Fairfield Township School Year-long Curricular Framework Mathematics - Grade 8

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● 8.EE.A.3
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● 8.EE.B.6</td><td>● Work with integer exponents

● Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres

● Know that there are numbers that are not rational, and approximate them by rational numbers
● Understand the connections between proportional relationships, lines, and linear equations</td><td rowspan="2">MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments & critique the reasoning. of others.

MP.4 Model with mathematics.</td></tr>
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Unit 2 **Functions, Equations, and Solutions**	• 8.F.A.1 • 8.F.A.2 • 8.F.A.3 • 8.F.B.4* • 8.F.B.5 • 8.EE.C.7 • 8.EE.C.8*	• Define, evaluate, and compare functions • Use functions to model relationships between quantities • Analyze and solve linear equations and simultaneous linear equations	MP.5 Use appropriate tools strategically.. MP.6 Attend to precision.
Unit 2: ***Suggested Open Educational Resources***	8.F.A.1 Function Rules 8.F.A.2 Battery Charging 8.F.A.3 Introduction to Linear Functions 8.F.B.4 Chicken and Steak, Variation 1 8.F.B.4 Baseball Cards 8.EE.C.7 The Sign of Solutions 8.EE.C.7 Coupon versus discount 8.EE.C.8a Intersection of Two Lines 8.EE.C.8 How Many Solutions		MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.
Unit 3 **Geometry: Pythagorean Theorem, Congruence and Similarity Transformations**	• 8.EE.A.2 • 8.G.C.9 • 8.G.B.6 • 8.G.B.7 • 8.G.B.8* • 8.G.A.1 • 8.G.A.2 • 8.G.A.3 • 8.G.A.4 • 8.G.A.5	• Work with radicals and integer exponents • Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres • Understand and apply the Pythagorean Theorem • Understand congruence and similarity using physical models, transparencies, or geometry software	

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<td>Unit 3:

Suggested Open Educational Resources</td>
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8.G.B.8 Finding isosceles triangles

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8.G.A.3 Effects of Dilations on Length, Area, and Angles

8.G.A.4 Are They Similar

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<td rowspan="4">MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments & critique the reasoning. of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically..

MP.6 Attend to precision.

MP.7 Look for and make use of structure.</td>
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<td>Unit 4

Statistics and Probability: Scatterplots and Association</td>
<td>● 8.SP.A.1
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● 8.G.B.8*
● 8.EE.C.8c*</td>
<td>● Investigate patterns of association in bivariate data
● Use functions to model relationships between quantities
● Understand and apply the Pythagorean Theorem
● Analyze and solve linear equations and simultaneous linear equations</td>
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<td>Unit 4:

Suggested Open Educational Resources</td>
<td colspan="2">8.SP.A.1 Texting and Grades 1

8.SP.A.2 Animal Brains

8.SP.A.3 US Airports

8.SP.A.4 What's Your Favorite Subject

8.SP.A.4 Music and Sports

8.F.B.4 Delivering the Mail</td>
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	8.G.B.8 Finding the distance between points 8.EE.C.8 Kimi and Jordan	MP.8 Look for and express regularity in repeated reasoning.

21st Century Life and Careers Career Awareness, Exploration, and Preparation	9.2.12.C.1 Review career goals and determine steps necessary for attainment. 9.2.12.C.2 Modify Personalized Student Learning Plans to support declared career goals 9.2.12.C.3 Identify transferable career skills and design alternate career plans. 9.2.12.C.6 Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business. 9.2.12.C.9 Analyze the correlation between personal and financial behavior and employability
CRP Standards	CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence
ELA Standards	RI.8.1. Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text. RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts. W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen

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	details; use appropriate eye contact, adequate volume, and clear pronunciation.
Technology Standards	8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory 8.1.8.C.1 Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries. 8.1.8.D.5 Understand appropriate uses for social media and the negative consequences of misuse. 8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem. 8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Unit 1 Grade 8 – Exponents, Expressions, Equations, scientific notation		
Content Standards	**Suggested Standards for Mathematical Practice**	**Transfer**
● 8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.* ● 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.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools	Concept(s): ● Exponents as simplified representation of repeated multiplication. Students are able to: ● apply properties of exponents to numerical expressions. ● generate equivalent numerical expressions using positive and negative integer exponents. ● find volume of cones, cylinders and spheres using to solve real world problems.

