Madison Public Schools

Geometry
Grades 9-10

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Course Overview

Description
Geometry is a course that is primarily approached from a Euclidean point of view. Coordinate geometry, solid geometry, and transformational geometry are explored. In the course, the primary emphasis is on inductive and deductive reasoning and logical problem-solving techniques. Geometry offers opportunities for students to develop as active problem solvers, critical thinkers and effective communicators. Consistent practice of algebraic skills enables students to make conjectures while working through challenging problems. Geometry requires students to explain their thinking and analyze diverse problems, while also providing students with the chance to develop mathematical reasoning to work through everyday mathematical challenges.   Each unit provides students occasions to develop deeper understanding of mathematics coupled with gaining procedural skill and fluency and application as outlined in the Common Core State Standards. Major topics include congruence, similarity, right triangles and trigonometry, and circles.

Goals
This course aims to: ● enable students to make sense of various types of problems and the reasonableness of their answers ● build student confidence with the various approaches to solving a problem and persevere in solving them ● encourage students to become abstract thinkers who make sense of quantities and their relationships in problem situations ● develop students' ability to cooperatively discuss, make conjectures and critique ideas of one another ● use, apply, and model mathematics to solve problems arising in everyday life, society, and the workplace ● consider the variety of available tools when solving a mathematical problem ● communicate mathematical ideas precisely and effectively to others ● determine a pattern or analyze structure within mathematical content to apply to related ideas ● use repeated reasoning to follow a multi-step process through to completion

Materials
Core: Big Ideas Geometry Series **Supplemental:** Khan Academy, Various websites related to Geometry

Resources
[Suggested activities and resources page](#)

Benchmark Assessments
Common Benchmark Assessment are given for each unit with common types of questions across the levels including problems that focus on the main ideas and anchor standards of the course.

Scope and Sequence
(Pacing Guide)

Unit Number	Topic of Study	Duration Lessons Taught (Honors)
1	Basics of Geometry	9 lessons (4 lessons)
2	Reasoning and Proofs	10 lessons
3	Parallel and Perpendicular lines	8 lessons
4	Transformations	9 lessons
5	Congruent Triangles	13 lessons
6	Relationships within Triangles	11 lessons
7	Quadrilaterals and Other Polygons	9 lessons
8	Similarity	8 lessons
9	Right Triangles and Trigonometry	13 lessons
10	Circles	14 lessons
11	Circumference, Area and Volume	15 lessons

Unit 1 Overview

Unit Title: Basics of Geometry

Unit Summary: This unit presents a great deal of vocabulary, basic concepts, and the beginning of building an axiomatic system by establishing definitions, undefined terms, and postulates. Linear measurements, angle measurements, and relationships between angles are explored and extended to find area.

Suggested Pacing: 4 lessons **(H)**; 9 lessons

Learning Targets

Unit Essential Questions:
- How can you use dynamic geometry software to visualize geometric concepts?
- How can you measure and construct a line segment?

- How can you find the midpoint, length of a line segment, perimeter and area in a coordinate plane?
- How can you measure and classify an angle?
- How can you describe angle pair relationships and use these descriptions to find angle measures?

Unit Enduring Understandings:
- The undefined concepts of point, line, and plane are the basis of geometry.
- Geometric concepts can be better explained and understood by using constructions.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc…

Summative Assessment: Assessment for Unit 1

Objectives (Students will be able to…)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing
Understand the undefined concepts of point, line, and plane.

Apply the undefined concepts of point, line, and plane to define and use collinear points, coplanar points, line segment, ray, opposite rays, intersections of lines, planes, and segments.

Use the Ruler Postulate to understand measurement and length.

Understand and use the Segment Addition Postulate to determine lengths of segments.

Copy segments and compare segments for congruence.

Students will be able to compare, contrast, and classify polygons.

Define an angle and identify its parts.

Compare, contrast, and classify angles (obtuse, acute, right, straight, and reflex **(H)**).

Define and identify congruent angles and angle bisectors.

Define and identify complementary and supplementary angles.

Define and identify a linear pair and vertical angles. | Content:
point
line
plane
line segment
ray
opposite rays
collinear points
coplanar points
intersections
postulate/axiom
coordinate/distance
construction
congruent segments
midpoint formula
distance formula
midpoint
segment bisector
polygon (side, vertex)
convex
concave
interior/exterior of polygon
angle (vertex, sides)
acute, right, obtuse, straight, reflex (H)
congruent angles
angle bisector
complementary angles
supplementary angles
linear pair
vertical angles

Skills:
Naming points, lines, planes, line segments, rays, opposite rays.

