Mathematics Department

Geometry

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Effective Date: September 2024

Scope and Sequence

Month	Geometry	Advanced Geometry	Accelerated Geometry **(NHS & Grade 8-JHWMS)**
September	**Prerequisite -** Solving equations **Assessment - Prerequisite Test** **Unit 1: Foundations for Geometry** -Identify and correctly name points, lines, planes, segments, and rays -Categorize points and lines as collinear and coplanar -Use inductive reasoning to continue patterns and make conjectures -Name the intersection of lines and planes **Unit 2: Angles and Segments** -Measure segments and angles -Use properties of equality and congruence -Use the segment and angle addition postulates to find missing measurements	**Prerequisite -** factoring, solving square root equations, simplifying square roots **Assessment - Prerequisite Test** **Unit 1: Foundations for Geometry** -Identify and correctly name points, lines, planes, segments, and rays -Categorize points and lines as collinear and coplanar -Name the intersection of lines and planes -Sketch simple figures and their intersections **Unit 2: Angles and Segments** -Measure segments and angles -Use properties of equality and congruence -Use the segment and angle addition postulates to find missing measurements -Classify angles	**Prerequisite -** Solving equations **Assessment - Prerequisite Test** **Unit 1: Foundations for Geometry** Add in: *Simplifying Radicals and Operations with Radicals (depending on if students did this in Grade 7) -Identify and correctly name points, lines, planes, segments, and rays -Categorize points and lines as collinear and coplanar -Use inductive reasoning to continue patterns and make conjectures -Name the intersection of lines and planes -Sketch simple figures and their intersections

	-Classify angles -Find the measures of complementary and supplementary angles -Bisect a segment and find the coordinates of the midpoint of a segment --Use the properties of bisectors to find missing measurements -Identify adjacent angles **Replacement Modifications:** Unit 2 (Concepts Ch 1) 1.3 Points, Lines, Planes 1.4 Sketching Intersections 1.5 Segments and their Measures 2.1 Segment Bisectors and Midpoint	-Find the measures of complementary and supplementary angles -Bisect a segment and find the coordinates of the midpoint of a segment -Bisect an angle -Use the properties of bisectors to find missing measurements -Identify adjacent angles	**Unit 2: Angles and Segments** -Measure segments and angles -Use properties of equality and congruence -Use the segment and angle addition postulates to find missing measurements -Classify angles -Find the measures of complementary and supplementary angles -Bisect a segment and find the coordinates of the midpoint of a segment -Bisect an angle -Use the properties of bisectors to find missing measurements -Identify adjacent angles
October	**Unit 2: Angles (Cont.) Angle Relationships Formed by Lines** -Identify angles formed by intersecting lines as vertical angles or linear pair and use their properties of find angle measurements -Identify special angle relationships formed by two lines and a transversal (alternate interior, alternate exterior, corresponding, and same side interior angles) **Unit 3: Triangles** -Find angle measures in triangles -Use exterior angles to find the measure of interior angles and vice-versa **Replacement Modifications:** Remain in Unit 2 (Concepts Ch 1 & 2) 1.6 Angles and Their Measures	**Unit 2: Angles (Cont.) Angle Relationships Formed by Lines** -Identify relationships between lines (parallel, perpendicular, skew, …) -Identify angles formed by intersecting lines as vertical angles or linear pair and use their properties of find angle measurements -Identify special angle relationships formed by two lines and a transversal (alternate interior, alternate exterior, corresponding, and same side interior angles) -Find the congruent angles formed when a transversal cuts parallel lines -Prove lines are parallel and perpendicular using special angle relationships **Unit 3:Triangles** -Classify triangles by their sides and by their angles	**Unit 2 Reasoning and Proof Component** -Use inductive reasoning -Analyze conditional statements -Apply deductive reasoning -Understand and use proof statements about line segments and angles -Prove angle relationships **Unit 2: Angles (Cont.) Angle Relationships Formed by Lines** -Identify relationships between lines (parallel, perpendicular, skew, …) -Identify angles formed by intersecting lines as vertical angles or linear pair and use their properties of find angle measurements -Identify special angle relationships formed by two lines and a transversal (alternate interior, alternate exterior, corresponding, and same side interior angles)

	2.2 Angle Bisectors 2.3 Complementary and Supplementary Angles 2.4 Vertical Angles Begin chapter 3 on parallel lines/transversals	-Find angle measures in triangles -Use exterior angles to find the measure of interior angles and vice-versa -Use properties of isosceles and equilateral triangles to find angle and segment measurements -Apply the Triangle Inequality Theorem to determine whether three sides make a triangle -Identify the shortest and longest sides of a triangle given angle measurements -Identify the smallest and biggest angles given side measurements -Identify and apply properties of medians, angle bisectors, perpendicular bisectors, and altitudes	-Find the congruent angles formed when a transversal cuts parallel lines -Prove lines are parallel and perpendicular using special angle relationships --Complete proofs involving special angle relationships **Unit 3: Triangles** -Classify triangles by their sides and by their angles -Find angle measures in triangles -Use exterior angles to find the measure of interior angles and vice-versa -Use properties of isosceles and equilateral triangles to find angle and segment measurements -Apply the Triangle Inequality Theorem to determine whether three sides make a triangle -Identify the shortest and longest sides of a triangle given angle measurements -Identify the smallest and biggest angles given side measurements -Identify and apply properties of medians, angle bisectors, perpendicular bisectors, and altitudes --Complete proofs involving Triangles
November	**Unit 3: Triangles (Cont)** -Use properties of isosceles and equilateral triangles to find angle and segment measurements -Use the Pythagorean Theorem to find missing side lengths of a right triangle -Identify the shortest and longest sides of a triangle given	**Unit 4 Part 1: Triangle Congruence** -Identify congruent polygons and their corresponding parts -Use congruence properties to find missing angle and segment measures. -Show triangles are congruent using SSS, SAS, ASA, AAS, and HL	**Unit 4 Part 1: Triangle Congruence** -Identify congruent polygons and their corresponding parts -Use congruence properties to find missing angle and segment measures -Show triangles are congruent using SSS, SAS, ASA, AAS, and HL

