



MIDLAND PARK PUBLIC SCHOOLS
Midland Park, New Jersey
CURRICULUM

Geometry

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Superintendent of Schools:
Marie C. Cirasella, Ed.D.
Director of Curriculum, Instruction, & Assessment:
Melissa Quackenbush

*Approved by the Midland Park Board of Education on
July 11, 2017*

Content Area: Geometry	
Unit Title: 10 - Measurement of Figures and Solids	
Grade Level: 10	
<p>Unit Summary: In this unit, students develop and use a formula for the area of a regular polygon. They use lengths of segments and areas of regions to calculate probabilities. They identify and name solids, including Platonic solids, and use Euler's Theorem to relate the number of faces, vertices, and edges of solids. Students describe cross sections of solids, find the volume of prisms, cylinders, pyramids, cones, and composite solids, and find the surface area and volume of spheres. Finally, they use scale factors in similar solids to compare the ratios of the surface areas and the ratios of the volumes of the solids.</p> <p>Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.</p> <p>21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively. CRP6. Demonstrate creativity and innovation. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
NJSLS.G-CO.D.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
NJSLS.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
NJSLS.G-GMD.A.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. <i>Use dissection arguments, Cavalieri's principle, and informal limit arguments.</i>
NJSLS.G-GMD.A.3	Use volume formulas for cylinders, pyramids, cones and spheres to solve problems.
NJSLS.G-GMD.B.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.
NJSLS.G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints to minimize cost; working with typographic grid systems based on ratios).
NJSLS.S-CP.A.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions
Unit Essential Question(s): <ul style="list-style-type: none"> How can we use formulas to determine the area of triangles, parallelograms, trapezoids, and other polygons? 	Unit Enduring Understandings: <ul style="list-style-type: none"> Solving problems using surface area and volume. Connecting similarity to solids.

- How can we use lengths of segments and areas of regions to calculate probabilities?
- How can we use ratios of areas to find missing lengths in similar figures?

Unit Learning Targets/Objectives:

Students will...

- Develop and use formulas for the area of triangles, parallelograms, trapezoids, and other polygons.
- Use volume formulas for cylinders, pyramids, cones and spheres to solve problems.
- Use lengths of segments and areas of regions to calculate probabilities.
- Use ratios of areas to find missing lengths in similar figures.
- Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- Define the radian measure of the angle as the constant of proportionality.
- Identify the shapes of two-dimensional cross-sections of three-dimensional objects.
- Identify three-dimensional objects generated by rotations of two-dimensional objects.

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):

Larson Geometry Teacher Resources
www.njctl.org/courses/math/geometry/

Modifications:

- | | |
|---|--|
| <ul style="list-style-type: none"> ● Special Education Students <ul style="list-style-type: none"> ○ Allow errors ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions, and permit drawing, as an explanation ○ Accept participation at any level, even one word ○ Consult with Case Managers and follow IEP accommodations/modifications ● English Language Learners <ul style="list-style-type: none"> ○ Assign a buddy, same language or English speaking ○ Allow errors in speaking ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions ○ Accept participation at any level, even one word | <ul style="list-style-type: none"> ● At-Risk Students <ul style="list-style-type: none"> ○ Provide extended time to complete tasks ○ Consult with Guidance Counselors and follow I&RS procedures/action plans ○ Consult with classroom teacher(s) for specific behavior interventions ○ Provide rewards as necessary ● Gifted and Talented Students <ul style="list-style-type: none"> ○ Provide extension activities ○ Build on students' intrinsic motivations ○ Consult with parents to accommodate students' interests in completing tasks at their level of engagement |
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Grade 10 Geometry Curriculum Overview

Geometry is taught in ten units throughout the school year. The Geometry curriculum is a rigorous, open-ended and sequential process of connecting previously learned mathematical topics and expanding them to include the study of triangles, quadrilaterals, circles and trigonometry. As part of the spiraling curriculum, aspects of Algebra I are reviewed throughout the year. A guided inquiry program gives students the opportunity to explore topics and concepts through mathematical investigations. Participating in this rigorous program helps students:

1. To foster a lifelong enjoyment of learning mathematics.
2. To observe mathematics in the world around them.
3. To meet the Geometry standards for New Jersey Public Schools.