Identifying collinear and coplanar points.

Compare and contrast the terminology.

Visualize and identify/describe various intersections.

Use SAP to determine the lengths of segments.

Construction: Copying a segment

Use the midpoint and distance formulas

Identify segment bisectors

Find the perimeter and area of a polygon in the coordinate plane (some requiring decomposition of the polygon).

Classify angles appropriately. | Explorations:
  1 and 2 p. 3
  1, 2 and 3 **(H)** p. 11
  1 and 2 p. 19
  1 and 2 p. 29
  1 and 2 (E & H) p. 37
  1 and 2 p. 47

Quiz Question:
Define a line segment.

Exit Ticket:
Duplicate a segment using a compass and straightedge

Use dynamic software to construct a segment.

Quiz Question:
Find the perimeter and area of a figure.

Quiz Question:
Define an angle.

Use paper folding and/or compass/straightedge to bisect an angle.

Concept card mapping T-46 | G-CO.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

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.)

G-GPE.7
Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

G-MG.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)

G-GPE.7
Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

9.1.12.A.1
Apply critical thinking and problem-solving strategies during structured learning experiences.

CRP11. Use technology to enhance productivity

9.1.12.F.2
Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. | 4 lessons due to summer assignment **(H)**

9 lessons |

	Define congruent angles and angle bisectors. Define and identify complementary and supplementary angles, as well as a linear pair and vertical angles. Describe objects using geometric shapes and properties.			

Unit 2 Overview

Unit Title: Reasoning and Proofs

Unit Summary: In this unit, students learn how to construct logical arguments and how to reason. Inductive and deductive reasoning are introduced, and conditionals in the if-then form are explored. Connections are made to algebraic concepts in the form of justification of steps. Students will begin to use a combination of algebraic and geometric reasoning to construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures about geometric figures. Finally, proofs including two-column, flow-chart and/or paragraph are examined.

Suggested Pacing: 10 lessons

Learning Targets

Unit Essential Questions:
- When is a conditional statement true or false?
- How can you use reasoning to solve problems?
- In a diagram, what can be assumed and what needs to be labeled?
- How can algebraic properties help you solve an equation?
- How can you prove a mathematical statement?

Unit Enduring Understandings:
- Proofs of theorems are a form of deductive reasoning.
- Reasoning skills allow one to successfully prove ideas and solve problems.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc…

Summative Assessment: Assessment for Unit 2

Alternative Assessment: Create a multimedia presentation proving vertical angles are congruent and all right angles are congruent.

Objectives (Students will be able to…)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Write conditional and biconditional statements.
 	
Use and understand definitions as biconditionals.
 	
Compare and contrast inductive and deductive reasoning.
 	
Identify postulates using diagrams.
 	
Sketch and interpret diagrams of points, lines, planes
 	
Apply Algebraic Properties and the Distributive Property to justify steps in solving equations and involving segment lengths and angle measures.
 	
Develop and write two-column proofs on segment and angle relationships.
	Content:
	conditional statement
	if-then form
	hypothesis
	conclusion
	converse
	negation **(H)**
	inverse **(H)**
	contrapositive **(H)**
	equivalent statements **(H)**
	perpendicular lines
	inductive reasoning
	deductive reasoning
	conjecture
	counterexample
	proof
	two-column proof
	theorem
	Skills:
	Write a conditional statement in if-then form.
	
	Write the converse, inverse **(H)**, and contrapositive **(H)** of a conditional
	
	Write proofs about segments, angles and geometric relationships.
		Journal writing/exit ticket: Compare and contrast inductive and deductive reasoning.
		
		Quiz question: Write a conditional statement for which the converse is not true.
		
		Explorations:
		  1, 2, 3 pg. 65
		  1, 2, 3 **(H)** pg. 75
		  1, 2 pg 83
		  1 and 2 pg 91
		  1 and 2 pg 99
		
		Prove that vertical angles are congruent.
		
		Prove that all right angles are congruent.
			G-CO.9
			Prove theorems about lines and angles.
			
			G-CO.10
			Prove theorems about triangles.
			
			G-CO.11
			Prove theorems about parallelograms
			
			G-SRT.4
			Prove theorems involving similarity.
			
