

Shepard Preparatory High School

Geometry Curriculum



A high school geometry course provides a comprehensive study of Euclidean geometry, focusing on the properties of points, lines, planes, angles, and 2D/3D shapes. Students master logical reasoning through formal proofs, similarity, congruence, trigonometry, and coordinate geometry. Key areas include transformations, circles, and calculating area, surface area, and volume.



Unit 1

Essentials of Geometry, Reasoning and Proof, Parallel and Perpendicular Lines

<u>Timeframe</u>	September through mid-November (10-12 weeks)
<u>Unit Overview</u>	<p>In earlier grades, learners measured angles, identified parallel and perpendicular lines in figures, and worked with triangles in a variety of ways to understand various mathematical concepts. In this unit, learners deepen their understanding of these concepts by performing constructions using a variety of tools and technologies. First, they learn the precise definitions of angle, circle, perpendicular line, parallel line, and line segment. They build on their grade 8 work with transformations as functions. Throughout this unit, learners explore and utilize proof to deepen and apply their understanding of congruence. They prove theorems about lines, angles, triangles, and parallelograms; and use the definition of congruence in terms of rigid motions to show that two triangles are congruent.</p>
<u>Essential Questions</u>	<ol style="list-style-type: none">1. What are the building blocks of Geometry2. How can you make a conjecture and prove that it is true?3. How do you prove that lines are parallel or perpendicular, or that two triangles are congruent?4. How can you change a figure's position without changing its size or shape? How can you change a figure's size without changing its shape?5. How can you represent a transformation in the coordinate plane?
<u>Unit Focus</u>	<ul style="list-style-type: none">• Precise definitions of angle, circle, perpendicular line, parallel line, and line segment• Explore transformations in terms of rigid motions, representing transformations in the plane and describing transformations as functions• Explore and utilize proof to deepen and apply understanding of congruence• Prove theorems about lines, angles, triangles, and parallelograms• Use the definition of congruence in terms of rigid motions to show that two triangles are congruent
<u>Interdisciplinary Connections</u>	<p>21st Century Life Skills and Careers</p> <ul style="list-style-type: none">• NJSLS-9.4 Life Literacies and Key Skills

<u>Common Assessments</u>		<ul style="list-style-type: none"> • Pre- Assessment: Students demonstrate prior knowledge with “Getting Ready” activities before each chapter/topic • On-going Formative Assessments: Students demonstrate understanding through “Got It” activities in the text as well as through homework and classwork checks • End of Unit Assessment: Students demonstrate knowledge through summative assessments in the text 	
<u>Materials</u>			
Common Materials		Supplemental Materials	
<p><i>Pearson Mathematics: Geometry Foundations</i> <i>Pearson Mathematics: Geometry Foundations Online Teacher Resources</i> Khan academy</p>		<p>Pearson Mathematics: Geometry Foundations: Student Companion Teacher created quizzes/tests Kahn Academy Online worksheet generators</p>	
<u>New Jersey Student Learning Standards (NJSLs)</u>			
<u>Subject Area</u>	<u>Technology</u>	<u>21st Century Life and Careers</u>	<u>ELA Companion</u>
Mathematics / High School/Geometry	<p><i>8.1: Educational Technology</i> <i>8.2: Technology Education, Engineering, Design and Computational Thinking - Programming</i></p>	NJSLs-9.4 Life Literacies and Key Skills	<p><i>Secondary Science and Social Studies Only</i></p>

