right)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Geometry Course Content Framework and Content Emphases

Students should spend the majority of their time on the major work of the grade (M). Supporting work (S) and, where appropriate, additional work (A) can engage students in the major work of the grade

Key: M — Major, S — Supporting Clusters, A — Additional Clusters

Geometry Conceptual Category

Cluster Letter and Heading	Standard Number	Content Emphasis
A. Experiment with transformations in the plane	1, 2, 3, 4, 5	S
B. Understand congruence in terms of rigid motions	6, 7, 8	M
C. Prove geometric theorems	9, 10, 11	M
D. Make geometric constructions	12, 13	S

Cluster Letter and Heading	Standard Number	Content Emphasis
A. Understand similarity in terms of similarity transformations	1, 2, 3	M
B. Prove theorems involving similarity	4, 5	M
C. Define trigonometric ratios and solve problems involving right triangles	6, 7, 8	M

Cluster Letter and Heading	Standard Number	Content Emphasis
A. Understand and apply theorems about circles	1, 2, 3	A
B. Find arc lengths and areas of sectors of circles	5	A

Cluster Letter and Heading	Standard Number	Content Emphasis
A. Translate between the geometric description and the equation for a conic section	1	A
B. Use coordinates to prove simple geometric theorems algebraically	4, 5, 6, 7	M

Cluster Letter and Heading	Standard Number	Content Emphasis
A. Explain volume formulas and use them to solve problems	1, 3	A
B. Visualize relationships between two-dimensional and three-dimensional objects	4	A

Cluster Letter and Heading	Standard Number	Content Emphasis
A. Apply geometric concepts in modeling situations	1, 2, 3	M

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NJ Digital Item Library