NEW MILFORD PUBLIC SCHOOLS

New Milford, Connecticut

Math 8

December 2021

BOE Approved May 2022

New Milford Board of Education

Wendy Faulenbach, Chairperson

Pete Helmus, Vice Chairperson

Olga I. Rella, Secretary

Tammy McInerney, Assistant Secretary

Eric Hansell

Brian McCauley

Tom O'Brien

Leslie Sarich

Keith A. Swanhall, Jr.

Superintendent of Schools

Ms. Alisha DiCorpo

Assistant Superintendent

Mrs. Holly Hollander

Authors of Course Guide

Kevin Deitz

BOE Approved May 2022

New Milford's Mission Statement

The mission of the New Milford Public Schools, a collaborative partnership of students, educators, family and community, is to prepare each and every student to compete and excel in an ever-changing world, embrace challenges with vigor, respect and appreciate the worth of every human being, and contribute to society by providing effective instruction and dynamic curriculum, offering a wide range of valuable experiences, and inspiring students to pursue their dreams and aspirations.

BOE Approved May 2022

Math 8

Grade 8

In grade 8, students will learn what makes figures similar and congruent. They will increase their ability to solve linear equations in one variable beyond one-step and two-step equations, finding that equations exist for which there are infinitely many or no solutions. Their knowledge of exponents will be expanded to include how like bases interact with each other when multiplied, divided, or raised to multiple powers. Students will learn about relationships that exist within triangles and use these relationships to find the lengths of sides of triangles, given two of the three sides. Students will continue to expand their understanding of proportional relationships and will learn to graph these relationships using varying combinations of points and slope. They will then learn to model situations with simultaneous equations and solve them graphically, as well as algebraically. Students will learn to find the volume of more three dimensional solids, including those which require the students to understand pi. Finally, students will collect and analyze bivariate data, using tables and graphs.

Pacing Guide

Include a list of the units and the approximate number of days/weeks it will take to teach the unit.

Unit 1 - Similarity and Congruence - 6 Weeks

Unit 2 - Solving One Variable Linear Equations - 4 Weeks

Unit 3 - Working with Powers - 4 Weeks

Unit 4 - Relationships in Triangles - 4 Weeks

Unit 5 - Linear Relationships and Functions - 8 Weeks

Unit 6 - Systems of Linear Equations - 5 Weeks

Unit 7 - Volume - 2 Weeks

Unit 8 - Patterns in Data - 3 Weeks

UNIT 1 - SIMILARITY AND CONGRUENCE

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.G.A.1:
Verify experimentally the properties of rotations, reflections, and translations:

CCSS.MATH.CONTENT.8.G.A.1.A:
Lines are taken to lines, and line segments to line segments of the same length.

CCSS.MATH.CONTENT.8.G.A.1.B:
Angles are taken to angles of the same measure.

CCSS.MATH.CONTENT.8.G.A.1.C:
Parallel lines are taken to parallel lines.

CCSS.MATH.CONTENT.8.G.A.2:
Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

CCSS.MATH.CONTENT.8.G.A.3:
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

CCSS.MATH.CONTENT.8.G.A.4:
Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Transfer

Students will be able to independently use their learning to extend their understanding of congruence and similarity

Meaning

UNDERSTANDINGS

Students will understand that…

- Translations, rotations, and reflections are rigid motions
- A rigid motion preserves distance and angle measure
- Rigid motions produce congruent figures
- Dilations produce similar figures
- Compositions of rigid motions are rigid motions

ESSENTIAL QUESTIONS

Students will keep considering…

- What transformations result in congruent figures?
- What transformations result in similar figures?
- Does the order matter in compositions?
- Are there multiple ways to map one figure onto another?

Acquisition

Students will know…

- Similarity Transformations
- Congruence
- Similarity
- Transformation
- Translation
- Reflection
- Line of Reflection
- Line Symmetry
- Rotation
- Center of Rotation
- Dilation
- Center of Dilation
- Scale Factor
- Compositions of Transformations
- Rigid Motion

Students will be skilled at…

- Using transformations to create similar and congruent figures
- Writing rules for transformations
- Identifying similar and congruent figures

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read.	PERFORMANCE TASK(S): **Goal:** To design a wrapping paper pattern using tessellations **Role:** Designer **Audience:** Company Management Team **Product:** A completed tessellation design **Standards for Success:** Scoring rubric including focus on creation of a tessellation colored with a repeating pattern **Differentiation:** Students can attempt to create more or less complex designs using varying creative design elements.