<p>NJ: 2023 SLS: Mathematics</p> <p>NJ: Grades 9-12</p> <p>MP Mathematical Practice</p> <p>Standards for Mathematical Practice</p> <p>MP.1 Make sense of problems and persevere in solving them</p> <p>MP.2 Reason abstractly and quantitatively</p> <p>MP.3 Construct viable arguments and critique the reasoning of others</p> <p>MP.4 Model with mathematics</p> <p>MP.5 Use appropriate tools strategically</p> <p>MP.6 Attend to precision</p> <p>MP.7 Look for and make use of structure</p> <p>MP.8 Look for and express regularity in repeated reasoning</p> <p>Geometry</p> <p>G.CO.A. Congruence Experiment with transformations in the plane</p> <p>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.</p> <p>G.GPE.B. Expressing Geometric Properties with Equations Use coordinates to prove simple geometric</p>	<p>NJ: 2020 SLS: Science</p> <p>NJ: Grades 9-12</p> <ul style="list-style-type: none"> • HS-ETS1 Engineering Design • Students who demonstrate understanding can: <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineerin</p>	<ul style="list-style-type: none"> • 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6 	<p>NJ: 2023 SLS: English Language Arts</p> <p>NJ: Grades 11-12</p> <ul style="list-style-type: none"> • Speaking and Listening Domain • Speaking and Listening
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Geometry

<p>theorems algebraically.</p> <p>G.GPE.B.6. (+) Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</p> <p>CO.C. Congruence</p> <p>Prove geometric theorems</p> <p>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.</p> <p>G.GPE.B. Expressing Geometric Properties with Equations</p> <p>Use coordinates to prove simple geometric theorems algebraically.</p> <p>G.GPE.B.4. Use coordinates to prove simple geometric theorems algebraically.</p>			
<u>Differentiation</u>			
Differentiation for Support		Differentiation for Enrichment/Honors	
<p>Accommodations for Classroom:</p> <ul style="list-style-type: none"> Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate <p>Accommodations for Homework and Assignments:</p> <ul style="list-style-type: none"> Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments <p>Accommodations for Assessments:</p>		<ul style="list-style-type: none"> Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production of writing assignments Varying time requirements to complete assignments Independent studies at teacher/admin discretion Extension activities <p>Further Modifications for Honors Students</p> <p>Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular</p>	

Extended time on classroom assessments

Further Modifications for General Curriculum students:

Students on the General curriculum will have selected goals removed as per their IEP in order to facilitate mastery of foundational skills and allow more instructional time for re-teaching, review, and remediation. See Goals & Objectives for specific goals and objectives for General Curriculum students.

class period. These assignments may be projects, labs, research papers or other activities assigned by the teacher

Activities

Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible

Hands-on & Interactive Game Examples

- [Math War \(Cards\)](#): Students play with cards to practice multiplication or addition, trying to get the highest result.
- [Math Bingo](#): A fun way for students to practice multiplication, division, or addition in a group setting.
- [Dice Rolling Games](#): Roll dice to create and solve numbers, or use them to build shapes and towers.

Movement-Based Math

- [Math Scavenger Hunt](#): Hide numbers or equations around the room or outside for children to find
- [Math Relay Races](#): Students run to solve problems in teams, combining physical activity with mental calculation.
- [Human Number Line](#): Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers.

Creative & Visual Projects

- [Nature Sorting](#): Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability.
- [Marshmallow Geometry](#): Using marshmallows and toothpicks to build 3D shapes.

Digital & Cognitive Activities

- [Virtual Manipulatives](#): Using online tools like geoboards or fraction bars.
- [Brain Teasers/Riddles](#): Daily puzzles that encourage logical thinking and problem-solving skills.
- [Virtual Escape Rooms](#): Engaging, technology-based puzzles for older students.