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	strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Learning Goal 1: Apply the properties of integer exponents to write equivalent numerical expressions; apply formulas to find the volume of a cone, a cylinder, or a sphere when solving real-world and mathematical problems.
● 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 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): ● Very large and very small quantities can be approximated with numbers expressed in the form of a single digit times an integer power of 10. Students are able to: ● estimate very large and very small quantities with numbers expressed in the form of a single digit times an integer power of 10. ● compare numbers written in the form of a single digit times an integer power of 10 and express how many times as much one is than the other. Learning Goal 2: Estimate and express the values of very large or very small numbers with numbers expressed in the form of a single digit times an integer power of 10. Compare numbers expressed in this form, expressing how many times larger or smaller one is than the other.
● 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.	MP. 2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of	Concept(s): No new concept(s) introduced Students are able to: ● multiply and divide numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation. ● add and subtract numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation. ● use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.

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	structure. MP.8 Look for and express regularity in repeated reasoning.	● interpret scientific notation that has been generated by technology (e.g. recognize 4.1E-2 and 4.1e-2 as 4.1 x 10^{-2}). Learning Goal 3: Perform operations using numbers expressed in scientific notation, including problems where both decimals and scientific notation are used. In real-world problem-solving situations, choose units of appropriate size for measurement of very small and very large quantities and interpret scientific notation generated when technology has been used for calculations.
● 8.NS.A.1. Know that numbers that are not rational are called irrational. Understand 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.	MP. 2 Reason abstractly and quantitatively.	Concept(s): ● Numbers that are not rational are irrational. ● Every number has a decimal expansion. Students are able to: ● compare decimal expansions of rational and irrational numbers. ● represent a rational number with its decimal expansion, showing that it repeats eventually. ● convert a decimal expansion (which repeats eventually) into a rational number. Learning Goal 4: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers.
● 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., □²). *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.*	MP.1 Make sense of problems and persevere in solving them. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically.	Concept(s): ● Rational approximation of irrational numbers Students are able to: ● compare irrational numbers by replacing each with its rational approximation. ● locate rational approximations on a number line. ● estimate the value of expressions containing irrational numbers. Learning Goal 5: Use rational numbers to approximate irrational numbers, locate

		irrational numbers on a number line, and estimate the value of expressions containing irrational numbers.
● 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.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): ● Quantitative relationships can be represented in different ways. Students are able to: ● graph proportional relationships. ● interpret unit rate as the slope of a graph. ● compare two different proportional relationships that are represented indifferent ways (table of values, equation, graph, verbal description). Learning Goal 6: Graph proportional relationships, interpreting slope as unit rate, and compare two proportional relationships, each represented in different ways.
● 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*.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): No new concept(s) introduced Students are able to: ● show, using similar triangles, and explain why the slope, *m*, is the same between any two distinct points on a non-vertical line. ● derive, from two points, the equation $y = mx$ for a line through the origin. ● derive, from two points, the equation $y = mx + b$ for a line intercepting the vertical axis at *b.* Learning Goal 7: Derive the equation of a line ($y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*) and use similar triangles to explain why the slope (*m*) is the same between any two points on a non-vertical line in the coordinate plane.

District/School Formative Assessment Plan	District/School Summative Assessment Plan
● Teacher-Created Assessments	● Chapter Tests

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• Homework • Classwork • UDL's • whiteboard activities • IXL • Problem of the Day • Exit Ticket	• Unit Tests • EdConnect Assessments

Focus Mathematical Concepts

Vocabulary		Instruction and Pacing	
		Pretest	1 day
		Exponents	1 week
Rational Number		Scientific notation	1 week
Irrational number		Rational/Irrational numbers	1 week
Terminating decimal	Coefficient	Graphing on a number line	1 week
Repeating Decimal	Variable	Unit rate	1 week
Integer	Substitute	Unit rate as slope	2 weeks
Absolute Value	Unit rate	Similar triangles and slope	2 weeks
Exponent	Slope		
Scientific Notation	Similar Triangles		
Standard Form			
power			