	angle measurements -Identify the smallest and biggest angles given side measurements -Identify and apply properties of medians, angle bisectors, perpendicular bisectors, and altitudes **Replacement Modifications:** Remain in Unit 2 (Concepts Ch 3) 3.1 Relationships Between Lines 3.2 Theorems about Perpendicular Lines 3.3/3.4 Angles Formed by Transversals 3.5 Showing Lines are Parallel		-Use congruent triangles to show corresponding parts congruent CPCTC --Complete proofs involving Triangle Congruence
December	**Unit 4 Part 1: Triangle Congruence** -Identify congruent polygons and their corresponding parts -Use congruence properties to find missing angle and segment measures -Show triangles are congruent using SSS, SAS, ASA, AAS, and HL -Use congruent triangles to show corresponding parts congruent CPCTC **Replacement Modifications:** Still in Unit 3 (Concepts Ch 4) 4.1 Classify Triangles 4.2 Angle Measures of Triangles 4.3 Isosceles and Equilateral Triangles 4.4/4.5 Pythagorean Theorem 4.7 Triangle Inequality	**Unit 4 Part 1: Triangle Congruence (cont)** -Use congruent triangles to show corresponding parts congruent CPCTC -Complete proofs involving Triangle Congruence **Unit 4 Part 2: Triangle Similarity** -Identify similar polygons and their corresponding parts -Show triangles are similar using AA, SSS similarity, and SAS similarity -Determine the ratio of similarity and use it to set up a proportion to find missing segment lengths -Use the ratio of similarity to find perimeters -Complete proofs involving Triangle Similarity **ASSESSMENT: Triangles**	**Unit 4 Part 2: Triangle Similarity** -Identify similar polygons and their corresponding parts -Show triangles are similar using AA, SSS similarity, and SAS similarity -Determine the ratio of similarity and use it to set up a proportion to find missing segment lengths -Use the ratio of similarity to find perimeters -Complete proofs involving Triangle Similarity
January	**Unit 4 Part 2: Triangle Similarity** -Identify similar polygons and	**Unit 8: Right Triangle Trigonometry** -Calculate the geometric mean	**Unit 8: Right Triangle Trigonometry** -Calculate the geometric mean

	their corresponding parts -Show triangles are similar using AA, SSS similarity, and SAS similarity -Determine the ratio of similarity and use it to set up a proportion to find missing segment lengths -Use the ratio of similarity to find perimeters	given two numbers -Apply geometric mean properties given a right triangle and an altitude drawn from the right angle to its opposite side -Use The Pythagorean Theorem to find the side length of a right triangle -Apply the properties of 30-60-90 and 45-45-90 triangles to find side measures -Find the sine, cosine, and tangent of an acute angle -Use basic trigonometry ratios and inverse ratios to solve right triangles -Use the Law of Sines and Cosines to solve triangles	given two numbers -Apply geometric mean properties given a right triangle and an altitude drawn from the right angle to its opposite side -Use The Pythagorean Theorem to find the side length of a right triangle -Apply the properties of 30-60-90 and 45-45-90 triangles to find side measures -Find the sine, cosine, and tangent of an acute angle -Use basic trigonometry ratios and inverse ratios to solve right triangles -Use the Law of Sines and Cosines to solve triangles -Complete proofs involving Right TRiangles
February	**Unit 8: Right Triangle Trigonometry** -Use The Pythagorean Theorem to find the side length of a right triangle -Apply the properties of 30-60-90 and 45-45-90 triangles to find side measures -Find the sine, cosine, and tangent of an acute angle -Use basic trigonometry ratios and inverse ratios to solve right triangles	**Unit 10: Geometric Transformations** -Identify and use properties of translations, rotations, reflections, and dilations -Describe transformations using words and coordinate notation given a diagram -Determine the number of lines of symmetry a plane figure contains -Use coordinate notation to sketch a diagram of a transformation	**Unit 10: Geometric Transformations** -Identify and use properties of translations, rotations, reflections, and dilations -Describe transformations using words and coordinate notation given a diagram -Determine the number of lines of symmetry a plane figure contains -Use coordinate notation to sketch a diagram of a transformation -Complete proofs involving Geometric Transformations
March	**Unit 10: Geometric Transformations** -Identify and use properties of translations, rotations, reflections, and dilations -Describe transformations using	**Unit 9: Circles** -Identify segments and lines related to circles (chord, diameter, radius, secant, and tangent) -Use properties of tangents,	**Unit 9: Circles** -Identify segments and lines related to circles (chord, diameter, radius, secant, and tangent) -Use properties of tangents,