Unit 2	
Congruent Triangles, Relationships within Triangles, Similarity, Right Triangles and Trigonometry	
<u>Timeframe</u>	Mid-November through mid-February (10-12 weeks)
<u>Unit Overview</u>	In grade 7, learners represented and solved real world and mathematical problems using proportions. They studied angle measures and their relationships within geometric figures. Building on these ideas, learners solve problems involving similar geometric figures. They explain using similarity transformations, the meaning of similarity for triangle as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides, and use properties of similarity transformations to establish Angle-Angle criterion. This unit concludes as learners, building on earlier work with the Pythagorean Theorem, to apply proportions as they use trigonometric ratios and the Pythagorean Theorem to solve right triangles.
<u>Essential Questions</u>	<ol style="list-style-type: none"> 1. How do we define similar figures and how do we determine if figures are similar? 2. How can we use similarity transformations to establish the conditions for triangular similarity through the AA criterion? 3. How can we use similarity to prove the Pythagorean Theorem? 4. How can we use similarity to produce the trigonometric ratios for acute angles in right triangles? 5. How can we apply knowledge of similar figures to produce solutions in applied mathematics?
<u>Unit Focus</u>	<ul style="list-style-type: none"> • Experimentally verify how certain dilations and transformations maintain or change distances and angle measures • Apply similarity transformations to explain the meaning of similarity for triangles • Explore similarity in triangles as they relate to the AA criterion • Prove the Pythagorean Theorem through similarity and applying the Pythagorean to real-world scenarios • Apply similarity to triangle trigonometric ratios and apply techniques to real-world scenarios
<u>Interdisciplinary Connections</u>	21st Century Life Skills and Careers <ul style="list-style-type: none"> • NJSL-9.4 Life Literacies and Key Skills
<u>Common Assessments</u>	<ul style="list-style-type: none"> • Pre- Assessment: Students demonstrate prior knowledge with “Getting Ready” activities before each chapter/topic

- On-going Formative Assessments: Students demonstrate understanding through “Got It” activities in the text as well as through homework and classwork checks
- End of Unit Assessment: Students demonstrate knowledge through summative assessments in the text

Materials

Common Materials

Supplemental Materials

Pearson Mathematics: Geometry Foundations
Pearson Mathematics: Geometry Foundations Online Teacher Resources
 Khan academy

Pearson Mathematics: Geometry Foundations: Student Companion
 Teacher created quizzes/tests
 Kahn Academy
 Online worksheet generators

New Jersey Student Learning Standards (NJSLs)

Subject Area

Technology

21st Century Life and Careers

ELA Companion

Mathematics / High School/Geometry

8.1: Educational Technology
8.2: Technology Education, Engineering, Design and Computational Thinking - Programming

Secondary Science and Social Studies Only

<p>G.CO.A. Congruence Experiment with transformations in the plane</p> <p>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).</p> <p>G.CO.A.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.</p> <p>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.</p> <p>G.CO.B. Congruence Understand Congruence in terms of rigid motions</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>G.CO.C. Congruence Prove geometric theorems</p> <p>G.CO.C.10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of</p>	<p>NJ: 2020 SLS: Science NJ: Grades 9-12</p> <ul style="list-style-type: none"> • HS-ETS1 Engineering Design • Students who demonstrate understanding can: <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering</p>	<ul style="list-style-type: none"> • 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3, 7.1.NM.IPERS.6 	<p>NJ: 2023 SLS: English Language Arts NJ: Grades 11-12</p> <ul style="list-style-type: none"> • Speaking and Listening Domain • Speaking and Listening
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<p>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.</p> <p>G.CO.D. Congruence</p> <p>Make geometric constructions</p> <p>G.CO.D.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</p> <p>G.CO.D.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.</p> <p>G.GPE.B. Expressing Geometric Properties with Equations</p> <p>Use coordinates to prove simple geometric theorems algebraically.</p> <p>G.GPE.B.4. Use coordinates to prove simple geometric theorems algebraically.</p> <p>G.SRT.A. Similarity, Right Triangles, and Trigonometry</p> <p>Understand similarity in terms of similarity transformations</p> <p>G.SRT.A.1.a Verify experimentally the properties of dilations given by a center and a scale factor:</p> <p>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.</p> <p>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</p>			
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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.
G.SRT.B. Similarity, Right Triangles, and Trigonometry
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.