ENDURING UNDERSTANDING	ESSENTIAL QUESTIONS
• Models, diagrams, manipulatives and patterns are useful in developing and remembering algorithms for computing with positive and negative rational numbers. • Properties of real numbers hold for all rational numbers. • Positive and negative rational numbers are often used to solve problems in everyday life. • An irrational number is a real number that cannot be written as a ratio of	• What properties will help me simplify and evaluate rational numbers? • How can rational numbers be applied to solve real-world situations? • When are exponents used and why are they important? • What is the meaning of negative exponents? • How are power, base, and exponent related to multiplication? • Why is it useful for me to express quantities in scientific notation?

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two integers. ● All real numbers can be plotted on a number line. ● Exponents are useful for representing very large or very small numbers.	

Differentiation and Accommodations	District/School Primary and Supplementary Resources
● Provide graphic organizers ● Provide additional examples and opportunities for additional problems for repetition ● Provide tutoring opportunities ● Provide retesting opportunities after remediation (up to teacher and district discretion) ● Teach for mastery not test ● Teaching concepts in different modalities ● Adjust pace and homework assignments ●	● Prentice Hall Course 3 Mathematics Common Core Textbook ● IXL ● Teacher created materials

Instructional Strategies

Fairfield Township School recognizes the importance of the varying methodologies that may be successfully employed by teachers within the classroom and, as a result, identifies a wide variety of possible instructional strategies that may be used effectively to support student achievement. These may include, but not be limited to, strategies that fall into categories identified by the Framework for Teaching by Charlotte Danielson:

- Communicating with students
- Using questioning and discussion techniques
- Engaging students in learning
- Using assessment in instruction
- Demonstrating Flexibility and Responsiveness

Common Misconceptions	**Proper Conceptions**
When converting a fraction to a decimal, the numerator is the divisor.	When converting a fraction to a decimal, the numerator is the dividend.
Negative exponents yield a negative answer.	Negative exponents yield an answer that is a fraction.
Zero as an exponent equals zero.	Zero as an exponent always equals 1.

Performance Task

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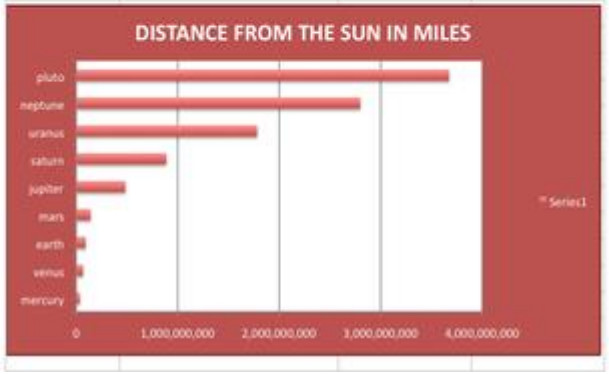
DISTANCE FROM THE SUN IN MILES

planets	average distance to the sun
mercury	35,983,610
venus	67,232,360.00
earth	92,957,100
mars	141,635,300
jupiter	483,632,000
saturn	888,188,000
uranus	1,783,950,000
neptune	2,798,842,000
pluto	3,674,491,000



Use the data in the chart above to make a new chart listing the distance each planet is from the sun in scientific notation. Rubric: Quiz grade worth 10 pts each.

Unit 2 Grade 8 – Functions, equations, and solutions		
Content Standards	**Suggested Standards for Mathematical Practice**	**Transfer**
● 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.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically.	Concept(s): ● A function is a rule. ● If a rule is a function, then for each input there is exactly one output. Students are able to: ● use function language. ● describe a function as providing a single output for each input.