	3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T, M, A T, M, A T, M, A M, A M, A T, M, A		OTHER EVIDENCE: ● **Embedded Assessment 1:** Congruence Transformations (Translations, Reflections, Rotations, and Compositions) ● **Embedded Assessment 2:** Similarity Transformations (Dilations and Compositions) ● **Common Unit Test:** Similarity and Congruence Transformations ● **Skill Check**: Daily warm-ups and/or Exit Tickets ● **Prompt**: What types of transformations result in congruent figures? What types of transformations result in similar figures? When might you use each type of transformation? ● **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment***	
M	● Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Teacher introduces vocabulary associated with the unit	
T, M, A	● Teacher demonstrates a variety of ways to transform an image using translations, reflections, rotations, and dilations	● IXL ● Homework
T, M, A	● Students complete a variety of transformations on worksheets, whiteboards, graph paper, and computer software	● Warm Ups ● Exit Tickets
M, A	● Teacher instructs students on how to create compositions of transformations and how to write rules for them	● Classwork Worksheets ● Performance Task
T, M, A	● Students practice compositions of transformations on worksheets, whiteboards, graph paper, and computer software	● Embedded Assessments
T, M, A	● Students will identify transformations and compositions that result in congruent figures and similar figures	
T, M, A	● Students will create a design that tessellates and will create a tessellation using it	

UNIT 2 - SOLVING ONE VARIABLE LINEAR EQUATIONS

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.EE.C.7:
Solve linear equations in one variable.

CCSS.MATH.CONTENT.8.EE.C.7.A:
Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

CCSS.MATH.CONTENT.8.EE.C.7.B:
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Transfer

Students will be able to independently use their learning to solve real-world problems with equations in one variable.

Meaning

UNDERSTANDINGS

Students will understand that…

- Inverse operations can be used along with properties of equality to produce equivalent equations
- Equivalent equations have the same solutions
- Inverse operations are operations that undo each other
- Linear Equations in one variable can have no solution, one solution, or infinitely many solutions

ESSENTIAL QUESTIONS

Students will keep considering…

- Is there more than one way to solve a multi-step linear equation in one variable?
- Do all equations have solutions?
- Can an equation have more than one solution?

Acquisition

Students will know…

- Inverse Operations
- Solution
- Identity
- Contradiction
- Distributive Property
- Addition Property of Equality
- Subtraction Property of Equality
- Multiplication Property of Equality
- Division Property of Equality
- Equivalent Equations

Students will be skilled at…

- Modeling situations with linear equations in one variable
- Using inverse operations and properties of equality to solve one-step, two-step, and multi-step equations

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M, A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read.	PERFORMANCE TASK(S): **Goal:** To explain to students what errors were made in their work **Role:** Teacher **Audience:** Students **Product:** Explanation of Errors **Standards for Success:** Scoring rubric including focus on explanation of errors in solving equations **Differentiation:** Students can have problems where equations of varying complexity are offered

	2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T, M, A T, M, A T, M, A T, M, A M, A M, A T, M, A		OTHER EVIDENCE: **Embedded Assessment 1:** Solving One-Step Equations **Embedded Assessment 2:** Solving Two-Step Equations **Embedded Assessment 3:** Solving Multi-Step Equations **Common Unit Test:** Solving Linear Equations in One Variable **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: How are solving equations and simplifying expressions similar? How are they different? **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment***	
M	• Solving Equations CFA	
M	• Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
M	• Opening Activity: What's in the pouch? - Present an image of a balanced scale with a pouch and coins on one side and just coins on the other side and tell the students they are equal in value. Pose the questions: How can we determine the value of the contents of the pouch? What happens if we take coins off of just one side? What if we take an unequal number of coins off the two sides? Present a few different examples of these.	• IXL • Homework • Warm Ups • Exit Tickets • Classwork Worksheets • Performance Task • Embedded Assessments
T, A	• Teacher will introduce the concept of inverse operations and the properties of equality. Discuss one-step equations using addition and subtraction and use inverse operations and the properties of equality to solve them.	
A	• Teacher will present a lesson on solving one-step equations using multiplication and division. At the end of the lesson, perform a lesson check by asking students to explain how to identify which operation is needed in solving an equation.	
M	• Teacher will present a lesson on modeling real-world situations with one-step equations. Students will think, pair, share their models and solutions for each situation.	
A	• Assess students by having them take a quiz	
A	• Return and discuss quiz, explaining common mistakes to clarify points of misunderstanding	
A	• Teacher will present a lesson on solving two-step equations, modeling this with a scale with multiple pouches and coins on one side and coins on the other. Students will practice solving two-step equations using inverse operations and properties of equality.	
M	• Teacher will present a lesson on modeling real-world situations using two-step equations. Students will practice modeling and solving two-step equations. At the end of the lesson, perform a lesson check by asking students to explain how they arrive at their strategy for solving a two-step equation.	
A	• Teacher will present a lesson on solving equations with variables	