Differentiation

Differentiation for Support (504, ELL, Special Education, Struggling Learners)	Differentiation for Enrichment
<p>Accommodations for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate</p> <p>Accommodations for Homework and Assignments: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Accommodations for Assessments: Extended time on classroom assessments</p> <p>Further Modifications for General Curriculum students: Students on the General curriculum will have selected goals removed as per their IEP in order to facilitate mastery of foundational skills and allow more instructional time for re-teaching, review, and remediation. See Goals & Objectives for specific goals and objectives for General Curriculum students.</p>	<p>Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production of writing assignments Varying time requirements to complete assignments Independent studies at teacher/admin discretion Extension activities</p> <p>Further Modifications for Honors Students Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers or other activities assigned by the teacher</p>

Activities

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Movement-Based Math

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Digital & Cognitive Activities

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Unit 3

Quadrilaterals, Properties of Transformations, Properties of Circles, Measuring Length and Area

<u>Timeframe</u>	Mid-February through April (10-12 weeks)
<u>Unit Overview</u>	In this unit, learners apply the concepts of congruence and similarity to prove simple theorems algebraically using coordinates. They prove slope criteria and use them to solve geometric problems. Learners compute perimeters of polygons and areas of triangles and rectangles using coordinates. This unit concludes as learners, knowing the precise definition of a circle, derive the equation of a circle using the Pythagorean Theorem and use algebra techniques to find the center and radius of a circle given by an equation.
<u>Essential Questions</u>	<ol style="list-style-type: none"> 1. How can we prove and utilize geometric concepts through the coordinate plane? 2. What is the precise definition of a circle? 3. How can we use the Pythagorean Theorem to derive the algebraic equation of a circle? 4. How can we use coordinate algebra to identify key characteristics of a circle?
<u>Unit Focus</u>	<ul style="list-style-type: none"> • Proving simple geometric theorems algebraically using coordinates • Computing properties of geometric figures using coordinates • Defining a circle • Deriving the equation of a circle given the center and radius using the Pythagorean Theorem • Computing properties of circles using coordinates
<u>Interdisciplinary Connections</u>	21st Century Life Skills and Careers <ul style="list-style-type: none"> • CRP11 Use technology to enhance productivity.
<u>Common Assessments</u>	<ul style="list-style-type: none"> • Pre- Assessment: Students demonstrate prior knowledge with “Getting Ready” activities before each chapter/topic • On-going Formative Assessments: Students demonstrate understanding through “Got It” activities in the text as well as through homework and classwork checks • End of Unit Assessment: Students demonstrate knowledge through summative assessments in the text
<u>Materials</u>	
Common Materials	

		Supplemental Materials	
<p><i>Pearson Mathematics: Geometry Foundations</i> <i>Pearson Mathematics: Geometry Foundations Online Teacher Resources</i> Khan academy</p>		<p>Pearson Mathematics: Geometry Foundations: Student Companion Teacher created quizzes/tests Kahn Academy Online worksheet generators</p>	
<u>New Jersey Student Learning Standards (NJSLs)</u>			
<u>Subject Area</u>	<u>Technology</u>	<u>21st Century Life and Careers</u>	<u>ELA Companion</u>
<p>Mathematics / High School/Geometry</p>	<p>8.1: Educational Technology 8.2: Technology Education, Engineering, Design and Computational Thinking - Programming</p>		
<p>G.CO.C. Congruence Prove geometric theorems</p> <p>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.</p> <p>G.GPE.B. Expressing Geometric Properties with Equations Use coordinates to prove simple geometric theorems algebraically.</p> <p>G.GPE.B.4. Use coordinates to prove simple geometric theorems algebraically.</p> <p>G.GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric</p>	<p>NJ: 2020 SLS: Science NJ: Grades 9-12</p> <ul style="list-style-type: none"> • HS-ETS1 Engineering Design • Students who demonstrate understanding can: <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineerin</p>	<p>9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). •</p> <p>9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). •</p> <p>9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive).</p> <p>9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource.</p> <p>9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6.</p>	<p>NJ: 2023 SLS: English Language Arts NJ: Grades 11-12</p> <ul style="list-style-type: none"> • Speaking and Listening Domain <ul style="list-style-type: none"> • Speaking and Listening