	words and coordinate notation given a diagram -Determine the number of lines of symmetry a plane figure contains -Use coordinate notation to sketch a diagram of a transformation	chords, and secants to find segment and angle measurements -Classify arcs by their measurements (semi, major, and minor) -Determine the measure of central and inscribed angles using their intercepted arcs and vice-versa -Write and graph the equation of a circle -Complete proofs involving Circles	chords, and secants to find segment and angle measurements -Classify arcs by their measurements (semi, major, and minor) -Determine the measure of central and inscribed angles using their intercepted arcs and vice-versa -Write and graph the equation of a circle -Complete proofs involving Circles
April	**Unit 9: Circles** -Identify segments and lines related to circles (chord, diameter, radius, secant, and tangent) -Use properties of tangents, chords, and secants to find segment and angle measurements -Classify arcs by their measurements (semi, major, and minor) -Determine the measure of central and inscribed angles using their intercepted arcs and vice-versa -Write and graph the equation of a circle	**Unit 5: Polygons and Quadrilaterals** -Identify and classify polygons by their number of sides -Identify and classify polygons by their number of sides -Find the measure of the sum of interior and exterior angles of polygons -Find the measure of an interior and exterior angle of a regular polygon -Classify polygons as convex, concave, equilateral, equiangular, and/or regular -Find angle measures of a quadrilateral -Use properties of parallelograms to find angle and segment measures -Show that a quadrilateral is a parallelogram using parallelogram properties -Identify and use properties of special parallelograms (rhombi, rectangles, and squares) -Apply properties of trapezoids to find angle and segment measures -Identify special quadrilaterals in a coordinate plane	**Unit 5: Polygons and Quadrilaterals** -Identify and classify polygons by their number of sides -Identify and classify polygons by their number of sides -Find the measure of the sum of interior and exterior angles of polygons -Find the measure of an interior and exterior angle of a regular polygon -Classify polygons as convex, concave, equilateral, equiangular, and/or regular -Find angle measures of a quadrilateral -Use properties of parallelograms to find angle and segment measures -Show that a quadrilateral is a parallelogram using parallelogram properties -Identify and use properties of special parallelograms (rhombi, rectangles, and squares) -Apply properties of trapezoids to find angle and segment measures -Identify special quadrilaterals in a coordinate plane

		-Identify special quadrilaterals based on limited information -Complete proofs involving Quadrilaterals	-Identify special quadrilaterals based on limited information -Complete proofs involving Quadrilaterals
May	**Unit 5: Polygons and Quadrilaterals** -Identify and classify polygons by their number of sides -Identify and classify polygons by their number of sides -Find the measure of the sum of interior and exterior angles of polygons -Find the measure of an interior and exterior angle of a regular polygon -Classify polygons as convex, concave, equilateral, equiangular, and/or regular -Find angle measures of a quadrilateral -Use properties of parallelograms to find angle and segment measures -Show that a quadrilateral is a parallelogram using parallelogram properties -Identify and use properties of special parallelograms (rhombi, rectangles, and squares) -Apply properties of trapezoids to find angle and segment measures -Identify special quadrilaterals in a coordinate plane -Identify special quadrilaterals based on limited information	**Unit 6: Geometric Measurement (2-D)** -Find the area and perimeter of squares, rectangles, triangles, parallelograms, trapezoids, regular polygons, and figures made up of a combination of those figures -Find the circumference and area of circles -Use segments and area to find the probability of an event **Unit 7: Geometric Measurement (3-D)** -Identify and name solid figures -Find the surface area of prisms, cylinders, cones, pyramids, and spheres	**Unit 6: Geometric Measurement (2-D)** -Find the area and perimeter of squares, rectangles, triangles, parallelograms, trapezoids, regular polygons, and figures made up of a combination of those figures -Find the circumference and area of circles -Use segments and area to find the probability of an event **Unit 7: Geometric Measurement (3-D)** -Identify and name solid figures -Find the surface area of prisms, cylinders, cones, pyramids, and spheres -Find the volume of prisms, cylinders, cones, pyramids, and spheres -Use properties of similar solids
June	**Unit 6: Geometric Measurement (2-D)** -Find the area and perimeter of squares, rectangles, triangles, parallelograms, trapezoids, regular polygons. -Find the circumference and area of circles	**Unit 7: Geometric Measurement (3-D)** -Find the volume of prisms, cylinders, cones, pyramids, and spheres -Use properties of similar solids	**Prepare for Algebra 2:** Suggested Topics: Quadratic Formula Algebra 1 Review

	Unit 7: Geometric Measurement (3-D) -Identify and name solid figures -Find the surface area of prisms, cylinders, cones, pyramids, and spheres Find the volume of prisms, cylinders, cones, pyramids, and spheres		

Unit 1

Foundations for Geometry

Summary and Rationale

Unit 1 introduces students to many of the basic ideas and terms in geometry. It begins with a study of patterns and inductive reasoning which is the foundation of fundamental reasoning skills. Next it introduces students to the basic undefined terms and defined terms of geometry and explores their relationships. These terms will be the basis of future definitions, theorems, and postulates. Furthermore, this unit stresses the importance of accurate notation and correctly naming geometric figures.

Recommended Pacing

For recommended pacing refer to the scope and sequence for each course.

Standards

Geometry	
G.CO.1	Know precise definitions of angles, 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.12	Make formal geometric constructions with a variety of tools and methods (Compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc). Copy a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	

ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**

The stages of inductive reasoning are the foundation of basic reasoning skills and will be useful throughout geometry to help problem solve, prove theorems true, and apply skills. Recognizing and describing patterns can be used to problem solve and make predictions. The fundamental terms, (points, line, plane, segment, and angle) are the building blocks used to define geometric figures, intersections, and explain postulates and theorems to justify the geometry of the world around you. Correct notation and using appropriate symbols are important when naming geometric figures, intersections, and writing proofs. This will ensure accurate solutions and help avoid confusion. Conditional statements are logical statements used to clearly write definitions and conjectures. Proving a statement wrong is often more efficient and effective than trying to prove a statement is true for all cases.	What are the stages of inductive reasoning and how can they be used when problem solving? Why is it easier to prove a conjecture false than true? What are the similarities and differences of the following: AB, $\underline{AB}$, ray AB, line AB. Are collinear points also coplanar? Are coplanar points also collinear? What is the difference between equality and congruence?
Evidence of Learning (Assessments)	
Tests Quizzes Homework Class participation	
Objectives (SLO)	

Students will know:	Students will be able to:
· Inductive reasoning · Conjectures · Collinear points · Coplanar points · Equality · Congruence	· Identify and correctly name points, lines, planes, segments, and rays · Categorize points and lines as collinear and coplanar · Use inductive reasoning to continue patterns and make conjectures · Name the intersection of lines and planes · Sketch simple figures and their intersections · Measure segments and angles · Apply laws of logic · Use properties of equality and congruence·

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic- Introduction to Symbolic Logic (Compound statements, truth tables, etc.)