			CRP4. Communicate clearly and effectively and with reason.
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			CRP4. Communicate clearly and effectively and with reason.
			
			SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
			
			NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
			
			NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
			
			RST.9-10.7
			 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
				10 lessons

Unit 3 Overview

Unit Title: Parallel and Perpendicular Lines

Unit Summary: This unit analyzes line relationships and angle-pair relationships. Students will prove and learn theorems involving parallel lines cut by a transversal, and they will explore the converse of these theorems. Reasoning skills are used to solve problems, and further connections to algebra are made.

Suggested Pacing: 8 lessons

Learning Targets

Unit Essential Questions:
- What does it mean when two lines are parallel, intersecting, coincident or skew?
- When two parallel lines are cut by a transversal, which of the resulting pairs of angles are congruent? Supplementary?
- For which of the theorems involving parallel lines and transversals is the converse true?
- What conjectures can you make about perpendicular lines?
- How can you write an equation of a line that is parallel or perpendicular to a given line passing through a given point?

Unit Enduring Understandings:
- Certain relationships exist between lines and angles.
- Logical arguments can be made based on known information or deduced information.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 3

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Identify lines and planes, parallel and perpendicular lines and pairs of angles formed by transversals.
 	
Use properties to prove theorems about parallel and perpendicular lines and apply these properties to real-life problems.
 	
Construct parallel and perpendicular lines.
 	
Use slope to partition directed line segments and to find the distance from a point to a line.
 	
Write equations of parallel and perpendicular lines.
	Content:
	parallel lines
	skew lines
	parallel planes
	transversal
	corresponding angles
	alternate interior angles
	alternate exterior angles
	consecutive interior angles
	distance from a point to a line
	perpendicular bisector
	directed line segment **(H)**
	
	Skills:
	Identify lines, planes, parallel lines, perpendicular lines
	
	Identify pairs of angles created by two lines (parallel) and a transversal
	
	Construct parallel lines
	
	Use theorems about parallel lines
	
	Find the distance from a point to a line
	
	Construct perpendicular lines
	
	Use slope to partition directed line segments and to find the distance from a point to a line.
	
	Write equations of parallel and perpendicular lines.
		Explorations:
		  1, 2, 3 pg 125
		  1, 2 **(H)** pg 131
		  1 pg 137
		  1, 2, 3 **(H)** pg 147
		  1, 2 pg 155
		
		Journal writing/exit ticket: Explain the relationship between the slopes of parallel lines and the slopes of perpendicular lines
		
		Quiz question:
		Decide whether there is enough information to prove two lines parallel (from a diagram).
		
		Construct a perpendicular line.
		
		Find the coordinate of a point along the directed line segment so that the ratio is 2:3.
			G-CO.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
			
			G-CO.9
			Prove theorems about lines and angles.
			
			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.)
			
			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.
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			CRP4. Communicate clearly and effectively and with reason.
			
			RST.9-10.7
			 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
			
			SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
			
			NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
				8 lessons

| | | | NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | |

Unit 4 Overview

Unit Title: Transformations

Unit Summary:
In this unit, key postulates and theorems relating to rigid motions are presented. Translations, reflections, glide reflections, rotations and dilations are all examined. Similarity is introduced and relationships between similar figures are discovered.

Suggested Pacing: 9 lessons

Learning Targets

Unit Essential Questions:
- How can you translate, reflect, and rotate a figure in a coordinate plane?
- What conjectures can you make about a figure reflected in two lines?
- What does it mean to dilate a figure?
- When a figure is translated, reflected, rotated or dilated in a plane, is the image always congruent and/or similar to the original figure?

Unit Enduring Understandings:
- Rigid motions are connected to congruence.
- Dilations are connected to similarity.
- There are certain relationships that exist between figures before and after transformations are applied.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 4