<p>problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).</p> <p>G.GPE.B.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. ★</p> <p>G.MG.A. Modeling with Geometry★ Apply geometric concepts in modeling situations</p> <p>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).</p> <p>G.CO.A. Congruence Experiment with transformations in the plane</p> <p>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).</p> <p>G.CO.A.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.</p> <p>G.CO.A.4. Develop definitions of</p>			
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<p>rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.</p> <p>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.</p> <p>G.CO.B. Congruence Understand Congruence in terms of rigid motions</p> <p>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.</p> <p>G.SRT.A. Similarity, Right Triangles, and Trigonometry Understand similarity in terms of similarity transformations</p> <p>G.SRT.A.1.a 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.</p> <p>G.SRT.A.2. Given two figures, use</p>			
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<p>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.</p> <p>G.C.A. Circles Understand and apply theorems about circles</p> <p>G.C.A.1. Prove that all circles are similar.</p> <p>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.</p> <p>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.</p> <p>G.C.A.4. (+) Construct a tangent line from a point outside a given circle to the circle.</p> <p>G.C.B. Circles Find arc lengths and areas of sectors of circles</p> <p>G.C.B.5. Derive using similarity the fact that the length of the arc intercepted by an angle is</p>			
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<p>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.</p> <p>G.GPE.A. Expressing Geometric Properties with Equations Translate between the geometric description and the equation for a conic section</p> <p>G.GPE.A.1. (+) Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.</p> <p>G.GPE.B. Expressing Geometric Properties with Equations Use coordinates to prove simple geometric theorems algebraically.</p> <p>G.GPE.B.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.</p>			
<u>Differentiation</u>			
Differentiation for Support (504, ELL, Special Education, Struggling Learners)		Differentiation for Enrichment	

<p>Accommodations for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate</p> <p>Accommodations for Homework and Assignments: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Accommodations for Assessments: Extended time on classroom assessments</p> <p>Further Modifications for General Curriculum students: Students on the General curriculum will have selected goals removed as per their IEP in order to facilitate mastery of foundational skills and allow more instructional time for re-teaching, review, and remediation. See Goals & Objectives for specific goals and objectives for General Curriculum students.</p>	<p>Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production of writing assignments Varying time requirements to complete assignments Independent studies at teacher/admin discretion Extension activities</p> <p>Further Modifications for Honors Students Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers or other activities assigned by the teacher</p>
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Unit 4

Surface Area and Volume of Solids

<u>Timeframe</u>	April through June (10-12 weeks)	
<u>Unit Overview</u>	<p>In this final unit, learners engage more deeply with circles, exploring measurement in two and three dimensions, and apply their geometric understanding in modeling situations. In order to further explore circles, students will apply their understanding of similarity to consider the relationships among various angles, radii, and chords. They determine the relationship between central, inscribed, and circumscribed angles, and construct inscribed and circumscribed circles of a triangle. Learners are introduced to and define the radian measure of the angle as the constant of proportionality in the proportional relationship an angle and the length of the intercepted arc.</p>	
<u>Essential Questions</u>	<ol style="list-style-type: none"> 1. How can we translate our understanding of circles from two dimensions to three dimensions? 2. How can similarity further our understanding of angles, radii, and chords associated with circles? 3. How can the proportional relationship between an angle and arc length be represented? 	
<u>Unit Focus</u>	<ul style="list-style-type: none"> • Working with formulas associated with circles • Using formulas associated with volume as it relates to cylinders, pyramids, cones, and spheres • Representing three dimensional objects as rotations of two dimensional figures 	
<u>Interdisciplinary Connections</u>	<p>21st Century Life Skills and Careers</p> <ul style="list-style-type: none"> • NJSLS-9.4 Life Literacies and Key Skills 	
<u>Common Assessments</u>	<ul style="list-style-type: none"> • Pre- Assessment: Students demonstrate prior knowledge with “Getting Ready” activities before each chapter/topic • On-going Formative Assessments: Students demonstrate understanding through “Got It” activities in the text as well as through homework and classwork checks • End of Unit Assessment: Students demonstrate knowledge through summative assessments in the text 	
<u>Materials</u>		
Common Materials	Supplemental Materials	
<i>Pearson Mathematics: Geometry Foundations</i>	Pearson Mathematics: Geometry Foundations: Student Companion	