	on both sides. This can be modeled using a scale with pouches and coins on both sides of the scale. Students will learn about identities and contradictions. Students will practice solving two-step equations.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss quiz, explaining common mistakes to clarify points of misunderstanding	
A	● Teacher will present a lesson on the Distributive Property and solving multi-step equations. These can be modeled using a scale with pouches and coins on both sides of the scale, where subtracting the pouches and coins from both sides leaves more than one pouch remaining, and situations where the pouches and coins on both sides can be divided into equal groups.	
M	● Teacher will present a lesson on modeling real-world situations with multi-step equations. At the end of the lesson, perform a lesson check by asking students to explain how they arrive at their strategy for solving a multi-step equation.	
T	● Performance Task: Students will perform an analysis of several equations that are not solved correctly. They take the role of the teacher and explain to their students what errors were made, as well as how to correct them.	
T	● Prompt: How are solving equations and simplifying expressions similar? How are they different?	
A	● Review concepts for end of unit assessment.	
A	● Students will take the end of unit assessment.	
A	● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	

UNIT 3 - WORKING WITH POWERS

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.EE.A.1:
Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3}^3 = \frac{1}{27}$.

CCSS.MATH.CONTENT.8.EE.A.2:
Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

CCSS.MATH.CONTENT.8.EE.A.3:
Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger.

CCSS.MATH.CONTENT.8.EE.A.4:
Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology

CCSS.MATH.CONTENT.8.NS.A.1:
Know that numbers that are not rational are called irrational. Understand

Transfer

Students will be able to independently use their learning to persevere through a mathematical problem to reach a solution.

Meaning

UNDERSTANDINGS

Students will understand that…

- Squaring an integer produces a perfect square
- Cubing an integer produces a perfect cube
- The square root of a perfect square is an integer
- The cube root of a perfect cube is an integer
- Rational numbers can be written as a fraction
- Irrational numbers cannot be written as a fraction
- Extremely large or extremely small numbers can be written in scientific notation

ESSENTIAL QUESTIONS

Students will keep considering…

- What makes a number rational?
- What makes a number irrational?
- How can expressions with exponents be evaluated?
- How can equations with exponents be solved?
- How can very large and very small numbers be expressed in a simple way?

Acquisition

Students will know…

- Zero Exponent Property
- Negative Exponent Property
- Power to a Power Property
- Product to a Power Property
- Product of Powers Property
- Quotient of Powers Property
- Power of a Quotient Property
- Square Root
- Cube Root
- Rational Numbers
- Irrational Numbers
- Scientific Notation

Students will be skilled at…

- Evaluating expressions with exponents
- Solving equations with exponents
- Evaluating expressions with square or cube roots
- Identifying numbers as rational or irrational
- Approximating square and cube roots
- Performing operations with numbers expressed in scientific notation

informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. **CCSS.MATH.CONTENT.8.NS.A.2:** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.		

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read.	PERFORMANCE TASK(S): **Goal:** To convince a newspaper editor that their article on Giantburger contained misinformation **Role:** Concerned Citizen **Audience:** Newspaper Editor **Product:** An explanation as to why the information printed in the newspaper was not accurate **Standards for Success:** Scoring rubric including focus on explanation of errors in calculations with scientific notation **Differentiation:** Students will have problems of different levels of complexity