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

Act as a responsible and contributing community members and employee
Attend to financial well-being
Consider the environmental, social and economic impacts of decisions
Demonstrate creativity and innovation
Utilize critical thinking to make sense of problems and persevere in solving them
Model integrity, ethical leadership and effective management
Plan education and career paths aligned to personal goals
Use technology to enhance productivity increase collaboration and communicate effectively
Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 2

Angles and Segments

Summary and Rationale

In Unit 2 students will use the undefined and defined terms studied in unit 1 to explore additional properties, postulates, and theorems on the subject of angles and segments. They will use these properties, that include the segment addition postulate, angle addition postulate, properties of bisectors, and theorems concerning angles formed by intersecting lines, to find missing angle measurements and segment lengths. Students will develop solid reasoning and justification skills by analyzing geometric relationships. Also, students will have opportunities to review algebra 1 skills by setting up equations and solving for an unknown value.

Recommended Pacing

For recommended pacing refer to the scope and sequence for each course.

Standards

Number and Quantity	
N.Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Algebra	
A.CED.1	Create equations and inequalities in one variable and use them to solve problems.
Geometry	
G.CO.1	Know precise definitions of angles, 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.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.12	Make formal geometric constructions with a variety of tools and methods (Compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc). Copy a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.GPE.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).
G.GPE.6 (+)	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	

9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment.

Instructional Focus

Enduring Understandings:	**Essential Questions:**
A variety of techniques of indirect measurements, the angle addition postulate, and the segment addition postulate can be used to find unknown values and solve problems. Properties of bisectors are the same for segments and angles and can be used to find unknown measurements. Complementary and Supplementary angles describe a relationship between two angles Two intersecting lines and two parallel lines cut by a transversal form angles with specific relationships. These relationships can be used to help find unknown measurements, help classify polygons, prove polygons are congruent or similar, and help find areas.	What is the relationship between the measures of the angles formed by intersecting lines? What are the relationships among the angels formed by two parallel lines and a transversal? How are the angle addition postulate and segment addition postulate the same? How can you use equations to help you find missing angle measurements and side lengths?

Two lines intersected by a transversal form angels with specific relationships that can also be used to prove lines are parallel or perpendicular. Measurements can be used to describe and compare real-life objects. Analyzing geometric relationships develops reasoning and justification skills. When two measurements are equal or equal to a known value, an equation can be written to solve for unknown values.	
Evidence of Learning (Assessments)	
Tests Quizzes Homework Class participation	
Objectives (SLO)	
Students will know: · Angles · Segments · Parallel lines · Intersecting lines	Students will be able to: · Use the segment and angle addition postulates to find missing measurements · Classify angles · Find the measures of complementary and supplementary angles · Bisect a segment and find the coordinates of the midpoint of a segment · Bisect an angle · Use the properties of bisectors to find missing measurements · Identify relationships between lines (parallel, perpendicular, skew, …) · Identify angles formed by intersecting lines as vertical angles or linear pair and use their properties of find angle measurements · Identify adjacent angles · Identify special angle relationships formed by two lines and a transversal (alternate interior, alternate exterior, corresponding, and same side interior angles)

	· Find the congruent angles formed when a transversal cuts parallel lines · Prove lines are parallel and perpendicular using special angle relationships

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items)
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented -Geometric Constructions, Segment Partition

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- Act as a responsible and contributing community members and employee
- Attend to financial well-being
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation
- Utilize critical thinking to make sense of problems and persevere in solving them
- Model integrity, ethical leadership and effective management
- Plan education and career paths aligned to personal goals
- Use technology to enhance productivity increase collaboration and communicate effectively
- Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 3

Triangles

Summary and Rationale

In unit 3 students will study the various properties of triangles. They will first explore properties true for all triangles and use them to find missing measurements and classify angles by their sides and angles. Next they will explore properties true for specific classifications and use their properties to find missing measurements. Throughout this unit students will use several skills and concepts introduced in the previous units, including properties of segments and angles, correctly naming geometric figures and intersections, and analyzing geometric relationships.

Recommended Pacing

For recommended pacing refer to the scope and sequence for each course.

Standards

Number and Quantity	
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Algebra	
A.CED.1	Create equations and inequalities in one variable and use them to solve problems.
Geometry	
G.CO.1	Know precise definitions of angles, 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.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.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum of 180 degrees; 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.
G.CO.12	Make formal geometric constructions with a variety of tools and methods (Compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc). Copy a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.SRT.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divided the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.

9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
All triangles have explicit properties that can be proven using angle relationships, undefined and defined terms, postulates, and theorems. The following properties are true for all triangles: interior angles add up to 180 degrees, the measure of an exterior angle is the sum of the two non-adjacent angles, the sum of any two sides of a triangle must be larger than the third, the shortest side of a triangle is across from the smallest angle, and properties of medians, angle bisectors, and altitudes. Triangles can be classified by both their sides and their angles and specific properties apply for each classification. These properties can be used to find missing angle measurements, missing side lengths, and to solve problems. You can use the Pythagorean Theorem, distance formula, midpoint formula, and theorems and postulates about angle and segment relationships to classify triangles.	What are some relationships among the interior angles of a triangle and exterior angles of a triangle? What do you know about the two acute interior angles in a right triangle? How can you use interior angles to classify triangles by their sides and how can you use side lengths to classify triangles by their angles? Can any three lengths define a triangle?