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		• determine whether non-numerical relationships are functions. • describe a function as a set of ordered pairs. • read inputs and outputs from a graph. • describe the ordered pairs as containing an input, and the corresponding output. Learning Goal 1: Define a function as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function.
• 8.F.A.2. Compare properties (e.g. rate of change, intercepts, domain and range) 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.*	MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • Functions (quantitative relationships) can be represented in different ways. • Functions have properties; properties of linear functions. Students are able to: • analyze functions represented algebraically, as a table of values, and as a graph. • interpret functions represented by a verbal description. • given two functions, each represented in a different way, compare their properties. Learning Goal 2: Compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts).
• 8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ 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.*	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically.	Concept(s): • A linear function is defined by the equation $y = mx + b$. • The graph of a linear function is a straight line. Students are able to: • analyze tables of values, graphs, and equations in order to classify a function as linear or non-linear. • determine if equations presented in forms other than y = mx + b (for example 3y – 2x = 7) define a linear function. • give examples of equations that are non-linear functions. • show that a function is not linear using pairs of points.

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		Learning Goal 3: Classify functions as linear or non-linear by analyzing equations, graphs, and tables of values; interpret the equation $y = mx + b$ as defining a linear function.
● 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.	MP.6 Attend to precision. MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): ● As with equations, two (x,y) values can be used to construct a function. Students are able to: ● determine the rate of change and initial value of a function from a description of a relationship. ● determine the rate of change and initial value of a function from two (x, y) values by reading from a table of values. ● determine the rate of change and initial value of a function from two (x, y) values by reading these from a graph. ● construct a function in order to model a linear relationship. ● interpret the rate of change and initial value of a linear function in context. Learning Goal 4: Model a linear relationship by constructing a function from two (x,y) values. Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values.
● 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.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically.	Concept(s): No new concept(s) introduced Students are able to: ● analyze a graph. ● provide qualitative descriptions of graphs (e.g. where increasing or decreasing, linear or non-linear). ● given a verbal description, sketch a graph of a function based on the qualitative features described. Learning Goal 5: Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function.

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● 8.EE.C.7. Solve linear equations in one variable. 8EE.C.7a. 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). 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concept(s): ● Linear equations may have an infinite number of solutions. ● Linear equations may have no solution or a single solution. Students are able to: ● give examples of linear equations in one variable with one solution *(x = a),* infinitely many solutions *(a = a),* or no solutions *(a = b.)* ● transform a given equation, using the properties of equality, into simpler forms. ● transform a given equation until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results *(a and b are different numbers).* ● solve linear equations that have fractional coefficients; include equations requiring use of the distributive property and collecting like terms. Learning Goal 6: Apply the distributive property and collect like terms to solve linear equations in one variable that contain rational numbers as coefficients. Use an equivalent equation of the form $x = a$, $a = a$, or $a = b$ (where a and b are different numbers) to describe the number of solutions.
● 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations. 8.EE.C.8a. 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. 8.EE.C.8b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For*	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concept(s): ● Simultaneous linear equations may have an infinite number of solutions. ● Simultaneous linear equations may have no solution or a single solution. ● Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs. Students will be able to: ● solve systems of two linear equations in two variables algebraically. ● estimate solutions of a linear system of two equations by graphing. ● solve simple cases of a linear system of two equations by inspection. ● solve real-world and mathematical problems leading to two linear equations in two variables.

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example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. 8.EE.C.8c. 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.*		Learning Goal 7: Solve systems of linear equations in two variables algebraically and by inspection. Estimate solutions by graphing, explain that points of intersection satisfy both equations simultaneously, and interpret solutions in context.

District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
● Teacher-Created Assessments ● Homework ● Classwork ● UDL's ● whiteboard activities ● IXL ● Problem of the Day ● Exit Ticket	● Chapter Tests ● Unit Tests ● EdConnect Assessments

Focus Mathematical Concepts

Vocabulary	**Instruction and Pacing**	
Equation Expression Variable	Pretest	1 day
	Function tables	1 week
	Graphing functions	1 week
	Linear functions	1 week
	Slope	1 week

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One step/two step/multi step equations Distributive property Inverse operations Like terms Function Linear function Slope System of equations solutions	Equations	1 week
	Equations with distributive property	2 weeks
	System of equations	2 weeks