Suggested Course Sequence*:

Unit 1: Essentials of Geometry: 19 days

Unit 2: Reasoning & Proof: 9 days

Unit 3: Parallel and Perpendicular Lines: 10 days

Unit 4: Congruent Triangles & Relationships with Triangles: 25 days

Unit 5: Similarity: 14 days

Unit 6: Right Triangles & Trigonometry: 16 days

Unit 7: Quadrilaterals: 12 days

Unit 8: Properties of Transformations: 14 days

Unit 9: Properties of Circles: 20 days

Unit 10: Measurement of Figures and Solids: 21 days

Prerequisite: Algebra 1

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*

Content Area: Geometry	
Unit Title: 1 - Essentials of Geometry	
Grade Level: 10	
<p>Unit Summary: In this unit students will name and sketch geometric figures, use postulates to identify congruent segments, find lengths of segments in the coordinate plane, and find the midpoint of a segment. Students also will name, measure and classify angles, identify complementary and supplementary angles, and classify polygons.</p> <p>Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.</p> <p>21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively. CRP6. Demonstrate creativity and innovation. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
NJSLS.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
NJSLS.G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
NJSLS.G-CO.C.9	Prove theorems about lines and angles. <i>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.</i>
NJSLS.G-CO.C.10	Prove theorems about triangles. <i>Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.</i>
NJSLS.G-CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) <i>Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</i>
NJSLS.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g. using the distance formula.
NJSLS.G-MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
NJSLS.G-C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources

Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions
Unit Essential Question(s): <ul style="list-style-type: none"> How do we develop an awareness of the structure of a mathematical system connecting definitions, postulate, and theorems? 	Unit Enduring Understandings: <ul style="list-style-type: none"> Understanding definitions of geometric figures. Find perimeter and areas of basic polygons. Understand congruence of segments and angles. Using basic construction techniques to explore properties.
Unit Learning Targets/Objectives: <i>Students will...</i> <ul style="list-style-type: none"> Be able to describe and identify points, lines, and planes. Be able to apply to calculate the distance between two points and find the midpoint. Be able to name, measure, and classify angles. Be able to apply segment and angle addition postulates Be able to find perpendicular bisectors of a segment and angle bisectors. Be able to classify polygons. 	
Formative Assessments: <ul style="list-style-type: none"> Quizzes Homework On spot checking for understanding activities Entry/Exit tickets Summative/Benchmark Assessment(s): <ul style="list-style-type: none"> Tests Projects Resources/Materials (copy hyperlinks for digital resources): Larson Geometry Teacher Resources www.njctl.org/courses/math/geometry/	
Modifications: <ul style="list-style-type: none"> Special Education Students <ul style="list-style-type: none"> Allow errors Rephrase questions, directions, and explanations Allow extended time to answer questions, and permit drawing, as an explanation Accept participation at any level, even one word Consult with Case Managers and follow IEP accommodations/modifications English Language Learners <ul style="list-style-type: none"> Assign a buddy, same language or English speaking Allow errors in speaking Rephrase questions, directions, and explanations At-Risk Students <ul style="list-style-type: none"> Provide extended time to complete tasks Consult with Guidance Counselors and follow I&RS procedures/action plans Consult with classroom teacher(s) for specific behavior interventions Provide rewards as necessary Gifted and Talented Students <ul style="list-style-type: none"> Provide extension activities Build on students' intrinsic motivations Consult with parents to accommodate students' interests in completing tasks at their level of engagement 	

- o Allow extended time to answer questions
- o Accept participation at any level, even one word

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Identify Points, Lines, & Planes	To name and sketch geometric figures	2 days
Use Segments & Congruence	To use segment postulates to identify congruent segments	1 day
Measure & Classify Angles	To name, measure, and classify angles	2 days
Use Angle Bisectors	To use Angle Bisectors to find distance relationships.	2 days
Describe Angle Pair Relationships	To use special angle relationships to find angle measures	3 days
Prove Angle Pair Relationships	To use properties of special pairs of angles	2 days
Classify Polygons	To classify polygons	2 days
Find Angle Measures in Polygons	To find angles measures in polygons	2 days
Use Midpoint & Distance Formulas	To find lengths of segments in the coordinate plane.	3 days
Teacher Notes:		
Additional Resources		
Click links below to access additional resources used to design this unit:		

Content Area: Geometry

Unit Title: 2 - Reasoning and Proof

Grade Level: 10

Unit Summary: This unit has students analyzing conditional statements to write the converse, inverse and contra-positive of a conditional statement. Students will use properties of equality and laws of logic to prove basic theorems about congruence, supplementary, complementary and vertical angles.

Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively.

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CRP9. Model integrity, ethical leadership and effective management.

CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted as the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
NJSLS.G-CO.C.9	Prove theorems about lines and angles. <i>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.</i>
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions

<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> How can one analyze conditional statements? How can we prove basic theorems about lines and congruence, supplementary and vertical angles? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> Understand conditional statements and find the converse, inverse, and contra-positive of these statements. Use algebraic properties in logical arguments Write proofs
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Unit Learning Targets/Objectives:
Students will...

- Analyze conditional statements and write the converse, inverse and contra-positive of a conditional statement.
- Be able to use laws of detachment and syllogism
- Be able to use properties of equality and law of logic to prove basic theorems about congruence, supplementary, complementary and vertical angles.

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):

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Modifications:

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- Gifted and Talented Students
 - Provide extension activities
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Analyze Conditional Statements	To write definition as conditional statements	3 days
Reason Using Properties from Algebra	To use algebraic properties in logical arguments	3 days
Prove Statements about Segments and Angles	To write proofs using geometric theorems	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Content Area: Geometry**Unit Title: 3 - Parallel and Perpendicular Lines****Grade Level: 10**

Unit Summary: This unit enables students to classify and study angle pairs. Students will also prove theorems about perpendicular lines and find the distance between parallel lines in the coordinate plane.

Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively.

CRP6. Demonstrate creativity and innovation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
NJSLS.G-CO.C.9	Prove theorems about lines and angles. <i>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.</i>
NJSLS.G-CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) <i>Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</i>
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions

Unit Essential Question(s):

- How do we classify and study angles pairs?
- How do we find the distance between parallel lines on a coordinate plane?
- How can we prove theorems about perpendicular lines?

Unit Enduring Understandings:

- Angle pairs
- Understand theorems of perpendicular lines
- The distance between parallel lines on a coordinate plane.
- How to use postulates about points, lines, planes, segments, and angles to solve problems.

Unit Learning Targets/Objectives:**Students will...**

- Be able to classify and study angle pairs.

- Be able to find the distance between parallel lines on a coordinate plane.
- Be able to prove theorems about perpendicular lines.
- Be able to apply postulates and theorems involving segments and angles to solve problems.

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):

Larson Geometry Teacher Resources
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Modifications:

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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Identify Pairs of Lines and Angle	To identify pairs of lines and angles	2 days
Use Parallel Lines and Transversals	To use angles formed by parallel lines and transversals	3 days
Prove Lines are Parallel	Use angle relationships to prove lines are parallel	2 days

Prove Theorems about Perpendicular Lines	To find the distance between a point and a line	3 days
<p>Teacher Notes:</p> <p>Additional Resources Click links below to access additional resources used to design this unit:</p>		

Content Area: Geometry**Unit Title: 4 - Congruent Triangles and Relationships with Triangles****Grade Level: 10**

Unit Summary: This unit explores congruence between triangles. Students learn to classify triangles, find measures of triangles, identify congruent figures, and prove triangles congruent. They will also use theorems about isosceles and equilateral triangles. Students will use properties of midsegments to find lengths of segments in triangles. They will explore perpendicular bisectors, medians of a triangle, and altitudes. Students will also relate side length and angle measures of a triangle, use inequalities to make comparisons in two triangles, use the Hinge Theorem and its converse to solve multi-step problems.

Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

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CRP9. Model integrity, ethical leadership and effective management.

CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.G-CO.A.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
NJSLS.G-CO-B.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definitions of congruence in terms of rigid motions to decide if they are congruent.
NJSLS.G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
NJSLS.G-CO.B.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
NJSLS.G-CO.C.9	Prove theorems about lines and angles. <i>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.</i>
NJSLS.G-CO.C.10	Prove theorems about triangles. <i>Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.</i>
NJSLS.G-CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) <i>Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</i>

NJSLS.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically. <i>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 $(0,2)$.</i>
NJSLS.G.C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
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Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions
Unit Essential Question(s): <ul style="list-style-type: none"> ● How can statements about triangles be proven? ● How do we classify triangles? ● How do we measure angles of triangles? ● How do we use inequalities to make comparisons in triangles? ● How do we use the Hinge Theorem to solve multi-step problems? 	Unit Enduring Understandings: <ul style="list-style-type: none"> ● Classifying triangles by sides and angles ● Proving that triangles are congruent ● Using coordinate geometry to investigate triangle relationships. ● Using properties of special segments in triangles ● Using triangle inequalities to determine what triangles are possible.
Unit Learning Targets/Objectives: <i>Students will...</i> <ul style="list-style-type: none"> ● Be able to identify triangles by sides and angles. ● Be able to find the congruent angles of an isosceles triangle given congruent sides. ● Be able to find the congruent sides of an isosceles triangle given congruent angles. ● Be able to show triangles are congruent and solve problems based on that congruence. ● Be able to state the congruence of corresponding parts knowing congruent triangles. ● Be able to construct incenter, circumcenter, orthocenter, and centroid of a triangle. ● Be able to identify which side of a triangle is largest knowing angle measures. ● Be able to identify which angle is largest knowing side lengths. ● Be able to solve problems using the Hinge Theorem 	
Formative Assessments: <ul style="list-style-type: none"> ● Quizzes ● Homework ● On spot checking for understanding activities ● Entry/Exit tickets Summative/Benchmark Assessment(s): <ul style="list-style-type: none"> ● Tests ● Projects Resources/Materials (copy hyperlinks for digital resources): Larson Geometry Teacher Resources www.njctl.org/courses/math/geometry/	
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Apply Triangle Sum Properties	To classify triangles and find measures of their angles	2 days
Use Isosceles and Equilateral Triangles	To use theorems about isosceles and equilateral triangles	2 days
Use Inequalities in a Triangle	To find possible side lengths of a triangle	3 days
Midsegment Theorem & Coordinate Proof	To use properties of midsegments and write coordinate proofs	2 days
Use Perpendicular Bisectors	To use perpendicular bisectors to solve problems	2 days
Use Inequalities in a Triangle	To use medians and altitudes of triangles	3 days
Apply Congruence and Triangles	To identify congruent figures	2 days
Relate Transformations and Congruence	To use transformation to show congruence	2 days

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Prove Triangles Congruent by SSS	To use the side lengths to prove triangles are congruent	2 days
Prove Triangles Congruent by SAS and HL	To use sides and angles to prove congruence	2 days
Prove Triangles Congruent by ASA and AAS	To use two more methods to prove congruences	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Content Area: Geometry**Unit Title: 5 - Similarity****Grade Level: 10**

Unit Summary: In this unit students use proportions to identify similar polygons and find the scale factor between two polygons, they use a scale factor to find corresponding lengths in similar polygons, and they use the AA Similarity Postulate, the SSS Similarity Theorem, or the SAS Similarity Theorem to determine whether two triangles are similar. Also, students use proportions and the Triangle Proportionality Theorem or its converse to find the lengths of segments related to triangles or parallel lines. Finally, students perform dilations that are reductions or enlargements and they verify that a figure is similar to its dilation.

Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively.