Evidence of Learning (Assessments)

Tests
Quizzes
Homework
Class participation

Objectives (SLO)

Students will know:	Students will be able to:
· Triangles · Angles · Pythagorean Theorem	· Classify triangles by their sides and by their angles · Find angle measures in triangles · Use exterior angles to find the measure of interior angles and vice-versa · Use properties of isosceles and equilateral triangles to find angle and segment measurements · Use the Pythagorean Theorem to find missing side lengths of a right triangle · Use the converse of the Pythagorean Theorem to classify triangles by their angles · Apply the Triangle Inequality Theorem to determine whether three sides make a triangle · Identify the shortest and longest sides of a triangle given angle measurements · Identify the smallest and biggest angles given side measurements · Identify and apply properties of medians, angle bisectors, perpendicular bisectors, and altitudes

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic_ Geometric Constructions in Triangles- Midpoint, Angle Bisector ,Perpendicular Bisector, etc.

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

Act as a responsible and contributing community members and employee
Attend to financial well-being
Consider the environmental, social and economic impacts of decisions
Demonstrate creativity and innovation
Utilize critical thinking to make sense of problems and persevere in solving them
Model integrity, ethical leadership and effective management

Plan education and career paths aligned to personal goals
Use technology to enhance productivity increase collaboration and communicate effectively
Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 4

Triangle Congruence and Similarity

Summary and Rationale

In unit 4 students will explore the properties, similarities, and differences of congruent and similar polygons and use them to find missing measurements and problem solve. Next, students will specifically study congruent and similar triangles. By using previous skills including, classifying angles, solving linear equations, finding midpoints, and using angle relationships students will prove triangles similar and congruent. In addition, students will strengthen their reasoning and justification skills by using visual recognition and representation to prove congruence and similarity.

Recommended Pacing

For recommended pacing refer to the scope and sequence for each course.

Standards

Algebra	
A.CED.1	Create equations and inequalities in one variable and use them to solve problems.
Geometry	
G.CO.1	Know precise definitions of angles, 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.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.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
G.CO.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.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum of 180 degrees; 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.
G.SRT.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.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
G.SRT.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divided the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.

Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
Equality is used to state two quantities are the same, congruence is used to state figures are the same shape and same size, and similarity is used to state figures are the same shape but different sizes. Previous skills such as classifying angles, solving linear equations, finding midpoints, and using angle relationships can be used to help prove polygons similar or congruent. SSS, SAS, ASA, AAS, and HL are five ways to prove triangles are congruent. Once two triangles are proven congruent then you know all six of their corresponding parts are congruent. AA, SSS similarity, and SAS similarity are three ways to prove triangles are similar. Once two triangles are proven similar then all properties of similarity are true.	What is the difference between equality, congruence, and similarity? Why is HL the only side-side-angle combination that works to prove triangles are congruent? How is the ratio of corresponding sides of similar polygons related to the ratio of their perimeters? Why do you only need two pairs of congruent angles to prove triangles are similar and not three?

A constant ratio exists between corresponding lengths of the sides of similar figures. The ratio can be used to find unknown side lengths.	

Evidence of Learning (Assessments)

Tests
Quizzes
Homework
Class participation

Objectives (SLO)

Students will know: · Congruence · Similarity · Equality	Students will be able to: · Identify congruent and similar polygons and their corresponding parts · Use congruence properties to find missing angle and segment measures · Show triangles are congruent using SSS, SAS, ASA, AAS, and HL · Show triangles are similar using AA, SSS similarity, and SAS similarity · Determine the ratio of similarity and use it to set up a proportion to find missing segment lengths · Use the ratio of similarity to find perimeters

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom

Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
-Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic: Constructing Triangles using SAS, ASA, etc,

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- Act as a responsible and contributing community members and employee
- Attend to financial well-being
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation
- Utilize critical thinking to make sense of problems and persevere in solving them
- Model integrity, ethical leadership and effective management
- Plan education and career paths aligned to personal goals
- Use technology to enhance productivity increase collaboration and communicate effectively
- Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 5

Polygons and Quadrilaterals

Summary and Rationale

In unit 5 students will explore, classify, compare, and apply properties of polygons. Students will first classify polygons by their number of sides, whether they are convex or concave, and whether they are regular, equilateral, or equiangular. Students will then use those classifications to find the measures of interior and exterior angles of polygons

Students will specifically study the various properties of four-sided polygons, quadrilaterals. Using properties, postulates, and theorems about undefined and defined terms, angles, segments, and triangles studied in previous units students will be able to classify special quadrilaterals. In addition, students will use the properties of special quadrilaterals to find missing angle measurements and unknown segment lengths. By analyzing angle and segment relationships within quadrilaterals students will continue to develop reasoning and justification skills.

Recommended Pacing

For recommended pacing refer to the scope and sequence for each course.

Standards

Number and Quantity	
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Algebra	
A.CED.1	Create equations and inequalities in one variable and use them to solve problems.
Geometry	
G.CO.1	Know precise definitions of angles, 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.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.CO.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.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum of 180 degrees; 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.
G.CO.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.
G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GPE.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).
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
Two dimensional figures can be described, classified, and analyzed by their attributes including their number of sides, relationship between angles and side measurements, and whether it is convex or concave. The sum of the interior angles of a convex polygon is dependent on the number of sides the polygon has. This can be proven using the interior angles of a triangle. The sum of the exterior angles of a convex polygon is always 360 degrees.	What does regular mean? What does it tell you about a polygon? How can you use the measure of an interior angle of a regular polygon to find an exterior and vice-versa? What properties are true for all quadrilaterals/ parallelograms/ special parallelograms/ trapezoids? How can you use angle relationships to classify quadrilaterals?