	3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T, M, A T, M, A T, M, A T, M, A M, A M, A T, M, A		OTHER EVIDENCE: **Embedded Assessment 1:** Using Exponent Rules 1 **Embedded Assessment 2:** Using Exponent Rules 2 **Embedded Assessment 3:** Scientific Notation and Roots **Common Unit Test:** Working With Powers **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: How can exponents be used to model real-world situations? How do you solve equations using exponents? **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment***	
M	Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Opening Activity: Carbon Dating - Explain that carbon-14 is measured in items to determine their ages. The half-life of carbon-14 is about 5730 years. Show the students how the amount of carbon-14 is cut in half every 5730 years, and cut it in half again and again, showing an exponent each time. Explain that the exponent means the number of half-lives that have passed, as well as the number of times the base ½ is used in a multiplication problem to find the fraction of the original amount of carbon-14 remaining.	● IXL ● Homework ● Warm Ups ● Exit Tickets ● Classwork Worksheets ● Performance Task ● Embedded Assessments
T, A	● Teacher will introduce the concept of exponents and the Zero Power rule and Negative Exponent rule. Students will then practice simplifying expressions using these rules.	
A	● Teacher will present a lesson on the Product of Powers rule. Students will practice simplifying expressions using this rule.	
A	● Teacher will present a lesson on the Quotient of Powers rule. Students will practice simplifying expressions using this rule.	
M	● Teacher will present a lesson on combining the learned rules. Students will practice simplifying expressions by using multiple exponent rules. At the end of the lesson, perform a lesson check by asking students to explain how to simplify expressions using each of the four rules that have been taught.	
A	● Assess students by having them take a quiz	
A	● Return and discuss quiz, explaining common mistakes to clarify points of misunderstanding	
A	● Teacher will present a lesson on the Power of a Power rule. Students will practice simplifying expressions using this rule.	
A	● Teacher will present a lesson on the Power of a Product rule. Students will practice simplifying expressions using this rule.	
A	● Teacher will present a lesson on the Power of a Quotient rule. Students will practice simplifying expressions using this rule.	
M	● Teacher will present a lesson on combining all of the rules. At the	

	end of the lesson, perform a lesson check by asking students to explain how using the Power of a Product and Power of a Quotient are similar and how they are different.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss quiz, explaining common mistakes to clarify points of misunderstanding	
A	● Teacher will present a lesson on square and cube roots, including definitions of rational and irrational numbers. Students will practice approximating roots to the nearest tenth, and identifying them as rational or irrational numbers.	
A	● Teacher will present a lesson on modeling real-world situations with scientific notation. Students will convert numbers from standard (decimal) notation to scientific notation and vice versa.	
A	● Teacher will present a lesson on adding and subtracting numbers written in scientific notation by converting to standard (decimal) notation, performing the operation, and converting back to scientific notation. Students will practice this.	
A	● Teacher will present a lesson on multiplying numbers written in scientific notation using exponent rules. Students will practice this.	
M	● Teacher will present a lesson on dividing numbers written in scientific notation using exponent rules. Students will practice this. At the end of the lesson, perform a lesson check by asking students to explain how to multiply and divide numbers in scientific notation.	
T	● Performance Task: Students will assume the role of a concerned citizen writing to the editor of a newspaper to explain why the information provided in an advertisement for Giantburger was not accurate.	
M	● Prompt: How can exponents be used to model real-world situations? How do you solve equations using exponents?	
A	● Review concepts for end of unit assessment.	
A	● Students will take the end of unit assessment.	
A	● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	

UNIT 4 - RELATIONSHIPS IN TRIANGLES

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.G.A.5:
Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

CCSS.MATH.CONTENT.8.G.B.6:
Explain a proof of the Pythagorean Theorem and its converse.

CCSS.MATH.CONTENT.8.G.B.7:
Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

CCSS.MATH.CONTENT.8.G.B.8:
Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Transfer

Students will be able to independently use their learning to apply critical thinking and geometric reasoning skills to solve real-world problems.

Meaning

UNDERSTANDINGS

Students will understand that…

- Missing lengths of right triangles can be found by using the Pythagorean Theorem
- The distance between two points on a coordinate plane can be found using the Distance Formula
- Interior and exterior angles of triangles can be found

ESSENTIAL QUESTIONS

Students will keep considering…

- What is the relationship between the sides of a right triangle?
- How do you know if a triangle is acute, right, or obtuse based on the side lengths?
- How can you find the distance between two points on a coordinate plane?
- What relationships exist between the angles of a triangle?