CRP6. Demonstrate creativity and innovation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.G-SRT.A.1	Verify experimentally the properties of dilations given by a center and a scale factor. a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
NJSLS.G-SRT.A.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
NJSLS.G-SRT.A.3	Use the properties of similarity transformation to establish the AA criterion for two triangles to be similar.
NJSLS.G-SRT.B.4	Prove theorems about triangles. <i>Theorems include: a line parallel to one side of a triangle divides the other two proportionally and conversely; the Pythagorean Theorem proved using triangle similarity.</i>
NJSLS.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
NJSLS.G-C.A.1	Prove that all circles are similar.
NJSLS.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically. <i>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 $(0,2)$.</i>
NJSLS.G-GPE.B.6	Find the point on a directed line segment between two given points that partitions that segment in a given ratio.
NJSLS.G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

NJSLS.G-CO.A.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.	
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources	
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions	
Unit Essential Question(s): <ul style="list-style-type: none"> ● How can we recognize similar polygons and use this fact to solve problems? ● How can we find the length of segments related to triangles or parallel lines using proportions? ● How can we prove that a figure is similar to its dilation? 	Unit Enduring Understandings: <ul style="list-style-type: none"> ● Use ratios and proportions to solve geometry problems. ● Show that triangles are similar. ● Use indirect measurement and similarity 	
Unit Learning Targets/Objectives: <i>Students will...</i> <ul style="list-style-type: none"> ● Be able to construct similar triangles. ● Be able to identify similar figures using triangle similarity postulates. ● Be able to solve problems involving similar figures. ● Be able to find the length of segments related to triangles or parallel lines using proportions. ● Be able to prove if a figure is similar to its dilation. 		
Formative Assessments: <ul style="list-style-type: none"> ● Quizzes ● Homework ● On spot checking for understanding activities ● Entry/Exit tickets Summative/Benchmark Assessment(s): <ul style="list-style-type: none"> ● Tests ● Projects Resources/Materials (copy hyperlinks for digital resources): Larson Geometry Teacher Resources www.njctl.org/courses/math/geometry/		
Modifications: <ul style="list-style-type: none"> ● Special Education Students <ul style="list-style-type: none"> ○ Allow errors ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions, and permit drawing, as an explanation ○ Accept participation at any level, even one word ○ Consult with Case Managers and follow IEP accommodations/modifications ● English Language Learners ● At-Risk Students <ul style="list-style-type: none"> ○ Provide extended time to complete tasks ○ Consult with Guidance Counselors and follow I&RS procedures/action plans ○ Consult with classroom teacher(s) for specific behavior interventions ○ Provide rewards as necessary ● Gifted and Talented Students <ul style="list-style-type: none"> ○ Provide extension activities ○ Build on students' intrinsic motivations 		

- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions
- Accept participation at any level, even one word
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Use Similar Polygons	To use proportions to identify similar polygons	2 days
Relate Transformations and Similarity	To identify similarity transformation called dilations	2 days
Prove Triangles Similar by AA	To use the AA Similarity Postulate	3 days
Prove Triangles Similar by SSS and SAS	To use the SSS and SAS Similarity Theorems	2 days
Use Proportionality Theorems	To use proportions with a triangle or parallel lines	2 days
Perform Similarity Transformations	To perform dilations	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Content Area: Geometry	
Unit Title: 6 - Right Triangles & Trigonometry	
Grade Level: 10	
<p>Unit Summary: In this unit students investigate side lengths and angles in triangles. They start by using the Pythagorean theorem to find the length of the third side in a right triangle, then use the Converse of the Pythagorean Theorem, and other theorems, to decide if three given sides lengths form an acute, right, or obtuse triangle. Students explore ratios of lengths formed by an altitude to the hypotenuse of a right triangle and use the ratios of side lengths for a 458-458-908 triangle and a 308-608-908 triangle. Finally, students apply trigonometric ratios, the Law of Sines, and the Law of Cosines to find side lengths and angle measures in triangles.</p>	
<p>Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.</p>	
<p>21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively. CRP6. Demonstrate creativity and innovation. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
NJSLS.G-SRT.B.4	Prove theorems about triangles. <i>Theorems include: a line parallel to one side of a triangle divides the other two proportionally and conversely; the Pythagorean Theorem proved using triangle similarity.</i>
NJSLS.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
NJSLS.G-SRT.B.6	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
NJSLS.G-SRT.B.7	Explain and use the relationship between the sine and cosine of complementary angles.
NJSLS.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
NJSLS.G-SRT.D.9	(+) Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
NJSLS.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
NJSLS.G-MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions
<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> What is the relationship between the sides and angles of right triangles? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> Using the Pythagorean Theorem and its converse. Using special relationships in right triangles

<ul style="list-style-type: none"> ● How can the Pythagorean Theorem be used to find a third length of a triangle? ● How can we apply trigonometry ratios to find side lengths and angle measures? 	<ul style="list-style-type: none"> ● Using trigonometric ratios to solve right triangles.
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Unit Learning Targets/Objectives:
Students will...