Spatial sense offers ways to visualize, to interpret, and to reflect on our physical environment. Previous skills including identifying angle relationships, proving lines are parallel or perpendicular, and solving linear equations can be used to classify quadrilaterals. Parallelograms, rectangles, rhombi, square, trapezoids, and isosceles trapezoids each have distinct properties and these properties can be used to find missing angle measurements and side lengths, prove triangles are congruent or similar, classify triangles, and problem solve. Rectangles, rhombi, and squares are all special types of parallelograms and therefore have all the properties of parallelograms as well as their own specific characteristics. (EX: A square is a rectangle but a rectangle is not a square.)	What are the similarities between isosceles triangles and isosceles trapezoids?
Evidence of Learning (Assessments)	
Tests Quizzes Homework Class participation	
Objectives (SLO)	
Students will know: -Polygons -Quadrilaterals · Parallelograms · Trapezoids · Triangles · Angle relationship	Students will be able to:\ -Identify and classify polygons by their number of sides · Find the measure of the sum of interior and exterior angles of polygons · Find the measure of an interior and exterior angle of a regular polygon · Classify polygons as convex, concave, equilateral, equiangular, and/or regular · Find angle measures of a quadrilateral · Use properties of parallelograms to find angle and · segment measures · Show that a quadrilateral is a parallelogram using parallelogram properties

	· Identify and use properties of special parallelograms (rhombi, rectangles, and squares) · Apply properties of trapezoids to find angle and segment measures · Identify special quadrilaterals in a coordinate plane · Identify special quadrilaterals based on limited information

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction

- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic: Constructing Regular Polygons

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

Act as a responsible and contributing community members and employee
Attend to financial well-being
Consider the environmental, social and economic impacts of decisions
Demonstrate creativity and innovation
Utilize critical thinking to make sense of problems and persevere in solving them
Model integrity, ethical leadership and effective management
Plan education and career paths aligned to personal goals
Use technology to enhance productivity increase collaboration and communicate effectively
Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 6	
Geometric Measurement (2-D)	
Summary and Rationale	
In unit 6 students will calculate the perimeter, circumference, and area of polygons and circles. Students will review similarity and compare perimeters and areas of similar polygons.	
Recommended Pacing	
For recommended pacing refer to the scope and sequence for each course.	
Standards	
Number and Quantity	
N.Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Geometry	
G.CO.1	Know precise definitions of angles, 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.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GPE.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

G.GMD.4	Identify the shapes of two dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two dimensional objects.
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
Perimeter is the distance around the figure and is measured in units. Area is the amount of surface covered by a figure and is measured in units squared. Circumference is the distance around a circle. A change in one dimension of an object results in predictable changes in area. Geometric figures can be represented in the coordinate plane. Area and segment length can be used to determine the probability of hitting a particular point.	What is the connection between the constant ratio between corresponding lengths of the sides of similar figures and the ratio of their perimeters and areas? What are some real life situations where you would use perimeter and area?

Evidence of Learning (Assessments)

Tests
Quizzes
Homework
Class participation

Objectives (SLO)

Students will know:	Students will be able to:
· Circumference · Area · Perimeter	· · Find the area and perimeter of squares, rectangles, triangles, parallelograms, trapezoids, regular polygons, and figures made up of a combination of those figures · Find the circumference and area of circles · Use segments and area to find the probability of an event

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator -Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic: Using Circumference and Area to Develop π, Using Trigonometry to Calculate the Area of Triangles

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- Act as a responsible and contributing community members and employee
- Attend to financial well-being
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation
- Utilize critical thinking to make sense of problems and persevere in solving them
- Model integrity, ethical leadership and effective management
- Plan education and career paths aligned to personal goals
- Use technology to enhance productivity increase collaboration and communicate effectively
- Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 7	
Geometric Measurement (3-D)	
Summary and Rationale	
In unit 7 students will investigate the surface area and volume of solids. Using tools from previous units students will distinguish solids by their characteristics and use those characteristics to calculate surface area, lateral area, and volume. In addition, students will investigate similar solids and compare their surface area and volumes.	
Recommended Pacing	
For recommended pacing refer to the scope and sequence for each course.	
Standards	
Number and Quantity	
N.Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Geometry	
G.CO.1	Know precise definitions of angles, 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.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GMD.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.
G.GMD.2	Give an informal argument using Cavalieri's principle for the formulas for the volume of a

	sphere and other solid figures.
G.GMD.3	Use volume formulas for cylinders, pyramids, cones and spheres to solve problems.
G.GMD.4	Identify the shapes of two dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two dimensional objects.
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTU's per cubic feet).
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
Three dimensional figures can be described, classified, and analyzed by their attributes including their bases, lateral faces, and relationship between angles and side measurements. A change in one dimension of an object results in predictable changes in surface area and volume. Polyhedrons are solids made up of polygons. The surface area of a solid is the sum of the areas of all their faces and is measured in units squared. The volume of a solid is the number of cubic units contained in its interior and is measured in cubic units.	What solids can be made using congruent regular polygons? How do you calculate the surface area of a polyhedron? What is the difference between height and slant height of cones and pyramids? Which one is used when finding surface area and which one is used when finding volume? Why? How is the volume of a pyramid related to the volume of a prism with the same base and height? How are the surface areas and volumes of similar solids related?

Evidence of Learning (Assessments)

Tests
Quizzes
Homework
Class participation

Objectives (SLO)

Students will know:	Students will be able to:
· Surface area · Volume · Solid Figures	· Identify and name solid figures · Find the surface area and volume of prisms, cylinders, · cones, pyramids, and spheres · Use properties of similar solids

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items)
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topics:3-D Solids Generated by the Revolution of a 2-D figure through Space

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- Act as a responsible and contributing community members and employee
- Attend to financial well-being
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation
- Utilize critical thinking to make sense of problems and persevere in solving them
- Model integrity, ethical leadership and effective management
- Plan education and career paths aligned to personal goals
- Use technology to enhance productivity increase collaboration and communicate effectively
- Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 8

Right Triangle Trigonometry

Summary and Rationale

In unit 8 students will continue their exploration with triangles by exclusively studying the characteristics and attributes of right triangles. Previous objectives will be revisited including the Pythagorean Theorem and the converse of Pythagorean Theorem as well as new ideas such as geometric mean and trigonometric ratios. Also, students will examine special right triangles and discover ways to find side lengths using constant ratios. Students will continue to apply properties of angles, segments, and triangles, reinforce their reasoning and justification skills, and review algebra skills.

Recommended Pacing

For recommended pacing refer to the scope and sequence for each course.

Standards

Number and Quantity	
N.RN.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Algebra	
A.CED.1	Create equations and inequalities in one variable and use them to solve problems.
Geometry	
G.CO.1	Know precise definitions of angles, 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.SRT.4	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divided the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.SRT.6	Understand that by similarity, side ratios in right triangles are properties of angles in the triangle, leading to the definitions of trigonometric ratios for acute angles.
G.SRT.7	Explain and use the relationship between the side and cosine complementary angles.
G.SRT.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
G.SRT.10	Prove the Laws of Sines and Cosines and use them to solve problems.
G.SRT.11	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	

9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
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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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
The Pythagorean Theorem can be used to find the lengths of the sides of a right triangle and the converse of the Pythagorean Theorem can be used to classify triangles by their angles. Any right triangle can be split into two similar triangles when you draw the altitude from the right angle to its opposite side. Furthermore, when an altitude is drawn in a right triangle from the right angle to its opposite side, the altitude is the geometric mean of the two segments of the hypotenuse and the leg is the geometric mean of the hypotenuse and the segment of the hypotenuse adjacent to the leg. Using the Pythagorean Theorem, you can prove that the extended ratio of the side lengths of a 45-45-90 triangle is $1:1:\sqrt{2}$ and the extended ratio of	Are all right triangles similar? Why or why not? Are all 45-45-90 triangles isosceles? Why or why not? What relationship exists among the sides of a right triangle? How can you use the side lengths in a triangle to classify the triangle by its angle measures? How are geometric means related to the altitude of a right triangle? What does it mean to solve a right triangle?

the side lengths for 30-60-90 triangles is 1:$\sqrt{3}$:2. The ratios can be used to find missing side lengths. A trigonometric ratio is a ratio of the lengths of two sides in a right triangle. Sine, Cosine, and tangent ratios are constant for a given angle measure. These ratios can be used to find the measure of a side or an acute angle in a right triangle	

Evidence of Learning (Assessments)

Tests
Quizzes
Homework
Class participation

Objectives (SLO)

Students will know:	Students will be able to:
· Right Triangle · Isosceles Triangle	· Use The Pythagorean Theorem to find the side length of a right triangle · Apply the properties of 30-60-90 and 45-45-90 triangles to find side measures · Find the sine, cosine, and tangent of an acute angle · Use basic trigonometry ratios and inverse ratios to solve right triangles · Calculate the geometric mean given two numbers · Apply geometric mean properties given a right triangle and an altitude drawn from the right angle to its opposite side

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic: Proving Pythagorean Theorem using Similar Triangles, Inverses of Trig Functions

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

Act as a responsible and contributing community members and employee
Attend to financial well-being
Consider the environmental, social and economic impacts of decisions
Demonstrate creativity and innovation
Utilize critical thinking to make sense of problems and persevere in solving them
Model integrity, ethical leadership and effective management

Plan education and career paths aligned to personal goals
Use technology to enhance productivity increase collaboration and communicate effectively
Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 9	
Circles	
Summary and Rationale	
In unit 9 students will study the properties and characteristics of circles. First, students will identify and name segments and lines related to circles. In addition to properties, theorems, and postulates previously learned, students will use properties of tangents, secants, chords, arcs, central angles, and inscribed angles to find angle measurements, arc measurements, and unknown segment lengths. Finally, students will write equations of circles and graph them in a coordinate plane.	
Recommended Pacing	
For recommended pacing refer to the scope and sequence for each course.	
Standards	
Algebra	
A.CED.1	Create equations and inequalities in one variable and use them to solve problems.
Geometry	
G.C.1	Prove that all circles are similar.
G.C.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.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
G.C.4	Construct a tangent line from a point outside a given circle to the circle.
G.C.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 measures of the angle as the constant of proportionality derive the formula for the area of a sector.

G.CO.1	Know precise definitions of angles, 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.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.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum of 180 degrees; 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.
G.CO.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.
G.CO.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.GPE.1 **(+)**	Derive the equations of a circle given center and radius using the Pythagorean Theorem; complete the square to find the center and the radius of a circle given by an equation.
G.GPE.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).
G.MG.1	Use geometric shapes, their measures, and their properties to describe objects.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**

There are several relationships between tangents, secants, and chords. These relationships can help determine that two chords or tangents are congruent, find the length of a secant, chord, or radius, and determine how far a chord is from the center of the circle. Tangents, secants, and chords can be used to find the measures of angles formed inside, outside, and on circles. Also angles inside, outside, and on the circle can be used to find the measure and lengths of arcs. Circles in the coordinate plane can be written using a standard equation. Circles have many connections with other geometric figures. When a polygon is inscribed in a circle or vice-versa you can use the properties of circles to find missing angle measures and side lengths. For example a quadrilateral can be inscribed in a circle if and only if their opposite angles are supplementary.	How are the lengths of tangent segments related? How are inscribed angles related to central angles? How are central angles, inscribed angles, angles inside the circle, and angles outside the circle related to their intercepted arcs? What is the relationship between the lengths of segments in a circle formed by two intersecting chords?
Evidence of Learning (Assessments)	
Tests Quizzes Homework Class participation	
Objectives (SLO)	
Students will know: · Circles · Tangents · Secants · Chords · Angles	Students will be able to: · Identify segments and lines related to circles (chord, diameter, radius, secant, and tangent) · Use properties of tangents, chords, and secants to find segment and angle measurements · Classify arcs by their measurements (semi, major, and minor)

	· Determine the measure of central and inscribed angles using their intercepted arcs and vice-versa · Write and graph the equation of a circle

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items)
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
-Calculators when specified
-Google Classroom
-Desmos graphing calculator
-Kuta Software

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

General Modifications for students struggling to learn:
Small group instruction within the classroom
Differentiation through content, process, product,and environment
Individual feedback and praise towards what is done correctly based upon effort, attitude and strategy.
Help students manage individual stressors for the student and plan alternate pathways for completion of assignments

Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time
-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language
- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic: Measuring Angles in Radians

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- Act as a responsible and contributing community members and employee
- Attend to financial well-being
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation
- Utilize critical thinking to make sense of problems and persevere in solving them
- Model integrity, ethical leadership and effective management
- Plan education and career paths aligned to personal goals
- Use technology to enhance productivity increase collaboration and communicate effectively
- Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

Unit 10	
Geometric Transformations	
Summary and Rationale	
In unit 10 students will study the motion of geometric figures in the form of transformations. They will review and use properties of angles, segments, polygons, congruency, and similarity to identify reflections, rotations, translations, dilations, and compositions of transformation.	
Recommended Pacing	
For recommended pacing refer to the scope and sequence for each course.	
Standards	
Number and Quantity	
N.Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Geometry	
G.CO.1	Know precise definitions of angles, 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.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 at outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
G.CO.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.CO.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G.CO.5	Given a geometric figure and a rotation, reflections, 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.
G.CO.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.
G.SRT.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.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.MG.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).
Interdisciplinary Connections	
ELA	
RL.10	Read and comprehend complex literary and informational texts independently and proficiently.
W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
9.1	All students will demonstrate the creative, critical thinking, collaboration, and problem solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Integration of Technology	
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Career Readiness, Life Literacies and Key Skills	
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.4	Evaluate different careers and develop various plans.
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9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.
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 specific task.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environment

Instructional Focus

Enduring Understandings:	**Essential Questions:**
A transformation is an operation that maps a preimage onto the image. Translating, reflecting and rotating polygons yield congruent polygons while dilating polygons yield similar polygons. There are multiple ways to describe transformations including coordinate notation and verbal notation. Both representations are important and useful. When you perform combinations of two or more transformations it can be equivalent to performing only one transformation. For example, the composition of two reflections results in either a translation or rotation.	What transformations maintain the congruence of a figure? What is the relationship between the line of reflections and the segment connecting a point and its image? What happens when you reflect a figure about the x axis and then the y axis? How can you use the value of the scale factor of a dilation to determine if it is an enlargement or reduction?

Evidence of Learning (Assessments)

Tests
Quizzes
Homework
Class participation

Objectives (SLO)

Students will know:	Students will be able to:
· Transformation · Notations · Congruence	· Identify and use properties of translations, rotations, reflections, and dilations · Describe transformations using words and coordinate notation given a diagram · Determine the number of lines of symmetry a plane figure contains · Use coordinate notation to sketch a diagram of a transformation

Suggested Resources/Technology Tools

-Textbooks, workbooks, and assessment aides
-Online textbook
-NJSLA Practice Tests and Released Items)
-Khan Academy; www.insidemathematics.org/performanceassessment-tasks
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Tier 1 Modifications and Accommodations

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Special Education:
Modifications are determined by each student's Individual Education Plan. Examples include:
-Use concrete examples of concepts before teaching the abstract
-Reduce the number of concepts presented at one time-Give additional presentations by varying the methods using repetition, simpler explanations, more examples and modeling
-Use of aids (calculator, computer, tape recorder, etc.)
-Frequently check on progress of independent work
-Provide study guides and copy of notes
-Provide repetition and practice

MLL:
Modifications are determined by each student. Examples include:
- Provide students with notes, examples, tests, and quizzes in their primary language

- Monitor the student's comprehension of language used during instruction
- Give written directions to supplement verbal directions
- Frequently check on progress of independent work

504:
Modifications are determined by each student's 504 plan. Examples include:
-Teacher will review, restate and repeat directions, as needed
-Frequently check on progress of independent work

Gifted and Talented - Extension Topic: Transformations of Functions Learned in Algebra

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

Act as a responsible and contributing community members and employee
Attend to financial well-being
Consider the environmental, social and economic impacts of decisions
Demonstrate creativity and innovation
Utilize critical thinking to make sense of problems and persevere in solving them
Model integrity, ethical leadership and effective management
Plan education and career paths aligned to personal goals
Use technology to enhance productivity increase collaboration and communicate effectively
Work productively in teams while using cultural/global competence

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/