Acquisition

Students will know…

- Right Triangle
- Acute Triangle
- Obtuse Triangle
- Leg
- Hypotenuse
- Pythagorean Theorem
- Distance Formula
- Transversal
- Interior Angle
- Exterior Angle
- Alternate Interior Angles
- Alternate Exterior Angles
- Corresponding Angles
- Same-Side Interior Angles
- Same-Side Exterior Angles
- Vertical Angles
- Complementary Angles
- Supplementary Angles

Students will be skilled at…

- Finding missing lengths of right triangles using Pythagorean Theorem
- Finding the distance between two points on a coordinate plane using the Distance Formula
- Identifying triangles as acute, right, or obtuse by using the converse of the Pythagorean Theorem
- Finding the measures of interior and exterior angles of triangles
- Finding the measures of angles formed by parallel lines cut by transversals

	• Linear Pair	

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read.	PERFORMANCE TASK(S): **Goal:** To explain to the viewers the expected outcome of the race **Role:** Sports Analyst **Audience:** TV Viewers **Product:** Explanation of which racer will arrive at the finish first **Standards for Success:** Scoring rubric including focus on explanation of distances traveled and speed **Differentiation:** Students will have different sets of numbers, with easier sets having more compatible numbers

	3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T, M, A T, M, A T, M, A M, A M, A T, M, A		OTHER EVIDENCE: **Embedded Assessment 1:** Angle Relationships **Embedded Assessment 2:** Pythagorean Theorem and Its Converse **Common Unit Test:** Relationships in Triangles **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: Compare and contrast the procedure for finding the hypotenuse of a right triangle and the procedure for finding a leg **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment***	
M	Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Opening Activity: Spider Web. Draw a "spider web" of parallel lines and transversals. Explain to the students that all angles of the web can be found from knowing only a few angles. Ask the students which angles look like they could have the same measure and start labeling angles with their measure. Work through until all of the angles are measured.	● IXL ● Homework ● Warm Ups ● Exit Tickets ● Classwork Worksheets ● Performance Task ● Embedded Assessments
A	● Teacher will reintroduce complementary, supplementary, adjacent and vertical angles. Students will complete practice with these types of angles.	
T, A	● Teacher will introduce interior and exterior angles of triangles and demonstrate finding missing values. Students will then practice finding interior and exterior angles of triangles.	
A	● Teacher will introduce parallel lines cut by transversals and corresponding angles. Students will practice finding missing angle measures using corresponding angles, vertical angles, complementary angles, and supplementary angles.	
A	● Teacher will introduce alternate interior angles and alternate exterior angles. Students will practice finding missing angle measures usings all of the angle relationships taught so far.	
M, A	● Teacher will introduce same-side interior angles and same-side exterior angles. Students will practice finding missing angle measures usings all of the angle relationships. At the end of the lesson, perform a lesson check by asking students to explain how to find missing angles formed by a transversal and parallel lines.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss quiz, explaining common mistakes to clarify points of misunderstanding	
A	● Teacher will introduce the Pythagorean Theorem. Students will use Pythagorean Theorem to find the length of the hypotenuse.	
A	● Teacher will show students that the Pythagorean Theorem can also be used to find the length of a leg when the hypotenuse and one leg are known. Students will practice finding the missing leg.	
M, A	● Teacher will show students that Pythagorean Theorem can be	

	used to find the distance between two points on a coordinate plane. It will then be shown that the distance formula can be used to achieve the same goal without the visual of the coordinate plane. Students will then practice using the distance formula to find the distance between two points. At the end of the lesson, perform a lesson check by asking students to explain how the distance formula and Pythagorean Theorem are similar and how they are different.	
A	● Teacher will introduce the converse of the Pythagorean Theorem and its corollaries and show how they can be used to determine if a triangle is acute, right, or obtuse. Students will practice this.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss quiz, explaining common mistakes to clarify points of misunderstanding	
T	● Performance Task: Students will assume the role of a sports analyst and make predictions about who will win a race where racers have to follow different paths to the finish line. They will then have to explain their predictions.	
M	● Prompt: Compare and contrast the procedure for finding the hypotenuse of a right triangle and the procedure for finding a leg	
A	● Review concepts for end of unit assessment.	
A	● Students will take the end of unit assessment.	
A	● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	

UNIT 5 - LINEAR RELATIONSHIPS AND FUNCTIONS

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.EE.B.5:
Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

CCSS.MATH.CONTENT.8.EE.B.6:
Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

CCSS.MATH.CONTENT.8.F.A.1:
Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.[1]

CCSS.MATH.CONTENT.8.F.A.2:
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

CCSS.MATH.CONTENT.8.F.A.3:
Interpret the equation y = mx + b as defining a linear function, whose graph

Transfer

Students will be able to independently use their learning to model real-world problems mathematically and provide visual representations of their models.

Meaning

UNDERSTANDINGS

Students will understand that…

- The slope of a linear function is constant, meaning it is the same, regardless of which points from the line are used to calculate it
- A function is a rule that assigns exactly one output to each input
- The graph of a function is the set of ordered pairs consisting of an input and the corresponding output
- Linear functions can be modeled by equations in the form y = mx + b

ESSENTIAL QUESTIONS

Students will keep considering…

- Does the slope of a line change if it is calculated using different points?
- What is the difference between a relation and a function?
- How can a function be expressed as an equation?