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing
Perform translations, reflections, rotations, dilations, and compositions of transformations Solve real-life problems involving transformations Identify lines of symmetry and rotational symmetry Describe and perform congruence transformations and similarity transformations	Content: vector initial point terminal point horizontal component vertical component component form transformation image preimage translation rigid motion composition of transformations reflection line of reflection glide reflection line of symmetry rotation center of rotation angle of rotation rotational symmetry center of symmetry dilation center of dilation scale factor enlargement reduction similar figures Skills: Perform translations, compositions, reflections, glide reflections, and rotations. Identify lines of symmetry and rotational symmetry. Use theorems to describe congruence transformations. Identify and perform dilations. Prove that figures are similar.	Explorations: 1, 2, 3 **(H)** p 173 1, 2 p 181 1, 2, 3 **(H)** p 189 1, 2 p 199 1, 2 **(H)** p 207 1, 2 **(H)** p 215 Quiz question: Given a diagram, determine the number of lines of symmetry for the figure. Partner assessment: Draw a figure in the coordinate plane. Perform a reflection over the y-axis and discuss congruence and/or similarity. Repeat with other transformations. Given a center and a scale factor, perform a dilation. Explain how the dilated figure compares with the original figure. Exit ticket: Which transformations preserve distance and angle? Which do not?	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 as 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, 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. 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-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). G-SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor. 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	9 lessons

			all pairs of corresponding pairs of sides. CRP4. Communicate clearly and effectively and with reason. CRP11. Use technology to enhance productivity 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences. 9.1.12.F.2 Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences. 8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.	

Unit 5 Overview

Unit Title: Congruent Triangles

Unit Summary:
This unit connects transformations to triangle congruence. Proofs are used to explain relationships between triangles. Transformations are also used to show why two triangles are congruent. Finally, properties of equilateral and isosceles triangles are discovered and examined.

Suggested Pacing: 13 lessons

Learning Targets

Unit Essential Questions:
- How are the angle measures of a triangle related?
- Given two congruent triangles, how can you use rigid motions to map one triangle to the other triangle?
- What can you conclude about two triangles when you know that two pairs of corresponding sides and the corresponding included angles are congruent?
- What conjectures can you make about the side lengths and angle measures of an isosceles triangle?
- What can you conclude about two triangles when you know that the corresponding sides are congruent?
- What information is sufficient to determine whether two triangles are congruent?
- How can you use congruent triangles to make an indirect measurement?

Unit Enduring Understandings:
- Congruence and rigid transformations are related.
- Triangles can be prove congruent in several ways with certain given information.
- There is a relationship between the sides and angles of triangles.
- Properties of congruent triangles can be used to solve real-life problems.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 5

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing
Identify and use corresponding parts of triangles prove or show that triangles are congruent. Use theorems about the angles of a triangle Use SAS, SSS, HL, ASA and AAS to prove two triangles congruent Construct an equilateral triangle and explore its properties. Write coordinate proofs.	Content: interior/exterior angles corollary corresponding parts legs of an isosceles triangle vertex angle base base angles legs of a right triangle hypotenuse coordinate proof Skills: Classify triangles by sides and angles. Find interior and exterior angle measures of triangles. Identify and use corresponding parts of triangles. Use the Third Angles Theorem. Prove or show that triangles are congruent using SAS, SSS, HL, ASA, AAS. Understand properties of isosceles triangles and equilateral triangles. Construct an equilateral triangle. Place figures in the coordinate plane and write coordinate proofs.	Explorations: 1, 2 p 231 1, 2 **(H)** p 239 1 p 245 1 p 251 1 p 261 1, 2 p 269 1, 2 p 277 1 2 **(H)** p 283 Partner assessment: Given information about two triangles, use the coordinate plane to determine whether or not the triangles are congruent. Journal/exit ticket: Explain how AAS and ASA are related. How are they similar? Different? Prove that two triangles are congruent. Apply properties of congruent triangles to real-life problems. Assessment question: Construct an equilateral triangle. Write a coordinate proof. **(H)**	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.10 Prove theorems about triangles. G-CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. G-MG.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) 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). G-SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figure. G-GPE.4 Use coordinates to prove simple geometric theorems algebraically. 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences. 9.1.12.F.2 Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences. CRP4. Communicate clearly and effectively and with reason. CRP11. Use technology to enhance productivity 8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.	13 lessons

| | | | SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | |
|---|---|---|---|---|

Unit 6 Overview

Unit Title: Relationships Within Triangles

Unit Summary:
This unit uses deductive skills to explore special segments in a triangle including perpendicular bisectors, angle bisectors, medians, altitudes and midsegments. Inequalities in triangles are also explored, and an indirect proof is used.

Suggested Pacing: 11 lessons

Learning Targets

Unit Essential Questions:
- ● What conjectures can you make about a point on the perpendicular bisector of a segment and on the bisector of an angle?
- ● What conjectures can you make about the perpendicular bisectors and the angle bisectors of a triangle?
- ● What conjectures can you make about the medians and altitudes of a triangle?
- ● How are the midsegments of a triangle related to the sides of a triangle?
- ● How are the sides of a triangle related to the angles of the triangle?
- ● How are any two sides of a triangle related to the third side?

Unit Enduring Understandings:
- ● Sides and angles of a triangle are related to each other.
- ● Indirect proof is an alternate way of explaining or reasoning.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 6

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing
Understand and use angle bisectors and perpendicular bisectors to find measures Find and use the circumcenter, incenter, centroid and orthocenter of a triangle Understand, use and apply the Triangle Midsegment Theorem and the Triangle Inequality Theorem Write indirect proofs	Content: equidistant concurrent point of concurrency circumcenter incenter median centroid altitude orthocenter midsegment indirect proof Skills: Use perpendicular bisectors and angle bisectors to find measures Use and find the circumcenter, incenter, centroid and orthocenter of a triangle Use the Midsegment Theorem to find distances Write indirect proofs List sides and angles in order by size Use the Triangle Inequality Theorem to find possible side lengths of triangles Compare measures in triangles and apply the Hinge Theorem to real-life problems	Explorations 1, 2 p 301 1, 2 p 309 1, 2 p 319 1, 2 p 329 1, 2 p 335 1 p 343 Quiz question: Prove the Midsegment Theorem Use a map of town to find distances between destinations. (Sides of triangles) Construct a circle around a triangle. Assessment question: Prove one of the properties of angles for a quadrilateral inscribed in a circle.	G-CO.9 Prove theorems about lines and angles. G-CO.10 Prove theorems about triangles. 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.) G-MG.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) 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). G-C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. CRP4. Communicate clearly and effectively and with reason. CRP11. Use technology to enhance productivity 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences. 9.1.12.F.2 Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences. RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners,	11 lessons

			building on others' ideas and expressing their own clearly and persuasively. NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.	

Unit 7 Overview

Unit Title: Quadrilaterals and Other Polygons

Unit Summary:
In this unit, the properties of quadrilaterals studied in middle school are expanded. Parallelograms, rectangles, rhombuses, squares, trapezoids, isosceles trapezoids and kites are explored. Students will derive the formula to find the sum of interior and exterior angles and each angle of a regular polygon.

Suggested Pacing: 9 days

Learning Targets

Unit Essential Questions:
- What is the sum of the measures of the interior angles of a polygon?
- What are the properties of parallelograms?
- How can you prove that a quadrilateral is a parallelogram?
- What are the properties of the diagonals of rectangles, rhombuses and squares?
- What are the properties of trapezoids and kites?

Unit Enduring Understandings:
- Knowledge of parallelograms can be extended to learn properties of special parallelograms.
- Information about polygons enables one to solve real-world problems.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 7

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Find and use the interior and exterior angle measures of polygons
 	
Use properties of parallelograms and special parallelograms
 	
Prove that a quadrilateral is a parallelogram
 	
Identify and use properties of trapezoids and kites
	Content:
	diagonal
	equilateral polygon
	equiangular polygon
	regular polygon
	parallelogram
	rhombus
	rectangle
	square
	trapezoid
	bases
	base angles
	legs of a trapezoid
	isosceles trapezoid
	midsegment of a trapezoid
	kite
	
	Skills:
	
	Use interior and exterior angle measures of polygons
	
	Find side lengths and angles of parallelograms
	
	Use parallelograms in the coordinate plane
	
	Show or prove that a quadrilateral is a parallelogram
	
	Use properties of special parallelograms to solve problems
	
	Use coordinate geometry to identify special parallelograms
	
	Use the Trapezoid Midsegment Theorem to find distances
		Explorations
		  1, 2 p 359
		  1, 2 p 367
		  1, 2 p 375
		  1, 2 p 387
		  1, 2 p 397
		
		Partner Assessment:
		Each partner has their own set of properties about quadrilaterals. A Q&A session takes place between partners to try to "guess the special quadrilateral."
		
		Use triangle congruence to prove properties of special quadrilaterals.
			G-CO.11
			Prove theorems about parallelograms.
			
			G-SRT.5
			Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figure.
			
			G-MG.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).
			
			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).
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			CRP4. Communicate clearly and effectively and with reason.
				9 days

Unit 8 Overview
Unit Title: Similarity
Unit Summary: This unit revisits similarity. Similar polygons and triangles are explored, and methods for proving triangles similar are established. Several proportionality theorems are introduced and connected mainly to triangles.
Suggested Pacing: 8 lessons

Learning Targets
Unit Essential Questions: ● How are similar polygons related? ● What can you conclude about two triangles when you know that two pairs of corresponding angles are congruent? ● What are two ways to use corresponding sides of two triangles to determine that the triangles are similar? ● What proportionality relationships exist in a triangle intersected by an angle bisector or by a line parallel to one of the sides?
Unit Enduring Understandings: ● Similar figures and triangles can be explored through dilations. ● Proportions are used to solve many real-life problems, including triangle problems. ● There exist relationships between various segments in triangles.

Evidence of Learning
Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...
Summative Assessment: Assessment for Unit 8

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Use the AA, SSS and SAS Similarity Theorems to prove triangles are similar
 	
Determine whether triangles are similar
 	
Use similarity criteria to solve problems about lengths, perimeters and areas
 	
Prove the slope criteria using similar triangles
 	
Use the Triangle Proportionality Theorem and other proportionality theorems
	Content:
	All content is based on previous terms/definitions
	
	Skills:
	Find corresponding lengths, perimeters and areas of similar polygons
	
	Decide whether polygons are similar
	
	Use the AA, SAS and SSS similarity theorems to solve real-life problems
	
	Use the Triangle Proportionality Theorem to find lengths
		Explorations
		  1, 2 p 417
		  1 p 427
		  1, 2 p 435
		  1, 2 p 445
		
		Partner Assessment: Partners discuss and conclude whether or not polygons are similar.
		
		Journal/exit ticket: Explain how/why dilations help to explain similarity.
		
		Use AA, SSS and SAS Similarity theorems to solve proofs about triangles.
		
		Apply similarity and ratios to solve real-life problems.
			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 pairs of 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.
			
			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 (e.g., modeling a tree trunk or a human torso as a cylinder).
			
			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).
			
			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).
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			RST.9-10.7
			 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
			
			SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the
				8 lessons

			organization, development, and style are appropriate to task, purpose, and audience. NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. CRP4. Communicate clearly and effectively and with reason. CRP11. Use technology to enhance productivity	

Unit 9 Overview

Unit Title: Right Triangles and Trigonometry

Unit Summary:
In this unit, right triangles are explored. A connection is made from similarity to a right triangle with the altitude to the hypotenuse drawn in. Relationships are made, the Pythagorean Theorem is used, relationships in special right triangles are discovered, and trigonometry is introduced.

Suggested Pacing: 13 lessons

Learning Targets

Unit Essential Questions:
- How can you prove the Pythagorean Theorem?
- What is the relationship among the side lengths of 45-45-90 and 30-60-90 triangles?
- How are altitudes and geometric means of right triangles related?
- How is a right triangle used to find the tangent, sine and cosine of a right triangle?
- What are the Law of Sines and the Law of Cosines?

Unit Enduring Understandings:
- Relationships exist between side lengths and angles of right triangles.
- Trigonometry can help one to find unknown information about triangles.
- The Law of Sines and the Law of Cosines enable one to find unknown information about triangles.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 9

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Use the Pythagorean Theorem and its converse to solve problems
 	
Understand and use geometric means
 	
Find side lengths and tangent, sine and cosine ratios to solve real-life problems involving right triangles
 	
Derive the formula A=½ absin(c) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. **(H)**
 	
Prove the Law of Sines and the Law of Cosines and use them to solve triangles and problems. **(H)**
	Content:
	Pythagorean Triple
	geometric mean
	trigonometric ratio
	tangent
	angle of elevation
	angle of depression
	sine
	cosine
	Inverse tan, sin, cos
	Law of Sines
	Law of Cosines
	
	Skills:
	Use the Pythagorean Theorem and its converse to find side lengths of right triangles.
	
	Find the side lengths of special right triangles.
	
	Identify similar triangles in a right triangle when an altitude is drawn to the hypotenuse.
	
	Use geometric means to discover relationships between the sides of right triangles.
	
	Use the tangent, sine and cosine ratios to solve real-life problems.
	
	Solve right triangles.
		Explorations
		  1, 2 **(H)** p 463
		  1, 2 p 471
		  1, 2 **(H)** p 477
		  1, 2 p 487
		  1 p 493
		  1, 2 p 501
		  1 **(H)**, 2 **(H)** p 507
		
		Quiz question
		Prove the Pythagorean Theorem algebraically. **(H)**
		
		Partner Assessment:
		Draw an altitude to the hypotenuse of a right triangle. Use similarity to discover relationships between the sides of the original right triangle.
		
		Journal/exit ticket
		Explain the relationship between the sine and cosine of complementary angles
			G-SRT.4
			Prove theorems about triangles.
			
			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 the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
			
			G-SRT.7
			Explain and use the relationship between the sine and cosine of complementary angles.
			
			G-SRT.8
			Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
			
			G-SRT.9 **(H)**
			Derive the formula A=½ absin(c) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
			
			G-SRT.10 **(H)**
			Prove the Law of Sines and Cosines and use them to solve problems.
			
			G-SRT.11 **(H)**
			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 (e.g., modeling a tree trunk or a human torso as a cylinder)
			
			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).
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			RST.9-10.7
			 Translate quantitative or technical information expressed in words in a text
				13 lessons

| | | | into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CRP4. Communicate clearly and effectively and with reason. | |
|---|---|---|---|---|

Unit 10 Overview

Unit Title: Circles

Unit Summary:
The focus of this unit is on circles. Vocabulary and symbols relating to circles are introduced. Angle relationships and segment relationships with chords, tangents, and secants are explored. The coordinate plane is used to derive the equation of a circle.

Suggested Pacing: 14 days

Learning Targets

Unit Essential Questions:
- What are the definitions of the lines and segments that intersect a circle?
- How are circular arcs measured?
- What are two ways to determine when a chord is a diameter of a circle?
- How are inscribed angles related to their arcs?
- What relationships exist among the angles formed when chords and tangents intersect?
- What relationships exist among the segments formed when chords, secants and tangents intersect?
- What is the equation of a circle with center (h, k) and radius r in the coordinate plane?

Unit Enduring Understandings:
- Several relationships exist within circles.
- Segments, angles, and triangles can all be explored in relation to circles.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 10

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Define and identify chords, diameters, radii, secants and tangents of circles
 	
Find arc and angle measures
 	
Use inscribed angles and polygons and use circumscribed angles to solve problems
 	
Use and apply properties of chords, tangents and secants to solve problems
 	
Write and graph equations of circles
 	
Construct a tangent line from a point outside a given circle to the circle. **(H)**
	Content:
	circle
	center
	radius
	chord
	diameter
	secant
	tangent
	point of tangency
	tangent circles
	concentric circles
	common tangent
	central angle
	minor arc
	major arc
	semicircle
	adjacent arcs
	congruent circles
	congruent arcs
	similar arcs
	inscribed angles
	intercepted arcs
	subtend
	inscribed polygon
	circumscribed circle
	equation of a circle
	
	Skills:
	Identify and define segments and lines of a circle.
	
	Find arc measures and identify congruent arcs.
	
	Use chords of circles to find lengths and arc measures.
	
	Use inscribed angles, inscribed polygons, and segments of tangents/secants/chords to find measures.
	
	Write an equation of a circle and graph it on the coordinate plane.
		Explorations
		  1, 2 p 529
		  1 p 537
		  1, 2, 3 **(H)** p 545
		  1, 2 p 553
		  1, 2 p 561
		  1, 2 p 569
		  1, 2, 3 **(H)** p 575
		
		Exit ticket
		Define a circle.
		
		Construct a regular hexagon inscribed in a circle
		
		Partner Assessment:
		Discuss whether or not all circles are similar. Defend your viewpoint.
		
		Partner Activity:
		Given a diagram, identify all special segments, lines, and angles of the circle. Apply theorems about circles to find the missing measurements and lengths.
		
		Quiz Question:
		Explain how a radian is related to degree measure.
		
		Partner Activity:
		Given a real-life example, develop a plan to find the area of a sector and apply it.
		
		Apply circles to real-life problems.
			G-CO.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
			
			G-CO.13
			Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
			
			G-C.1
			Prove that all circles are similar.
			
			G-C.2
			Identify and describe relationships among inscribed angles, radii, and chords.
			
			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 **(H)**
			Construct a tangent line from a point outside a given circle to the circle.
			
			G-MG.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)
			
			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).
			
			G-GPE.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.
			
			G-GPE.4
			Use coordinates to prove simple geometric theorems algebraically.
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			CRP4. Communicate clearly and effectively and with reason.
				14 days

Unit 11 Overview

Unit Title: Circumference, Area and Volume

Unit Summary:
In this unit, the study of measurement that began in middle school is extended. Many formulas for area and volume will be reviewed while some new formulas will be introduced. Students will be able to solve more involved real-life problems.

Suggested Pacing: 15 lessons

Learning Targets

Unit Essential Questions:
- How can you find the length of a circular arc?
- How can you find the area of a sector of a circle?
- How can you find the area of a regular polygon?
- What is the relationship between the numbers of vertices, edges and faces of a polyhedron?
- How can you find the volume of a prism or cylinder that is not a right prism/cylinder?
- How can you find the volume of a pyramid?
- How can you find the surface area and volume of a cone and a sphere?

Unit Enduring Understandings:
- Area and volume can be used in real-life situations.

Evidence of Learning

Formative Assessments: A variety of formative assessments will be used throughout the lesson, such as warm-up and closure questions completed on paper and handed in and on Google Classroom, Four Corners, Hand It In, Pass It Out, Self-Evaluation, Think-Pair-Share, Jigsaw, Socrative, etc...

Summative Assessment: Assessment for Unit 11

Alternative Assessment: Students will choose an everyday object (prisms, cylinders, pyramids, cones or sphere.) and demonstrate knowledge by calculating the volume of the object.)

Objectives (Students will be able to…)	Essential Content/Skills	Suggested Assessments	Standards (NJSLS)	Pacing

Measure angles in radians **(H)**
 	
Find arc lengths and areas of sectors.
 	
Find and use the areas of rhombuses, kites and regular polygons.
 	
Find and use volumes of prisms, cylinders, pyramids, cones and spheres.
 	
Describe cross-section and solids of revolution.
	Content:
	circumference
	arc length
	radian (H)
	population density
	sector of a circle
	center, radius, apothem and central angle of a regular polygon
	polygon
	polyhedron
	face
	edge
	vertex
	cross section
	solid of revolution
	axis of revolution
	volume
	density
	similar solids
	lateral surface of a cone
	chord of a sphere
	great circle
	
	Skills:
	Use the formula for circumference, arc lengths, circles to find measures.
	
	Measure angles in radians. **(H)**
	
	Use the formula for population density to solve real-life problems.
	
	Find and use areas of sectors.
	
	Find areas of rhombuses and kites.
	
	Find the angle measures and areas of regular polygons.
	
	Classify solids, describe cross sections and sketch solids.
	
	Find and use volumes of prisms, cylinders, pyramids, cones and spheres.
		Explorations
		  1, 2 p 593
		  1, 2 p 601
		  1, 2 p 609
		  1 p 617
		  1, 2 p 625
		  1, 2 p 635
		  1, 2 p 641
		
		Journal/exit ticket
		Give an informal explanation of the formula for the volume of a cylinder.
		
		Quiz question:
		Find the surface area and volume of a three-dimensional figure.
		
		Students investigate the relationship between a cone and cylinder with the same base and height and explain the relationship.
		
		Journal writing or assessment question:
		Explain the formula for the volume of a cylinder.
		
		Exit ticket:
		How did I use area, perimeter and/or circumference to extend to volume of a _____ in today's lesson?
		
		Partner Activity:
		Given a set of parameters, you are to construct a box with a maximum volume.
		
		Explain how similarity is used to define radians. **(H)**
		
		Quiz Question:
		Given several diagrams, describe the shape formed by the intersection of the plane and the solid.
		
		Partner Activity:
		Sketch and describe the solid produced by rotating the given figure around the given axis. Then identify and describe the solid.
			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.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-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 measure of the angle as the constant of proportionality; derive the formula for the area of a sector
			
			G-CO.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.
			
			G-MG.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)
			
			G-MG.2
			Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
			
			G-MG.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).
			
			9.1.12.A.1
			Apply critical thinking and problem-solving strategies during structured learning experiences.
			
			9.1.12.F.2
			Demonstrate a positive work ethic in various settings, including this classroom and during structured learning experiences.
			
			SL4. Present information, findings, and supporting evidence such that listeners
				15 lessons

| | | | can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

RST.9-10.7
 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CRP4. Communicate clearly and effectively and with reason. | |