<p>Pearson Mathematics: Geometry Foundations Online Teacher Resources Khan academy</p>	<p>Teacher created quizzes/tests Kahn Academy Online worksheet generators</p>		
<p>New Jersey Student Learning Standards</p>			
<p><u>Subject Area</u></p>	<p><u>Technology</u></p>	<p><u>21st Century Life and Careers</u></p>	<p><u>ELA Companion</u></p>
<p>Mathematics / High School/Geometry</p>	<p>8.1: Educational Technology 8.2: Technology Education, Engineering, Design and Computational Thinking - Programming</p>		<p>Secondary Science and Social Studies Only</p>
<p>G.GMD.A. Geometric Measurement and Dimension Explain volume formulas and use them to solve problems</p> <p>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.</p> <p>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.</p> <p>G.GMD.A.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★</p> <p>G.GMD.B. Geometric Measurement and Dimension Visualize relationships between two-dimensional and three-dimensional objects</p> <p>G.GMD.B.4. Identify the shapes of two-</p>	<p>NJ: 2020 SLS: Science NJ: Grades 9-12</p> <ul style="list-style-type: none"> • HS-ETS1 Engineering Design • Students who demonstrate understanding can: <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineerin</p>	<p>9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).</p> <ul style="list-style-type: none"> • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). <p>9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource.</p> <p>9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6</p>	<p>NJ: 2023 SLS: English Language Arts NJ: Grades 11-12</p> <ul style="list-style-type: none"> • Speaking and Listening Domain • Speaking and Listening

Geometry

<p>dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.</p> <p>G.MG.A. Modeling with Geometry★ Apply geometric concepts in modeling situations</p> <p>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).</p> <p>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).</p> <p>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)</p>			
<u>Differentiation</u>			
Differentiation for Support (504, ELL, Special Education, Struggling Learners)		Differentiation for Enrichment	
<p>Accommodations for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate</p> <p>Accommodations for Homework and Assignments: Extended time to complete assignments</p>		<p>Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production of writing assignments Varying time requirements to complete assignments Independent studies at teacher/admin discretion Extension activities</p> <p>Further Modifications for Honors Students</p>	

<p>Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Accommodations for Assessments: Extended time on classroom assessments</p> <p>Further Modifications for General Curriculum students: Students on the General curriculum will have selected goals removed as per their IEP in order to facilitate mastery of foundational skills and allow more instructional time for re-teaching, review, and remediation. See Goals & Objectives for specific goals and objectives for General Curriculum students.</p>	<p>Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers or other activities assigned by the teacher</p>
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<u>Activities</u>
<p>Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible</p> <p>Hands-on & Interactive Game Examples</p> <ul style="list-style-type: none"> • Math War (Cards): Students play with cards to practice multiplication or addition, trying to get the highest result. • Math Bingo: A fun way for students to practice multiplication, division, or addition in a group setting. • Dice Rolling Games: Roll dice to create and solve numbers, or use them to build shapes and towers. <p>Movement-Based Math</p> <ul style="list-style-type: none"> • Math Scavenger Hunt: Hide numbers or equations around the room or outside for children to find • Math Relay Races: Students run to solve problems in teams, combining physical activity with mental calculation. • Human Number Line: Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers. <p>Creative & Visual Projects</p> <ul style="list-style-type: none"> • Nature Sorting: Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability. • Marshmallow Geometry: Using marshmallows and toothpicks to build 3D shapes. <p>Digital & Cognitive Activities</p> <ul style="list-style-type: none"> • Virtual Manipulatives: Using online tools like geoboards or fraction bars. • Brain Teasers/Riddles: Daily puzzles that encourage logical thinking and problem-solving skills. • Virtual Escape Rooms: Engaging, technology-based puzzles for older students.