Acquisition

Students will know…

- Slope
- Y-Intercept
- X-Intercept
- Slope-Intercept Form
- Function
- Input
- Output
- Proportional Relationship
- Unit Rate
- Rate of Change
- Linear
- Non-Linear
- Relation

Students will be skilled at…

- Graphing linear functions
- Identifying the slope and intercepts of linear functions
- Writing equations representing linear functions

is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. **CCSS.MATH.CONTENT.8.F.B.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. **CCSS.MATH.CONTENT.8.F.B.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. [1] Function notation is not required for Grade 8.		

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read.	PERFORMANCE TASK(S): **Goal:** To produce a stained glass design using linear equations **Role:** Designer **Audience:** Company Management Team **Product:** A completed stained glass design **Standards for Success:** Scoring rubric including focus on creation of a stained glass design with a pattern **Differentiation:** Students can attempt to create more or less complex designs using varying creative design elements.

	3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T, M, A T, M, A T, M, A M, A M, A T, M, A		OTHER EVIDENCE: **Embedded Assessment 1:** Slope-Intercept Form and Finding Slope and Intercepts and Their Meanings **Embedded Assessment 2:** Graphing **Common Unit Test:** Linear Relationships and Functions **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: How can you tell if a function is linear or nonlinear by looking at its graph? Its equation? A table? **Homework:** Daily

Stage 3 – Learning Plan		
Code M	***Pre-Assessment*** ● Linear Relationships and Functions CFA ● Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction ● Opening Activity ● Teacher introduces solving linear equations for y and slope-intercept form. Students practice solving for y. ● Teacher introduces slope and y-intercept. Students practice identifying slope and y-intercept from a table, graph, equation, and pair of ordered pairs. ● Assess students by having them take a quiz. ● Return and discuss the quiz, explaining common mistakes to clarify points of misunderstanding. ● Teacher introduces graphing from slope and y-intercept. Students practice graphing. ● Teacher introduces graphing from a table. Students practice. ● Teacher introduces creating a table from an equation and then graphing from the table. Students practice. ● Assess students by having them take a quiz. ● Return and discuss the quiz, explaining common mistakes to clarify points of misunderstanding. ● Teacher introduces the concept of functions, including domain and range. Students practice identifying domain, range, and functions. ● Performance Task: Students will assume the role of a designer to create a stained glass window using linear equations. ● Prompt: How can you tell if a function is linear or nonlinear by looking at its graph? Its equation? A table? ● Review concepts for end of unit assessment. ● Students will take the end of unit assessment. ● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	Progress Monitoring ● IXL ● Homework ● Warm Ups ● Exit Tickets ● Classwork Worksheets ● Performance Task ● Embedded Assessments

UNIT 6 - SYSTEMS OF LINEAR EQUATIONS

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.EE.C.8:
Analyze and solve pairs of simultaneous linear equations.

CCSS.MATH.CONTENT.8.EE.C.8.A:
Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

CCSS.MATH.CONTENT.8.EE.C.8.B:
Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

CCSS.MATH.CONTENT.8.EE.C.8.C:
Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Transfer

Students will be able to independently use their learning to solve real-world problems with equations in two variables.

Meaning

UNDERSTANDINGS

Students will understand that…

- Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously
- Systems of two linear equations in two variables can have no solution, one solution, or infinitely many solutions
- Systems of two linear equations in two variables can be solved graphically, as well as in numerous ways algebraically

ESSENTIAL QUESTIONS

- How many points of intersection can two lines have?
- How can the point(s) of intersection of two lines be determined?
- Can the solutions of one equation also satisfy another equation?

Acquisition

Students will know…

- System of Linear Equations
- Solution of a System of Linear Equations
- Consistent
- Dependent
- Independent
- Inconsistent

Students will be skilled at…

- Solving systems of two linear equations in two variables by graphing
- Solving systems of two linear equations in two variables by substitution or elimination (linear combination)

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read.	PERFORMANCE TASK(S): **Goal:** To determine the most cost efficient scooter rental plan **Role:** Vacationer **Audience:** Family members **Product:** An explanation of which of the rental plans will be the most cost efficient for your family **Standards for Success:** Scoring rubric including focus on explanation of which rental plan is the most cost efficient **Differentiation:** Students will have problems of different levels of complexity

	2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T, M, A T, M, A T, M, A M, A M, A T, M, A		OTHER EVIDENCE: **Embedded Assessment 1:** Solving Systems of Linear Equations Graphically **Embedded Assessment 2:** Solving Systems of Linear Equations Algebraically **Common Unit Test:** Solving Systems of Linear Equations **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: Compare and contrast the procedures for solving a system of equations by substitution and solving by elimination. **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment*** Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
T	● Opening Activity. Present two cell phone plans and ask the students when the two plans will cost the same amount. Show students a graph of the plans, pointing out the point where the two plans cost the same, and that the two plans each have a time period where one is cheaper than the other.	● IXL ● Homework ● Warm Ups ● Exit Tickets ● Classwork Worksheets ● Performance Task ● Embedded Assessments
A	● Teacher will introduce solving systems of equations by graphing, building on the skills taught in the previous unit. Students will practice solving systems of equations by graphing.	
M, A	● Teacher will introduce special cases, where there will be no solution or infinitely many solutions. Students will practice identifying the number of solutions from graphs and from equations. At the end of the lesson, perform a lesson check by asking students to explain how to tell the number of solutions a system of equations will have without solving the system.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss the quiz, explaining common mistakes to clarify points of misunderstanding.	
A	● Teacher will introduce solving systems of equations by substitution where both equations are solved for y. Students will then practice this.	
A	● Teacher will instruct students on solving systems of equations by substitution where only one of the equations is solved for y. Students will then practice this.	
M, A	● Teacher will introduce solving systems of equations by elimination. Students will practice solving systems of equations by adding together equations where the coefficients of one of the variables are opposites. At the end of the lesson, perform a lesson check by asking students to explain how to solve a system of equations by elimination.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss the quiz, explaining common mistakes to clarify points of misunderstanding.	
T	● Performance Task: Students will assume the role of a vacationer	

	faced with having to determine which scooter rental will be the best deal for their family and explain their reasoning.	
M	● Prompt: Compare and contrast the procedures for solving a system of equations by substitution and solving by elimination.	
A	● Review concepts for end of unit assessment.	
A	● Students will take the end of unit assessment.	
A	● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.G.C.9:

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Transfer

Students will be able to independently use their learning to find the volume of cones, cylinders, and spheres

Meaning

UNDERSTANDINGS

Students will understand that…

- The volume of a cylinder is equal to pi times the height, times the radius of the base squared
- The volume of a cone is equal to one-third of the volume of a cylinder with the same dimensions
- The volume of a sphere is equal to four-thirds times pi, times the radius cubed

ESSENTIAL QUESTIONS

Students will keep considering…

- How can you find the volume of a cylinder, cone, or sphere?

Acquisition

Students will know…

- Volume of Cylinder
- Volume of Cone
- Volume of Sphere
- radius
- diameter
- volume

Students will be skilled at…

- Finding the volume of a cylinder
- Finding the volume of a cone
- Finding the volume of a sphere

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read.	PERFORMANCE TASK(S): **Goal:** To convince your friend whether or not their ice cream cone can hold all of the melted ice cream **Role:** Friend **Audience:** Friend **Product:** An explanation as to whether or not your friend's ice cream cone can hold all of the ice cream in the scoop if it were to melt **Standards for Success:** scoring rubric including focus on explanation of whether or not the melted ice cream will fit in the cone **Differentiation:** Students will receive different dimensions (some more difficult, some less)

	3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
		OTHER EVIDENCE: **Embedded Assessment 1:** Quiz - Volume of Cylinders and Cones **Common Unit Test:** Volume Unit Test **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: Compare and contrast the formulas for finding the volume of a cone and a sphere. **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment*** Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
T	● Opening Activity. Which holds the most? Show students a cylinder, a cone, and a sphere, each with the same radius and height. Ask the students which holds the most and which holds the least. Fill each with water and pour the water into a measuring cup, beaker, or graduated cylinder to measure the volume of each.	● IXL ● Homework ● Warm Ups ● Exit Tickets ● Classwork Worksheets ● Performance Task ● Embedded Assessments
A	● Teacher will introduce finding the volume of a cylinder. Students will practice finding the volume of a cylinder	
A	● Teacher will introduce finding the volume of a cone. Students will practice finding the volume of a cone.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss the quiz, explaining common mistakes to clarify points of misunderstanding.	
A	● Teacher will introduce finding the volume of a sphere. Students will practice finding the volume of a sphere.	
T	● Performance Task: Students will assume the role of a concerned friend and will have to explain to their friend why the ice cream cone will be able to hold the melting ice cream scoop or why it will fail to hold all of the melted ice cream.	
M	● Prompt: Compare and contrast the formulas for finding the volume of a cone and a sphere.	
A	● Review concepts for end of unit assessment.	
A	● Students will take the end of unit assessment.	
A	● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	

Stage 1 – Desired Results

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.8.SP.A.1:
Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

CCSS.MATH.CONTENT.8.SP.A.2:
Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

CCSS.MATH.CONTENT.8.SP.A.3:
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.

CCSS.MATH.CONTENT.8.SP.A.4:
Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way

Transfer

Students will be able to independently use their learning to model relationships between two quantitative variables.

Meaning

UNDERSTANDINGS

Students will understand that…

- Good models have smaller residuals
- Outliers can have a significant impact on the model of the data

ESSENTIAL QUESTIONS

Students will keep considering…

- How can we model data graphically?
- What makes a good model?

Acquisition

Students will know…

- Scatter Plot
- Bivariate Data
- Clustering
- Outlier
- Positive Association (Correlation)
- Negative Association (Correlation)
- Linear Association (Correlation)
- Nonlinear Association (Correlation)
- Residual
- Frequency
- Relative Frequency
- Two-way Table
- Categorical Data
- Correlation Coefficient

Students will be skilled at…

- Modeling relationships between two quantitative variables with a straight line
- Identifying the type of correlation between two quantitative variables
- Displaying frequencies and relative frequencies in a two-way table

table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?		

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts. 3 - Explanation shows substantial understanding of mathematical concepts. 2 - Explanation shows some understanding of mathematical concepts. 1 - Explanation shows very limited understanding of mathematical concepts OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the problem(s). 3 - Uses an effective strategy to solve the problem(s). 2 - Sometimes uses an effective strategy to solve the problem(s), but does not do it consistently. 1 - Rarely uses an effective strategy to solve the problem(s). **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - Less than 75% of the steps and solutions have no mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read.	PERFORMANCE TASK(S): **Goal:** To convince management which of the presented models best represent the data on roller coaster riders **Role:** Amusement Park Consultant **Audience:** Park Management **Product:** An explanation of which model presented to the management best represents the data on roller coaster riders **Standards for Success:** scoring rubric including focus on explanation of which model best represents the data **Differentiation:** More advanced students will have more data points, including outliers, while others have fewer data points, without outliers

	3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
		OTHER EVIDENCE: **Embedded Assessment 1:** Scatter Plots and Trend Lines **Common Unit Test:** Patterns in Data Unit Test **Skill Check**: Daily warm-ups and/or Exit Tickets **Prompt**: Explain the difference between correlation coefficient and slope. **Homework:** Daily

Stage 3 – Learning Plan		
Code	***Pre-Assessment***	
M	Teacher checks for prerequisite understandings through warm up questions	
	Summary of Key Learning Events and Instruction	Progress Monitoring
T	● Opening Activity. Show a scatter plot of assessment grades vs. homework completion (do not use actual grades). Show students how scatter plots are a visual representation of data and how they can be useful to identify trends.	● IXL ● Homework ● Warm Ups ● Exit Tickets ● Classwork Worksheets ● Performance Task ● Embedded Assessments
A	● Teacher will introduce scatter plots and trend lines. Students will plot the data points and trend lines, as well as write the equations for their trend lines.	
A	● Teacher will introduce the patterns associated with scatter plots (clustering and outliers, correlation, etc.). Students will practice identifying the type of correlation represented by different scatter plots, as well as clustering and outliers.	
A	● Assess students by having them take a quiz.	
A	● Return and discuss the quiz, explaining common mistakes to clarify points of misunderstanding.	
A	● Teacher will introduce the idea of residuals and how to identify good models for data. Students will practice using residuals to choose good models.	
A	● Teacher will introduce frequency, relative frequency, and two-way tables. Students will practice identifying frequency and relative frequency, as well as creating and reading two-way tables.	
T	● Performance Task: Students will assume the role of an amusement park consultant and explain to the park management which linear model best represents the data on roller coaster riders.	
M	● Prompt: Explain the difference between correlation coefficient and slope.	
A	● Review concepts for end of unit assessment.	
A	● Students will take the end of unit assessment.	
A	● Return and discuss assessment, explaining common mistakes to clarify points of misunderstanding.	