ENDURING UNDERSTANDING	ESSENTIAL QUESTIONS
● Systems of equations can be solved both graphically and algebraically ● There are situations that require two or more equations to be satisfied simultaneously. ● Some word problems can be solved using two variables or only one variable. ● Solutions to systems can be interpreted algebraically, geometrically, and in terms of problem contexts. ● The number of solutions to a system of equations can vary from no solution to an infinite number of solutions. ● An algebraic expression is variables and numbers combined by operations and can be represented by equivalent forms (such as combining like terms). ● The properties of real numbers are true for algebraic as well as numeric expressions. ● Expressions can be written using numeric values or variables. ● Relations show any correspondence between sets, while functions show *predictable* relations between sets. ● Linear functions are defined by constant slope. ● Written descriptions, tables, graphs, and equations are useful in representing and investigating relationships between varying quantities.	● How do you decide which method would be easier to use for finding the solution for a system of equations? ● How can you use systems of equations to solve real-world problems and interpret the results? ● How does an algebraic solution differ from a graphic solution in a real-life situation? ● How can I interpret the meaning of a "system of equations" algebraically and geometrically? ● How does mathematical notation indicate that equations are to be treated as a system? ● What does it mean to solve a system of linear equations? ● How can the solution to a system be interpreted geometrically? ● How can I recognize how many solutions a system of equations has prior to solving? ● How can I translate a problem situation into a system of equations? ● What does the solution to a system tell me about the answer to a problem situation? ● What is an algebraic expression? ● How are various properties used in order to simplify, evaluate, and expand algebraic expressions? ● Are there other forms of expressions that can illustrate the problem? ● How can I determine the rule that produces the output from the given input? ● How can I identify a function? ● How can I tell the difference between a relation and a function? ● Which tells me more about the relationship I am investigating – a table, a graph, or an equation? Why?

Differentiation and Accommodations	District/School Primary and Supplementary Resources

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● Provide graphic organizers ● Provide additional examples and opportunities for additional problems for repetition ● Provide tutoring opportunities ● Provide retesting opportunities after remediation (up to teacher and district discretion) ● Teach for mastery not test ● Teaching concepts in different modalities ● Adjust pace and homework assignments	● Prentice Hall Course 3 Mathematics Common Core Textbook ● IXL ● Teacher created materials

Instructional Strategies

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- Communicating with students
- Using questioning and discussion techniques
- Engaging students in learning
- Using assessment in instruction
- Demonstrating Flexibility and Responsiveness

Common Misconceptions	Proper Conceptions
Students confuse whether to add/subtract or multiply/divide first when solving 2-step equations	Add/subtract first; multiply/divide second
Students get confused when combining like terms	Only combine terms that have the same variable
Students get confused when moving a term from one side of the equal sign to the other	Be aware of the terms' sign before moving it (using inverse operation)

Performance Task

Tracey has two paintings in her portfolio and paints three more each week. Lisa has twelve paintings in her portfolio and paints two more each week. After how many weeks will Tracey and Lisa have the same number of paintings?

- Write an equation to represent the situation.
- Solve the equation.
- Work must be shown.
- Explain how you used inverse operations to solve the equation.

Rubric

When used as a quiz grade (based on 100%), each bullet would be worth 25 points for a correct answer.

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

Unit 3 Grade 8 Pythagorean Theorem, transformations		
Content Standards	**Suggested Standards for Mathematical Practice**	**Transfer**
● 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 $\sqrt{2}$ is irrational. ● 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.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): ● Square root and cube roots; perfect squares and perfect cubes ● Inverse relationship between powers and square roots Students are able to: ● give the value of square roots of small perfect squares. ● solve equations of the form $x^2 = p$, where p is a positive rational number. ● use the square root symbol to represent solutions to equations of the form $x^2 = p$. ● give the value of cube roots of small perfect cubes. ● solve equations of the form $x^3 = p$, where p is a positive rational number. ● use the cube root symbol to represent solutions to equations of the form $x^3 = p$. ● show or explain that $\sqrt{2}$ is an irrational number.

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

		● use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems. Learning Goal 1: Evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square 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; identify $\sqrt{2}$ as irrational. Learning Goal 2: Apply the formula for the volume of a cone, a cylinder, or a sphere to find a single unknown dimension when solving real-world and mathematical problems.
● 8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse.	MP.2 Reason abstractly and quantitatively.	Concept(s): ● Pythagorean Theorem ● If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle (Pythagorean theorem converse). Students are able to: ● given a proof of the Pythagorean theorem, explain the proof. ● given a proof of the converse of the Pythagorean theorem, explain the proof. Learning Goal 3: Explain a proof of the Pythagorean Theorem and its converse.
● 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.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: ● determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces. ● determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces. Learning Goal 4: Apply the Pythagorean Theorem to determine unknown side lengths

		of right triangles in two and three dimensional cases when solving real-world and mathematical problems.
• 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: • determine the distance between two points in a coordinate plane by drawing a right triangle and applying the Pythagorean Theorem. Learning Goal 5: Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.
• 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: 8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length. 8.G.A.1b. Angles are transformed to angles of the same measure. 8.G.A.1c. Parallel lines are transformed to parallel lines.	MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • A property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged. Students are able to: • show and explain that performing rotations, reflections, and translations on lines results in a line. • show and explain that performing rotations, reflections, and translations on line segments results in a line segment and does not alter the length of the line segment. • show and explain that performing rotations, reflections, and translations on angles results in an angle and does not alter the measure of the angle. • show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines. • explain that a property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged. Learning Goal 6: Explain and model the properties of rotations, reflections, and translations with physical representations and/or geometry software using pre-images and resultant images of lines, line

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		segments, and angles.
● 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.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): ● 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. Students are able to: ● given two congruent figures, describe a transformation or sequence of transformations that shows the congruence between them. Learning Goal 7: Describe and perform a sequence of rotations, reflections, and/or translations on a two dimensional figure in order to prove that two figures are congruent.
● 8.G.A.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning. of others. MP.5 Use appropriate tools strategically.	Concept(s): No new concept(s) introduced Students are able to: ● describe, using coordinates, the resulting two-dimensional figure after applying dilations with scale factor greater than, less than, and equal to 1. ● describe, using coordinates, the resulting two-dimensional figure after applying translation, rotation, and reflection. Learning Goal 8: Use the coordinate plane to locate images or pre-images of two-dimensional figures and determine the coordinates of a resultant image after applying dilations, rotations, reflections, and translations.
● 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	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): ● 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. ● Congruent figures are also similar.

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

exhibits the similarity between them.		Students are able to: ● describe a transformation or sequence of transformations that show the similarity between them given two similar two-dimensional figures. Learning Goal 9: Apply an effective sequence of transformations to determine that figures are similar when corresponding angles are congruent and corresponding sides are proportional. Write similarity statements based on such transformations.
● 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. *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.*	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning. of others.	Concept(s): No new concept(s) introduced Students are able to: ● give informal arguments to establish facts about the angle sum of triangles. ● give informal arguments to establish facts about exterior angles of triangles. ● give informal arguments to establish facts about the angles created when parallel lines are cut by a transversal. ● give informal arguments to establish the angle-angle criterion for similarity of triangles. Learning Goal 10: Give informal arguments to justify facts about the exterior angles of a triangle, the sum of the measures of the interior angles of a triangle, the angle-angle relationship used to determine similar triangles, and the angles created when parallel lines are cut by a transversal.

District/School Formative Assessment Plan	District/School Summative Assessment Plan
● Teacher-Created Assessments ● Homework ● Classwork ● UDL's ● whiteboard activities ● IXL ● Problem of the Day	● Chapter Tests ● Unit Tests ● EdConnect Assessments

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

• Exit Ticket	

Focus Mathematical Concepts

Vocabulary		Instruction and Pacing	
Coordinate Plane Axes Origin Quadrant Horizontal Vertical Translation Reflection Rotation Dilation Proportion	Similar Figures Complementary Angles Supplementary Angles Vertical Angles Adjacent Angles Corresponding Angles Alternate Interior Angles Alternate Exterior Angles Square root Cube root Leg Hypotenuse	Pretest	1 day
		Square roots & cube roots	1 week
		Volume of 3-d figures	2 weeks
		Pythagorean Theorem	2 weeks
		Transformations	2 weeks
		Angles	2 weeks

ENDURING UNDERSTANDING	ESSENTIAL QUESTIONS
• Use two-dimensional figure is congruent to another if the second can be obtained by a series of transformations. • Transformations of a two-dimensional figure on the coordinate plane will involve a change in coordinates. • Dilation is a transformation that changes the size of a figure, but not the shape. • If the second figure can be obtained from the first by a sequence of transformations, they are similar. • Use informal arguments to establish facts about the angle sum and exterior angles of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle relationship used to identify similar triangles. • There are many relationships between the lengths of the sides of a right	• How can you verify experimentally and apply the properties of transformations to prove that two- dimensional figures are congruent? • How can you describe the effect of transformations on two-dimensional figures using coordinates? • What is dilation and how does this transformation affect a figure in the coordinate plane? • How can you determine if a two-dimensional figure is similar to another a transformation? • How can you justify facts about the angle sum and exterior angles of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle relationship used to identify similar triangles? • What is the Pythagorean Theorem and when does it apply in real life?

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

triangle.	

Differentiation and Accommodations	District/School Primary and Supplementary Resources
● Provide graphic organizers ● Provide additional examples and opportunities for additional problems for repetition ● Provide tutoring opportunities ● Provide retesting opportunities after remediation (up to teacher and district discretion) ● Teach for mastery not test ● Teaching concepts in different modalities ● Adjust pace and homework assignments	● Prentice Hall Course 3 Mathematics Common Core Textbook ● IXL ● Teacher created materials

Instructional Strategies

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Common Misconceptions	**Proper Conceptions**
To find the leg (a) of a right triangle, you square side b and c and add their values	To find the leg (a) of a right triangle, you square side b and c and subtract their values.
Complementary angles have a sum of 90 degrees, not 180 degrees.	Complementary angles have a sum of 90 degrees.
Supplementary angles have a sum of 180 degrees, not 90 degrees.	Supplementary angles have a sum of 180 degrees.

Performance Task

ΔABC has coordinates A(1,2), B(2, 5), and C(3, 1).

- **On a coordinate plane, graph ΔABC and its image after a translation 6 units to the left.**
- **On the same coordinate plane, graph the image of ΔA'B'C' after a reflection over the x-axis.**
- **On the same coordinate plane, graph the image of ΔA''B''C'' after a rotation of 90° about the origin.**
- **Explain the difference between a translation, a reflection, and a rotation.**

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

Rubric : When used as a quiz grade (based on 100%), each bullet would be worth 25 points for a correct answer.

Unit 4 Grade 8 – Statistics and Probability ; review linear functions/slope & system of equations		
Content Standards	**Suggested Standards for Mathematical Practice**	**Transfer**
● 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.	MP.3 Construct viable arguments and critique the reasoning. of others. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): ● Association in data (bivariate measurement data) Students are able to: ● construct and interpret scatter plots. ● analyze patterns of association between the two quantities represented in a scatter plot. ● describe clustering, outliers, positive or negative association, linear or non-linear association when explaining patterns of association in a scatter plot. Learning Goal 1: Construct and interpret scatter plots for bivariate measurement data and describe visual patterns of association (clusters, outliers, positive or negative association, linear association and nonlinear association, strong, weak, and no association).

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

• 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 (e.g. line of best fit) by judging the closeness of the data points to the line.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): • Straight lines are used to model *approximately* linear relationships between quantitative variables. Students are able to: • informally fit a line (of best fit) to a scatter plot that suggests a linear association. • informally assess the model's fit by judging the closeness of the data points to the line (line of best fit). Learning Goal 2: For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model's fit.
• 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.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: • given the equation for a linear model (line of best fit), interpret the slope and intercept. • given the equation for a linear model, solve problems in the context of measurement data. Learning Goal 3: Use a linear model (equation) representing measurement data to solve problems, interpreting the slope and intercept in the context of the situation.
• 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 table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): • Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies. Students are able to: • construct and interpret a two-way frequency table containing data on two categorical variables. • construct and interpret a two-way relative frequency table containing data

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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?*		on two categorical variables. ● describe any association between the two categorical variables using relative frequencies calculated for rows or columns. Learning Goal 4: Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables.
● 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.	MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concept(s): ● As with equations, two (x,y) values can be used to construct a function. Students are able to: ● construct a function in order to model a linear relationship. ● interpret the rate of change and initial value of a linear function in context. Learning Goal 5: Model a linear relationship by constructing a function from two (x,y) values. Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values.
● 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. ● 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: ● determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems in two and three dimensions. ● determine the distance between two points in a coordinate plane by applying the Pythagorean Theorem. Learning Goal 6: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems and to determine the distance between two points in the coordinate plane.

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● 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations. 8.EE.C.8c. 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.*	MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.1 Make sense of problems and persevere in solving them. MP.7 Look for and make use of structure.	Concept(s): ● Simultaneous linear equations may have an infinite number of solutions. ● Simultaneous linear equations may have no solution or a single solution. ● Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs. Students will be able to: ● solve systems of two linear equations in two variables algebraically. ● estimate solutions of a linear system of two equations by graphing. ● solve simple cases of a linear system of two equations by inspection. ● solve real-world and mathematical problems leading to two linear equations in two variables. Learning Goal 7: Solve real world and mathematical problems leading to two linear equations in two variables, interpreting solutions in context.

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Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

Focus Mathematical Concepts

Vocabulary		Instruction and Pacing	
Frequency table Scatter plot Correlation/ Trend (Positive, negative, none) Line of best fit Slope Function Pythagorean theorem System of equations		Pretest	1 day
		Scatterplot	1 week
		Line of best fit in scatterplots	1 week
		Slope of line of best fit	1 week
		Frequency tables	1 week
		Review functions	1 week
		Review Pythagorean theorem Review system of equations	1 week 1 week

ENDURING UNDERSTANDING	ESSENTIAL QUESTIONS
● Slope is a rate of change for a set of data or a linear graph. ● Linear functions are defined by constant slope. ● Collecting and examining data can sometimes help one discover patterns in the way in which two quantities vary. ● Written descriptions, tables, graphs, and equations are useful in representing and investigating relationships between varying quantities. ● Different representations (written descriptions, tables, graphs, and equations) of the relationships between varying quantities may have different strengths and weaknesses. ● Solving problems involving linear relationships requires gathering data. ● A scatter plot's best fit line is used to make predictions for data not on the line or table. ● Memorizing formulas aids in efficient problem solving. ●	● For a given set of data or a graph, how can units of measurement help us explain the meaning of slope? ● What are the different ways to graph linear equations? ● How do coordinate graphs demonstrate solutions and non-solutions of equations with two variables? ● What does the graphical data tell me? ● What is the relationship between the x- and y- axis in any given situation? ● How does a change in one variable affect the other variable in a given situation? ● Which tells me more about the relationship I am investigating – a table, a graph, or an equation? Why? ● What strategies can I use to help me understand and represent real situations involving linear relationships? ● How will applying appropriate measurement techniques, tools, and formulas help solve geometric problems efficiently? ● How does fluency with formulas improve accuracy and speed in solving problems?

Differentiation and Accommodations	District/School Primary and Supplementary Resources
● Provide graphic organizers ● Provide additional examples and opportunities for additional problems	● Prentice Hall Course 3 Mathematics Common Core Textbook ● IXL

Key: Major Clusters | Supporting | Additional Clusters | * Benchmarked Standard

for repetition ● Provide tutoring opportunities ● Provide retesting opportunities after remediation (up to teacher and district discretion) ● Teach for mastery not test ● Teaching concepts in different modalities ● Adjust pace and homework assignments	● Teacher created materials

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Common Misconceptions	Proper Conceptions
Students confuse the x-axis and the y-axis.	The x-axis is horizontal and the y-axis is vertical.
Students confuse positive, negative, and no correlations	Positive correlations rise from the left to the right. Negative correlations decline from the left to the right. No correlations are scattered.

Performance Task

The class will participate in a survey during which each student will tell their height and shoe size.

- Students will record this data in a table.
- Students will use this data to construct a scatter plot.
- Students will title their scatter plot and label the axes.
- Students will explain what type of correlation is shown in their scatter plot.

Rubric

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