- Be able to solve problems and identify right triangles using the Pythagorean Theorem
- Be able to use trigonometric ratios to solve right triangles
- Be able to solve triangles using Law of Sines, and Law of Cosines

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
 Larson Geometry Teacher Resources
www.njctl.org/courses/math/geometry/

Modifications:

<ul style="list-style-type: none"> ● Special Education Students <ul style="list-style-type: none"> ○ Allow errors ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions, and permit drawing, as an explanation ○ Accept participation at any level, even one word ○ Consult with Case Managers and follow IEP accommodations/modifications ● English Language Learners <ul style="list-style-type: none"> ○ Assign a buddy, same language or English speaking ○ Allow errors in speaking ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions ○ Accept participation at any level, even one word 	<ul style="list-style-type: none"> ● At-Risk Students <ul style="list-style-type: none"> ○ Provide extended time to complete tasks ○ Consult with Guidance Counselors and follow I&RS procedures/action plans ○ Consult with classroom teacher(s) for specific behavior interventions ○ Provide rewards as necessary ● Gifted and Talented Students <ul style="list-style-type: none"> ○ Provide extension activities ○ Build on students' intrinsic motivations ○ Consult with parents to accommodate students' interests in completing tasks at their level of engagement
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Apply the Pythagorean Theorem	To find side lengths in right triangles	2 days

Content Area: Geometry	
Unit Title: 7 - Quadrilaterals	
Grade Level: 10	
<p>Unit Summary: In this unit students will investigate properties of parallelograms and learn what information they can use to conclude that a quadrilateral is a parallelogram. Students will also study special quadrilaterals such as rhombuses, rectangles, squares, trapezoids, and kites.</p> <p>Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.</p> <p>21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively. CRP6. Demonstrate creativity and innovation. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
NJSLS.G-CO.C.11	Prove theorems about parallelograms. <i>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.</i>
NJSLS.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
NJSLS.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically. <i>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 $(0,2)$.</i>
NJSLS.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions
Unit Essential Question(s): <ul style="list-style-type: none"> • What are the similarities and differences between the different quadrilaterals? • How can we conclude that a quadrilateral is a parallelogram • How can we classify quadrilaterals by their properties? 	Unit Enduring Understandings: <ul style="list-style-type: none"> • Using angle relationships in polygons • Using properties of parallelograms • Classifying quadrilaterals by their properties
Unit Learning Targets/Objectives: <i>Students will...</i> <ul style="list-style-type: none"> • Be able to construct quadrilaterals by applying sufficient conditions. • Be able to find the measure of interior and exterior angles of polygons. • Be able to find the measure of interior and exterior angles of polygons. 	

- Be able to identify the members of the quadrilaterals.

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):

Larson Geometry Teacher Resources
www.njctl.org/courses/math/geometry/

Modifications:

- **Special Education Students**
 - Allow errors
 - Rephrase questions, directions, and explanations
 - Allow extended time to answer questions, and permit drawing, as an explanation
 - Accept participation at any level, even one word
 - Consult with Case Managers and follow IEP accommodations/modifications
- **English Language Learners**
 - Assign a buddy, same language or English speaking
 - Allow errors in speaking
 - Rephrase questions, directions, and explanations
 - Allow extended time to answer questions
 - Accept participation at any level, even one word
- **At-Risk Students**
 - Provide extended time to complete tasks
 - Consult with Guidance Counselors and follow I&RS procedures/action plans
 - Consult with classroom teacher(s) for specific behavior interventions
 - Provide rewards as necessary
- **Gifted and Talented Students**
 - Provide extension activities
 - Build on students' intrinsic motivations
 - Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Use Properties of Parallelograms	To find angle and side measures in parallelograms	2 days
Show that a quadrilateral is a Parallelogram	To use properties to identify parallelograms	2 days
Properties of Rhombuses, Rectangles, & Squares	To use properties of rhombuses, rectangles, and squares	3 days

Midland Park Public Schools

Use Properties of Trapezoids and Kites	To use properties of trapezoids and kites	2 days
Identify Special Quadrilaterals	To identify special quadrilaterals	3 days
Teacher Notes: Additional Resources Click links below to access additional resources used to design this unit:		

Content Area: Geometry	
Unit Title: 8 - Properties of Transformations	
Grade Level: 10	
<p>Unit Summary: In this unit students will perform translations with vectors, algebra and matrices. They will reflect figure in a given line, rotate figures about a point, identify line and rotational symmetry, and perform dilations using drawing tools and matrices</p> <p>Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.</p> <p>21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively. CRP6. Demonstrate creativity and innovation. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
NJSLS.G-CO.A.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
NJSLS.G-CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
NJSLS.G-CO.A.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
NJSLS.G-CO.A.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
NJSLS.G-SRT.A.1	Verify experimentally the properties of dilations given by a center and a scale factor. a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
NJSLS.G-SRT.A.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions
Unit Essential Question(s):	Unit Enduring Understandings: <ul style="list-style-type: none"> Performing congruence and similarity transformations

<ul style="list-style-type: none"> Given a geometric figure and a rotation, reflection, or translation, in what ways can we draw the transformed figure? Using drawing tools how can we perform dilations? 	<ul style="list-style-type: none"> Making real-world connections to symmetry and tessellations Applying vectors in Geometry
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Unit Learning Targets/Objectives:
Students will...

- Be able to calculate magnitude and directions of a transformation..
- Be able to identify isometries.
- Be able to draw tessellations
- Be able to find a figure’s symmetry, if it exists.

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
 Larson Geometry Teacher Resources
www.njctl.org/courses/math/geometry/

Modifications:

<ul style="list-style-type: none"> Special Education Students <ul style="list-style-type: none"> Allow errors Rephrase questions, directions, and explanations Allow extended time to answer questions, and permit drawing, as an explanation Accept participation at any level, even one word Consult with Case Managers and follow IEP accommodations/modifications English Language Learners <ul style="list-style-type: none"> Assign a buddy, same language or English speaking Allow errors in speaking Rephrase questions, directions, and explanations Allow extended time to answer questions Accept participation at any level, even one word 	<ul style="list-style-type: none"> At-Risk Students <ul style="list-style-type: none"> Provide extended time to complete tasks Consult with Guidance Counselors and follow I&RS procedures/action plans Consult with classroom teacher(s) for specific behavior interventions Provide rewards as necessary Gifted and Talented Students <ul style="list-style-type: none"> Provide extension activities Build on students’ intrinsic motivations Consult with parents to accommodate students’ interests in completing tasks at their level of engagement
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Translate Figures and Use Vectors	To use a vector to translate a figure.	2 days

Midland Park Public Schools

Perform Reflections	To reflect a figure in any given line.	2 days
Perform Rotations	To rotate figures about a point.	3 days
Apply Compositions of Transformations	To perform combinations of two or more transformations .	2 days
Identify Symmetry	To identify line and rotational symmetries of a figure .	2 days
Identify and Perform Dilations	To use drawing tools to draw dilations.	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Content Area: Geometry**Unit Title: 9 - Properties of Circles****Grade Level: 10**

Unit Summary: In this unit students investigate aspects of circles. They start by drawing tangents to circles and seeing how a tangent to a circle is related to the radius at the point of tangency. They use intercepted arcs of circles to measure angles formed by chords in a circle and to measure angles formed by secants and tangents to a circle. They explore relationships between segment lengths of chords that intersect in a circle, and they investigate relationships between segment lengths of secants and tangents to a circle. Finally, they use the standard equation of a circle to graph and describe circles in a coordinate plane

Interdisciplinary Connections: Sports, Architecture, Home improvement, and Medical references.

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively.

CRP6. Demonstrate creativity and innovation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
NJSLS.G-CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) <i>Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</i>
NJSLS.G-C.A.2	Identify and describe relationships among inscribed angles, radii, and chords. <i>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.</i>
NJSLS.G-C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
NJSLS.G-C.A.4	(+) Construct a tangent line from a point outside a given circle to the circle.
NJSLS.G-C.B.5	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
NJSLS.G-GPE.A.1	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
NJSLS.G-GMD.A.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. <i>Use dissection arguments, Cavalieri's principle, and informal limit arguments.</i>
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources			
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions			
Unit Essential Question(s): <ul style="list-style-type: none"> ● How can we identify and describe relationships among inscribed, central, and circumscribed angles? ● How can we relate arc lengths and circumferences to areas of sectors? ● How can we derive the equation of a circle given center and radius using the Pythagorean Theorem? 	Unit Enduring Understandings: <ul style="list-style-type: none"> ● Using properties of segments that intersect circles. ● Applying angle relationships in circles. ● Using circles in the coordinate plane. ● Comparing measures for parts of circles and the whole circle. 			
Unit Learning Targets/Objectives: <i>Students will...</i> <ul style="list-style-type: none"> ● Be able to identify the parts of a circle. ● Be able to find the measure of angles given angles with vertices at the center, inside the circle, on the circle, or outside the circle. ● Be able to calculate the lengths of tangents, secant segments, and chords depending on the location of the intersection. ● Be able to find the center, radius, and point on a circle given the equation of the circle. ● Be able to explore circles, relating arc lengths and circumferences to areas of sectors. ● Be able to derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius. ● Be able to derive the formula for the area of a sector. 				
Formative Assessments: <ul style="list-style-type: none"> ● Quizzes ● Homework ● On spot checking for understanding activities ● Entry/Exit tickets 				
Summative/Benchmark Assessment(s): <ul style="list-style-type: none"> ● Tests ● Projects 				
Resources/Materials (copy hyperlinks for digital resources): Larson Geometry Teacher Resources www.njctl.org/courses/math/geometry/				
Modifications: <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> ● Special Education Students <ul style="list-style-type: none"> ○ Allow errors ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions, and permit drawing, as an explanation ○ Accept participation at any level, even one word ○ Consult with Case Managers and follow IEP accommodations/modifications ● English Language Learners </td> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> ● At-Risk Students <ul style="list-style-type: none"> ○ Provide extended time to complete tasks ○ Consult with Guidance Counselors and follow I&RS procedures/action plans ○ Consult with classroom teacher(s) for specific behavior interventions ○ Provide rewards as necessary ● Gifted and Talented Students <ul style="list-style-type: none"> ○ Provide extension activities ○ Build on students' intrinsic motivations </td> </tr> </table>			<ul style="list-style-type: none"> ● Special Education Students <ul style="list-style-type: none"> ○ Allow errors ○ Rephrase questions, directions, and explanations ○ Allow extended time to answer questions, and permit drawing, as an explanation ○ Accept participation at any level, even one word ○ Consult with Case Managers and follow IEP accommodations/modifications ● English Language Learners 	<ul style="list-style-type: none"> ● At-Risk Students <ul style="list-style-type: none"> ○ Provide extended time to complete tasks ○ Consult with Guidance Counselors and follow I&RS procedures/action plans ○ Consult with classroom teacher(s) for specific behavior interventions ○ Provide rewards as necessary ● Gifted and Talented Students <ul style="list-style-type: none"> ○ Provide extension activities ○ Build on students' intrinsic motivations
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- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions
- Accept participation at any level, even one word
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Use Properties of Tangents	To use properties of a tangent to a circle.	2 days
Find Arc Measures	To use angle measures to find arc measures	2 day
Apply Properties of Chords	To use relationships of arcs and chords in a circle.	2 day
Use Inscribed Angles and Polygons	To use inscribed angles of circles	2 days
Circumference and Arc Length	To find arc lengths and other measures	3 days
Areas of Circles and Sectors	To find the areas of circles and sectors	2 days
Apply Other Angle Relationships in Circles	To find the measures of angles inside or outside a circle	2 days
Find Segment Lengths in Circles	To find segment lengths in circles	2 days
Write and Graphs Equations of Circles	To write equations of circles in the coordinate plane.	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit: