Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 1 The Basics of Geometry	
In this unit, students will become familiar with the basic elements of geometry, such as points, lines, angles, and polygons.	
Essential Questions	**Learning Targets/Objectives**
1. How do you name geometric figures? 2. What are congruent segments? 3. How do you find the distance and the midpoint between two units in the coordinate plane? 4. How do you identify whether an angle is acute, right, obtuse, or straight? 5. How do you identify complementary and supplementary angles? 6. How do you classify polygons? 7. How do you find the perimeter and area of a figure?	Students will be able to: • Name points, lines, and planes • Name segments and rays • Sketch intersections of lines and planes • Use the Ruler Postulate • Use the Segment Addition Postulate • Find segment lengths using midpoint and segment bisectors • Use the Midpoint Formula • Use the Distance Formula • Name angles • Measure and classify angles • Identify congruent angles • Use the Angle Addition Postulate to find angle measures • Bisect angles • Identify complementary and supplementary angles • Identify linear pairs and vertical angles

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Point, line, plane, rays, intersection, axiom, coordinate, distance, midpoint, Midpoint Formula, Distance Formula, polygon, sides, vertex, protractor, degrees	Undefined terms, point, line, plane, collinear points, coplanar points, defined terms, undefined terms, segment, endpoints, ray, opposite rays, intersection, postulate, distance, length, Ruler Postulate, Segment Addition Postulate, congruent segments, between, midpoint, segment bisector, angle, vertex, sides of an angle, interior of an angle, exterior of an angle, measure of an angle, acute angle, obtuse angle, right angle, straight angle, congruent angles, angle bisector, Protractor Postulate, Angle Addition Postulate, complementary angles, supplementary angles, adjacent angles, vertical angles, linear pair

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. N-RN.A.3	1. Simplify radicals, including algebraic radicals.
2. G-CO.A.1	2. 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.
3. G-CO.B.7	3. 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.
4. A-CED.A.1	4. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.

5. G-GPE.B.7	5. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
6. G-CO.D.12	6. Make formal geometric constructions with a variety of tools and methods (paper folding)
7. G-MG.A.1 	7. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).  Climate Change Example: Students may use circles, their measures, and their properties to describe the cross-section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. HS-PSI-8	4. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.2.12.CAP.5	1. Assess and modify a personal plan to support current interests and postsecondary plans.
2. 9.4.12.CI.1	2. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
3. 9.4.5.DC.4	3. Model safe, legal, and ethical behavior when using online or offline technology

4. 9.4.12.CT.2	4. Explain the potential benefits of collaborating to enhance critical thinking and problem-solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.DA.3 2. 8.1.2.DA.4 3. 8.1.2.AP.4	1. Identify and describe patterns in data visualizations. 2. Make predictions based on data using charts or graphs. 3. Break down a task into a sequence of steps.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities

- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Definitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize the Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see the structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate the reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Geometry, A Common Core Curriculum – Big Ideas Math, Big Ideas Learning LLC., 2019

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Points, Lines, Line Segments, and Rays | Math with Mr. J
- Ruler Postulate and the Segment Addition Postulate
- Using Distance Formula to Find Distance Between Two Points!
- Angles: measuring angles and their names!
- Complementary and Supplementary Angles

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***

• Devices:
  ○ Chromebooks
  ○ Texas Instrument TI-84 Plus Graphing Calculator

ML Resources
• Multi-Language Glossary
Gifted & Talented Resources
• Leveled Assessments • Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 1.1 Points, Lines, and Planes		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 1.1**
• Students will name points, lines, and planes. • Students will name segments and rays. • Students will sketch intersections of lines and	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions	Big Ideas Text Exercises 1.1 #1, 2, 3 – 19 odd, 25 – 43 odd, 50, 55, 65 - 72

planes. • Students will solve real-life problems involving lines and planes.	from Lesson 1.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Write two lists of words on the board – those beginning with “geo-” and those ending with “-metry.” For example, geothermal, geopolitics, geophysical, geology, geoid, geometry; and asymmetry, symmetry, trigonometry, optometry, densitometry, geometry. Ask students to discuss the two lists with partners, specifically deciding what the prefix “geo-“ means and the suffix “-metry” means. The prefix “geo-“ is derived from the Greek word geo, which means earth. The suffix “-metry” means the process or science of measuring. It is derived from the Greek word metria, which means to measure.	

Section 1.2 Measuring and Constructing Segments		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 1.2**
• Students will use the Ruler Postulate. • Students will copy segments and compare segments for congruence. • Students will use the Segment Addition Postulate.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 1.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:**	Big Ideas Text Exercises 1.2 # 1, 2, 3 – 25 odd, 32, 34, 38 – 45 and Supplement Algebra Review based on student’s need, for example, solving two-step linear equation, solving linear equations with variables on both sides, . . .

	Display four items at the front of the room, such as a standard paper clip, an unsharpened pencil, a marker, and an empty 1-liter bottle. Divide the class into four groups. Each group is assigned one of the objects and asked to estimate the length of one classroom wall using their nonstandard unit. Gather estimates and record. Do a quick vote to decide on the best estimate. Ask the students if it is possible to measure the wall using any of the four objects as the unit of measure. It would take quite some time to perform the actual estimates, so do this in advance using the efficient method of measuring in inches and doing a conversion. Share results.	

Section 1.3 Use Midpoint and Distance Formulas		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 1.3**
• Students will find segment lengths using midpoints and segment bisectors. • Students will use the Midpoint Formula. • Students will use the Distance Formula.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 1.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students what common distances they know. Discuss what it means to find a distance: for instance, not all of the examples provided in the Teaching Edition (page T-19) are segments.	Big Ideas Text Exercises 1.3 # 1, 2, 3 – 33 odd, 40, 42, 46 – 53 and Supplement Algebra Review based on student's need, for example, solving two-step linear equation, solving linear equations with variables on both sides, . . .

Section 1.5 Measuring and Constructing Angles

Specific Learning Objective	Warm-Up/Starting Options	Practice & Apply Exercises 1.5
• Students will name angles. • Students will measure and classify angles. • Students will identify congruent angles. • Students will use the Angle Addition Postulate to find angle measures. • Students will bisect angles	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 1.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Draw and label $\vec{YX}$ and $\vec{YZ}$ with an angle of about 80° on the board. Label ∠XYZ. Ask the students what the measure is of ∠XYZ. Ask them how they know for sure. Then extend one ray of the angle, and ask what the measure of the angle is now. Students should recognize that the measure of the angle has not changed. Model how to use a protractor and measure the angle. .	Big Ideas Text Exercises 1.5 # 1, 2, 3 – 27 odd, 52, 54, 58 – 65 and Supplement Algebra Review based on student's need, for example, solving two-step linear equation, solving linear equations with variables on both sides, . . .

Section 1.6 Describing Pairs of Angles

Specific Learning Objective	Warm-Up/Starting Options	Practice & Apply Exercises 1.6
• Students will identify complementary and supplementary angles. • Students will identify linear pairs and vertical angles.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 1.6 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:**	Big Ideas Text Exercises 1.6 # 7, 9, 11-14, 15-19 odd, 27, 31, 46,1, 2, 3 – 25 odd, 46, 48, 52 – 59 and Supplement Algebra Review based on student's need, for example, solving two-step linear equation, solving linear equations with variables on both sides, . . .

	Show an aerial view of the runways at an airport. Number the angles formed by different runways to facilitate students being able to reference them more easily. Ask students to make a list of pairs of angles and then state the relationships between each pair of angles. Do not specify the measures of the angles. You should have a sense of what relationships students recall and are familiar with.	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition, and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent Practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students		

- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

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Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 2 Reasoning and Proof	
In this unit, students will analyze conditional statements and write the converse, inverse, and contrapositive of a conditional statement. They will explore how conditional and biconditional statements are used to state definitions. Students will learn what can and cannot be assumed from a diagram. Finally, they will use properties of equality and the laws of logic to prove basic theorems about congruence, supplementary angles, complementary angles, and vertical angles.	
Essential Questions	**Learning Targets/Objectives**
1. How do you use inductive reasoning in mathematics? 2. How do you rewrite a biconditional statement? 3. How do you construct a logical argument? 4. How can you identify postulates illustrated by a diagram? 5. How do you solve an equation? 6. How do you write a geometric proof? 7. What is the relationship between vertical angles, between two angles that are supplementary to the same angle, and between two angles that are complementary to the same angle?	Students will be able to: ● Write conditional statements. ● Use definitions written as conditional statements. ● Write biconditional statements. ● Use Algebraic Properties of Equality to justify the steps in solving an equation. ● Use the Distributive Property to justify the steps in solving an equation. ● Use properties of equality involving segment lengths and angle measures. ● Write two-column proofs. ● Name and prove properties of congruence. ● Write proofs using geometric postulates and theorems.

	• Use properties of special pairs of angles.
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Equation, solve an equation, formula, Addition Property of Equality, Subtraction Property of Equality, Multiplication Property of Equality, Distributive Property, Substitution Property, congruence	Conditional statements, if-then form, hypothesis, conclusion, converse, equivalent statements, perpendicular lines, biconditional statement, Reflexive Property, Symmetric Property, Transitive Property, proof, two-column proof, theorem, Congruence Properties

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. G-CO.A.1	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.
2. G- CO.C.9	2. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
3. G-CO.C.10	3. Prove theorems about triangles. Theorems include measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
4. G-CO.C.11	4. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
5. G-SRT.B.4	5. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other

	two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
6. A-REI.A.1 	6. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **Climate Change Example**: Students will rearrange formulas related to the economic impact of climate change to highlight a quantity of interest, using the same reasoning as in solving equations.
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. HS-PS1-5	4. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.5.DC.4	2. Model safe, legal, and ethical behavior when using online or offline technology
3. 9.4.12.TL.3	3. Analyze the effectiveness of the process and quality of collaborative environments.
4. 9.4.12.CT.2	4. Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.CS.1	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
2. 8.1.2.DA.1	2. Collect and present data, including climate change data, in various visual formats.
3. 8.1.2.DA.3	3. Identify and describe patterns in data visualizations.

4. 8.1.2.DA.4 5. 8.1.2.AP.4 6. 8.1.5.DA.5	4. Make predictions based on data using charts or graphs. 5. Break down a task into a sequence of steps. 6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations

- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools

- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
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- Canva
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- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Biconditional Statements
- Addition and Subtraction Property of Equality
- What are the Properties of Congruence?
- Flowchart Proofs

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources
• Multi-Language Glossary
Gifted & Talented Resources
• Leveled Assessments • Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 2.1 Conditional Statements		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 2.1**
• Students will write conditional statements. • Students will use definitions written as conditional statements. • Students will write biconditional statements. • Students will make truth tables.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 2.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students what a conditional statement is. Then ask students how	Big Ideas Text Exercises 2.1 # 1, 2, 3 – 43 odd, 46, 58, 64 - 69

	to judge whether a conditional statement is true or not, and provide the example “If there is paper on the floor, then someone dropped the paper.” There have to be established conditions of when a conditional statement is true or false, and that is addressed in this lesson.	

Section 2.4 Algebraic Reasoning		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 2.4**
• Students will use Algebraic Properties of Equality to justify the steps in solving an equation. • Students will use the Distributive Property to justify the steps in solving an equation. • Students will use properties of equality involving segment lengths and angle measures.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 2.4 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students if they can sketch what it looks like when a light beam reflects off a mirror. Give students time to discuss with their partners, and then ask for a volunteer. Students should sketch something similar to the diagram shown on page T-91 of the Teaching Edition. Refer to the incident angle and reflected angle. These are congruent, and they will be discussed in an example in the lesson. If time permits, search the Internet (reflection of light in a plane mirror) and show a quick video that demonstrates angle of incidence = angle of reflection.	Big Ideas Text Exercises 2.4 # 1, 2, 3 – 41 odd, 45, 46, 52 and Supplement Algebra Review based on student’s need, for example, solving equations that require factoring

Section 2.5 Proving Statements about Segments and Angles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 2.5**
• Students will write two-column proofs. • Students will name and prove properties of congruence.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 2.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students what it means to prove something. Then ask them if they can think of examples from the field of science where a theory was proven. Explain to students that in geometry they will have opportunities to prove something; a statement that they believe is true. Just as a scientist has protocols to follow in proving a theory, we will have protocols that we will follow to prove statements.	Big Ideas Text Exercises 2.5 # 1 – 10, 17

Section 2.6 Proving Geometric Relationships		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 2.5**
• Students will write flowchart proofs to prove geometric relationships. • Students will write paragraph proofs to prove geometric relationships	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 2.6 in the Big Ideas Resources file. Review the answers as a class.	Big Ideas Text Exercises 2.6 # 1 – 18, 20

	Starting Options: Show students a picture of a staircase with a balustrade (handrail, balusters, and newel posts) and ask the students if there are pairs of angles in the picture that they know are congruent without measuring. Explain to students that in this lesson they will study theorems that will answer this question.	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students		

- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

<u>WHY</u> ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 3 Parallel and Perpendicular Lines	
In this unit, students will classify angle pairs formed by three intersecting lines and study angle pairs formed by a line that intersects two parallel lines. They will investigate slopes of lines and study the relationship between slopes of parallel and perpendicular lines. Students will find equations of lines.	
Essential Questions	**Learning Targets/Objectives**
1. What angle pairs are formed by transversals? 2. How are corresponding angles and alternate interior angles related for two parallel lines and a transversal? 3. How do you prove lines are parallel? 4. How do you find the slope of a line given the coordinates of two points on the line? 5. How do you write an equation of a line? 6. How do you find the distance between a point and a line?	Students will be able to: ● Identify lines and planes. ● Identify parallel and perpendicular lines. ● Identify pairs of angles formed by transversals. ● Use properties of parallel lines. ● Prove theorems about parallel lines. ● Use the Corresponding Angle Theorem and its converse. ● Use the Transitive Property of Parallel Lines. ● Prove theorems about Perpendicular Lines. ● Identify parallel and perpendicular lines using slope. ● Write equations of parallel and perpendicular lines. ● Use slope to find the distance from a point to a line.

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Perpendicular lines, parallel lines, supplementary angles, complementary angles, vertical angles, converse, congruent, slope, slope-intercept form, standard form, y-intercept	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, Corresponding Angle Postulate, Alternate Interior Angle Theorem, Alternate Exterior Angle Theorem, Consecutive Interior Angle Theorem, Converse, Lines Perpendicular to a Transversal Theorem

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. A-CED.A.1	1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Climate Change Example: Students may create equations to represent the economic impact of climate change.
2. A-CED.A.2	2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales
3. G-CO.A.1	3. 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.
4. G-CO.C.9	4. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
5. G-CO.D.12	5. Make formal geometric constructions with a variety of tools and methods (compass and straightedge,

	string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
6. G-GPE.B.5	6. 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.
7. G.GPE.B.6	7. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
8. 8.SP.A.3 	8. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. Climate Change Example: Students may use the equation of a linear model to interpret the slope when comparing local and global precipitation rates for rainfall in different regions.
9. F-LE.A.2	9. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
10. F-IF.B.6 	10. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Climate Change Example: Students may calculate the average rate of change of a function c(m) presented symbolically or as a table, where c(m) represents the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline).
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. HS-PS1-5	4. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.5.DC.4	2. Model safe, legal, and ethical behavior when using online or offline technology
3. 9.4.12.TL.3	3. Analyze the effectiveness of the process and quality of collaborative environments.
4. 9.4.12.CT.2	4. Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.CS.1	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
2. 8.1.2.DA.1	2. Collect and present data, including climate change data, in various visual formats.
3. 8.1.2.DA.3	3. Identify and describe patterns in data visualizations.
4. 8.1.2.DA.4	4. Make predictions based on data using charts or graphs.
5. 8.1.2.AP.4	5. Break down a task into a sequence of steps.
6. 8.1.5.DA.5	6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions

- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components

- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Geometry, A Common Core Curriculum – Big Ideas Math, Big Ideas Learning LLC., 2019

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics

- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Angle Pairs-Parallel Lines Cut by a Transversal
- What are Parallel Lines and Parallel Planes? | Don't Memorise
- What are perpendicular lines?
- Find the Distance from a Point to a Line

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources

- Multi-Language Glossary

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 3.1 Pairs of Lines and Angles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 3.1**
• Students will identify lines and planes. • Students will identify parallel and perpendicular lines. • Students will identify pairs of angles formed by transversals.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 3.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Hold up three pieces of uncooked spaghetti or three chopsticks. Have students Turn and Talk to discuss how these three coplanar lines are related in terms of intersection possibilities. Then ask how the lines are related when they are not coplanar.	Big Ideas Text Exercised 3.1 # 1 – 18, 25 – 28

Section 3.2 Parallel Lines and Transversals		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 3.2**
• Students will use properties of parallel lines. • Students will prove theorems about parallel lines. • Students will solve real-life problems.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 3.2 in the Big Ideas Resources file. Review the answers as a class.	Big Ideas Text Exercises 3.2 # 1 – 13, 17, 18 and Supplement Factoring Problem

	Starting Options: Show students an image that contains many parallel lines (segments) and a transversal that intersects them, perhaps the 2-by-4 framing of a house. Identify several angles and ask students what they notice.	

Section 3.3 Proofs and Parallel Lines		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 3.3**
• Students will use the Corresponding Angles Converse. • Students will construct parallel lines. • Students will prove theorems about parallel lines. • Students will use the Transitive Property of Parallel Lines.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 3.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students how to write a converse given a conditional statement. Have students discuss with partners the converse of each statement. Decide whether the original statement is true or false, and decide whether the converse is true or false. If today is Tuesday, then tomorrow is Wednesday. If x = 4, then x2 = 16. If you live in California, then you live in San Francisco. If 2x + 7 = 11, then x = 3. Discuss with students that a statement and its converse may both be true, or not!	Big Ideas Text Exercises 3.3 # 1 – 8, 13 – 25, 27

Section 3.4 Proofs with Perpendicular Lines

Specific Learning Objective	Warm-Up/Starting Options	Practice & Apply Exercises 3.4
• Students will find the distance from a point to a line. • Students will construct perpendicular lines. • Students will prove theorems about perpendicular lines. • Students will solve real-life problems involving perpendicular lines.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 3.4 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Borrow a plumb line from the custodial staff. Stand on a chair and hold the plumb line extended from your body. Ask the students what a plumb line is and what it is used for. Hold the plumb line next to a wall and demonstrate how to draw a vertical line to the floor, one that should be perpendicular to the edge of the floor. The goal is to have a discussion of the word perpendicular and how you know whether two lines or two segments are perpendicular. There are online videos if you prefer to not do the demonstration yourself.	Big Ideas Text Exercises 3.4 # 17 – 22, 25, 27

Section 3.5 Write and Graph Equations of Lines		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 3.5**
• Students will use slope to partition directed line segments. • Students will identify parallel and perpendicular lines. • Students will write equations of parallel and perpendicular lines. • Students will use slope to find the distance from a point to a line.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 3.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Before students arrive, make three sets of cards with equation written on them. The first set, labeled A, has an equation of a	Big Ideas Text Exercises 3.5 # 3 – 24, 27 - 31 and Supplement with review of writing, graphing and interpreting linear equations

	line. Each equation in Set B is parallel to one of the equations in Set A. Each equation in Set C is perpendicular to one of the equations in Set A. All of the equations can be written in slope-intercept or standard form, allowing you to differentiate for students in your class. Hand each student a card. The goal is for students to find their matches so that a set of three students will have an A, B, and C card.	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork

• Standardized Tests	• Independent practice	

List of Accommodations and Modifications

- Special Education
- 504 Students
- At Risk Students
- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 4 Transformations	
In this unit, students will perform translations with vectors and algebra. They will reflect figures in a given line, rotate figures about a point, identify line and rotational symmetry, and perform dilations using drawing tools.	
Essential Questions	**Learning Targets/Objectives**
1. How do you translate a figure using a vector? 2. How do you reflect a figure in the line y = x? 3. How do you rotate a figure 90 degrees, 180 degrees, or 270 degrees about the origin? 4. What is a glide reflection? 5. When does a figure have line symmetry? 6. How can you rotate a figure in a coordinate plane? 7. What does it mean to dilate a figure?	Students will be able to: ● Use a vector to translate a figure. ● Use a rule to translate a figure. ● Perform reflections. ● Perform glide reflections. ● Perform rotations ● Perform a composition with rotations. ● Identify rotational symmetry. ● Identify and perform dilations.

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Ordered pair, coordinate, x coordinate, y coordinate, opposite, proportional	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 symmetry, line of symmetry, rotation, center of rotation, angle of rotation, rotational symmetry, center of symmetry, dilation, center of dilation, scale factor, enlargement, reduction

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. G-CO.A.2	1. Represent transformations in the plane using, e.g., … 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).
2. G-CO.A.3	2. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the … reflections that carry it onto itself.
3. G-CO.A.4	3. Develop definitions of translations, reflections, rotations, and dilations in terms of angles, … perpendicular lines, parallel lines, and line segments.
4. G-CO.A.5	4. Given a geometric figure and a … translation, reflection, rotation or dilation, draw the transformed figure using, e.g., graph paper, … or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
5. G-CO.B.6	5. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid

6. G-MG.A.3  7. G-SRT.A.1.a 8. G-SRT.A.1.b	motion on a given figure; … 6. 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). Climate Change Example: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints. 7. 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. 8. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.9-10.1.D 2. SL.PI.9-10.4	1. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented. 2. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1 2. 9.4.5.DC.4 3. 9.4.12.TL.3 4. 9.4.12.CT.2	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas. 2. Model safe, legal, and ethical behavior when using online or offline technology 3. Analyze the effectiveness of the process and quality of collaborative environments. 4. Explain the potential benefits of collaborating to enhance critical thinking and problem-solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.CS.1 2. 8.1.2.DA.1 3. 8.1.2.DA.4	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. 2. Collect and present data, including climate change data, in various visual formats. 3. Make predictions based on data using charts or graphs.

4. 8.1.2.AP.4 5. 8.1.5.DA.5	4. Break down a task into a sequence of steps. 5. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize

- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools

- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

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Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- How to Perform Translations: The Mathematical Slide
- GLIDE Reflections - Learn High School Geometry
- Transformations - Composition of a Rotation, Translation, and a Reflection - FishMath.com
- Dilations: Geometry Transformations Explained!

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources

• Multi-Language Glossary
Gifted & Talented Resources
• Leveled Assessments • Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 4.1 Translations		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 4.1**
• Students will perform translations. • Students will perform compositions. • Students will solve real-life problems involving compositions	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 4.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask for four volunteers. Hand them a piece of yarn or rope at least 12 feet long that has been knotted to form a loop. Have students form the yarn in the shape of	Big Ideas Exercises 4.1 # 3-25 odd 26, 27, 32

	a rectangle by holding the vertices. Tell students that you are going to give them instructions to move and that on the word “go” they will all move at the same time. Example: “Take two steps to the front of the classroom. Go.” Discuss the results of each instruction. In particular, what happened to the rectangle? The rectangle should have remained the same – congruent. Repeat with four new students and ask them to form a trapezoid. Tap three of the students on the shoulder and tell them to follow your instructions. The remaining student is to ignore your instructions.	

Section 4.2 Reflections		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 4.2**
• Students will perform reflections. • Students will perform glide reflections. • Students will identify lines of symmetry. • Students will solve real-life problems involving reflections.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 4.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** 60-Second Write: Tell students that they have 60 seconds to make a list of words that can be reflected in a vertical or horizontal line and the result is the same word or a new word. Example: When the word MOM is reflected in a vertical line, it is still MOM. When it is reflected in a	Big Ideas Exercises 4.2 # 2-6, 7-19 odd, 20-25

	horizontal line, it becomes WOW. Share word lists after 60 seconds. The list should contain letters that have line symmetry themselves: A, B, C, D, E, H, I, K, M, O, T, V, W, X, and Y.	

Section 4.3 Rotations		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 4.3**
● Students will perform rotations. ● Students will perform compositions with rotations. ● Students will identify rotational symmetry.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 4.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** A windshield wiper blade is a useful model in this lesson. The next time you change blades, keep a used blade for the demonstration. Hold the blade at one end of the wiper (point A). Without saying anything, pretend to use the blade for wiping a windshield (rotating about point A). Ask students if all the points on the blade travel the same distance, if any points do not move, and if there is anything that is true about all of the points on the blade. Now tape the blade to a meterstick and ask the students to envision the blade on a car and attached to an arm. Model the movement of the blade now and ask questions similar to before. The difference now is that point A is no longer the center of the rotation, so it is moving.	Big Ideas Exercises 4.3 # 7-23 odd, 25, 26, 28, 35

Section 4.5 Dilations		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 4.5**
• Students will identify and perform dilations. • Students will solve real-life problems involving scale factors and dilations.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 4.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Cut a rectangle out of heavier card stock. Use a flashlight to cast a shadow of the rectangle onto the wall. Ask the students if the angles still appear to be right angles. Then vary the distance between the bulb of the flashlight and the rectangle, and discuss how this changes the shadow. Ask the students if the shadow is always similar to the original figure.	Big Ideas Exercises 4.5 # 3, 5, 15-21 odd, 25, 29, 31 - 35

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to:	The following assessments require students to utilize various strands of mathematics. • Projects

Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. • Diagnostic Pre-Test • Chapter Tests • Periodic Benchmark Tests • Standardized Tests	• Teacher observations • Self-Assessments • Student record-keeping • Quizzes • Warm-ups • Exit Tickets • Participation in class discussions • Independent practice	• Performance Tasks • Homework • Classwork
List of Accommodations and Modifications • Special Education • 504 Students • At Risk Students • MLL • Gifted and Talented		

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 5 Congruent Triangles	
In this unit, students will classify triangles and find measures of the angles of triangles. Students will work with a variety of proof formats as they identify congruent figures and investigate and prove triangle congruence. They will also use theorems about isosceles and equilateral triangles.	
Essential Questions	**Learning Targets/Objectives**
1. How are the angle measures in a triangle related? 2. Given two congruent triangles, how can you use rigid motion to map one triangle to the other triangle? 3. What can you conclude about two triangles when you know that two pairs of corresponding sides and the corresponding included angles are congruent? 4. What conjectures can you make about the side lengths and angles of an isosceles triangle? 5. What can you conclude about two triangles when you know the corresponding sides are congruent? 6. What information is sufficient to determine whether two triangles are congruent? 7. How can you use congruent triangles to make an indirect measurement?	Students will be able to: ● Classify triangles and find measures of their interior and exterior angles. ● Identify and use corresponding parts congruent figures. ● Use the Third Angles Theorem ● Use the Side-Angle-Side (SAS) Congruence Theorem. ● Use the Base Angles Theorem ● Use isosceles and equilateral triangles ● Use the Side-Side-Side (SSS) Congruence Theorem ● Use the Hypotenuse-Leg (HL) Congruence Theorem ● Use the Angle-Side-Angle (ASA) and Angle-Angle-Side (AAS) Congruence Theorems ● Use congruent triangles

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Triangle, acute triangle, obtuse triangle, right triangle, equiangular triangle, scalene triangle, isosceles triangle, equilateral triangle, congruent figures, rigid motion,	Interior angles, exterior angles, Corollary to a Theorem, Classify Triangles, corresponding parts, Third Angle Theorem, SAS Triangle Congruence Theorem, SSS Triangle Congruence Theorem, ASA Triangle Congruence Theorem, AAS Triangle Congruence Theorem, HL Triangle Congruence Theorem, Vertex Angle, Base Angles, Legs, Base, Base Angle Theorem, Converse of the Base Angle Theorem, Corollary to the Base Angle Theorem, hypotenuse,

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. A-CED.A.1	1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Climate Change Example: Students may create equations to represent the economic impact of climate change.
2. G-CO.B.7	2. 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.
3. G-CO.B.8	3. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motion.
4. G-CO.C.10	4. Prove theorems about triangles. Theorems include measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent.
5. G.CO.D.13	5. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

6. G-MG.A.1 	6. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Climate Change Example: Students may use circles, their measures, and their properties to describe the cross-section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.
7. G-MG.A.3 	7. 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). Climate Change Example: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.5.DC.4	2. Model safe, legal, and ethical behavior when using online or offline technology
3. 9.4.12.TL.3	3. Analyze the effectiveness of the process and quality of collaborative environments.
4. 9.4.12.CT.2	4. Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
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1. 8.1.2.CS.1	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
2. 8.1.2.DA.1	2. Collect and present data, including climate change data, in various visual formats.

3. 8.1.2.DA.3	3. Identify and describe patterns in data visualizations.
4. 8.1.2.DA.4	4. Make predictions based on data using charts or graphs.
5. 8.1.2.AP.4	5. Break down a task into a sequence of steps.
6. 8.1.5.DA.5	6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities

- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Geometry, A Common Core Curriculum – Big Ideas Math, Big Ideas Learning LLC., 2019

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Classifying Triangles By Their Angles | Math with Mr. J
- Geometry: 6-3 Third Angle Theorem
- Triangle Congruence: Side Angle Side vs. Angle Side Angle
- 4.7 Isosceles Triangles - Base Angles Theorems
- Hypotenuse-Leg Congruence Theorem
- Determining congruent triangles

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***
- Devices:

○ Chromebooks ○ Texas Instrument TI-84 Plus Graphing Calculator
ML Resources
● Multi-Language Glossary
Gifted & Talented Resources
● Leveled Assessments ● Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 5.1 Angles of Triangles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.1**
• Students will classify triangles by sides and angles. • Students will find interior and exterior angle measures of triangles.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.1 in the Big Ideas Resources file. Review the answers as a class.	Big Ideas Text Exercises 5.1 # 1, 2, 3–27 odd, 37, 46, 48, 54–57

	Starting Options: Before students arrive, cut out large models of triangles. Laminate them to use them throughout the year for different discussions. There is a sample of triangles on page T-231 in the Teaching Edition. Ask for seven volunteers. Hand each of them a triangle. Have students sort the triangles by angle measure and then by side length. Ask the students what they have in common. Then explain that in today's lesson the vocabulary of triangles will be reviewed, and students will prove their conjecture about the sum of the interior angles of a triangle.	

Section 5.2 Congruent Polygons		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.2**
• Students will identify and use corresponding parts. • Students will use the Third Angles Theorem.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Tell students about an antique patchwork quilt that you purchased recently that needs a bit of repair. There are several triangular pieces, each different from the others, that are worn and need to be replaced. Ask	Big Ideas Text Exercises 5.2 # 1, 2, 3–17 odd, 22, 26–29

	students what a quilt restorer would need to measure in order to repair the quilt.	

Section 5.3 Prove Triangles Congruent by SAS		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.3**
• Students will use the Side-Angle-Side (SAS) Congruence Theorem. • Students will solve real-life problems.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Pose the following problem to get students thinking about triangles. Tell students to draw six segments of equal length to form a closed figure that contains eight equilateral triangles. Give students time to fool around with the problem. There is one solution on page T-245 in the Teaching Edition. The figure has six small equilateral triangles and two large equilateral triangles, for a total of eight equilateral triangles.	Big Ideas Text Exercises 5.3 # 1, 2, 3–15 odd, 19, 25, 26, 30, 32–35

Section 5.4 Equilateral and Isosceles Triangles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.4**
• Students will use the Base Angles Theorem. • Students will use isosceles and equilateral triangles.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.4 in the Big Ideas Resources file.	Big Ideas Text Exercises 5.4 # 1, 2, 3–19 odd, 22, 23, 38, 40

	Review the answers as a class. **Starting Options:** Isosceles and equilateral triangles appear in many figures that students will study in art and architecture. Tell students that in this lesson they will learn properties of triangles that have two or more congruent sides or angles.	

Section 5.5 Prove Triangles Congruent by SSS		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.5**
• Students will use the Side-Side-Side (SSS) Congruence Theorem. • Students will use the Hypotenuse-Leg (HL) Congruence Theorem.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students to consider the following statements and whether the two triangles would be congruent. -All equilateral triangles are congruent. -All equiangular triangles are congruent. -All isosceles triangles with a vertex angle of 40° are congruent. -All isosceles triangles with legs of 4 inches and a vertex angle of 40° are congruent. -All scalene triangles with side lengths 3 inches, 4 inches, and 5 inches are congruent.	Big Ideas Text Exercises 5.5 # 1 – 15, 19, 20, 23

Section 5.6 Prove Triangles Congruent by ASA and AAS		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.6**
• Students will use the ASA and AAS Congruence Theorems.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.6 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** If possible, bring a wall mirror to class. Stand in front of the mirror and describe the amount of your reflection that you see in the mirror. Ask students if the amount of reflection you see will change as you move closer to or farther away from the mirror. Explain that in this lesson, additional congruence theorems will be introduced, and in the exercises students will explore this question.	Big Ideas Text Exercises 5.6 #3 – 6, 9 – 12, 15, 16, 26

Section 5.7 Using Congruent Triangles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 5.7**
• Students will use congruent triangles. • Students will prove constructions.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 5.7 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students what they know about Napoleon Bonaparte. Here	Big Ideas Text Exercises 5.7 #3 – 6, 17

	are a few facts that you might expect to hear: • military leader and first emperor of France • lived 1769 – 1821 • considered one of the world's greatest military leaders • led reform within France (legal system, education, economy, and church) Explain to students that the second exploration is connected to Napoleon.	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. • Diagnostic Pre-Test • Chapter Tests • Periodic Benchmark Tests • Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: • Teacher observations • Self-Assessments • Student record-keeping • Quizzes • Warm-ups • Exit Tickets • Participation in class discussions • Independent practice	The following assessments require students to utilize various strands of mathematics. • Projects • Performance Tasks • Homework • Classwork
List of Accommodations and Modifications • Special Education • 504 Students		

- At Risk Students
- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 7 Quadrilaterals and Other Polygons	
In this unit, students will find angle measures in polygons. They 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. They will be able to use the properties of these quadrilaterals to classify.	
Essential Questions	**Learning Targets/Objectives**
1. What is the sum of the measures of the interior angles of a polygon? 2. What are the properties of parallelograms? 3. How can you prove that a quadrilateral is a parallelogram? 4. What are the properties of the diagonals of rectangles, rhombi, and squares? 5. What are some properties of trapezoids and kites?	Students will be able to: ● Use the interior angle measures of polygons. ● Use the exterior angle measures of polygons. ● Use properties to find side lengths and angles of parallelograms ● Use properties of special parallelograms ● Use properties of diagonals of special parallelograms ● Use properties of trapezoids ● Use the Trapezoid Midsegment Theorem to find distances ● Use properties of kites ● Identify quadrilaterals

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Polygon, convex, interior angles, exterior angles, quadrilateral, segment bisector, parallelogram,	Diagonal, equilateral polygon, equiangular polygon, regular polygons, parallelogram, rhombus, rectangle, square, trapezoid, bases, base angles, legs, isosceles trapezoid, midsegment of a trapezoid, kite

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

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2. G-CO.C.11	2. Prove theorems about parallelograms.
3. G-SRT.B.5	3. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
4. G-MG.A.1	4. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Climate Change Example: Students may use circles, their measures, and their properties to describe the cross-section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.
5. G-MG.A.3	5. 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). Climate

	Change Example: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.
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3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. HS-PS1-5	4. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
5. HS-PS1-8	5. Develop models to illustrate the changes in the composition of the nucleus of the atom and theenergy released during the processes of fission, fusion, and radioactive decay.
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4. 8.1.2.DA.4	4. Make predictions based on data using charts or graphs.

5. 8.1.2.AP.4 6. 8.1.5.DA.5	5. Break down a task into a sequence of steps. 6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

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- Reason Abstractly

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- Use Logic
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Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
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- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools

- Use Other Resources
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- EdPuzzle
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- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- How do you find the measure of one interior angle of a polygon
- Find the Angles & Lengths of a Parallelogram | Geometry | Eat Pi
- Classifying parallelograms
- Geometry - Trapezoids & Kites

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources
• Multi-Language Glossary
Gifted & Talented Resources
• Leveled Assessments • Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 7.1 Angles of Polygons		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 7.1**
• Students will use the interior angle measures of polygons. • Students will use the exterior angle measures of polygons.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 7.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Capture and display images from the Internet of common objects that are	Big Ideas Text Exercises 7.1, # 1-33 odd, 37-40, 50, 53-56

	shaped like various polygons (pentagon: top of a fire hydrant; hexagon: honeycomb; octagon: stop sign or tiles; decagon: concave five-pointed star). Explain to students that in this lesson they will be investigating properties of polygons.	

Section 7.2 Properties of Parallelograms		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 7.2**
• Students will use properties to find side lengths and angles of parallelograms. • Students will use parallelograms in the coordinate plane.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 7.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Capture and display images from the Internet of parallelograms used in structural and artistic designs. Refer back to these images at the end of the lesson, and identify the properties of parallelograms.	Big Ideas Text Exercises 7.2 # 1-21 odd, 33, 34, 39, 43, 48-50

Section 7.4 Properties of Special Parallelograms		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 7.4**
• Students will use properties of special parallelograms. • Students will use properties of diagonals of special parallelograms. • Students will use coordinate geometry to identify	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 7.4 in the Big Ideas Resources file. Review the answers as a class.	Big Ideas Text Exercises 7.4 # 1-63 odd, 65-70, 75, 76, 84, 89-91

special types of parallelograms.	**Starting Options:** Draw and cut out a large copy of a rhombus. It should not be a square. The rhombus has 180° rotational symmetry and line symmetries through the opposite vertices. Fold and crease the rhombus on both lines of symmetry. If possible, display it under a document camera. Have students Turn and Talk about what the symmetry tells them about the diagonals and opposite angles of a rhombus.	

Section 7.5 Properties of Trapezoids and Kites		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 7.5**
● Students will use properties of trapezoids. ● Students will use the Trapezoid Midsegment Theorem to find distances. ● Students will use properties of kites. ● Students will identify quadrilaterals.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 7.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask students to sketch quadrilaterals with different numbers of lines of symmetry: 0, 1, 2, 3, and 4. Use Popsicle Sticks to solicit responses for each of the following statements: A square is the only quadrilateral with 4 lines of symmetry. No quadrilateral has 3 lines of symmetry. Rectangles and rhombuses have 2 lines of symmetry. Isosceles trapezoids and kites have 1 line of symmetry. Parallelograms and non-isosceles trapezoids have 0 lines of symmetry. Explain that today's lesson is about trapezoids and kites.	Big Ideas Text Exercises 7.5 # 1-29 odd, 31-34, 41, 53, 54

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

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Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources
● New Jersey Student Learning Standards ● Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 8 Similarity	
In this unit, students will understand what it means for two figures to be similar by showing the corresponding sides proportional and corresponding angles congruent. Students will use ratios and proportions to find a scale factor. They will use this factor to find missing side lengths of similar figures as well as area and perimeters. Students will use sides and angles of triangles to prove triangles similar. Students will also learn to use several proportionality theorems.	
Essential Questions	**Learning Targets/Objectives**
1. How are similar polygons related? 2. What can you conclude about two triangles when you know that two pairs of corresponding angles are congruent? 3. What are two ways to use the corresponding sides of two triangles to determine that the triangles are similar? 4. What proportionality relationships exist in a triangle intersected by an angle bisector or a line parallel to one of the sides?	Students will be able to: ● Set up and solve proportions. ● Use similarity statements. ● Find the corresponding lengths in similar polygons. ● Find perimeters and areas of similar polygons. ● Decide whether polygons are similar. ● Use the Angle-Angle Similarity Theorem. ● Solve real-life problems. ● Use the Side-Side-Side Similarity Theorem. ● Use the Side-Angle-Side Similarity Theorem. ● Prove slope criteria use similar triangles. ● Use the Triangle Proportionality Theorem and its converse.

	• Use the Triangle Angle Bisector Theorem.
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Similar figures, similarity transformations, corresponding parts, slope, parallel lines, perpendicular lines, ratio, proportions,	AA Similarity Theorem SAS Similarity Theorem, SSS Similarity Theorem, Triangle Proportionality Theorem, Converse of Triangle Proportionality Theorem, Three Parallel Lines Theorem, Triangle Angle Bisector Theorem

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. N-Q.A.1	1. Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.
2. A-CED.A.1	2. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Climate Change Example: Students will create equations to represent the economic impact of climate change.
3. G-SRT.A.2	3. 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.
4. G-SRT.A.3	4. 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).
5. G-SRT.B.4	5. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other

	two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
6. G-SRT.B.5	6. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
7. G-MG.A.1 	7. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Climate Change Example: Students may use circles, their measures, and their properties to describe the cross-section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.
8. G-MG.A.3 	8. 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). Climate Change Example: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.
9. G-GPE.B.5	9. *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)*
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. HS-PS1-5	4. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
5. HS-PS1-8	5. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.1.12.PB.6	1. Describe and calculate interest and fees that are applied to various forms of spending, debt and saving.

2. 9.4.12.CI.1	2. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
3. 9.1.12.CDM.8	3. Compare and compute interest and compound interest and develop an amortization table using business tools.
4. 9.4.12.TL.3	4. Analyze the effectiveness of the process and quality of collaborative environments.
5. 9.4.12.CT.2	5. Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.CS.1	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
2. 8.1.2.DA.1	2. Collect and present data, including climate change data, in various visual formats.
3. 8.1.2.DA.3	3. Identify and describe patterns in data visualizations.
4. 8.1.2.DA.4	4. Make predictions based on data using charts or graphs.
5. 8.1.2.AP.4	5. Break down a task into a sequence of steps.
6. 8.1.5.DA.5	6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points

- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Definitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Geometry, A Common Core Curriculum – Big Ideas Math, Big Ideas Learning LLC., 2019

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos
• Similar Polygons – Let's solve this EASY geometry problem! • Angle-Angle Similarity Theorem • SSS Similarity Theorem of Triangles (2-MINUTE MATH) • Triangle Proportionality Theorem
Integrated Technology

• Google Suite: Google Classroom, Docs, Drive, Mail, etc...
• ***Big Ideas online program***
• Devices:
  ○ Chromebooks
  ○ Texas Instrument TI-84 Plus Graphing Calculator

ML Resources
• Multi-Language Glossary
Gifted & Talented Resources
• Leveled Assessments • Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 6.1 Ratios and Proportions Supplement (McDougal Littel Geometry Textbook)		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply McDougal Little Exercises 6.1**
● Set up and solve proportions.	**Warm-Up:** Simply expressions that require the students to use the distributive property, e.g. 4(x + 6), x(3x - 2) **Starting Options:** Pair/Share: review the distributive property, then review the terms ratio and proportion, and put several examples of proportions on the board some just with numbers and others that include variables. Without explaining see if students can find the values of the variables.	McDougal Little Geometry pg.360 #2-36, 42-46, 49-51, 57

Section 8.1 .Similar Polygons		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 8.1**
● Students will use similarity statements. ● Students will find corresponding lengths in similar polygons. ● Students will find perimeters and areas of similar polygons. ● Students will decide whether polygons are similar.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 8.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Display an image of a Major League baseball diamond and a Little League baseball diamond. Ask students if these polygons are similar. Have them explain	Big Ideas Text Exercises 8.1 # 1-23 odd, 28-34, 36 - 42

	their reasoning. Ask students how the ratios of the perimeter of the base path to the distance from home plate to second base are related. Ask students how the ratio of the infield areas is related to the ratio of the perimeters. Explain to students that in this lesson they will be working with relationships found in similar polygons.	

Section 8.2 Proving Triangle Similarity by AA		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 8.2**
• Students will use the Angle-Angle Similarity Theorem. • Students will solve real-life problems.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 8.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Refer to an object outside your school building, such as a flagpole, tree, or building. Ask students how tall they think the object is. Explain to students that in today's lesson they will learn a technique for measuring the height of an object using a method that uses indirect measure.	Big Ideas Text Exercises 8.2, # 1-21 odd

Section 8.3 Proving Triangle Similarity by SSS and SAS		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 8.3**
• Students will use the Side-Side-Side Similarity	**Warm-Up:**	Big Ideas Text Exercises 8.3 # 1 – 8, 13 – 16, 19

Theorem. ● Students will use the Side-Angle-Side Similarity Theorem. ● Students will prove slope criteria using similar triangles.	Have students answer Start Thinking and/or Warm Up questions from Lesson 8.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Gather pictures of quilts that contain what appear to be similar triangles and likely congruent triangles as well. Make a slide show of the quilts. Have students identify triangles that appear to be similar. Explain to students that in this lesson they will learn additional ways to prove triangles are similar besides the Angle-Angle Similarity Theorem.	

Section 8.4 Proportionality Theorems		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 8.4**
● Students will use the Triangle Proportionality Theorem and its converse. ● Students will use other proportionality theorems.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 8.4 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Display a street map, as shown on page T-445 in the Teaching Edition, with parallel city streets that are intersected by nonparallel streets. Have students describe the orientations of the various streets. Explain to students that in this lesson they will look at proportional segments found in triangles.	Big Ideas Text Exercises 8.4 # 3 – 8, 13 – 24, 25, 26, 29, 34

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition, and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

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PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 9 Right Triangles and Trigonometry

In this unit, students will be introduced to right triangle trigonometry. The first lesson on the Pythagorean Theorem will not be completely new to students who will have familiarity with this theorem from idle school. The next two lessons use knowledge of similar triangles to investigate relationships in special right triangles (30°-60°-90° and 45°-45°-90°) as well as similar triangles that are formed when the altitude to the hypotenuse is drawn in a right triangle. Being familiar with these relationships and solving for segment lengths in triangles will be helpful in subsequent lessons. The next three lessons present the tangent, sine, and cosine ratios. The focus of these lessons is to solve for parts of a right triangle. Many real-life applications are presented.

Essential Questions	Learning Targets/Objectives
1. How can you prove the Pythagorean Theorem? 2. How are altitudes and geometric means of right triangles related? 3. How is a right triangle used to find the sine, cosine, and tangent of an acute triangle? 4. When you know the lengths of the sides of a right triangle, how can you find the measures of the two acute angles?	Students will be able to: ● Find side lengths in right triangles ● Use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle ● Use properties of the altitude of a right triangle ● To use trigonometric ratios to solve for side lengths in right triangles ● Use inverse tangent, sine, and cosine ratios

Tier 2 Vocabulary *High-frequency words used throughout the unit*	Tier 3 Vocabulary *Discipline-specific words used throughout the unit*
Right triangle, legs of a right triangle, hypotenuse, acute triangle, obtuse triangle, isosceles triangle, altitude of a triangle, similar figures,	The Pythagorean Theorem, Pythagorean Triple, Converse of Pythagorean Theorem, trigonometric ratio, tangent, sine, cosine, angle of elevation, angle of depression, inverse tangent, inverse sine, inverse cosine, solve a right triangle

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. N-RN.A.3	1. Simplify radical expressions.
2. G-SRT.B.4	2. Prove theorems about triangles.
3. G.SRT.B.5	3. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
4. G-SRT.C.6	4. 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.
5. G-SRT.C.7	5. Explain and use the relationship between the sine and cosine of complementary angles.
6. G-SRT.C.8	6. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
7. G-MG.A.1 	7. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).  Climate Change Example: Students may use circles, their measures, and their properties to describe the cross-section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.

8. G-MG.A.3 	8. 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). Climate Change Example: Students may apply geometric methods to solve design problems such as increasing access to green spaces in cities given physical and cost constraints.
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4. HS-PS1-5	4. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
5. HS-PS1-8	5. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.3.12.AG-PST.1	1. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.
2. 9.4.12.CI.1	2. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
3. 9.4.5.DC.4	3. Model safe, legal, and ethical behavior when using online or offline technology
4. 9.4.12.TL.3	4. Analyze the effectiveness of the process and quality of collaborative environments.
5. 9.4.12.CT.2	5. Explain the potential benefits of collaborating to enhance critical thinking and problem-solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
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2. 8.1.2.DA.1 3. 8.1.2.DA.3 4. 8.1.2.DA.4 5. 8.1.2.AP.4 6. 8.1.5.DA.5	needs and preferences. 2. Collect and present data, including climate change data, in various visual formats. 3. Identify and describe patterns in data visualizations. 4. Make predictions based on data using charts or graphs. 5. Break down a task into a sequence of steps. 6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

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- Find Entry Points
- Analyze Givens
- Interpret a Solution
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- Consider Similar Problems
- Check Progress
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- Problem Solve

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- Use Equations
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- Contextualize
- Relationships
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Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
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- Use Prior Results
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- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
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- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

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Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

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Resources

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- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Pythagorean Theorem
- Similar Triangles
- The Tangent Ratio - Intro to Trigonometry (Learn it Fast and Easy)
- Intro to the trigonometric ratios

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***

• Devices:
  ○ Chromebooks
  ○ Texas Instrument TI-84 Plus Graphing Calculator

ML Resources
• Multi-Language Glossary
Gifted & Talented Resources
• Leveled Assessments • Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 9.1 The Pythagorean Theorem		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 9.1**
• Students will use the Pythagorean Theorem. • Students will use the Converse of the Pythagorean Theorem.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from	Big Ideas Exercises 9.1 # 3 - 6, 7 - 25 odd, 38 and Supplement with a review of rational numbers (include simplifying, sum and product of rational

• Students will classify triangles.	Lesson 9.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Share information about Pythagoras, who was born in Greece in 569 B.C. He is known as the Father of Numbers. He traveled extensively in Egypt, learning math, astronomy, and music. Pythagoras undertook a reform of the cultural life of Cretona, urging the citizens to follow his religious, political, and philosophical goals. He created a school where his followers, known as Pythagoreans, lived and worked. They observed a rule of silence called echemythia, the breaking of which was punishable by death. One had to remain silent for five years before being allowed to contribute to the group. Over the years, many mathematicians and non-mathematicians have given various proofs of the Pythagorean Theorem. One of our former presidents, President James Garfield, is credited with a proof.	numbers and solving equations involving rational numbers)

Section 9.3 Similar Right Triangles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 9.3**
• Students will identify similar triangles. • Students will solve real-life problems involving similar triangles.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson	Big Ideas Text Exercises 9.3 # 3 - 10, 19 – 30, 31 - 35

• Students will use geometric means.	9.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Pose the following problem: You invest $1000. The first year your money earns 10%, and the second year your money earns 20%. What is your average rate of return over the two years? Students may incorrectly say 15%. Perform the computation: $1000 × 1.1 = $1100 at the end of year one. $1100 × 1.2 = $1320 at the end of year two. The geometric mean of 1.1 (110%) and 1.2 (120%) is approximately 1.1489, which is the average rate of return over two years. Today's lesson involves finding geometric means.	

Section 9.4 The Tangent Ratio		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 9.4**
• Students will use the tangent ratio. • Students will solve real-life problems involving the tangent ratio.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 9.4 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Draw a right triangle and label the sides a, b, and c. Ask students how many different ratios can be written using the sides a, b, and c, and have them explain. Explain to students that today they will learn about the tangent of an angle, one of the six trigonometric ratios. Share a bit of history of trigonometry if time permits.	Big Ideas Text Exercises 9.4 # 3 – 11 odd, 15, 16, 21 (provide diagrams for word problems)

Section 9.5 The Sine and Cosine Ratios		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 9.5**
• Students will use the sine and cosine ratios. • Students will find the sine and cosine of angle measures in special right triangles. • Students will solve real-life problems involving sine and cosine ratios.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 9.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Share information with your students about a spring ski trip you (or your friends) are planning to Tuckerman Ravine, on the east side of Mt. Washington in the White Mountain Forest of New Hampshire. Tuckerman Ravine is famous for its spectacular scenery, deep snow, and challenging terrain. Thousands of motivated skiers make the six-mile round trip to the floor of the Tuckerman Ravine every year. There are no ski lifts – you hike in and hike out, thus you need to be motivated! To decide whether the hike is worth it, skiers want to know the length of the trail. Explain to students that in this lesson they will find a way to determine the length of a ski trail.	Big Ideas Text Exercises 9.5 # 3 – 21 odd, 27, 28, 30, 34 (provide diagrams for word problems)

Section 9.6 Solving Right Triangles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 9.6**
• Students will use inverse trigonometric ratios. • Students will solve right triangles.	**Warm-Up:** Have students answer Start Thinking	Big Ideas Text Exercises 9.6 # 7 – 19 odd, 21, 23, 24 (provide diagrams for word problems)

	and/or Warm Up questions from Lesson 9.6 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Show the Table of Trigonometric Ratios available at BigIdeasMath.com. Explain that before scientific calculators were readily available, tables such as these were included in textbooks. Also printed in textbooks were tables of square roots and cube roots.	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork

List of Accommodations and Modifications • Special Education • 504 Students • At Risk Students • MLL • Gifted and Talented		

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

<u>WHY</u> ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 10 Properties of Circles (Sections 10.1, 10.2, 10.4 & 10.5)	
In this unit, students will learn about circles. The first three lessons introduce the vocabulary and symbols related to circles. They are followed by a lesson looking at circular arcs that are intercepted by chords. The next lesson introduces all of the angle relationships that occur when two chords, secants, or tangents intersect a circle.	
Essential Questions	**Learning Targets/Objectives**
1. What are the definitions of the lines and segments that intersect a circle? 2. How are circular arcs measured? 3. How are inscribed angles related to their intercepted arcs? 4. How are the angles of an inscribed quadrilateral related to each other? 5. When a chord intersects a tangent line or another chord, what relationships exist among the angles and arcs formed?	Students will be able to: ● Identify special segments and lines. ● Draw and identify common tangents. ● Use properties of tangents. ● Find arc measures. ● Identify congruent arcs. ● Use inscribed angles. ● Used inscribed quadrilaterals. ● Find angle and arc measures. ● Use circumscribed angles.

Tier 2 Vocabulary *High-frequency words used throughout the unit*	Tier 3 Vocabulary *Discipline-specific words used throughout the unit*
Intersection, point of intersection, perpendicular, right angle, equidistant, polygon, quadrilateral, congruent measures	Circle, center, radius, chord, diameter, secant, tangent, point of tangency, tangent circles, common tangent, concentric circles, central angle, minor arc, major arc, semicircle, measure of a minor arc, measure of a major arc, adjacent arcs, congruent circles, inscribed angle, intercepted arc, subtend, inscribed polygon, inscribed quadrilateral, circumscribed angle

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. A-CED.A.1 	1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.  Climate Change Example: Students will create equations to represent the economic impact of climate change.
2. G-CO.A.1	2. 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.
3. G-C.A.1	3. Prove that all circles are similar.
4. G-C.A.2	4. Identify and describe relationships among inscribed angles, radii, and chords.
5. G.C.A.3	5. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
6. G.C.A.4	6. Construct a tangent line from a point outside a given circle to the circle.

7. G.CO.D.13	7. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.5.DC.4	2. Model safe, legal, and ethical behavior when using online or offline technology
3. 9.4.12.TL.3	3. Analyze the effectiveness of the process and quality of collaborative environments.
4. 9.4.12.CT.2	4. Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.CS.1	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
2. 8.1.2.DA.1	2. Collect and present data, including climate change data, in various visual formats.
3. 8.1.2.DA.3	3. Identify and describe patterns in data visualizations.
4. 8.1.2.DA.4	4. Make predictions based on data using charts or graphs.
5. 8.1.2.AP.4	5. Break down a task into a sequence of steps.
6. 8.1.5.DA.5	6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Geometry, A Common Core Curriculum – Big Ideas Math, Big Ideas Learning LLC., 2019

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Geometry 10.4- Finding Common Internal Tangents
- Intro to arc measure
- How to Solve Inscribed Angles Problems
- Circumscribed Angles

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- ***Big Ideas online program***
- Devices:
    - Chromebooks
    - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources

- Multi-Language Glossary

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 10.1 Lines and Segments That Intersect Circles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 10.1**
• Students will identify special segments and lines. • Students will draw and identify common tangents. • Students will use properties of tangents.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 10.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Show students a diagram of several soccer players standing on a circle that contains the posts of the goal (like the one shown on page T-553 in the Teaching Edition). Discuss with them whether any player has the greatest "kicking angle" for the goal. Tell students that in this lesson they will see why each player has the same "kicking angle."	Big Ideas Text Exercises 10.1 # 1-35 odd, 39, 45, 49, 50

Section 10.2 Finding Arc Measures		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 10.2**
● Students will find arc measures. ● Students will identify congruent arcs. ● Students will prove circles are similar.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 10.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Have students write on scrap paper to answer. Ask students to list three things that are circular. Give students 15 seconds and then ask how many of them have pizza on their list. It is fairly likely that all students in the room will have pizza on their lists. Ask students how many pieces pizzas are often cut into. Also ask what the measure of the angle at the tip of each slice is when the pizza is cut into 6, 8, and 10 equal slices. Explain to students that in this lesson they will work with the central angle of a circle (the tip of the pizza slice) and also with the circular arc (the crust).	Big Ideas Text Exercises 10.2 # 1-29 odd, 31, 39-42

Section 10.4 Inscribed Angles and Polygons		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 10.4**
● Students will use inscribed angles. ● Students will use inscribed polygons.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 10.4 in the Big Ideas Resources file.	Big Ideas Text Exercises 10.4 # 1-17 odd, 19-21, 34, 43-46

	Review the answers as a class. **Starting Options:** Show students a diagram of several soccer players standing on a circle that contains the posts of the goal (like the one shown on page T-553 in the Teaching Edition). Discuss with them whether any player has the greatest "kicking angle" for the goal. Tell students that in this lesson they will see why each player has the same "kicking angle."	

Section 10.5 Angle Relationships in Circles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises10.5**
● Students will find angle and arc measures. ● Students will use circumscribed angles.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 10.5 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Ask whether anyone can speak about the aurora borealis, commonly known as the northern lights. Let students share what they know. Polar lights (aurora polaris) are a natural phenomenon found in both the northern and southern hemispheres. The polar lights are a natural light display in the sky, particularly in the high-latitude (Arctic and Antarctic) regions, caused by the collision of energetic charged particles with atoms in the high-altitude atmosphere. In this lesson, the connection to high altitudes is made.	Big Ideas Text Exercises 10.5 # 1-23 odd, 34, 41-43

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Periodic Benchmark Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources
● New Jersey Student Learning Standards ● Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: ML Geometry
Course Number: 033900

Updated: June 2024

PART I: UNIT RATIONALE

<u>WHY</u> ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Chapter 10.3, 10.6, 11.1 & 11.2 Properties of Circles, Arc Lenth and Sectors	
In this unit, students will learn about circles. In the first two lessons, students will investigate segment relationships that occur when two chords, secants, or tangents intersect a circle. In the previous chapter, students worked with the measures of circular arcs. In this chapter, they will work with the length of a circular arc and the area of a sector of a circle. The definition of population density is included in the lesson.	
Essential Questions	**Learning Targets/Objectives**
1. What are two ways to determine when a chord is a diameter of a circle? 2. What relationships exist among segments formed by two intersecting chords or among segments of two secants that intersect outside a circle? 3. How can you find the length of a circular arc? 4. How can you find the area of a sector?	Students will be able to: ● Use chords of circles to find lengths and angles. ● Use segments of chords, secants, and tangents. ● Use the formula for circumference. ● Use arc lengths to find measures. ● Use the area formula for area of a circle. ● Use the formula for population density. ● Find the areas of sectors.

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Circle, chord, secant, tangent, diameter, intercepted arc, arc, diameter	Equidistant Chord Theorem, segments of a chord, tangent segment, secant segment, external segment, Segments of Chords Theorem, Segments of Secants Theorem, Segments of Secants and Tangents Theorem, arc length, sector of a circle, area of a sector, population density,

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. A-CED.A.1	1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Climate Change Example: Students will create equations to represent the economic impact of climate change.
2. G.C.A.2	2. Identify and describe relationships among inscribed angles, radii, and chords.
3. G.C.B.5	3. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius.
4. G.CO.A.1	4. 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.

5. G–GMD.A.1	5. Give an informal argument for the formulas for the circumference of a circle and the area of a circle.
6. G-MG.A.1 	6. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).  Climate Change Example: Students may use circles, their measures, and their properties to describe the cross-section of a tree and compare changes in radial diameter or circumference variations of tree trunks when considering changes in seasonal weather patterns over time.
7. G.MG.A.2 	7. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).  Climate Change Example: Students may apply the concept of population density of different urban areas, including calculations of population density, and discuss different environmental factors (e.g., air and water quality, waste disposal, energy consumption) that might be exacerbated by increased population density.
NJSLS	**Interdisciplinary Connections**
1. L.KL.9-10.2.A	1. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
2. SL.PE.9-10.1.D	2. Respond thoughtfully to various perspectives, summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented.
3. SL.PI.9-10.4	3. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. HS-PS1-5	4. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
5. HS-PS1-8	5. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.5.DC.4	2. Model safe, legal, and ethical behavior when using online or offline technology
3. 9.4.12.TL.3	3. Analyze the effectiveness of the process and quality of collaborative environments.

4. 9.4.12.CT.2	4. Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.2.CS.1 2. 8.1.2.DA.1 3. 8.1.2.DA.3 4. 8.1.2.DA.4 5. 8.1.2.AP.4 6. 8.1.5.DA.5	1. Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. 2. Collect and present data, including climate change data, in various visual formats. 3. Identify and describe patterns in data visualizations. 4. Make predictions based on data using charts or graphs. 5. Break down a task into a sequence of steps. 6. Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

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Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress

- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

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- Relationships
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- Use Counterexamples
- Justify Conclusions
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- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram

- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
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- Model Real Life

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Resources

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- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Videos

- Use Chords of Circles to Find Arc Measures
- Geometry: Circles - Special Segments of Chords, Secants, and Tangents
- Arc Measure vs Arc Length
- Circle Equation in Standard Form (How to Graph)

Integrated Technology
● Google Suite: Google Classroom, Docs, Drive, Mail, etc... ● ***Big Ideas online program*** ● Devices: ○ Chromebooks ○ Texas Instrument TI-84 Plus Graphing Calculator
ML Resources
● Multi-Language Glossary
Gifted & Talented Resources
● Leveled Assessments ● Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 10.3 Using Chords		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 10.3**
• Students will use chords of circles to find lengths and arc measures.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 10.3 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:**	Big Ideas Text Exercises 10.3 #1-17 odd, 26-28

	If possible, bring a piece of a broken dinner plate that has a portion of the edge remaining. If you have never broken a plate and saved a shattered piece, then you could instead tear a paper plate and make believe. If you are a storyteller, give details of the event that led up to the breaking of the plate. Ask students what the diameter of the plate was. Explain to students that in this lesson they will discover a method for locating the center of a circle.	

Section 10.6 Segment Relationships in Circles		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 10.6**
• Students will use segments of chords, tangents, and secants.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 10.6 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Pose the following problem: You are parasailing above the ocean and looking out at the horizon. If you know your height above the water and the radius of Earth, do you think you can calculate how far you can see? Students should recognize this as an application of the Pythagorean Theorem. Explain to students that they will look at an alternate way to solve this problem using a new theorem in this lesson.	Big Ideas Text Exercises 10.6 # 1-15 odd, 27-30

Section 11.1 Circumference and Arc Length		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 11.1**
● Students will use the formula for circumference. ● Students will use arc lengths to find measures. ● Students will solve real-life problems. ● Students will measure angles in radians.	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 11.1 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** Give students information about fat-tire biking. The tires average 4 inches wide versus 2 inches on a mountain bike or 1 inch on a road bike. The diameter of the tires varies. Explain to students that in this lesson they will solve problems about tires.	Big Ideas Text Exercises 11.1 # 1-13 odd, 23, 24, 43, 44

Section 11.2 Areas of Circles and Sectors		
Specific Learning Objective	**Warm-Up/Starting Options**	**Practice & Apply Exercises 11.2**
● Students will use the formula for the area of a circle. ● Students will use the formula for population density. ● Students will find areas of sectors. ● Students will use areas of sectors	**Warm-Up:** Have students answer Start Thinking and/or Warm Up questions from Lesson 11.2 in the Big Ideas Resources file. Review the answers as a class. **Starting Options:** When students enter, display the iconic Pac-Man symbol and ask whether they are familiar with it. Tell them that you were such a fan of this video game that, in college, you had a rug in this shape in your dorm room. Everyone envied you!	Big Ideas Text Exercises 11.2 # 1-23 odd, 26, 30-32, 42-45

	"How big was this rug you ask? I'll tell you at the end of class!"	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
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List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices